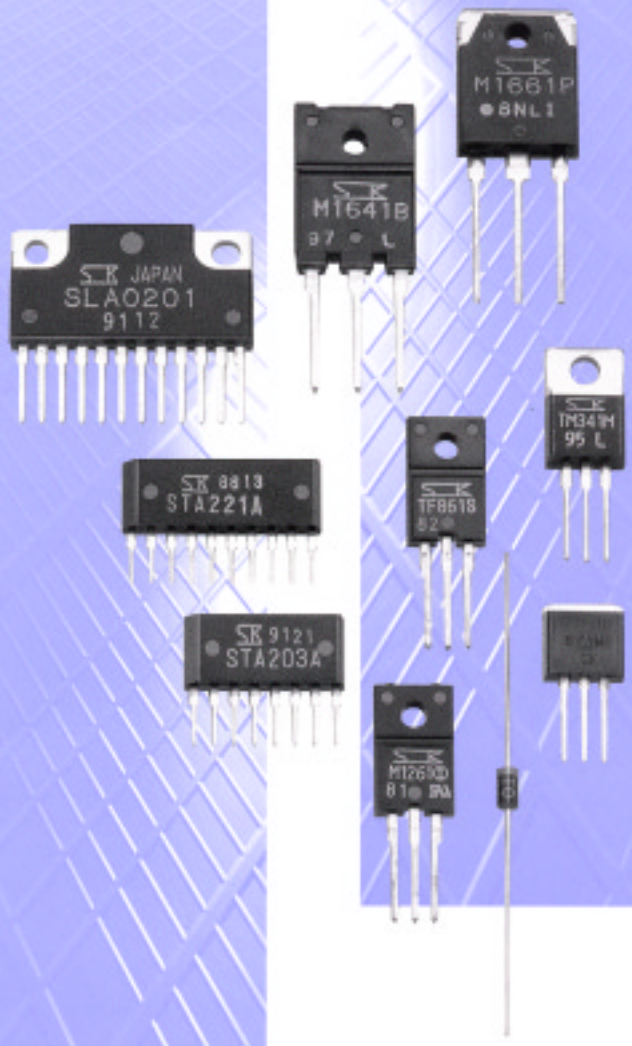
Bulletin No.
D03ED0
(Oct., 2001)

THYRISTORS & TRIACS



SANKEN ELECTRIC CO.,LTD.

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- Anti radioactive ray design is not considered for the products listed herein.
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CONTENTS

Notes regarding Storage, Characteristics inspection, and Handling precautions

Since reliability can be affected adversely by improper storage environment and handling methods during Characteristic tests, please observe the following cautions.

(a) Cautions for Storage

1. Ensure that storage conditions comply with the standard temperature (5 to 35°C) and the standard relative humidity (around 40 to 75%) and avoid storage locations that experience extreme changes in temperature or humidity.
2. Avoid direct sunlight, and locations where dust or harmful gases are present.
3. Reinspect the product, which have been stored for a long time, for rust in leads and solderability.

(b) Cautions for Characteristic Tests and Handling

1. When characteristic tests are carried out on a product during an incoming inspection and other standard inspections, protect the product from surges of power from the test equipment, shorts between terminals, and faulty connections. Avoid testing that exceeds standard ratings.

(c) Silicone Grease

When silicone grease is used for mounting a product on a heat sink it should be applied on the product's back side and on both sides of the insulating plate in a thin and even way. Depending on the kinds of silicone grease, base oil permeates into the product, resulting in shortening product's service life. Therefore, careful selection should be made.

Recommended Silicone Grease

- **●G-746** Shin-Etsu Chemical Co.,Ltd.
- **●YG6260** GE Toshiba Silicones Co.,Ltd.
- **●SC102** Dow Corning Toray Silicone Co.,Ltd.

(d) Fastening Torque

When fastening torque is lower than recommended, thermal resistance increases and radiation effects decrease. On the contrary, when it is too high, the screw might be cut down and / or the heat sink might be deformed. As a result of that, distortion of the product's frame could arise. In order to avoid these problems, recommended fastening torque for each product type is shown in the following.

●Fastening Torque

Package	Fastening Torque
MT-25 (TO-220)	0.490 to 0.686N・m (5 to 7kgf・cm)
FM20 (TO-220F)	
MT-100 (TO-3P)	0.686 to 0.882N・m (7 to 9kgf・cm)
FM100 (TO-3PF)	

* When the surface of the heatsink where the Full Mold package is to be mounted is not flat and/or burrs exist around the mounting hole of the heatsink, the resin of the package might be cracked even if the torque is lower than the recommended value.

* When a screw is fastened with an air driver for the Full Mold package, a large impact is generated at the time of stop, and the resin may crack even if the torque is lower than the recommended value. An electric driver, therefore, should be used instead of an air driver.

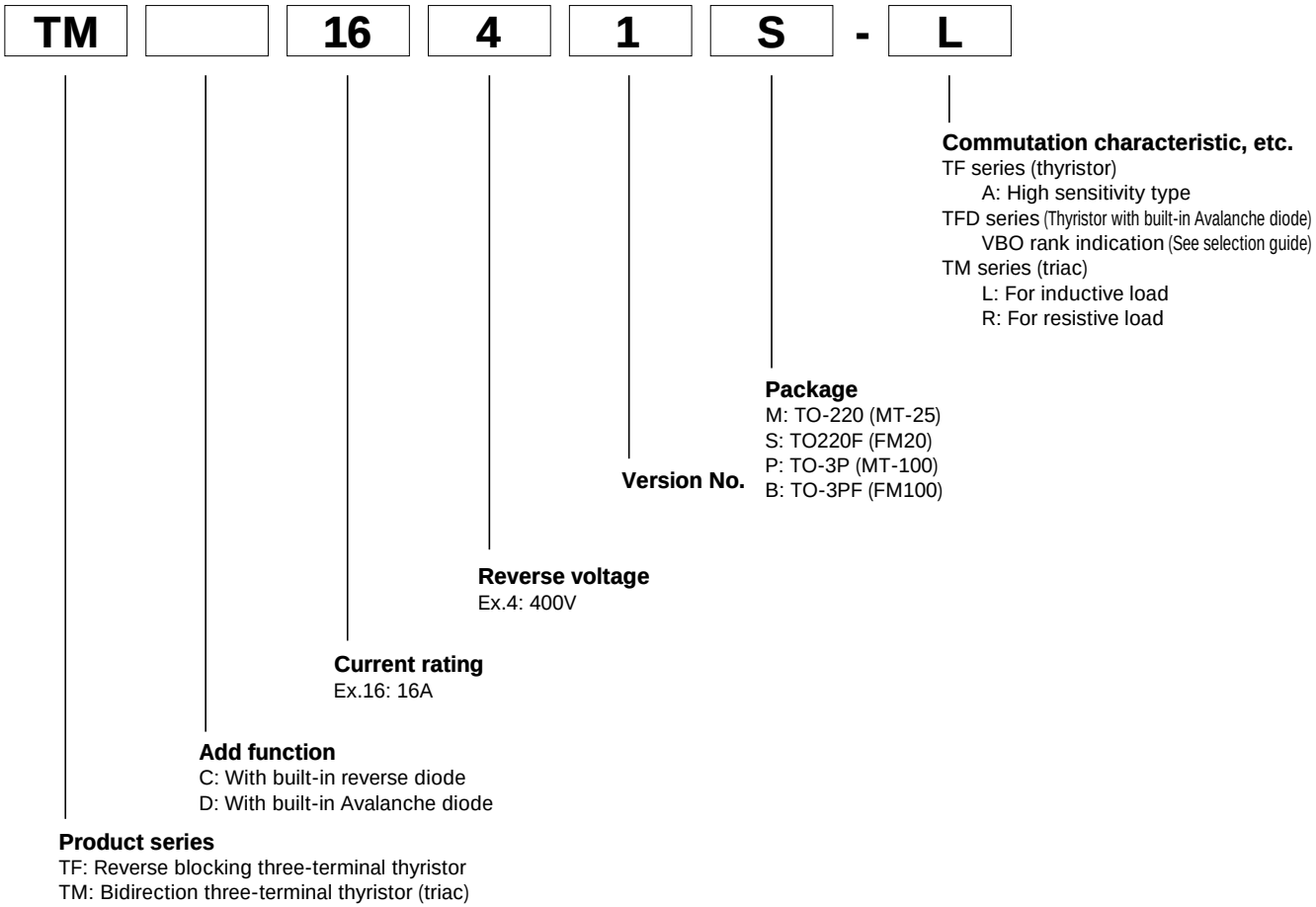
(e) Soldering Temperature

In general, the product is subjected to high temperature when it is mounted on the printed circuit board, mainly whether by either flow solder from a Solderbath or manual soldering with a soldering iron. The testing method and conditions (JIS-C-7021 standards) for the product's heat resistance during soldering are:

"Apply 260°C for 10 seconds, and 350°C for 3 seconds at a distance of 1.5mm from the product's body." It is highly recommended soldering in as short a time as possible under the conditions.

Part-Numbering Systems (except for Array and PNPN Switch)

■Ex. TM1641S-L



Selection Guide

Thyristors

Type	Rated Current	Reverse Voltage			Gate trigger current I_{GT} (mA) max	Package	Page
		200V	400V	600V			
General purpose	3A	TF321M	TF341M	TF361M	10	TO-220	6
		TF321S	TF341S	TF361S	15	TO-220F	8
	5A	TF521M	TF541M	TF561M	15	TO-220	10
		TF521S	✻TF541S	✻TF561S	15	TO-220F	12
	8A	TF821M	TF841M	TF861M	15	TO-220	14
		TF821S	✻TF841S	✻TF861S	15	TO-220F	16
High sensitivity	3A	TF321M-A	TF341M-A	TF361M-A	0.1	TO-220	18
	5A	—	TF541S-A	TF561S-A	0.2	TO-220F	20
Array	5A×4 circuits	—	—	SLA0201	10	SLA12Pin	22

✻UL approved type available

Thyristor with built-in reverse diode for HID lamp ignition

V_{DRM} (V)	I_{TRM} (A)	di/dt	Part number	Package	Page
600	430	1200A/μs	TFC561D	TO-220F	24

Thyristor with built-in Avalanche diode

V_{BO} (V)	V_{DRM} (V)	Part number	$I_{T(AV)}$ (A)	Package	Page
30±3	20	TFD312S-C	3	TO-220F	26
55±5	35	TFD312S-F			
65±5	45	TFD312S-G			
100±10	80	TFD312S-J			
125±10	100	TFD312S-K			
150±10	120	TFD312S-L			
175±12	145	TFD312S-M			
200±15	170	TFD312S-N			
225±15	190	TFD312S-O			

Triacs (Bidirection three-terminal thyristor)

Type	Rated Current	Reverse Voltage		Gate trigger current I_{GT} (mA) max	Package	Page
		400V	600V			
For inductive load	3A	TM341M-L	TM361M-L	20	TO-220	28
		✻TM341S-L	✻TM361S-L	20	TO-220F	30
	5A	TM541M-L	TM561M-L	20	TO-220	32
		✻TM541S-L	✻TM561S-L	20	TO-220F	34
	8A	TM841M-L	TM861M-L	30	TO-220	36
		✻TM841S-L	✻TM861S-L	30	TO-220F	38
	10A	✻TM1041S-L	✻TM1061S-L	30	TO-220F	40
	12A	✻TM1241S-L	✻TM1261S-L	30	TO-220F	42
	16A	✻TM1641S-L	✻TM1661S-L	30	TO-220F	44
		TM1641P-L(L)	TM1661P-L(L)	30	TO-3P	46
		✻TM1641B-L	✻TM1661B-L	30	TO-3PF	48
	25A	✻TM2541B-L	✻TM2561B-L	30	TO-3PF	50
For resistive load	3A	✻TM341S-R	✻TM361S-R	12	TO-220F	52
	5A	✻TM541S-R	✻TM561S-R	12	TO-220F	54
	10A	✻TM1041S-R	✻TM1061S-R	7	TO-220F	56
	12A	✻TM1241S-R	✻TM1261S-R	8	TO-220F	58
Array	1.2A×3 circuits	STA203A	—	3	STA8Pin	60
	1.0A×4 circuits	STA221A	—	3	STA10Pin	62

✻UL approved type available

PNPN Swich

V_{BO} (V)	V_{DRM} (V)	Part number	$I_{T(RMS)}$ (A)	Package	Page
120 to 138	90	ET013	0.6	Axial	66
133 to 147	115	ET014			
142 to 157	115	ET015			
190 to 170	170	ET020			

Index by Part Number

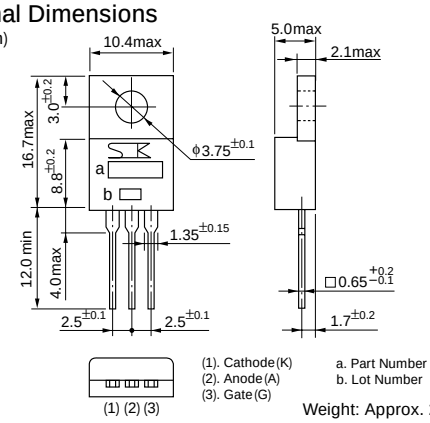
TO-220 3A Thyristor

TF321M / TF341M / TF361M

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=3A
- ●Gate trigger current: I_{GT}=10mA max

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

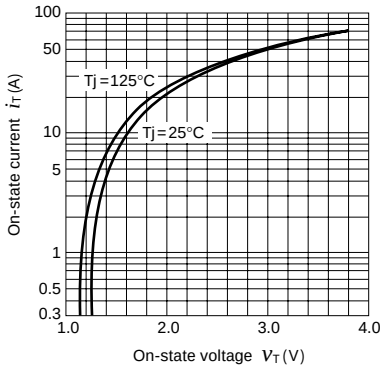
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF321M	TF341M	TF361M		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	3.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=102°C
RMS on-state current	$I_{T(RMS)}$	4.7			A	
Surge on-state current	I_{TSM}	60			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	

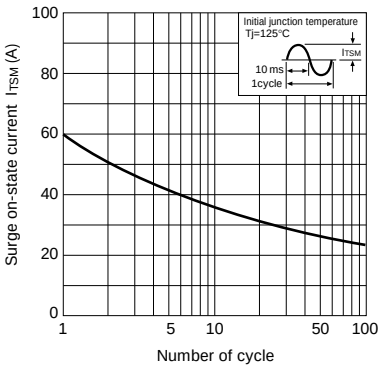
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=5A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		2.0	10	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			3.0	°C/W	Junction to case

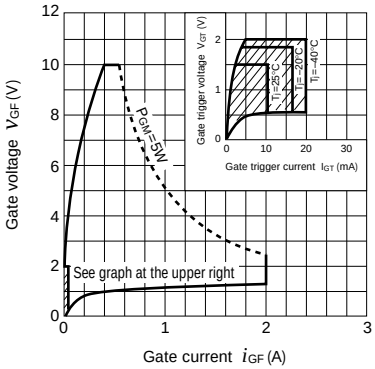
$v_T - i_T$ Characteristics (max)



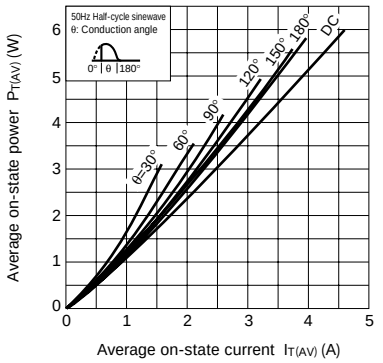
I_{TSM} Ratings



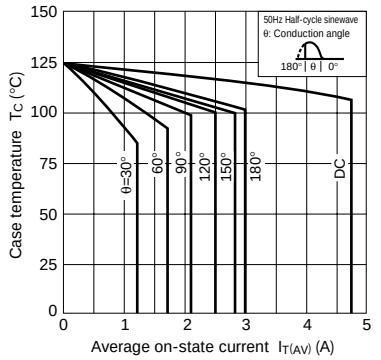
Gate Characteristics



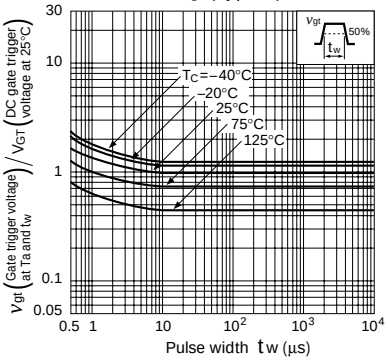
$I_{T(AV)} - P_{T(AV)}$ Characteristics



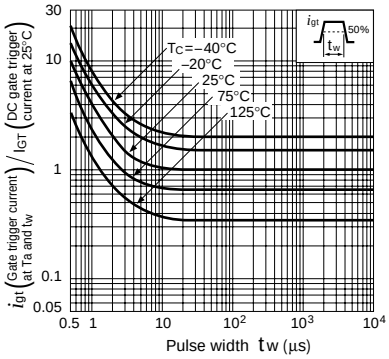
$I_{T(AV)} - Tc$ Ratings



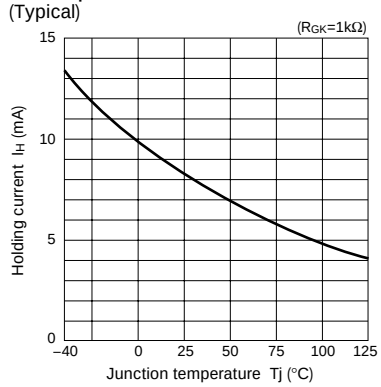
Pulse trigger temperature Characteristics v_{gt} (Typical)



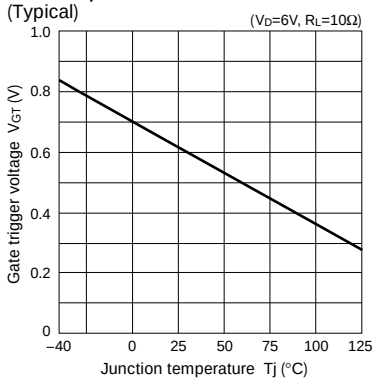
Pulse trigger temperature Characteristics i_{gt} (Typical)



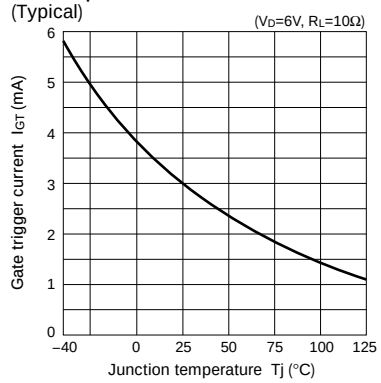
I_H temperature Characteristics (Typical)



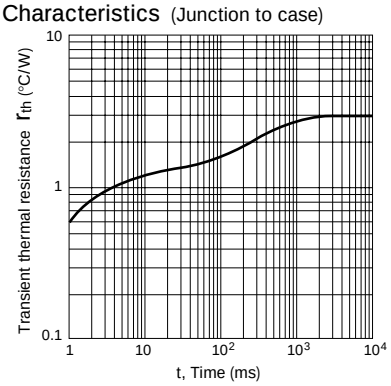
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



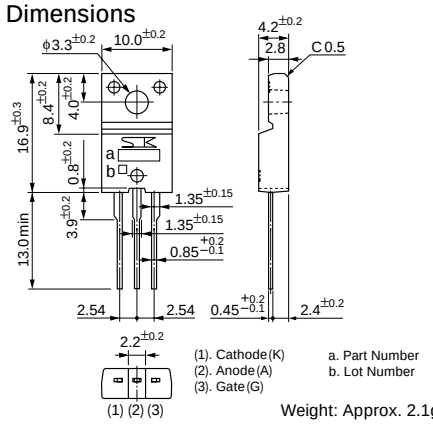
TO-220F 3A Thyristor

TF321S, TF341S, TF361S

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=3A
- ●Gate trigger current: I_{GT}=15mA max
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF321S	TF341S	TF361S		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	3.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=93°C
RMS on-state current	$I_{T(RMS)}$	4.7			A	
Surge on-state current	I_{TSM}	60			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	
Isolation voltage	V_{ISO}	1500			V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=5A
Gate trigger voltage	V_{GT}		0.7	1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		3.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		5.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			5.0	°C/W	Junction to case

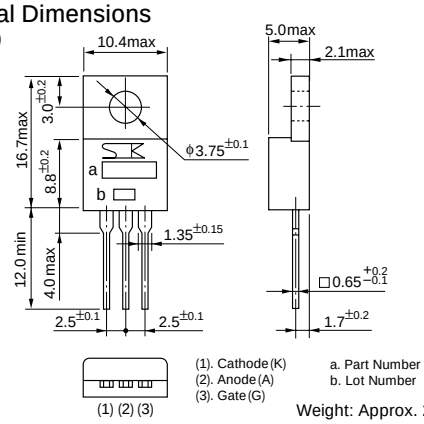
TO-220 5A Thyristor

TF521M, TF541M, TF561M

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=5A
- ●Gate trigger current: I_{GT}=15mA max

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

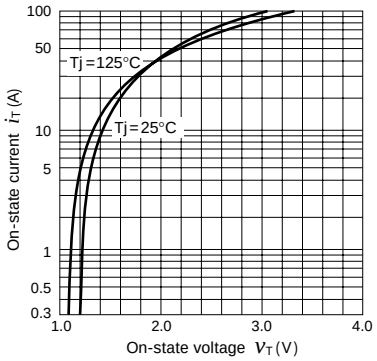
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF521M	TF541M	TF561M		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	5.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=96°C
RMS on-state current	$I_{T(RMS)}$	7.8			A	
Surge on-state current	I_{TSM}	80			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	

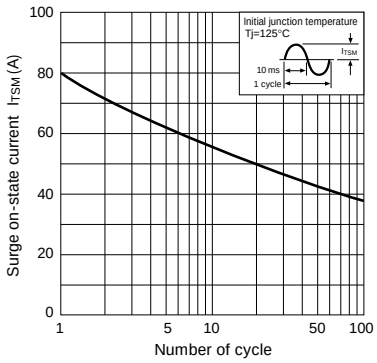
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=10A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		3.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			3.0	°C/W	Junction to case

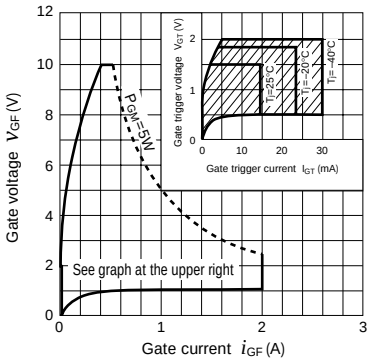
$v_T - i_T$ Characteristics (max)



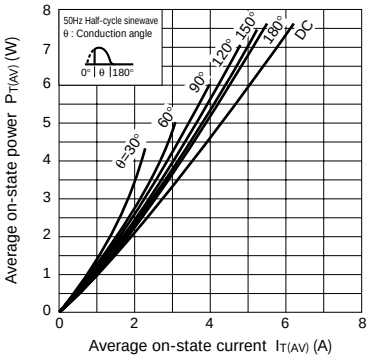
I_{TSM} Ratings



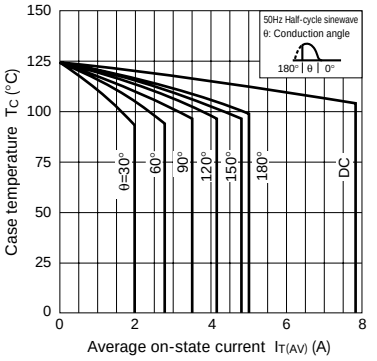
Gate Characteristics



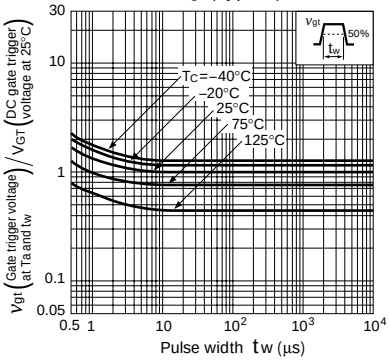
$I_{T(AV)} - P_{T(AV)}$ Characteristics



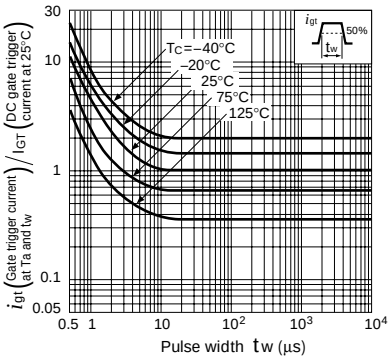
$I_{T(AV)} - T_C$ Ratings



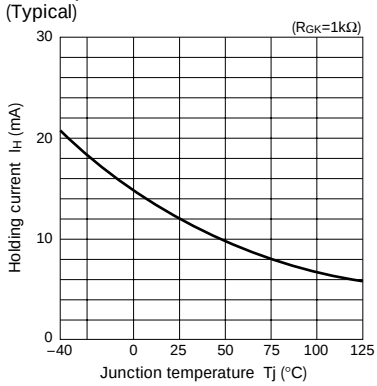
Pulse trigger temperature Characteristics v_{gt} (Typical)



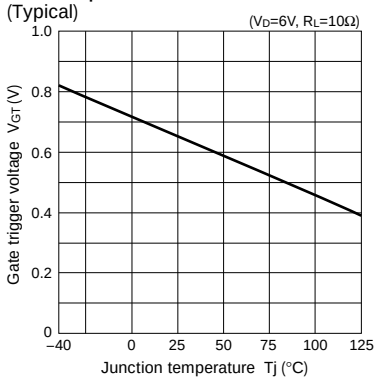
Pulse trigger temperature Characteristics i_{gt} (Typical)



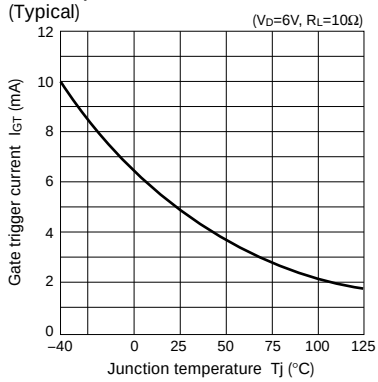
I_H temperature Characteristics (Typical)



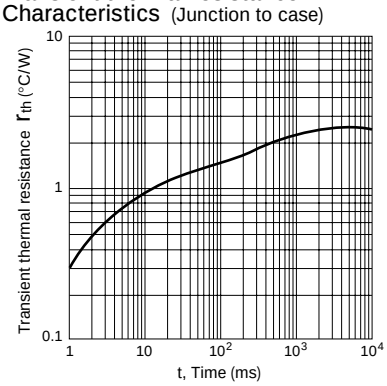
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



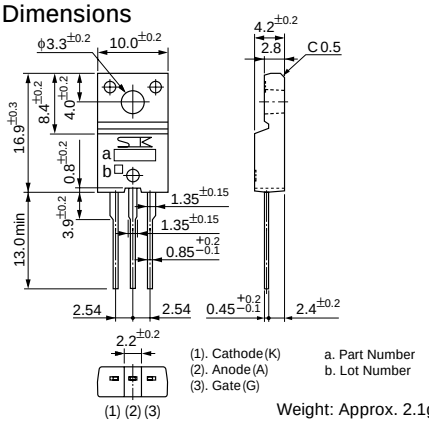
TO-220F 5A Thyristor

TF521S, TF541S, TF561S

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=5A
- ●Gate trigger current: I_{GT}=15mA max
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

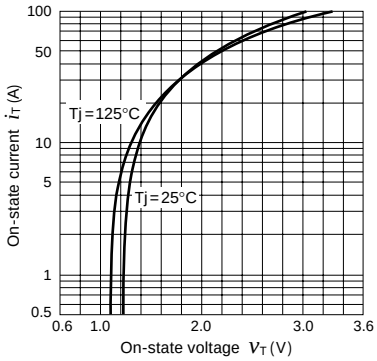
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF521S	TF541S	TF561S		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	5.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=87°C
RMS on-state current	$I_{T(RMS)}$	7.8			A	
Surge on-state current	I_{TSM}	80			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	
Isolation voltage	V_{ISO}	1500			V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

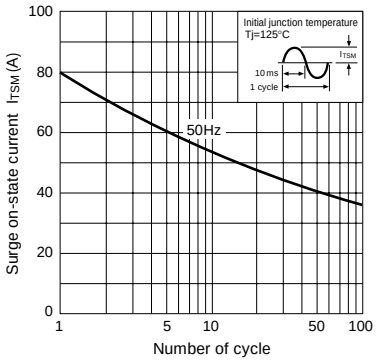
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=10A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		3.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			4.0	°C/W	Junction to case

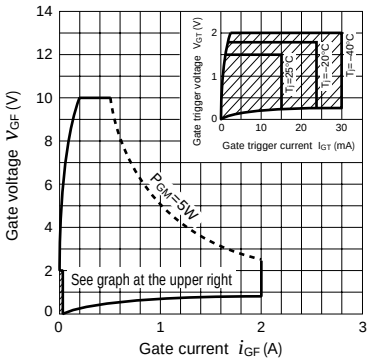
$v_T - i_T$ Characteristics (max)



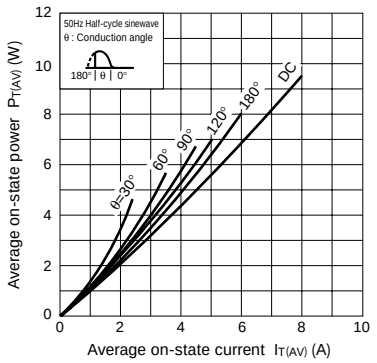
I_{TSM} Ratings



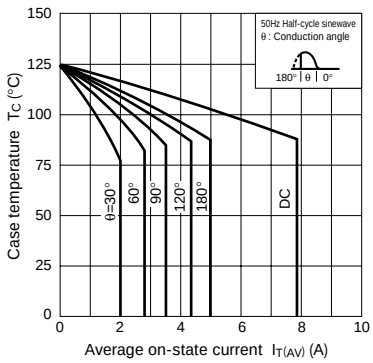
Gate Characteristics



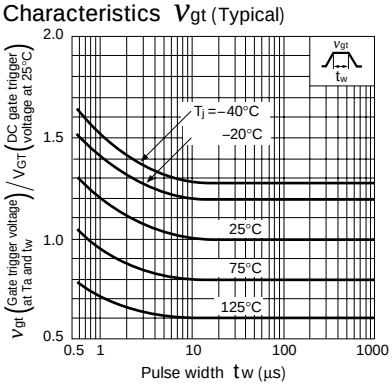
$I_{T(AV)} - P_{T(AV)}$ Characteristics



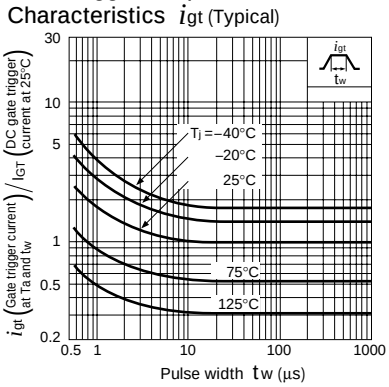
$I_{T(AV)} - Tc$ Ratings



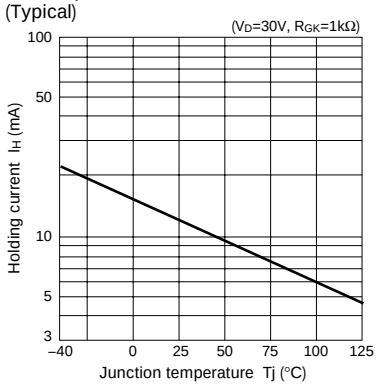
Pulse trigger temperature Characteristics V_{gt} (Typical)



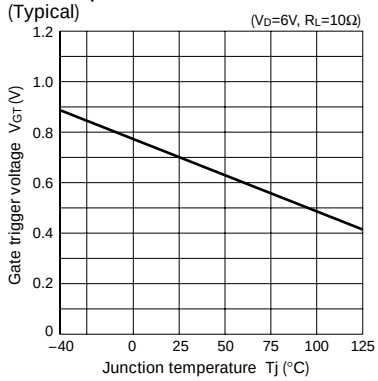
Pulse trigger temperature Characteristics i_{gt} (Typical)



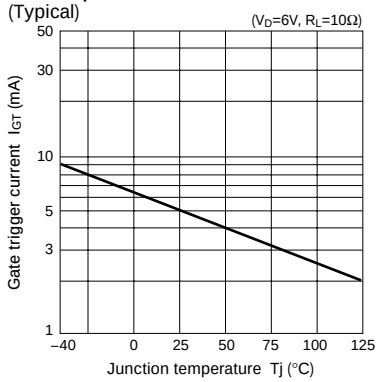
I_H temperature Characteristics (Typical)



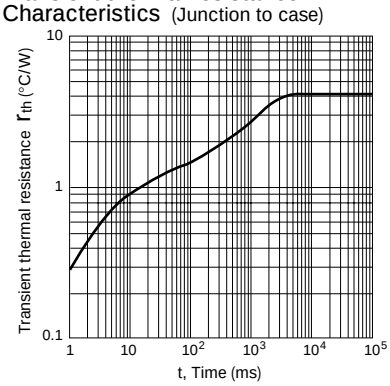
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



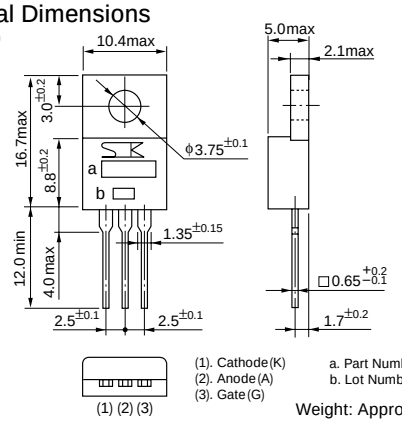
TO-220 8A Thyristor

TF821M, TF841M, TF861M

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=8A
- ●Gate trigger current: I_{GT}=15mA max

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

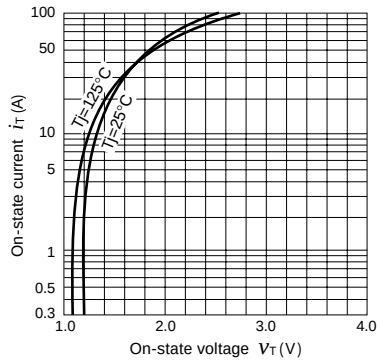
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF821M	TF841M	TF861M		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	8.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=83°C
RMS on-state current	$I_{T(RMS)}$	12.6			A	
Surge on-state current	I_{TSM}	120			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	

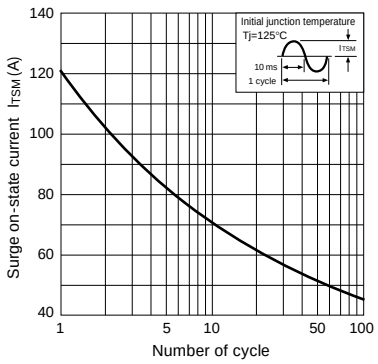
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=15A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		5.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			2.7	°C/W	Junction to case

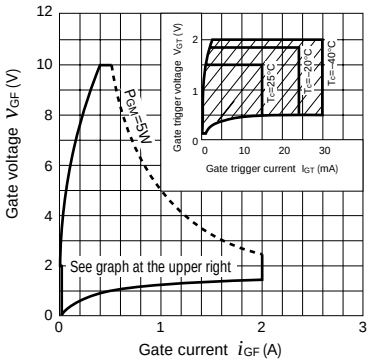
$v_T - i_T$ Characteristics (max)



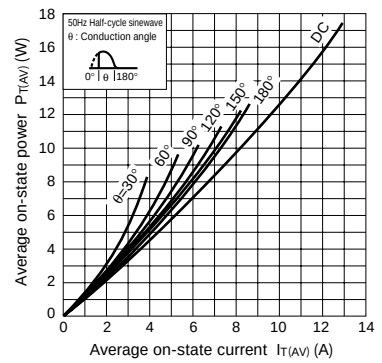
I_{TSM} Ratings



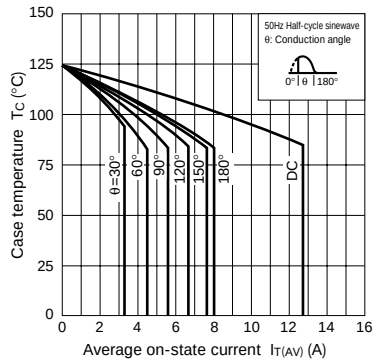
Gate Characteristics



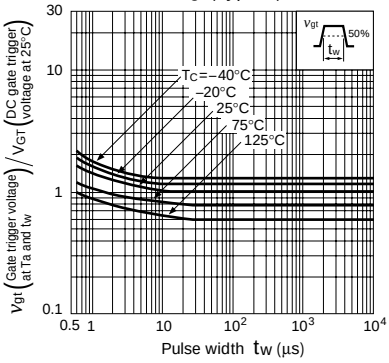
$I_{T(AV)} - P_{T(AV)}$ Characteristics



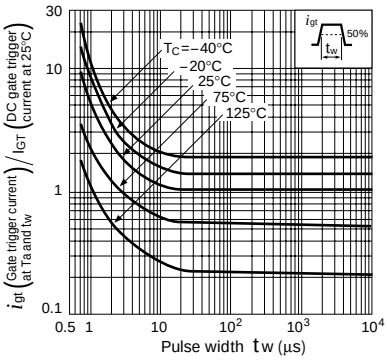
$I_{T(AV)} - Tc$ Ratings



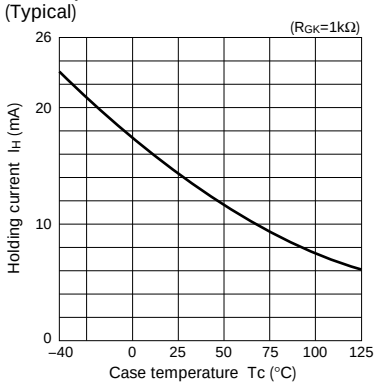
Pulse trigger temperature Characteristics v_{gt} (Typical)



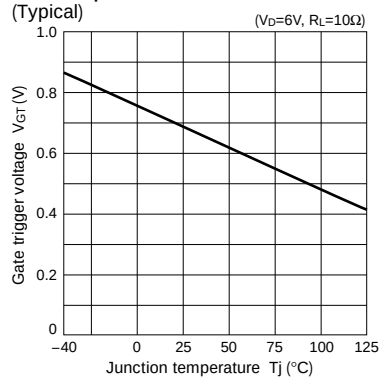
Pulse trigger temperature Characteristics i_{gt} (Typical)



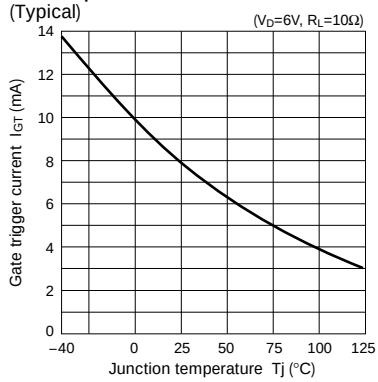
I_H temperature Characteristics (Typical)



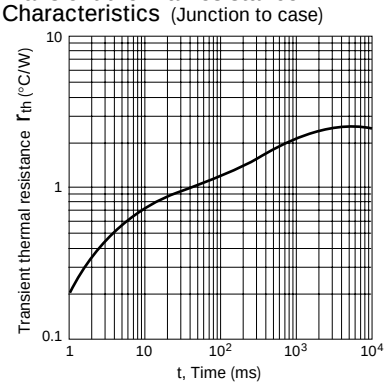
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



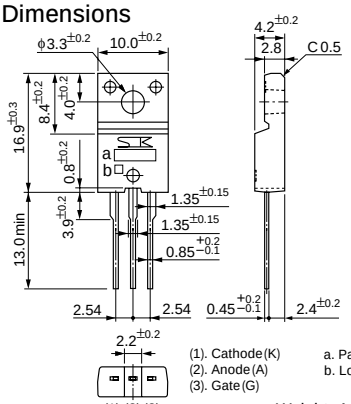
TO-220F 8A Thyristor

TF821S, TF841S, TF861S

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=8A
- ●Gate trigger current: I_{GT}=15mA max
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

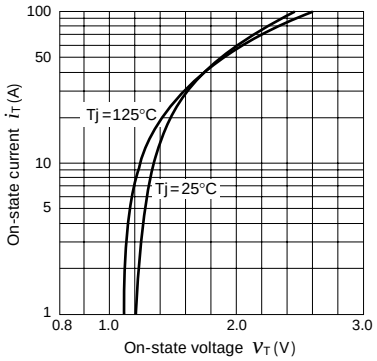
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF821S	TF841S	TF861S		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	8.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=87°C
RMS on-state current	$I_{T(RMS)}$	12.6			A	
Surge on-state current	I_{TSM}	120			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	
Isolation voltage	V_{ISO}	1500			V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

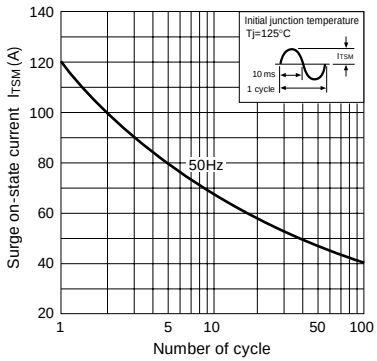
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=15A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		5.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			3.6	°C/W	Junction to case

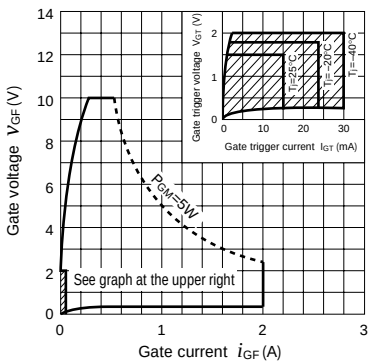
$v_T - i_T$ Characteristics (max)



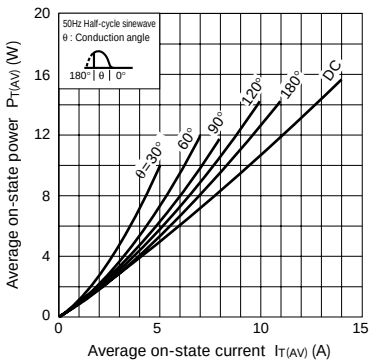
I_{TSM} Ratings



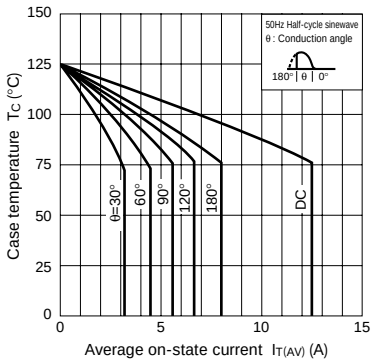
Gate Characteristics



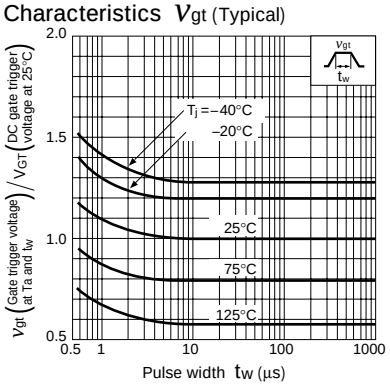
$I_{T(AV)} - P_{T(AV)}$ Characteristics



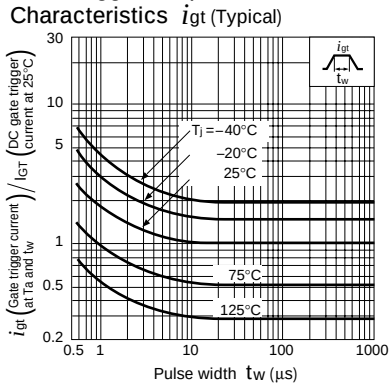
$I_{T(AV)} - Tc$ Ratings



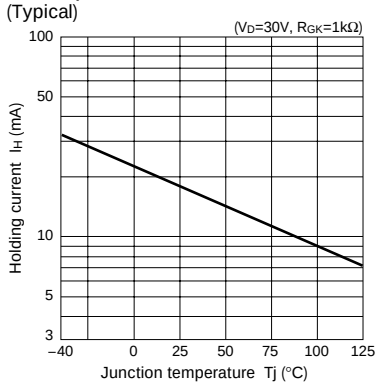
Pulse trigger temperature Characteristics V_{gt} (Typical)



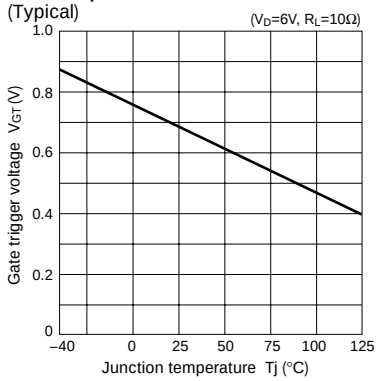
Pulse trigger temperature Characteristics i_{gt} (Typical)



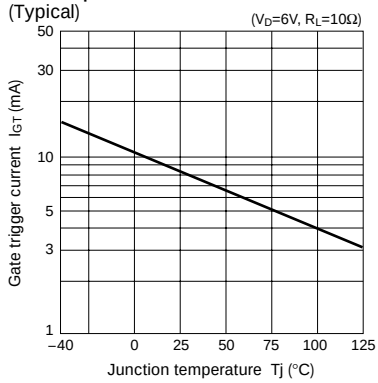
I_H temperature Characteristics (Typical)



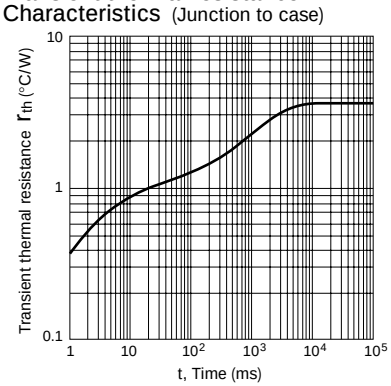
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



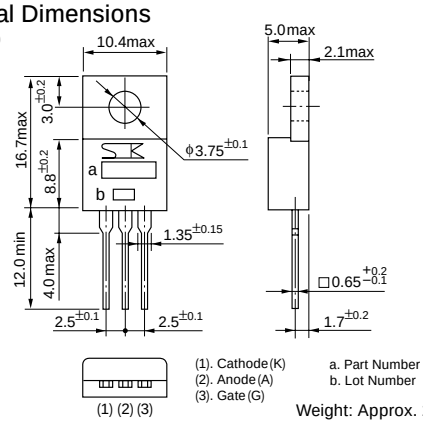
TO-220 3A High sensitive Thyristor

TF321M-A, TF341M-A, TF361M-A

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=200, 400, 600V
- ●Average on-state current: $I_{T(AV)}$=3A
- ●High sensitive Gate trigger Current: I_{GT}=0.1mA max

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

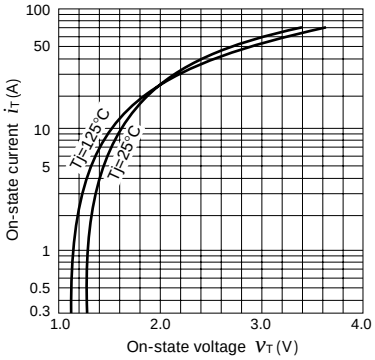
■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		TF321M-A	TF341M-A	TF361M-A		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	3.0			A	50Hz Half-cycle sinewave, Continuous current, Tc=87°C
RMS on-state current	$I_{T(RMS)}$	4.7			A	
Surge on-state current	I_{TSM}	60			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0			A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	f≧50Hz
Peak gate power loss	P_{GM}	5.0			W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	Tj	−40 to +110			°C	
Storage temperature	Tstg	−40 to +125			°C	

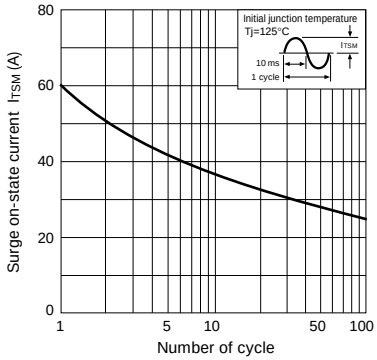
■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			1.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			1.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=5A
Gate trigger voltage	V_{GT}			1	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}			0.1	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		1.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		20		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			3.0	°C/W	Junction to case

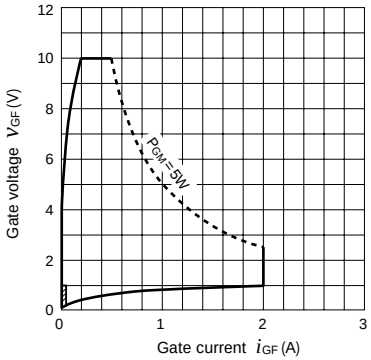
$v_T - i_T$ Characteristics (max)



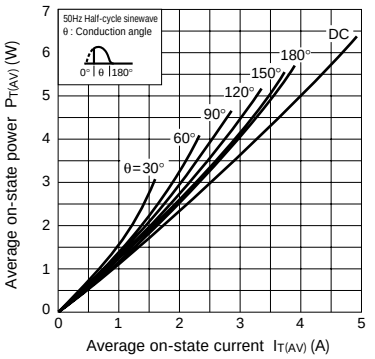
ITSM Ratings



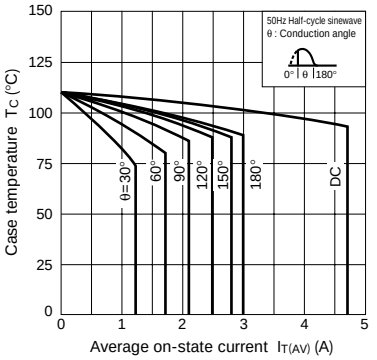
Gate Characteristics



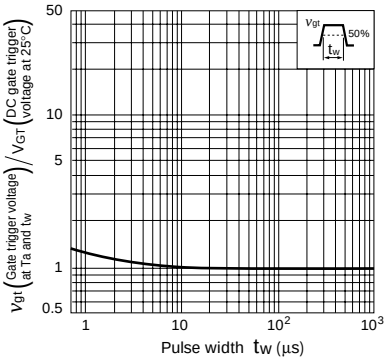
IT(AV) – PT(AV) Characteristics



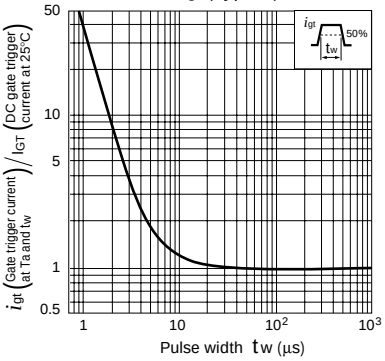
IT(AV) – Tc Ratings



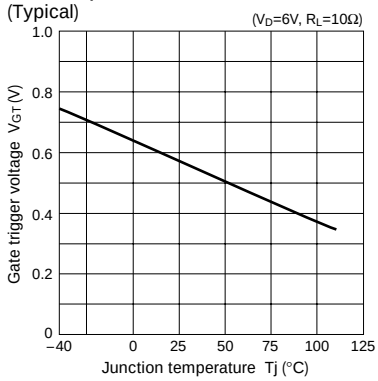
Pulse trigger temperature Characteristics v_{gt} (Typical)



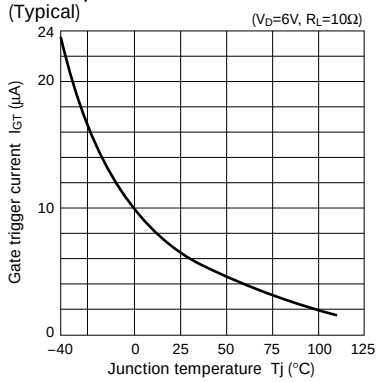
Pulse trigger temperature Characteristics i_{gt} (Typical)



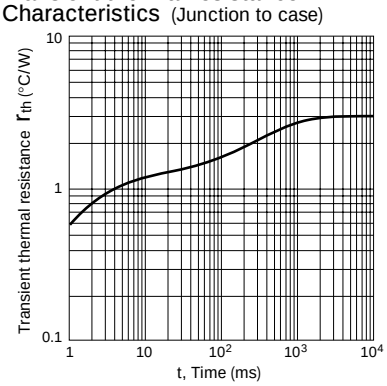
VGT temperature Characteristics (Typical)



IGT temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



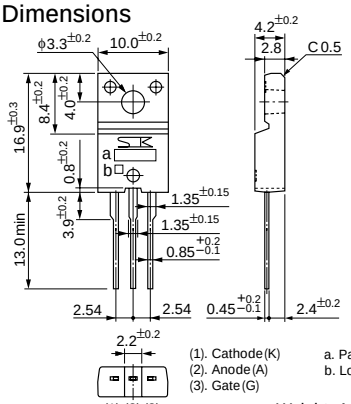
TO-220F 5A High sensitive Thyristor

TF541S-A,TF561S-A

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●Average on-state current: $I_{T(AV)}$=5A
- ●High sensitive Gate trigger current: I_{GT}=0.2mA max
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TF541S-A	TF561S-A		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	Tj=−40 to +125°C, R_{GK}=470Ω
Repetitive peak reverse voltage	V_{RRM}	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	500	700	V	
Average on-state current	$I_{T(AV)}$	5.0		A	50Hz Half-cycle sinewave, Continuous current, Tc=88°C
RMS on-state current	$I_{T(RMS)}$	7.8		A	
Surge on-state current	I_{TSM}	80		A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0		A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10		V	
Peak reverse gate voltage	V_{RGM}	5.0		V	f≧50Hz
Peak gate power loss	P_{GM}	5.0		W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=V_{DRM}(V_{RRM}), R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=10A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		0.03	0.2	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		20		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Turn-off time	tq		30		μS	Tc=25°C
Thermal resistance	Rth			4.0	°C/W	Junction to case

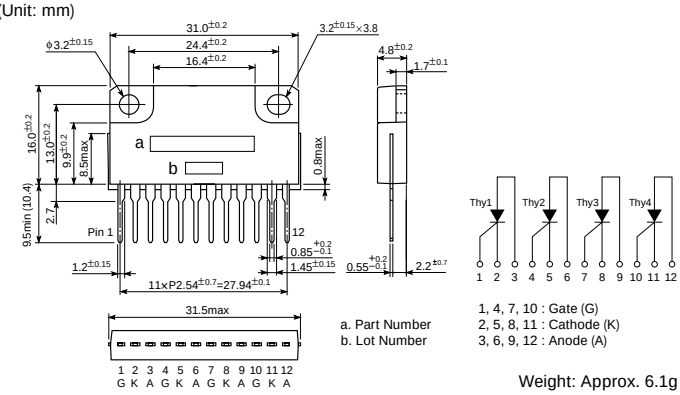
5A 600V 4 circuits Thyristor array

SLA0201

■Features

- ●5A 4 Thyristors combined one package
- ●Repetitive peak off-state voltage: V_{DRM}=600V
- ●Average on-state current: $I_{T(AV)}$=5A
- ●Gate trigger current: I_{GT}=10mA max

External Dimensions
(Unit: mm)



Weight: Approx. 6.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive peak reverse voltage	V_{RRM}	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	650	V	
Non-repetitive peak reverse voltage	V_{RSM}	650	V	
Average on-state current	$I_{T(AV)}$	5.0	A	50Hz Half-cycle sinewave, Conduction angle 180°, Continuous current
RMS on-state current	$I_{T(RMS)}$	7.8	A	
Surge on-state current	I_{TSM}	80	A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, Tj=125°C
Peak forward gate current	I_{FGM}	2.0	A	f≧50Hz, duty≦10%
Peak forward gate voltage	V_{FGM}	10	V	
Peak reverse gate voltage	V_{RGM}	5.0	V	f≧50Hz
Peak gate power loss	P_{GM}	5.0	W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5	W	
Junction temperature	Tj	−40 to +125	°C	
Storage temperature	Tstg	−40 to +125	°C	

■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	Tj=125°C, V_D=600V, R_{GK}=1kΩ
				100	μA	Tj=25°C, V_D=600V, R_{GK}=1kΩ
Reverse current	I_{RRM}			2.0	mA	Tj=125°C, V_D=600V, R_{GK}=1kΩ
				100	μA	Tj=25°C, V_D=600V, R_{GK}=1kΩ
On-state voltage	V_{TM}			1.4	V	T_C=25°C, I_{TM}=10A
Gate trigger voltage	V_{GT}		0.7	1.5	V	V_D=6V, R_L=10Ω, T_C=25°C
Gate trigger current	I_{GT}		5.0	10	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H		4.0		mA	R_{GK}=1kΩ, Tj=25°C
Critical rate-of-rise of off-state voltage	dv/dt		50		V/μS	V_D=1/2×V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Total power dissipation	P_T			4	W	Without Heatsink, T_j=25°C, All elements operation
				32		With infinite Heatsink, T_j=25°C, All elements operation

TO-220S Thyristor with built-in reverse diode for HID lamp ignition

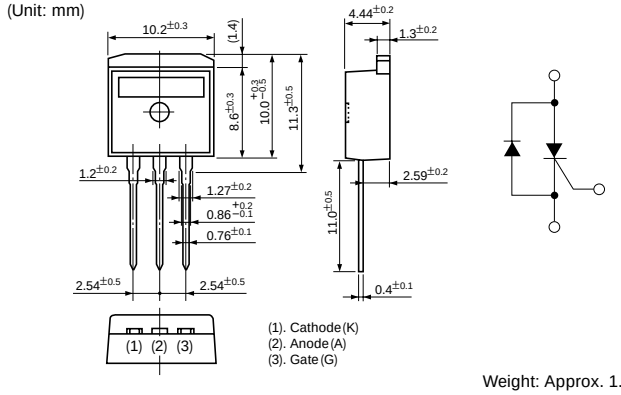
TFC561D

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=600V
- ●Repetitive peak surge on-state current: I_{TRM}=430A
- ●Critical rate-of-rise of on-state current: di/dt=1200A /μs
- ●Gate trigger current: I_{GT}=20mA max
- ●With built-in reverse diode

External Dimensions

(Unit: mm)



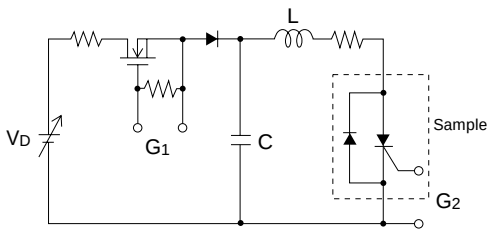
Weight: Approx. 1.5g

■Absolute Maximum Ratings

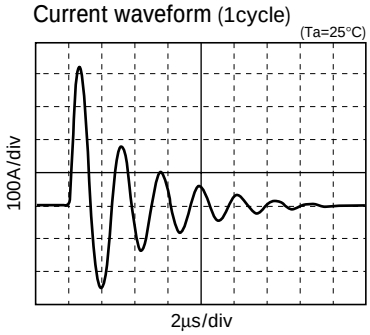
Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	600	V	Tj=−40 to +125°C, R_{GK}=1kΩ
Repetitive surge peak on-state current	I_{TRM}	430	A	V_D ≦430V, 100kcycle, Wp=1.3μs, Ta=125°C ✻
Critical rate-of-rise of on-state current	di/dt	1200	A/μs	✻
Peak forward gate current	I_{FGM}	2.0	A	f≧50Hz, duty≦10%
Peak gate power loss	P_{GM}	5.0	W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5	W	
Peak reverse gate voltage	V_{RGM}	5	V	f≧50Hz
Diode repetitive peak surge forward current	I_{FRM}	240	A	V_D ≦430V, 100kcycle, Wp=1.3μs, Ta=125°C ✻
Junction temperature	Tj	−40 to +125	°C	
Storage temperature	Tstg	−40 to +125	°C	

✻ The surge current for T=10ms /cycle shall be applied 50 cycles successively, and an interval time shall follow to cool down the junction temperature of the device to 125°C. This process shall be repeated up to 100K cycles.

Measurement circuit



Current waveform (1cycle)



■Electrical Characteristics

(Tj=25°C)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
On-state voltage	V_{TM}			1.4	V	I_T=10A
Gate trigger voltage	V_{GT}			1.5	V	V_D=6V, R_L=10Ω
Gate trigger current	I_{GT}			20	mA	V_D=6V, R_L=10Ω
Gate non-trigger voltage	V_{GD}	0.1			V	V_D=480V, Tj=125°C
Holding current	I_H	2	10.0		mA	R_{G-K}=1kΩ, Tj=25°C
Off-state current (1)	I_{DRM} (1)			100	μA	V_D=V_{DRM}, R_{G-K}=1kΩ, Tj=25°C
Off-state current (2)	I_{DRM} (2)			1	mA	V_D=V_{DRM}, R_{G-K}=1kΩ, Tj=125°C
Thermal resistance	Rth			4.0	°C/W	Junction to case
Diode forward voltage	V_F			1.4	V	I_F=10A

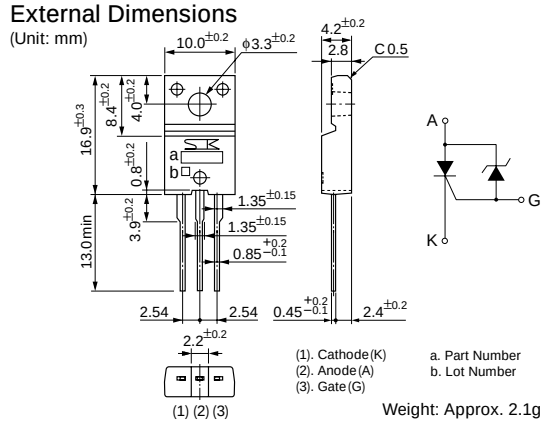
TO-220F 3A Thyristor with built-in Avalanche diode

TFD312S series

■Features

- ●With built-in Avalanche diode
- ●Average on-state current: $I_{T(AV)}$=3A
- ●Gate trigger current: I_{GT}=10mA max
- ●Isolation voltage: V_{ISO}=1500V(50Hz AC, RMS, 1min.)

External Dimensions
(Unit: mm)



(1). Cathode(K)
(2). Anode(A)
(3). Gate(G)

a. Part Number
b. Lot Number

Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	✻	V	Tj=−10 to +125°C, R_{GK}=1kΩ
Average on-state current	$I_{T(AV)}$	3.0	A	50Hz Half-cycle sinewave, 180°, Continuous current, Tc=92°C
RMS on-state current	$I_{T(RMS)}$	4.7	A	
Surge on-state current	I_{TSM}	60	A	50Hz Half-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Squared rated current and time product	I^2t	18	A^2·sec	2ms≦t≦10ms
Peak forward gate voltage	V_{FGM}	1.5	V	f≧50Hz, duty≦10%
Peak reverse gate voltage	V_{RGM}	5.0	V	f≧50Hz
Peak gate power loss	P_{GM}	5.0	W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5	W	
Junction temperature	Tj	−10 to +125	°C	
Storage temperature	Tstg	−40 to +125	°C	
Isolation voltage	V_{ISO}	1500	V	50Hz Sine wave, RMS, Terminal to case, 1min.

✻V_{DRM}

Rank	-C	-F	-G	-J	-K	-L	-M	-N	-O
Ratings	20	35	45	80	100	120	145	170	190

■Electrical Characteristics

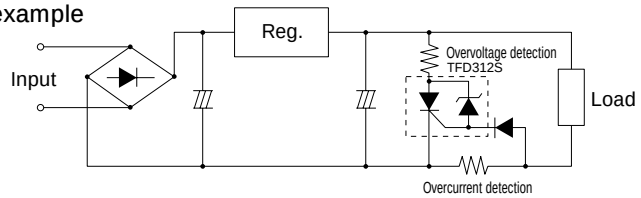
(Tj=25°C, unless otherwise specified)

Parameter	Symbol	Ratings min	Ratings typ	Ratings max	Unit	Conditions
Off-state current	I_{DRM}			1.0	mA	Tj=125°C, V_D=V_{DRM}, R_{GK}=1kΩ
				100	μA	Tj=25°C, V_D=V_{DRM}, R_{GK}=1kΩ
Breakover voltage	V_{BO}		✻		V	
Breakover current	I_{BO}	0.2		15	mA	
On-state voltage	V_{TM}			1.4	V	I_{TM}=5A
Gate trigger voltage	V_{GT}			1.0	V	V_D=6V, R_L=10Ω
Gate trigger current	I_{GT}	0.2		10	mA	
Gate non-trigger voltage	V_{GT}	0.1			V	V_D=V_{DRM}, Tj=125°C, R_{GK}=1kΩ
Holding current	I_H			15	mA	R_{GK}=1kΩ, Tj=125°C
Critical rate-of-rise of off-state voltage	dv/dt		40		V/μS	V_D=V_{DRM}, Tj=125°C, R_{GK}=1kΩ, C_{GK}=0.033μF
Thermal resistance	Rth			5.0	°C/W	Junction to case

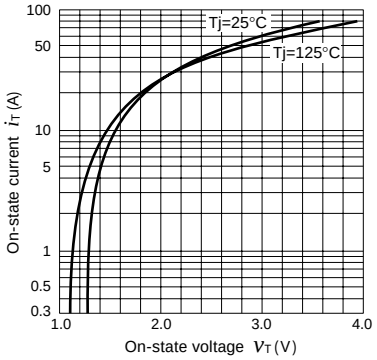
✻V_{BO}

Rank		-C	-F	-G	-J	-K	-L	-M	-N	-O
Ratings	min	27	50	60	90	115	140	163	185	210
	typ	30	55	65	100	125	150	175	200	225
	max	33	60	70	110	135	160	187	215	240

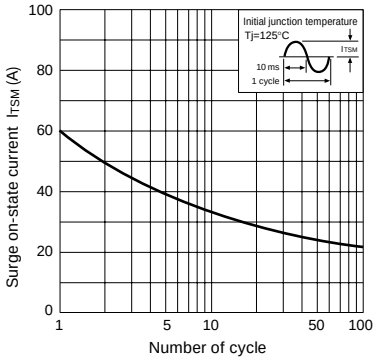
Application example



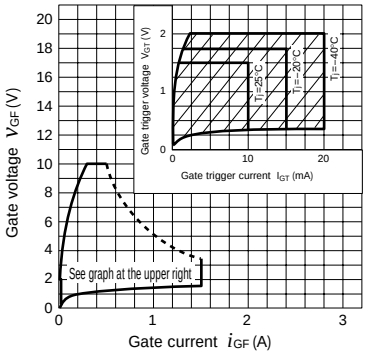
$v_T - i_T$ Characteristics (max)



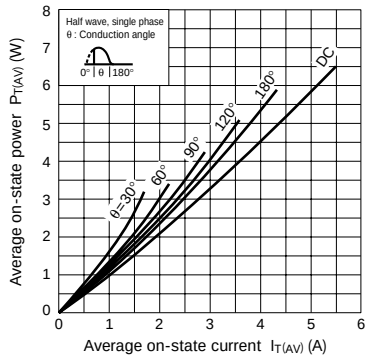
I_{TSM} Ratings



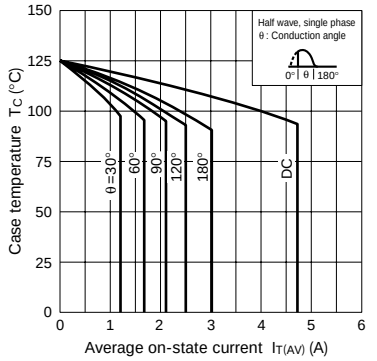
Gate Characteristics



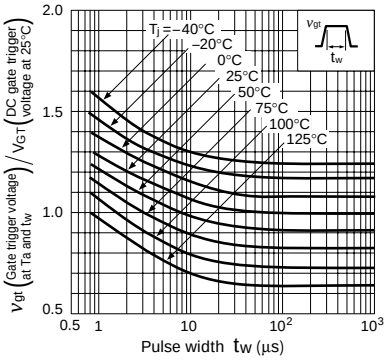
$I_{T(AV)} - P_{T(AV)}$ Characteristics



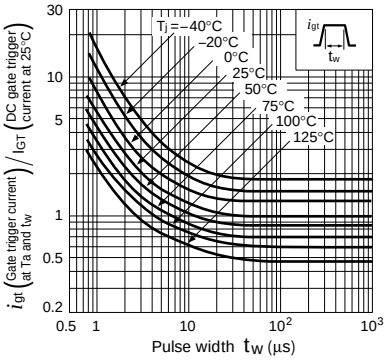
$I_{T(AV)} - Tc$ Ratings



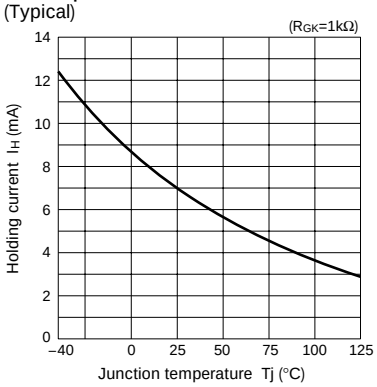
Pulse trigger temperature Characteristics v_{gt} (Typical)



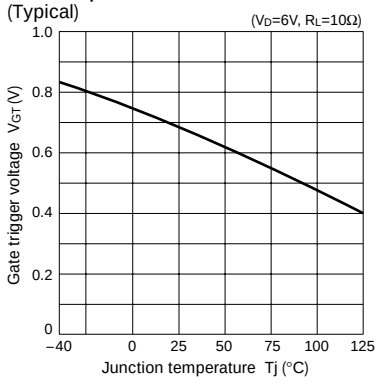
Pulse trigger temperature Characteristics i_{gt} (Typical)



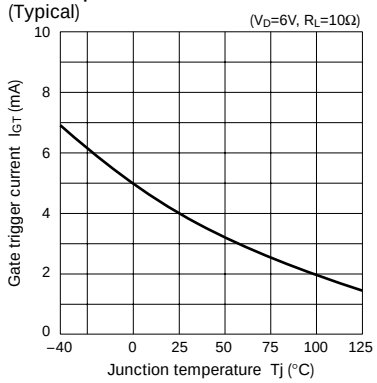
I_H temperature Characteristics (Typical)



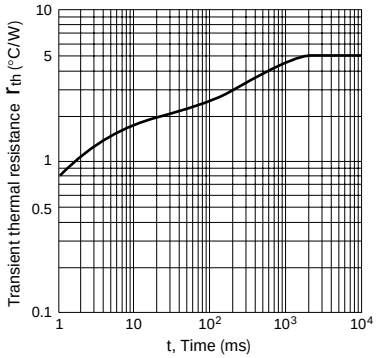
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



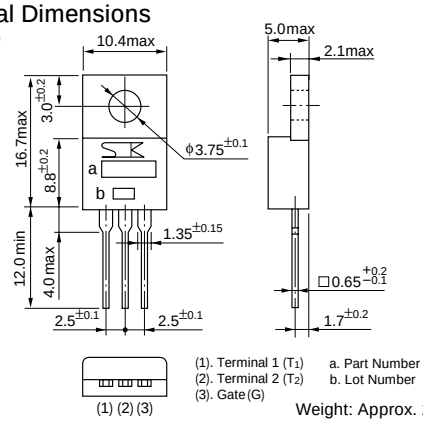
TO-220 3A Triac

TM341M-L, TM361M-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=3A
- ●Gate trigger Current: I_{GT}=20mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

■Absolute Maximum Ratings

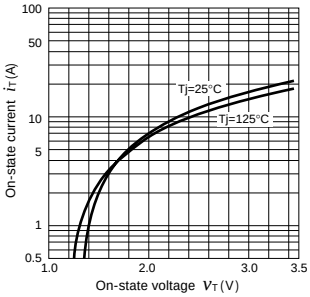
Parameter	Symbol	Ratings		Unit	Conditions
		TM341M-L	TM361M-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	3.0		A	Conduction angle 360°, Tc=115°C
Surge on-state current	I_{TSM}	30		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	6		V	
Peak gate current	I_{GM}	0.5		A	
Peak gate power loss	P_{GM}	3		W	
Average gate power loss	$P_{G(AV)}$	0.3		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	

■Electrical Characteristics

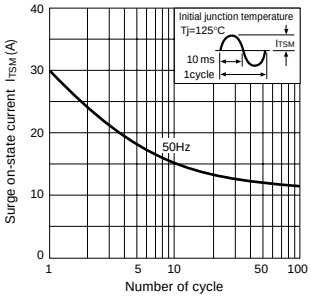
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=5A	
Gate trigger voltage	Ⅰ	V_{GT}		0.7	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.8				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		8	20	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			10	20			T_2^+, G^-
	Ⅲ			12	20			T_2^-, G^-
	Ⅳ			15				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		10		mA	V_D=6V	
Thermal resistance		Rth			3.0	°C/W	Junction to case	

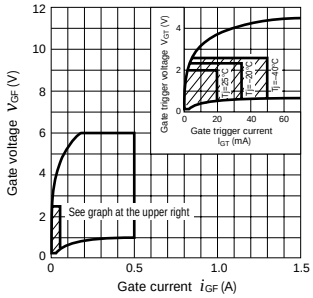
$v_T - i_T$ Characteristics (max)



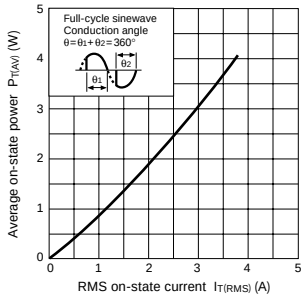
I_{TSM} Ratings



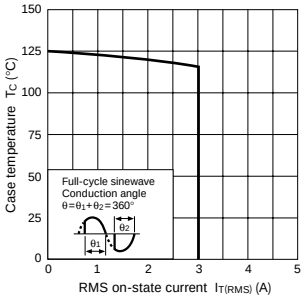
Gate Characteristics



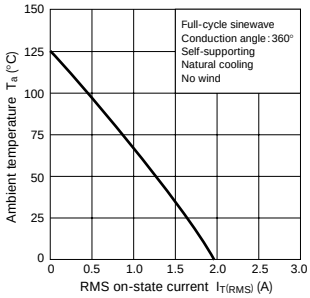
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



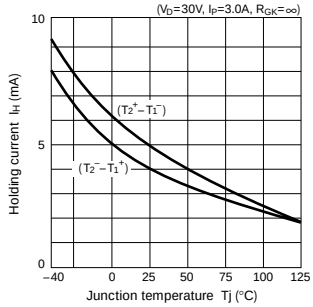
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

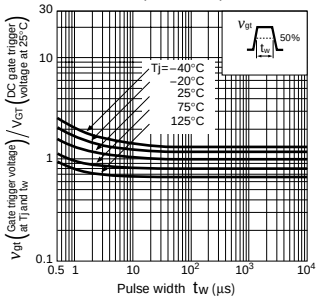


I_H temperature Characteristics (Typical)

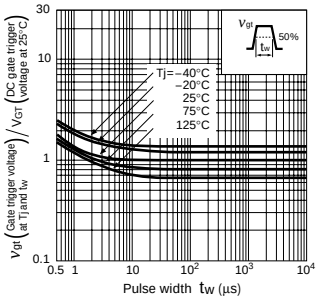


Pulse trigger temperature Characteristics V_{gt} (Typical)

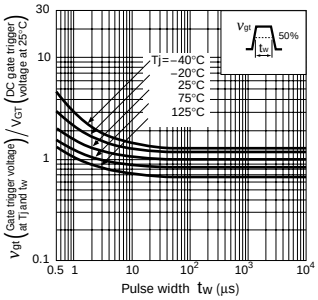
(MODE−Ⅰ)



(MODE−Ⅱ)

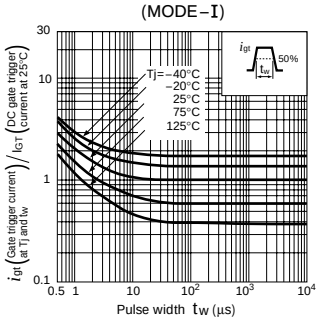


(MODE−Ⅲ)

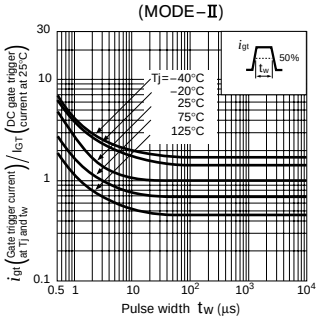


Pulse trigger temperature Characteristics i_{gt} (Typical)

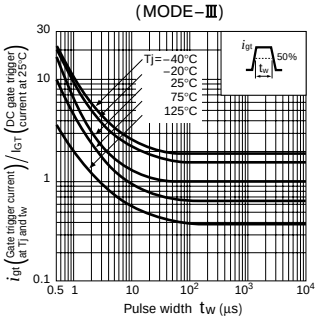
(MODE−Ⅰ)



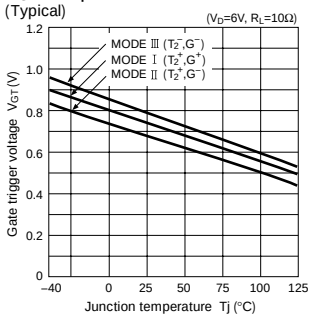
(MODE−Ⅱ)



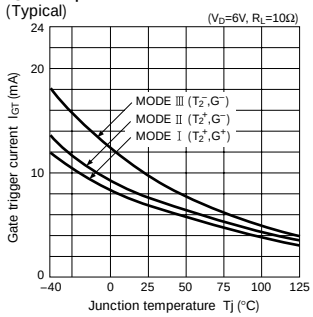
(MODE−Ⅲ)



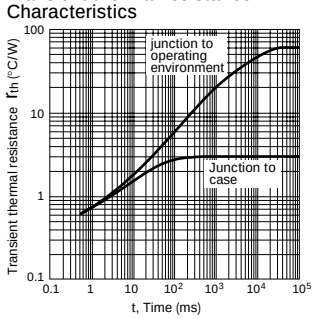
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



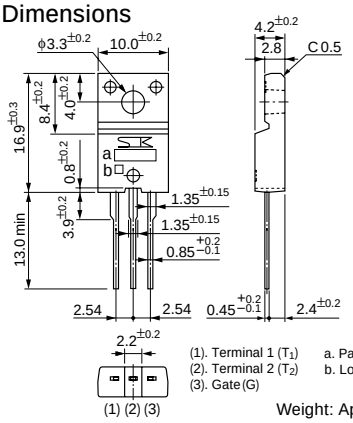
TO-220F 3A Triac

TM341S-L, TM361S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●Rms on-state current: $I_{T(RMS)}$=3A
- ●Gate trigger current: I_{GT}=20mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

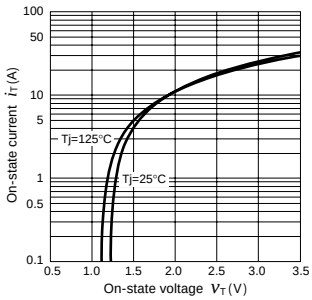
Parameter	Symbol	Ratings		Unit	Conditions
		TM341S-L	TM361S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	3.0		A	Conduction angle 360°, Tc=109°C
Surge on-state current	I_{TSM}	30		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	6		V	
Peak gate current	I_{GM}	0.5		A	
Peak gate power loss	P_{GM}	3		W	
Average gate power loss	$P_{G(AV)}$	0.3		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

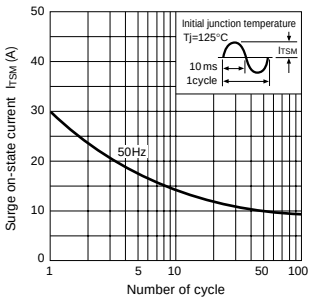
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=5A	
Gate trigger voltage	Ⅰ	V_{GT}		0.7	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.8				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		8	20	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			10	20			T_2^+, G^-
	Ⅲ			12	20			T_2^-, G^-
	Ⅳ			15				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		10		mA	V_D=6V	
Thermal resistance		Rth			5.0	°C/W	Junction to case	

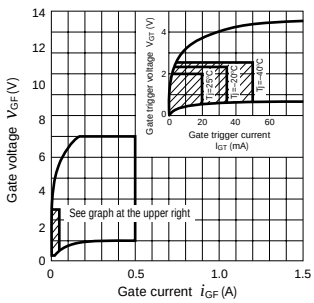
$v_T - i_T$ Characteristics (max)



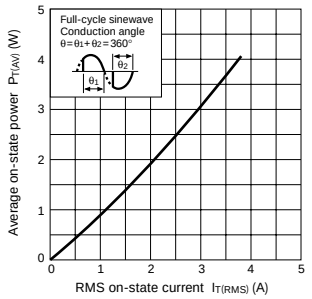
I_{TSM} Ratings



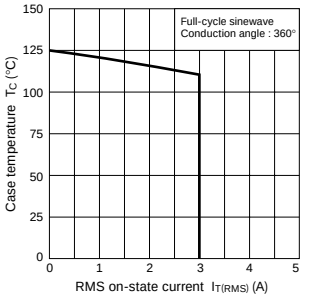
Gate Characteristics



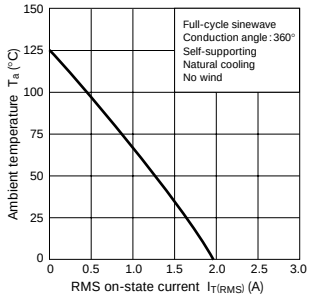
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



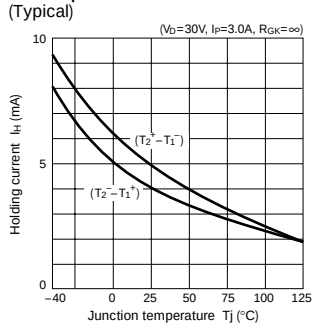
$I_{T(RMS)} - Tc$ Ratings



$I_{T(RMS)} - Ta$ Ratings

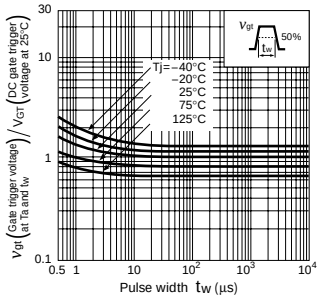


I_H temperature Characteristics (Typical)

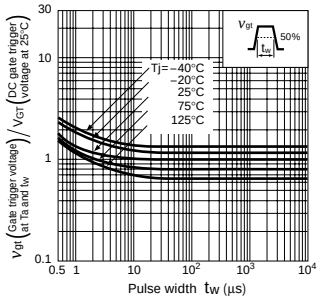


Pulse trigger temperature Characteristics V_{gt} (Typical)

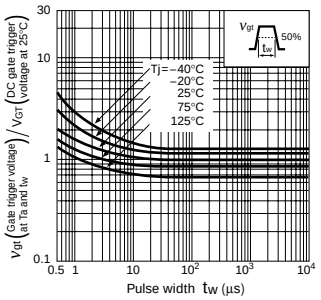
(MODE－Ⅰ)



(MODE－Ⅱ)

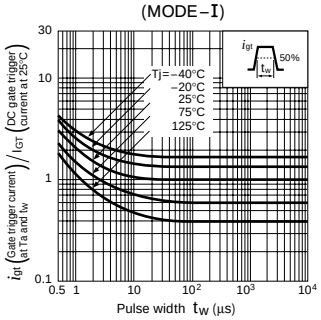


(MODE－Ⅲ)

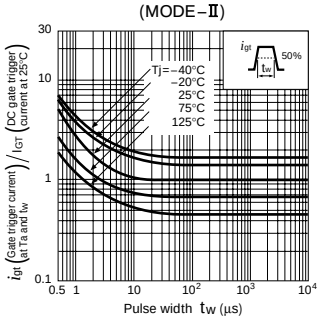


Pulse trigger temperature Characteristics i_{gt} (Typical)

(MODE－Ⅰ)



(MODE－Ⅱ)



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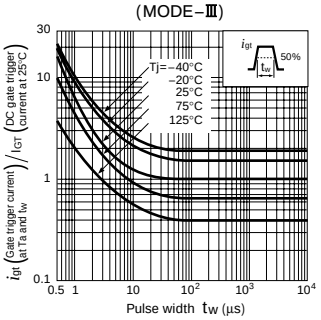
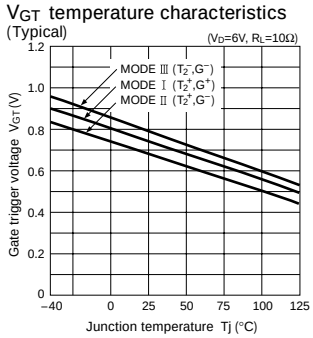
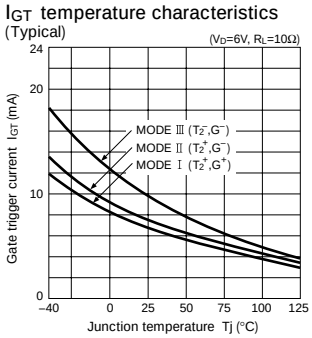


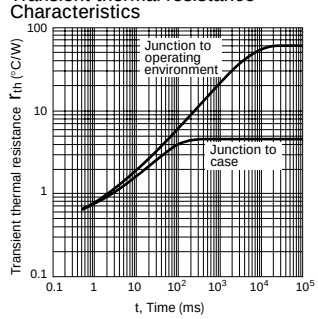
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



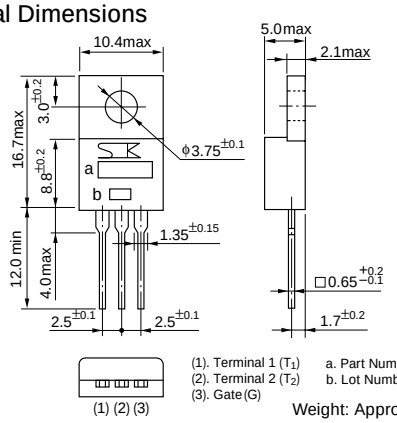
TO-220 5A Triac

TM541M-L, TM561M-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=5A
- ●Gate trigger Current: I_{GT}=20mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

■Absolute Maximum Ratings

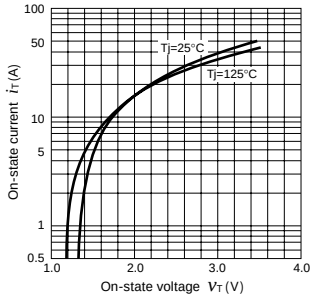
Parameter	Symbol	Ratings		Unit	Conditions
		TM541M-L	TM561M-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	5.0		A	Conduction angle 360°, Tc=111°C
Surge on-state current	I_{TSM}	50		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	

■Electrical Characteristics

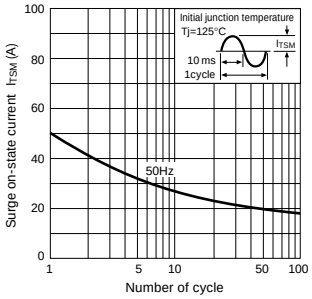
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=7A	
Gate trigger voltage	Ⅰ	V_{GT}		0.7	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.8				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		7	20	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			8	20			T_2^+, G^-
	Ⅲ			10	20			T_2^-, G^-
	Ⅳ			15				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		5		mA	V_D=6V	
Thermal resistance		Rth			2.7	°C/W	Junction to case	

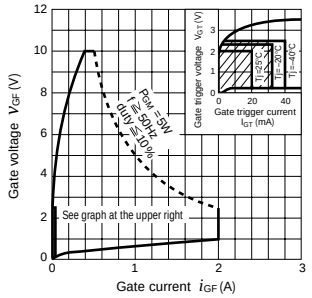
$v_T - i_T$ Characteristics (max)



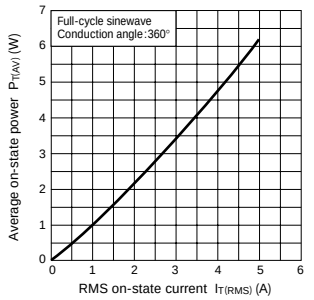
I_{TSM} Ratings



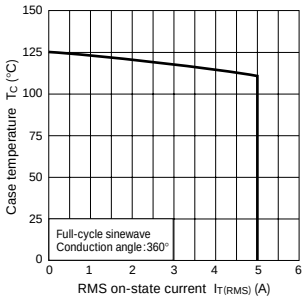
Gate Characteristics



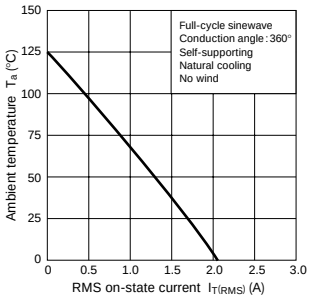
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



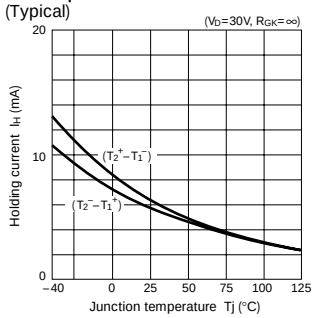
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

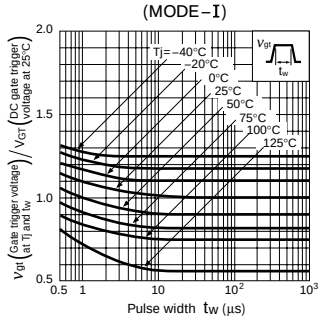


I_H temperature Characteristics (Typical)

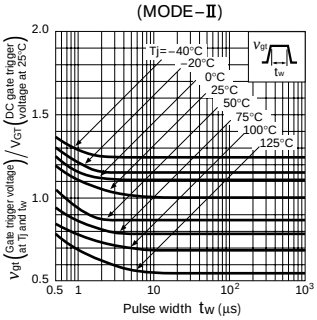


Pulse trigger temperature Characteristics V_{gt} (Typical)

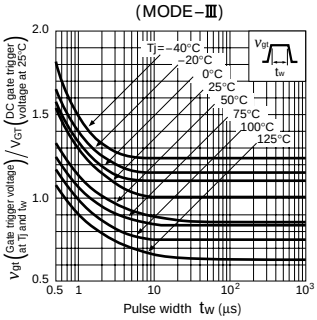
(MODE－Ⅰ)



(MODE－Ⅱ)

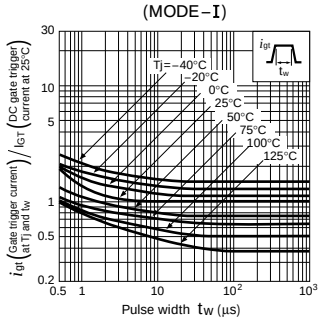


(MODE－Ⅲ)

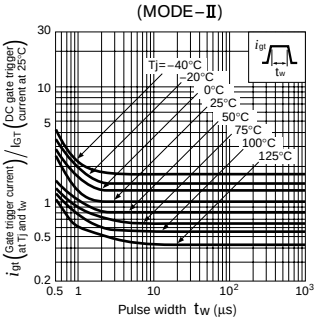


Pulse trigger temperature Characteristics i_{gt} (Typical)

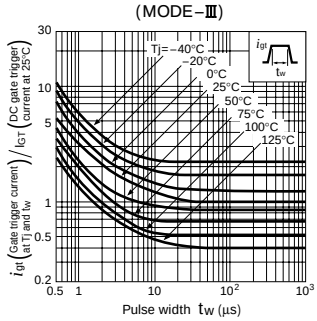
(MODE－Ⅰ)



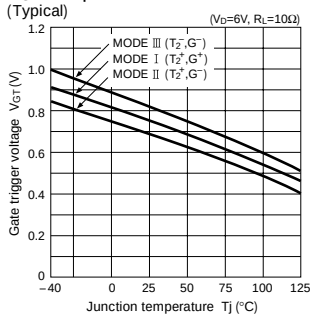
(MODE－Ⅱ)



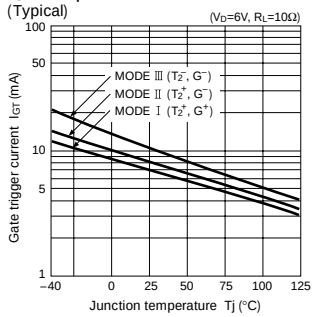
(MODE－Ⅲ)



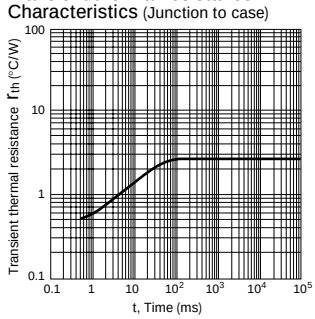
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



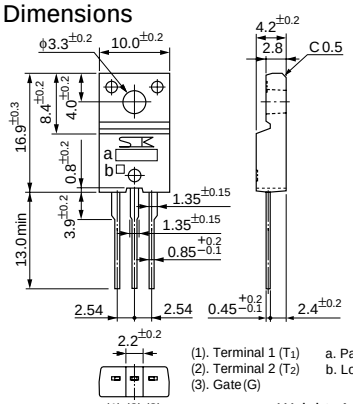
TO-220F 5A Triac

TM541S-L, TM561S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=5A
- ●Gate trigger current: I_{GT}=20mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

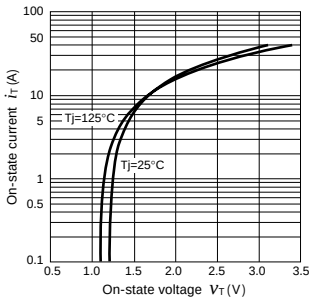
Parameter	Symbol	Ratings		Unit	Conditions
		TM541S-L	TM561S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	5.0		A	Conduction angle 360°, Tc=104°C
Surge on-state current	I_{TSM}	50		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

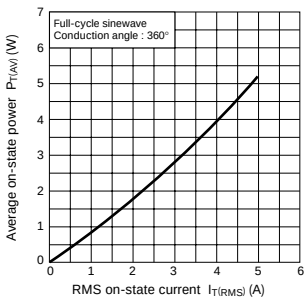
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=7A	
Gate trigger voltage	Ⅰ	V_{GT}		0.7	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.8				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		7	20	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			8	20			T_2^+, G^-
	Ⅲ			10	20			T_2^-, G^-
	Ⅳ			15				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		5		mA	V_D=6V	
Thermal resistance		Rth			4.0	°C/W	Junction to case	

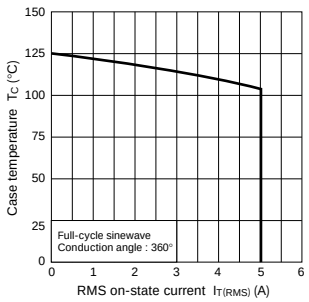
$v_T - i_T$ Characteristics (max)



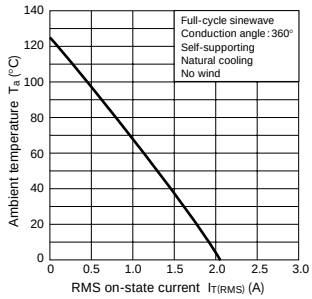
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



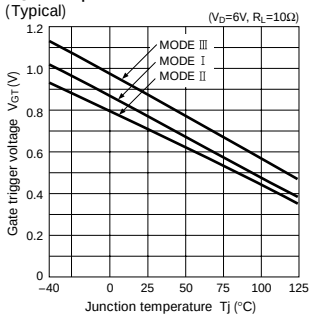
$I_{T(RMS)} - Tc$ Ratings



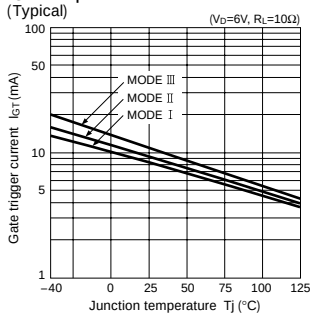
$I_{T(RMS)} - Ta$ Ratings



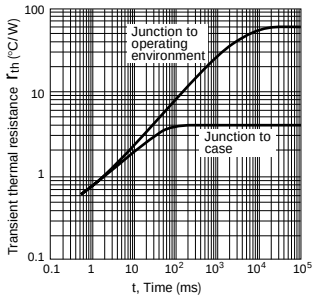
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



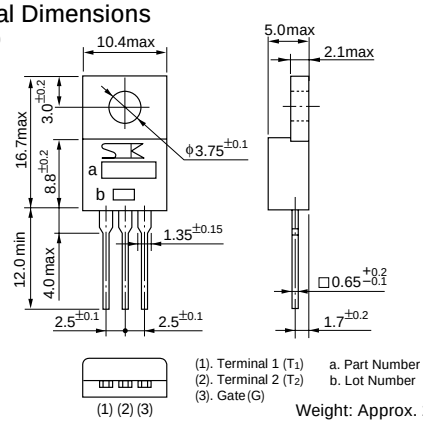
TO-220 8A Triac

TM841M-L, TM861M-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=8A
- ●Gate trigger Current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

■Absolute Maximum Ratings

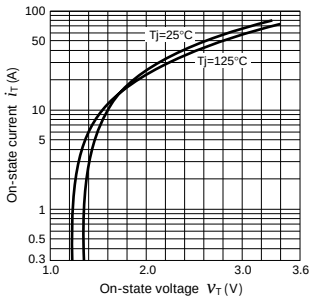
Parameter	Symbol	Ratings		Unit	Conditions
		TM841M-L	TM861M-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	8.0		A	Conduction angle 360°, Tc=108°C
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	

■Electrical Characteristics

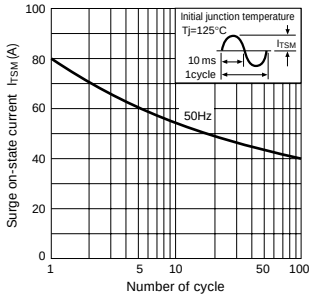
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=10A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.9				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		8	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			10	30			T_2^+, G^-
	Ⅲ			12	30			T_2^-, G^-
	Ⅳ			30				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		12		mA	V_D=6V	
Thermal resistance		Rth			1.8	°C/W	Junction to case	

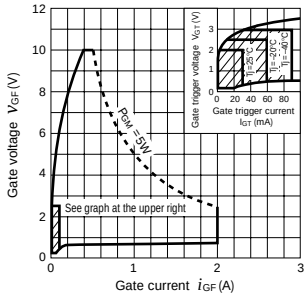
$v_T - i_T$ Characteristics (max)



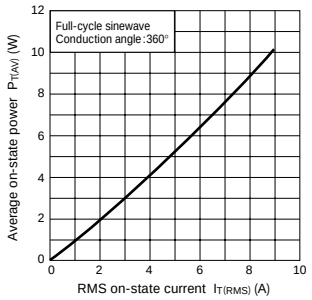
I_{TSM} Ratings



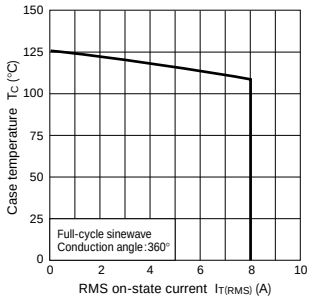
Gate Characteristics



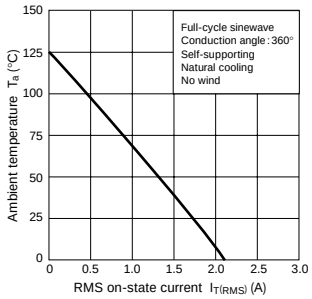
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



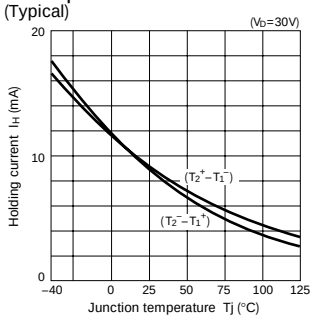
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

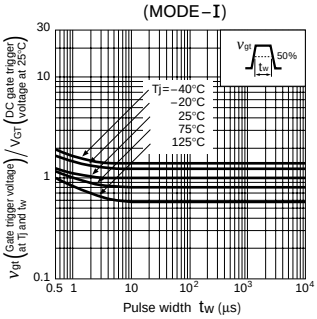


I_H temperature Characteristics (Typical)

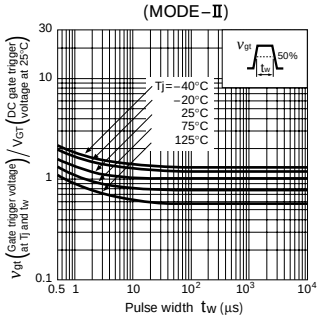


Pulse trigger temperature Characteristics V_{gt} (Typical)

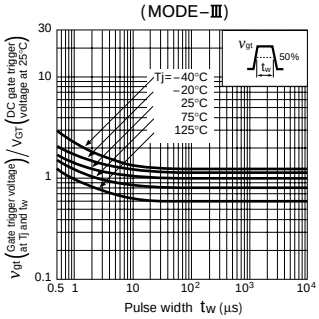
(MODE－Ⅰ)



(MODE－Ⅱ)

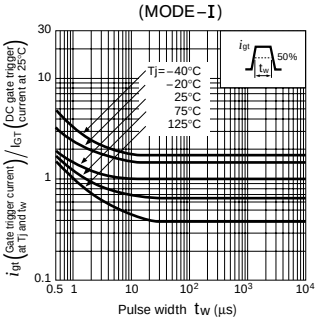


(MODE－Ⅲ)

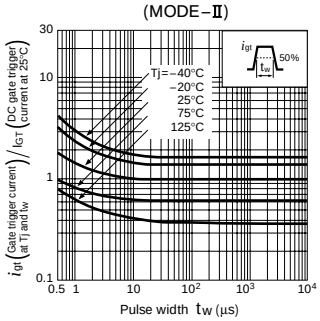


Pulse trigger temperature Characteristics i_{gt} (Typical)

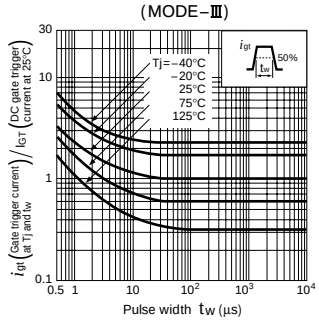
(MODE－Ⅰ)



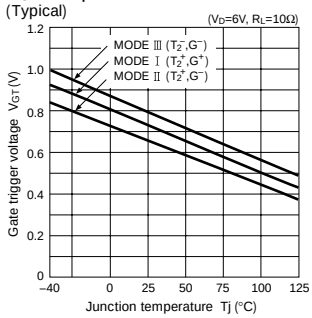
(MODE－Ⅱ)



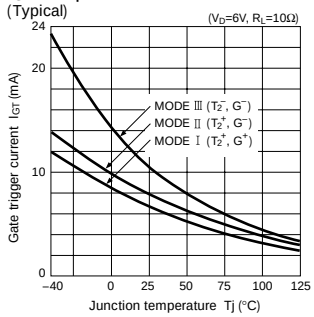
(MODE－Ⅲ)



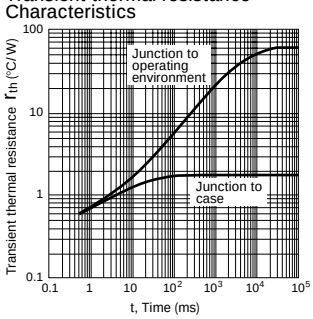
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



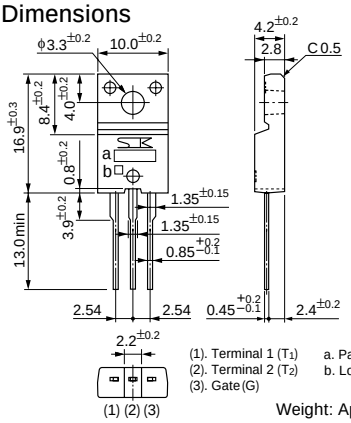
TO-220F 8A Triac

TM841S-L, TM861S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=8A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

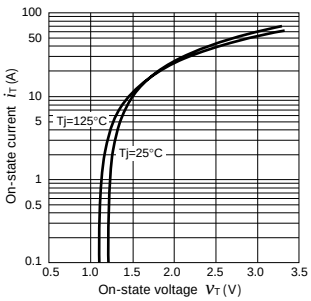
Parameter	Symbol	Ratings		Unit	Conditions
		TM841S-L	TM861S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	8.0		A	Conduction angle 360°, Tc=90°C
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

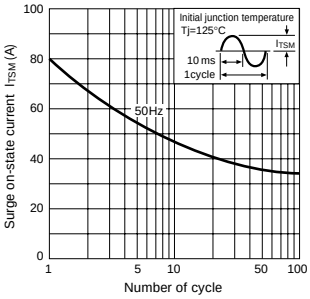
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=10A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.9				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		8	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			10	30			T_2^+, G^-
	Ⅲ			12	30			T_2^-, G^-
	Ⅳ			30				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		12		mA	V_D=6V	
Thermal resistance		Rth			3.6	°C/W	Junction to case	

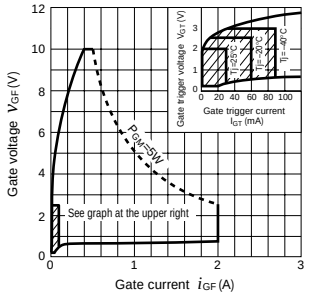
$v_T - i_T$ Characteristics (max)



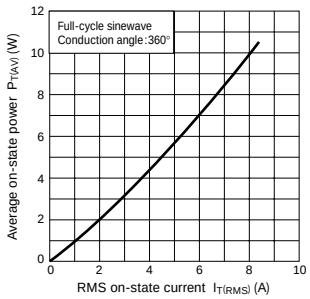
I_{TSM} Ratings



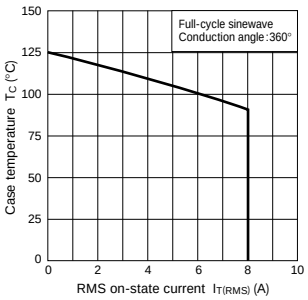
Gate Characteristics



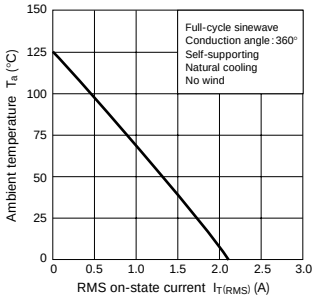
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



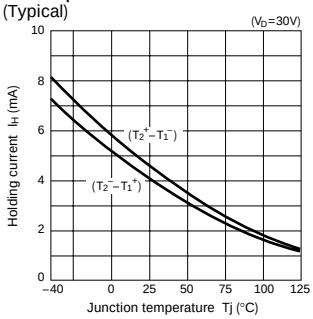
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

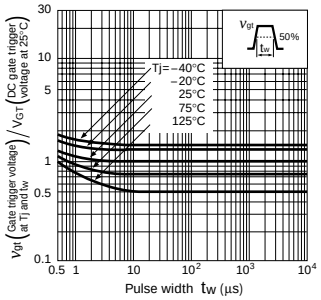


I_H temperature Characteristics (Typical)

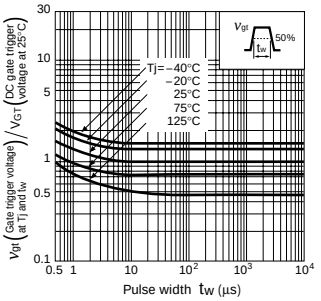


Pulse trigger temperature Characteristics V_{gt} (Typical)

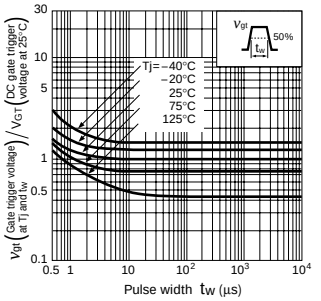
(MODE−Ⅰ)



(MODE−Ⅱ)

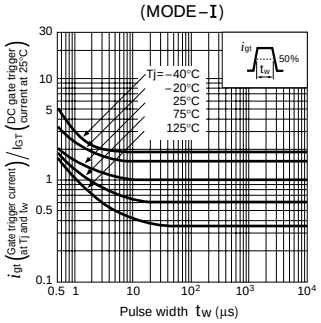


(MODE−Ⅲ)

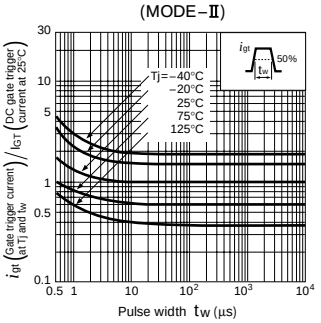


Pulse trigger temperature Characteristics i_{gt} (Typical)

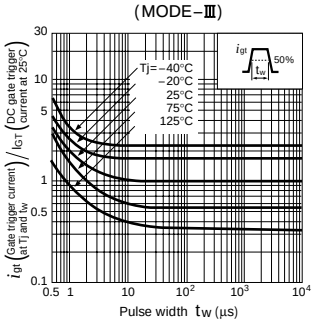
(MODE−Ⅰ)



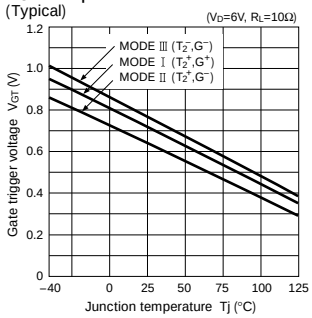
(MODE−Ⅱ)



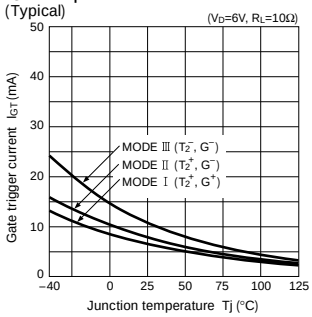
(MODE−Ⅲ)



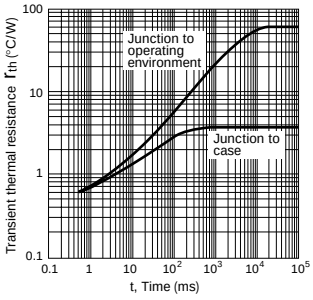
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



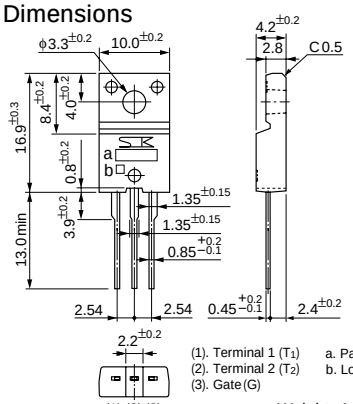
TO-220F 10A Triac

TM1041S-L, TM1061S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=10A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



(1). Terminal 1 (T_1)
(2). Terminal 2 (T_2)
(3). Gate(G)
a. Part Number
b. Lot Number

Weight: Approx. 2.1g

■Absolute Maximum Ratings

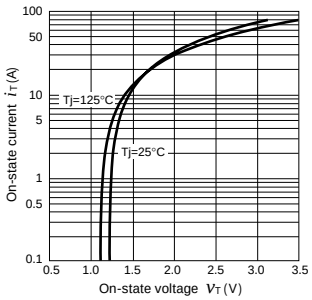
Parameter	Symbol	Ratings		Unit	Conditions
		TM1041S-L	TM1061S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	10.0		A	Conduction angle 360°, Tc=90°C
Surge on-state current	I_{TSM}	100		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

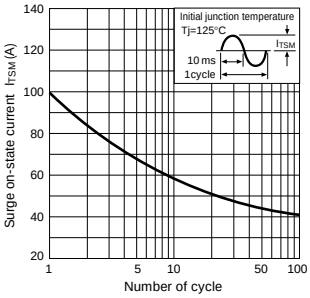
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=14A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			0.9				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		10	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			13	30			T_2^+, G^-
	Ⅲ			15	30			T_2^-, G^-
	Ⅳ			30				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		15		mA	V_D=6V	
Thermal resistance		Rth			3.3	°C/W	Junction to case	

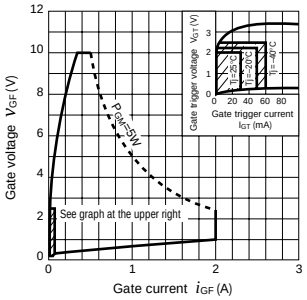
$v_T - i_T$ Characteristics (max)



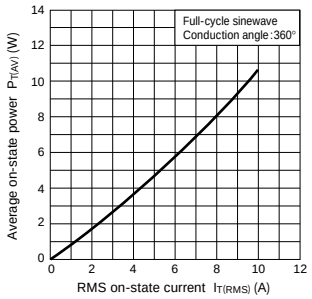
ITSM Ratings



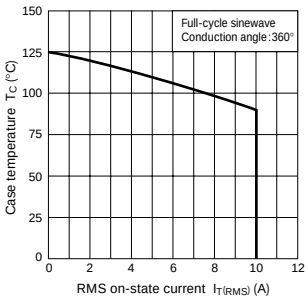
Gate Characteristics



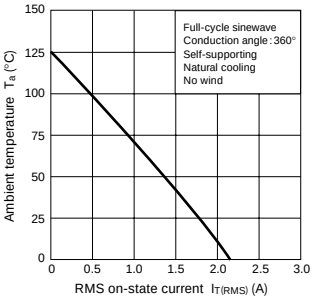
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



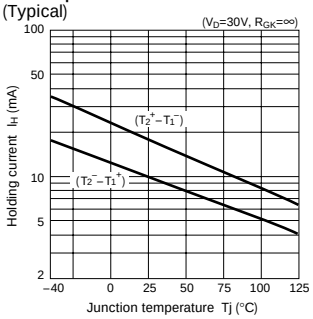
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

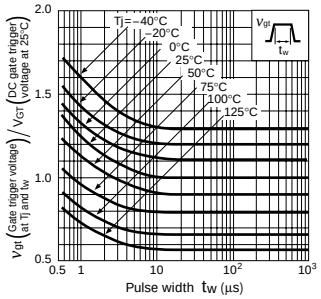


I_H temperature Characteristics (Typical)

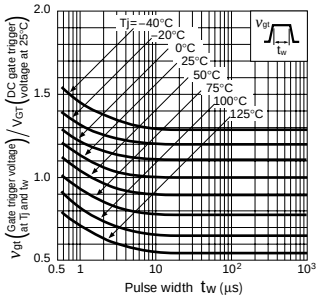


Pulse trigger temperature Characteristics v_{gt} (Typical)

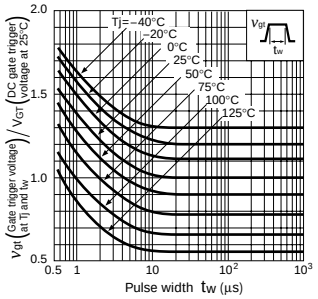
(MODE－Ⅰ)



(MODE－Ⅱ)

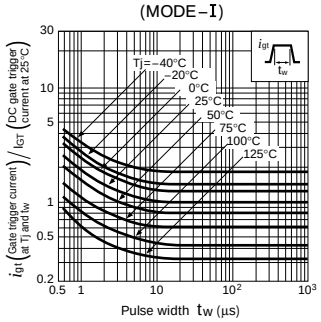


(MODE－Ⅲ)

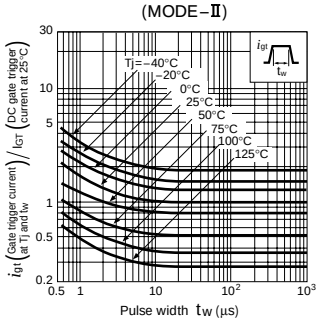


Pulse trigger temperature Characteristics i_{gt} (Typical)

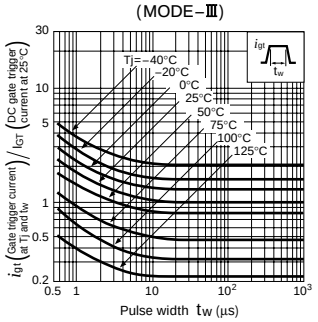
(MODE－Ⅰ)



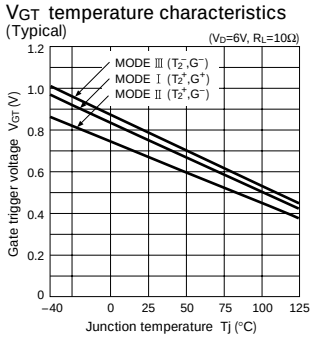
(MODE－Ⅱ)



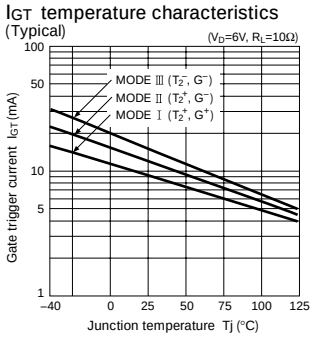
(MODE－Ⅲ)



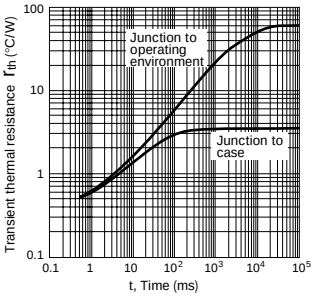
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



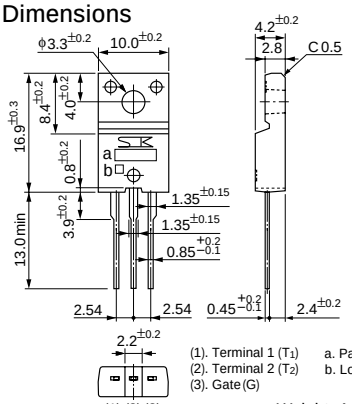
TO-220F 12A Triac

TM1241S-L, TM1261S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=12A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

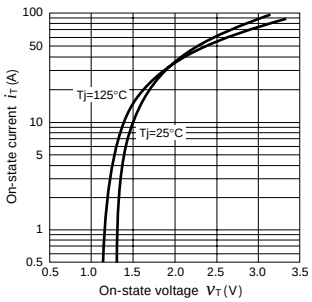
Parameter	Symbol	Ratings		Unit	Conditions
		TM1241S-L	TM1261S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	12.0		A	Conduction angle 360°, Tc=85°C
Surge on-state current	I_{TSM}	120		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

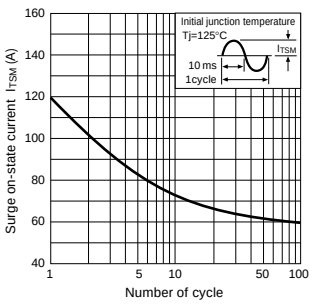
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=16A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			1.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		12	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			16	30			T_2^+, G^-
	Ⅲ			25	30			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		20		mA	V_D=6V	
Thermal resistance		Rth			3.0	°C/W	Junction to case	

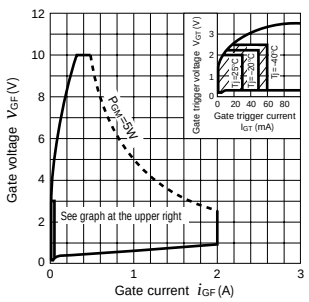
$v_T - i_T$ Characteristics (max)



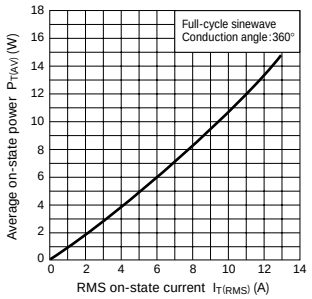
I_{TSM} Ratings



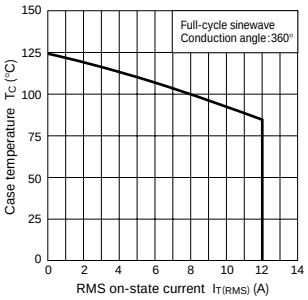
Gate Characteristics



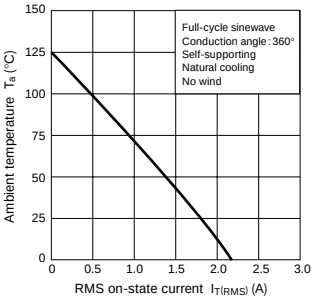
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



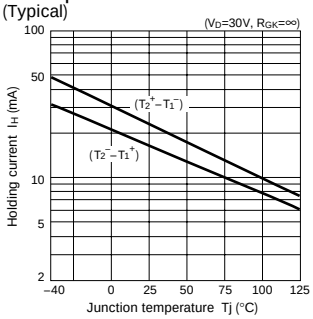
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

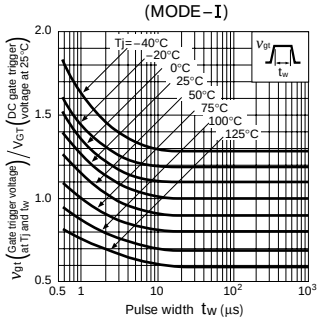


I_H temperature Characteristics (Typical)

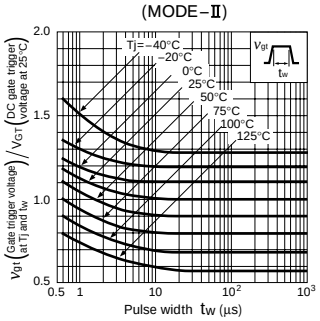


Pulse trigger temperature Characteristics V_{gt} (Typical)

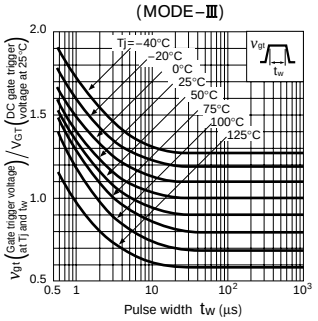
(MODE－Ⅰ)



(MODE－Ⅱ)

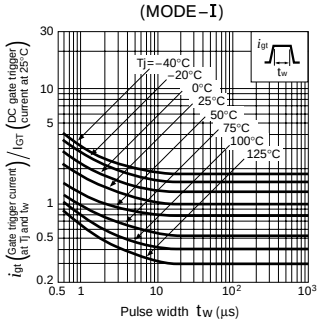


(MODE－Ⅲ)

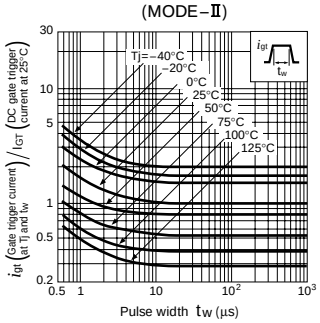


Pulse trigger temperature Characteristics i_{gt} (Typical)

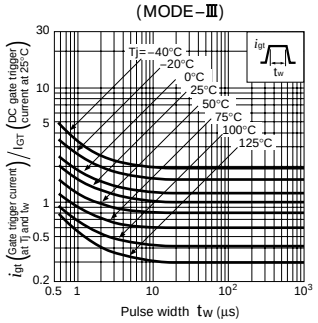
(MODE－Ⅰ)



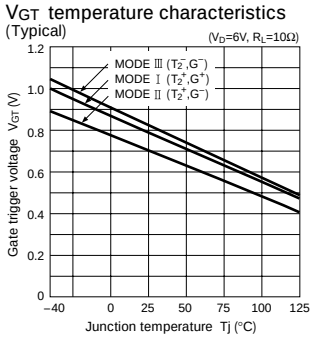
(MODE－Ⅱ)



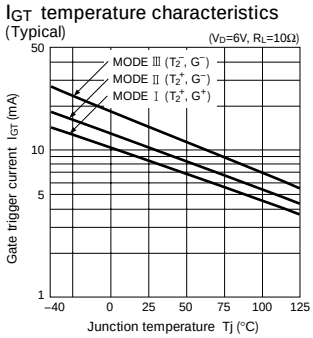
(MODE－Ⅲ)



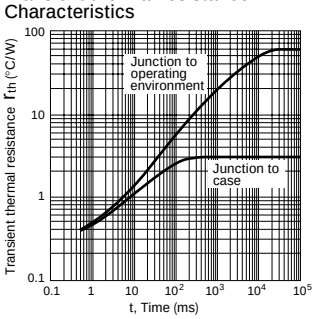
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



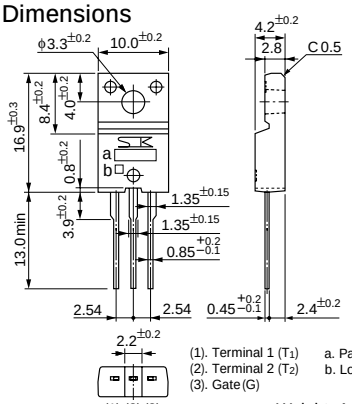
TO-220F 16A Triac

TM1641S-L, TM1661S-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=16A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

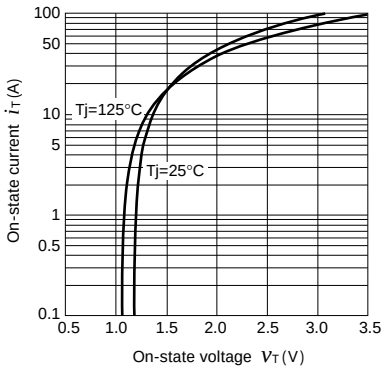
Parameter	Symbol	Ratings		Unit	Conditions
		TM1641S-L	TM1661S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, Tc=74°C
Surge on-state current	I_{TSM}	150		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

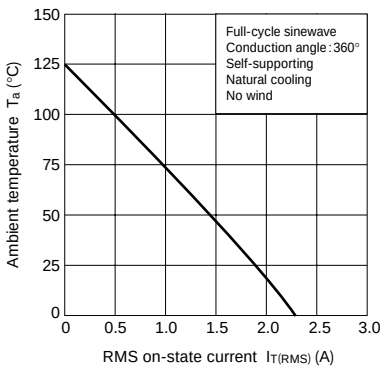
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=20A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			1.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		12	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			16	30			T_2^+, G^-
	Ⅲ			25	30			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		25		mA	V_D=6V	
Thermal resistance		Rth			3.0	°C/W	Junction to case	

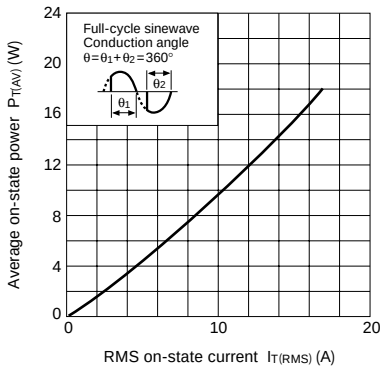
$v_T - i_T$ Characteristics (max)



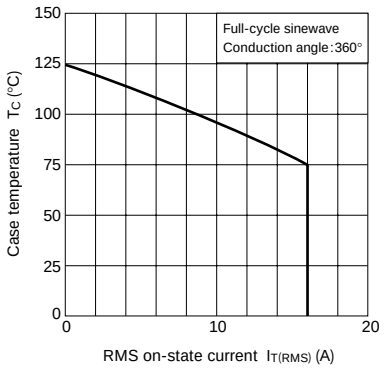
$I_{T(RMS)}$ – Ta Ratings



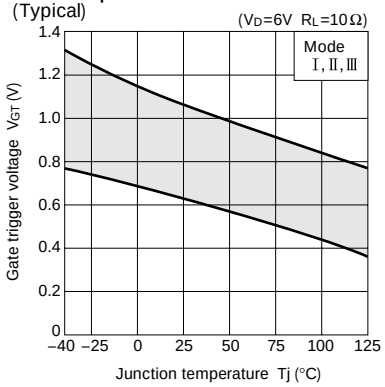
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



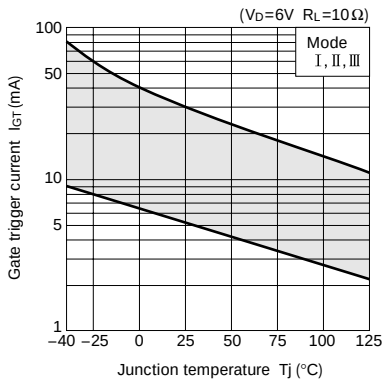
$I_{T(RMS)}$ – Tc Ratings



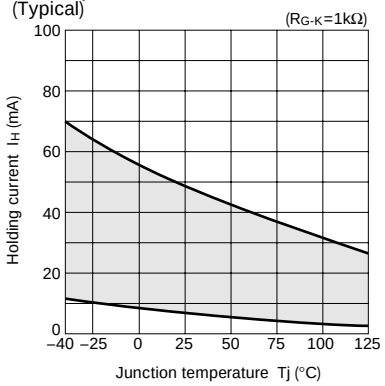
V_{GT} temperature characteristics (Typical)



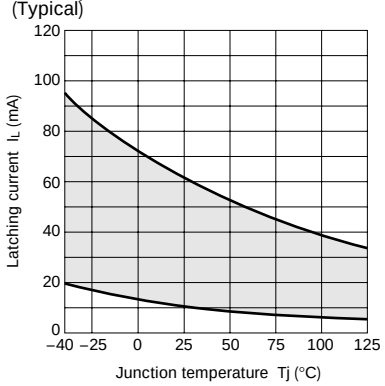
I_{GT} temperature characteristics



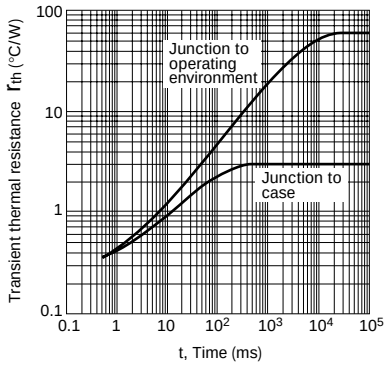
I_H temperature Characteristics (Typical)



I_L temperature Characteristics (Typical)



Transient thermal resistance Characteristics



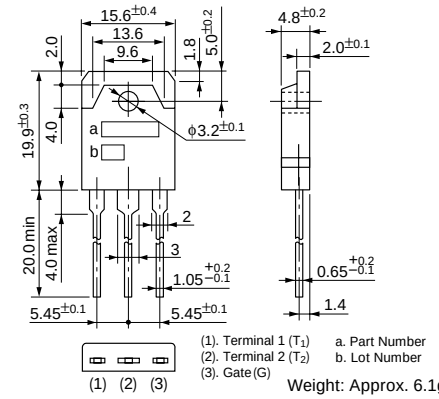
TO-3P 16A Triac

TM1641P-L(L), TM1661P-L(L)

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=16A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions
(Unit: mm)



Weight: Approx. 6.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1641P-L(L)	TM1661P-L(L)		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, Tc=103°C
Surge on-state current	I_{TSM}	160		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	

■Electrical Characteristics

(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}			2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=20A	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	1.5	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.5			T_2^+, G^-
	Ⅲ			0.8	1.5			T_2^-, G^-
	Ⅳ			1.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		12	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			16	30			T_2^+, G^-
	Ⅲ			25	30			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		25		mA	V_D=6V	
Thermal resistance		Rth			1.2	°C/W	Junction to case	

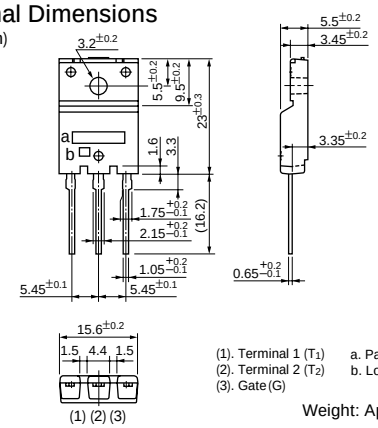
TO-3PF 16A Triac

TM1641B-L, TM1661B-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=16A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Rate-of-rise of off-state commutation voltage: (dv/dt)c=10V/μs min.
- ●Isolation voltage: V_{ISO}=2000V(AC, 1min.)
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 6.5g

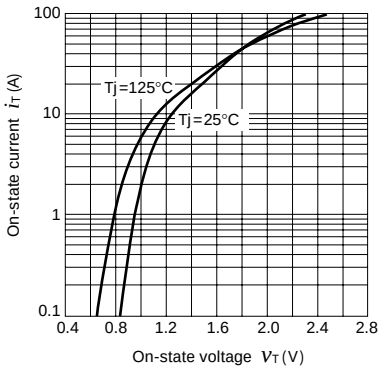
■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1641B-L	TM1661B-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, Tc=92.5°C
Surge on-state current	I_{TSM}	160		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	f ≧ 50Hz, duty ≦10%
Peak gate current	I_{GM}	2		A	f ≧ 50Hz, duty ≦10%
Peak gate power loss	P_{GM}	5		W	f ≧ 50Hz, duty ≦10%
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	2000		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

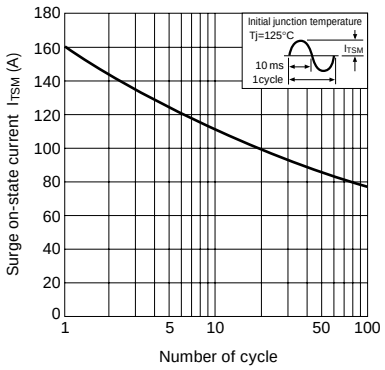
■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.1	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	I_{TM}=20A, T_C=25°C	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	1.5	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.5			T_2^+, G^-
	Ⅲ			0.8	1.5			T_2^-, G^-
	Ⅳ			1.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		12	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			16	30			T_2^+, G^-
	Ⅲ			25	30			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		25		mA	Tj=25°C	
Rate-of-rise of off-state commutation voltage		(dv/dt)c	10			V/μs	V_D=400V, Tj=125°C	
Thermal resistance		Rth			1.8	°C/W	Junction to case	

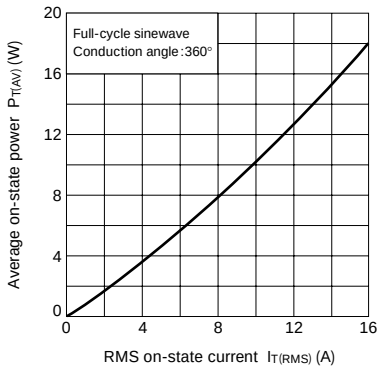
$v_T - i_T$ Characteristics (max)



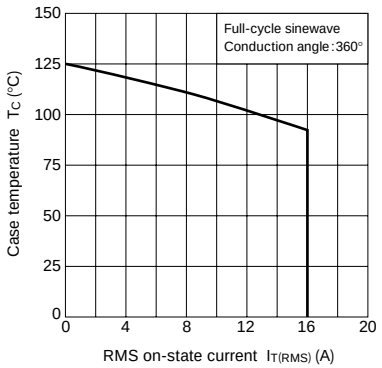
I_{TSM} Ratings



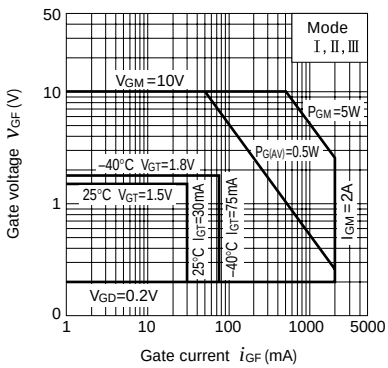
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



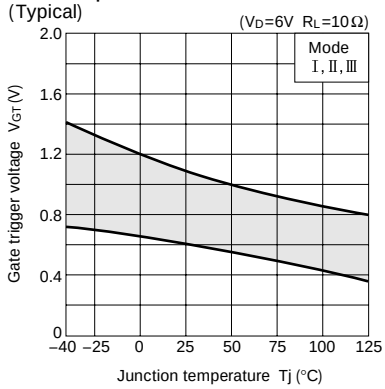
$I_{T(RMS)} - Tc$ Ratings



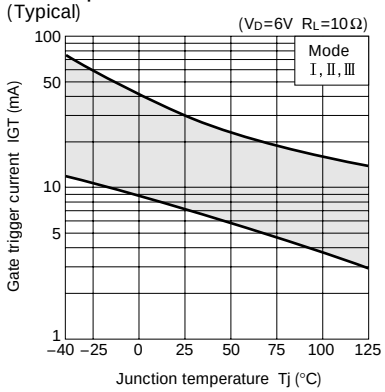
Gate Characteristics



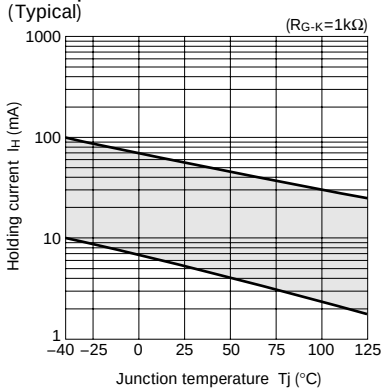
V_{GT} temperature characteristics (Typical)



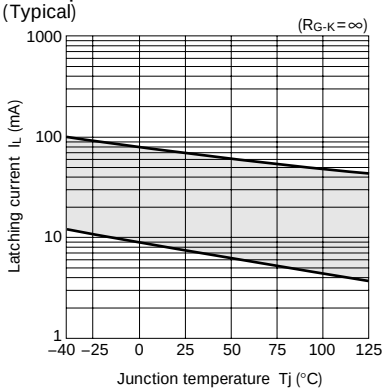
I_{GT} temperature characteristics (Typical)



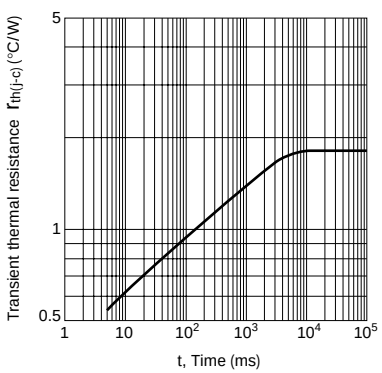
I_H temperature characteristics (Typical)



I_L temperature characteristics (Typical)



$r_{th(j-c)} - t$ Characteristics



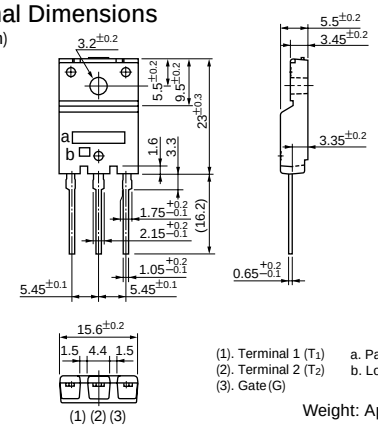
TO-3PF 25A Triac

TM2541B-L, TM2561B-L

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=25A
- ●Gate trigger current: I_{GT}=30mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=2000V(AC, 1min.)
- ●UL approved type available

External Dimensions
(Unit: mm)



(1). Terminal 1 (T_1)
(2). Terminal 2 (T_2)
(3). Gate(G)

a. Part Number
b. Lot Number

Weight: Approx. 6.5g

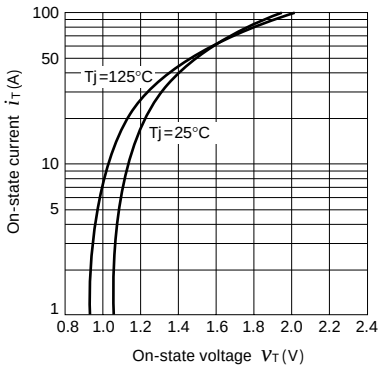
■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM2541B-L	TM2561B-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	R_{GK}=∞, Tj=−40°C to +125°C
RMS on-state current	$I_{T(RMS)}$	25		A	Conduction angle 360°, Tc=84°C
Surge on-state current	I_{TSM}	240		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	10		V	f≧50Hz, duty≦10%
Peak gate current	I_{GM}	2		A	f≧50Hz, duty≦10%
Peak gate power loss	P_{GM}	5		W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	2000		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

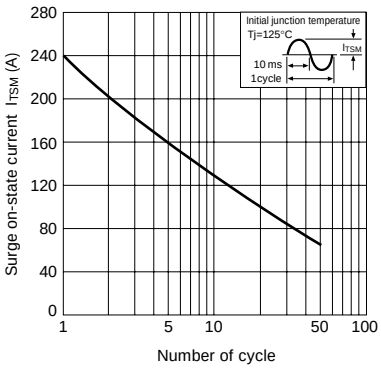
■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.3	2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.3	V	I_{TM}=20A, T_C=25°C	
Gate trigger voltage	Ⅰ	V_{GT}		0.8	2.0	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.8	2.0			T_2^+, G^-
	Ⅲ			0.8	2.0			T_2^-, G^-
	Ⅳ			1.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		17	30	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			19	30			T_2^+, G^-
	Ⅲ			22	30			T_2^-, G^-
	Ⅳ			50				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.2			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		40		mA	Tj=25°C	
Rate-of-rise of off-state commutation voltage		(dv/dt)c	10			V/μs	V_D=400V, Tj=125°C	
Thermal resistance		Rth			1.5	°C/W	Junction to case	

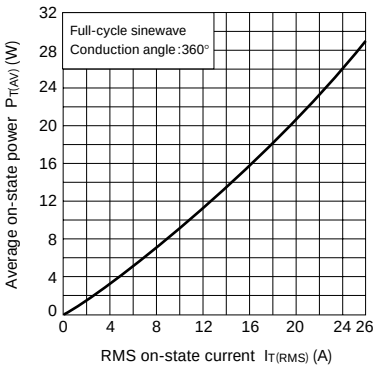
$v_T - i_T$ Characteristics (max)



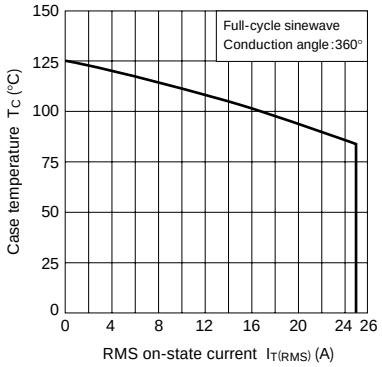
I_{TSM} Ratings



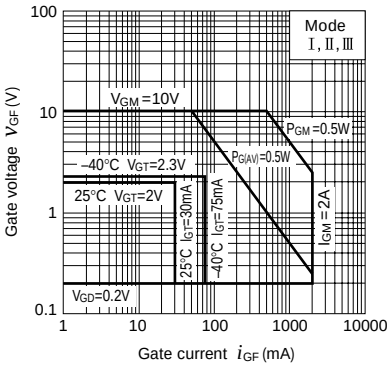
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



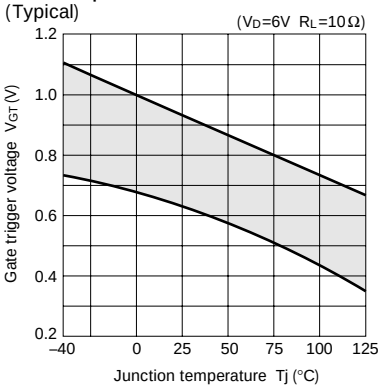
$I_{T(RMS)} - Tc$ Ratings



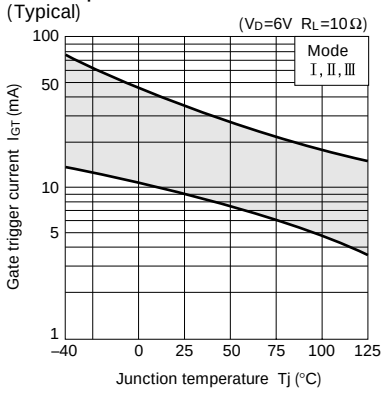
Gate Characteristics



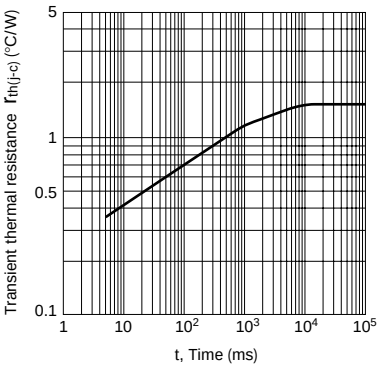
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



$r_{th(j-c)} - t$ Characteristics



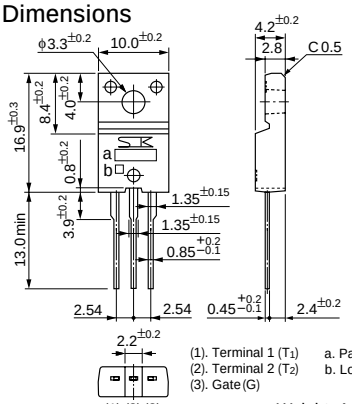
TO-220F 3A Triac

TM341S-R, TM361S-R

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=3A
- ●Gate trigger current: I_{GT}=12mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●For resistive load
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM341S-R	TM361S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	3.0		A	Conduction angle 360°, Tc=109°C
Surge on-state current	I_{TSM}	30		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	0.5		A	
Peak gate power loss	P_{GM}	3		W	
Average gate power loss	$P_{G(AV)}$	0.3		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}			2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=5A	
Gate trigger voltage	Ⅰ	V_{GT}		1.3	1.8	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.2			T_2^+, G^-
	Ⅲ			0.8	1.2			T_2^-, G^-
	Ⅳ			3.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		7	12	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			8	12			T_2^+, G^-
	Ⅲ			9	12			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		12		mA	V_D=6V	
Thermal resistance		Rth			5.0	°C/W	Junction to case	

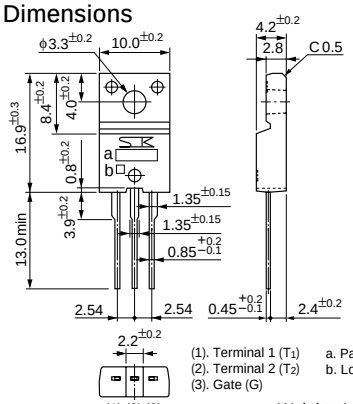
TO-220F 5A Triac

TM541S-R, TM561S-R

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=5A
- ●Gate trigger current: I_{GT}=12mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●For resistive load
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM541S-R	TM561S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	5.0		A	Conduction angle 360°, Tc=104°C
Surge on-state current	I_{TSM}	50		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	1		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}			2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=7A	
Gate trigger voltage	Ⅰ	V_{GT}		1.3	1.8	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.2			T_2^+, G^-
	Ⅲ			0.8	1.2			T_2^-, G^-
	Ⅳ			3.1				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		8	12	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			8.5	12			T_2^+, G^-
	Ⅲ			9	12			T_2^-, G^-
	Ⅳ			70				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		14		mA	V_D=6V	
Thermal resistance		Rth			4.0	°C/W	Junction to case	

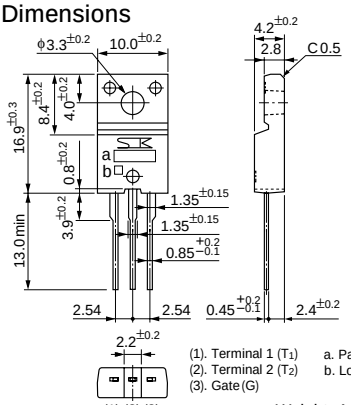
TO-220F 10A Triac

TM1041S-R, TM1061S-R

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=10A
- ●Gate trigger current: I_{GT}=7mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●For resistive load
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1041S-R	TM1061S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	10		A	Conduction angle 360°, Tc=90°C
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}			2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=14A	
Gate trigger voltage	Ⅰ	V_{GT}		1.2	2.0	V	V_D=20V, R_L=40Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.6	1.2			T_2^+, G^-
	Ⅲ			0.7	1.2			T_2^-, G^-
	Ⅳ			2.4				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		4.5	7.0	mA	V_D=20V, R_L=40Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			3.6	7.0			T_2^+, G^-
	Ⅲ			3.8	7.0			T_2^-, G^-
	Ⅳ			25				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		6		mA	V_D=6V	
Thermal resistance		Rth			3.3	°C/W	Junction to case	

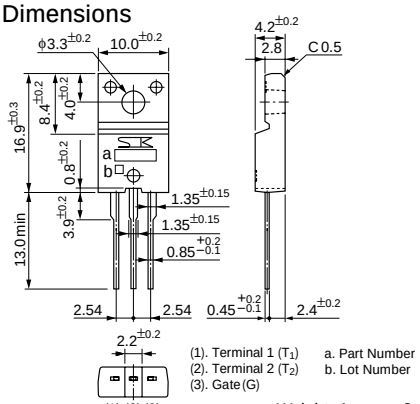
TO-220F 12A Triac

TM1241S-R, TM1261S-R

■Features

- ●Repetitive peak off-state voltage: V_{DRM}=400, 600V
- ●RMS on-state current: $I_{T(RMS)}$=12A
- ●Gate trigger current: I_{GT}=8mA max (MODE Ⅰ, Ⅱ, Ⅲ)
- ●Isolation voltage: V_{ISO}=1500V(50Hz Sine wave, RMS)
- ●For resistive load
- ●UL approved type available

External Dimensions
(Unit: mm)



Weight: Approx. 2.1g

■Absolute Maximum Ratings

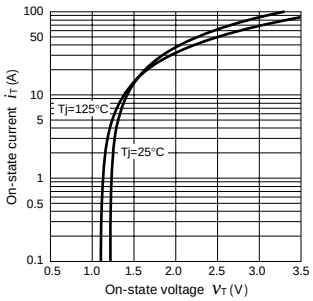
Parameter	Symbol	Ratings		Unit	Conditions
		TM1241S-R	TM1261S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	12		A	Conduction angle 360°, Tc=84°C
Surge on-state current	I_{TSM}	110		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	Tj	−40 to +125		°C	
Storage temperature	Tstg	−40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■Electrical Characteristics

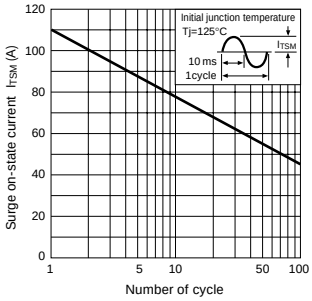
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}			2.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=16A	
Gate trigger voltage	Ⅰ	V_{GT}		1.1	1.8	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.6	1.2			T_2^+, G^-
	Ⅲ			0.7	1.2			T_2^-, G^-
	Ⅳ			2.1				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		5	8	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			4.5	8			T_2^+, G^-
	Ⅲ			5	8			T_2^-, G^-
	Ⅳ			25				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H		6		mA	V_D=6V	
Thermal resistance		Rth			3.0	°C/W	Junction to case	

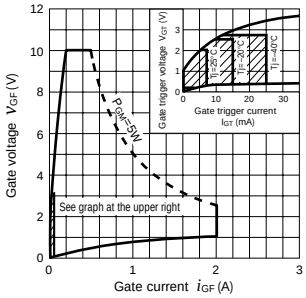
$v_T - i_T$ Characteristics (max)



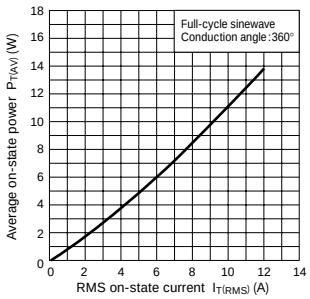
I_{TSM} Ratings



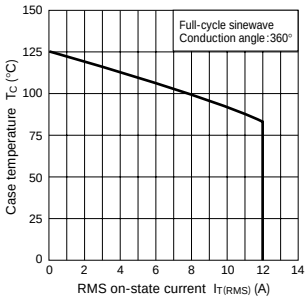
Gate Characteristics



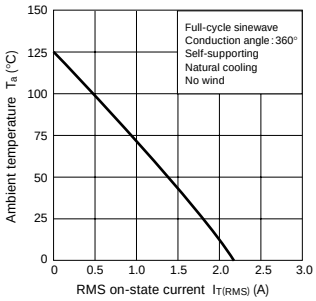
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



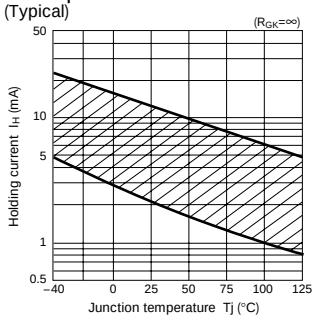
$I_{T(RMS)} - T_C$ Ratings



$I_{T(RMS)} - T_a$ Ratings

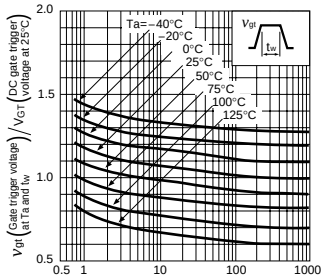


I_H temperature Characteristics (Typical)

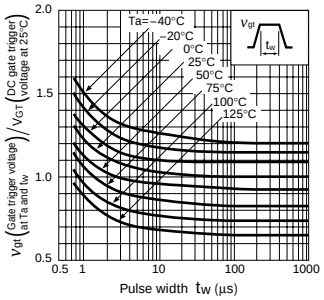


Pulse trigger temperature Characteristics V_{gt} (Typical)

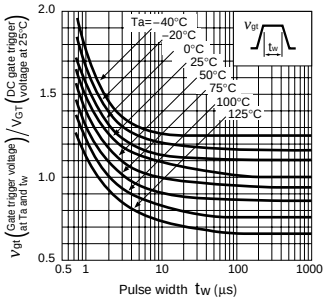
(MODE－Ⅰ)



(MODE－Ⅱ)

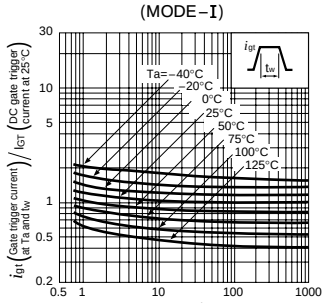


(MODE－Ⅲ)

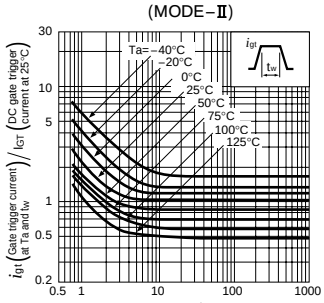


Pulse trigger temperature Characteristics i_{gt} (Typical)

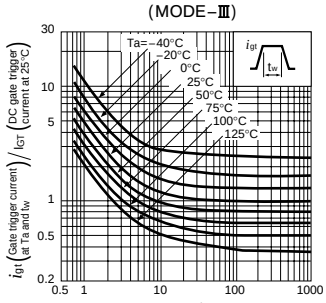
(MODE－Ⅰ)



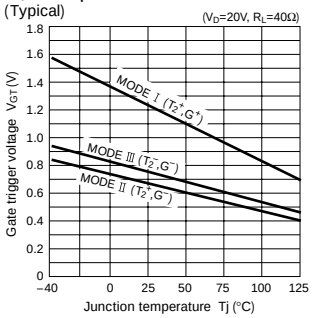
(MODE－Ⅱ)



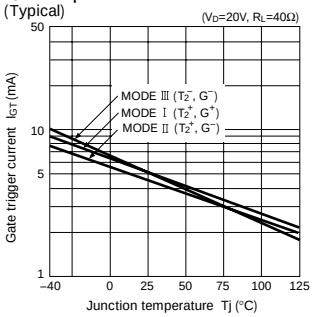
(MODE－Ⅲ)



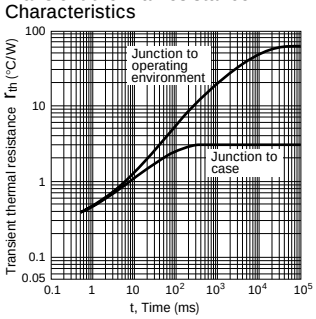
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics



1.2A 3 circuits Triac Array

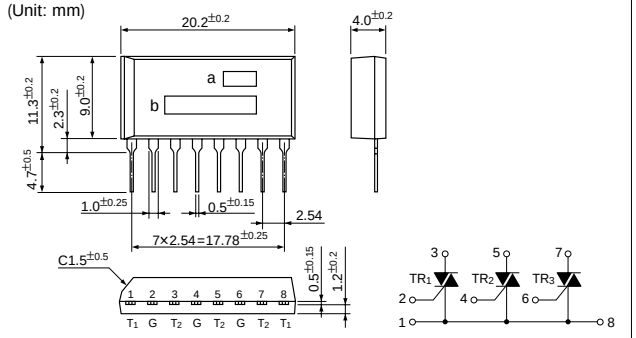
STA203A

■Features

- ●1.2A 3 Triacs combined one package
- ●Repetitive peak off-state voltage: V_{DRM}=400V
- ●RMS on-state current: $I_{T(RMS)}$=1.2A
- ●Gate trigger current: I_{GT}=3mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions

(Unit: mm)



a. Part Number
b. Lot Number

Weight: Approx. 2.1g

■Absolute Maximum Ratings

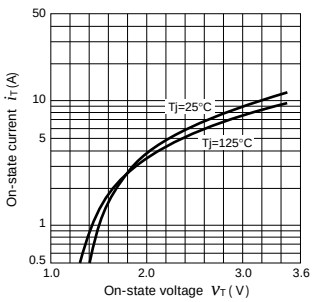
Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	400	V	
RMS on-state current	$I_{T(RMS)}$	1.2	A	Conduction angle 360°, Tc=97°C
Surge on-state current	I_{TSM}	10	A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak gate voltage	V_{GM}	6	V	
Peak gate current	I_{GM}	0.5	A	
Peak gate power loss	P_{GM}	1	W	
Average gate power loss	$P_{G(AV)}$	0.1	W	
Junction temperature	Tj	−40 to +125	°C	
Storage temperature	Tstg	−40 to +125	°C	

■Electrical Characteristics

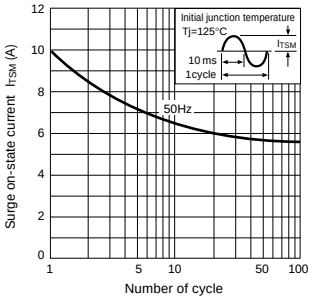
(Tj=25°C, unless otherwise specified)

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.1	1.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	Pulse test, I_{TM}=1.6A	
Gate trigger voltage	Ⅰ	V_{GT}		2.0	3.5	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.2			T_2^+, G^-
	Ⅲ			0.8	1.2			T_2^-, G^-
	Ⅳ			2.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		2.0	3.0	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			1.8	3.0			T_2^+, G^-
	Ⅲ			2.3	3.0			T_2^-, G^-
	Ⅳ			13.0				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Holding current		I_H			5.0	mA	V_D=6V	
Thermal resistance		Rth			20.0	°C/W	Junction to case	

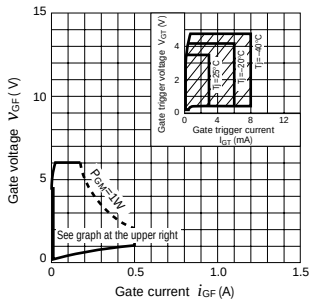
$v_T - i_T$ Characteristics (max)



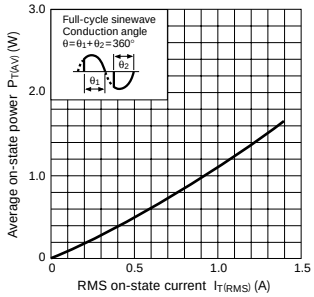
I_{TSM} Ratings



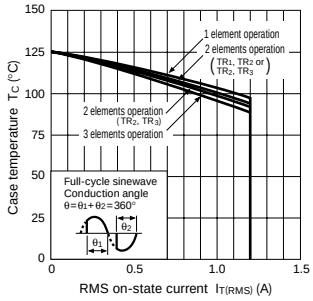
Gate Characteristics



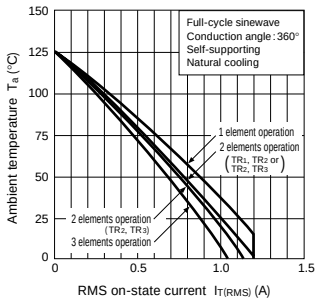
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



$I_{T(RMS)} - T_C$ Ratings

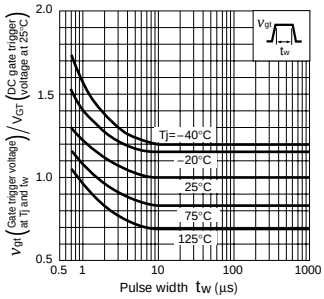


$I_{T(RMS)} - T_a$ Ratings

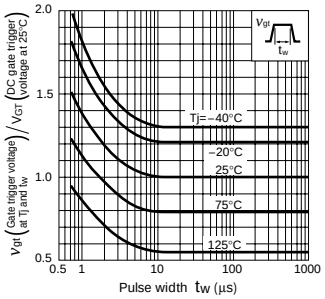


Pulse trigger temperature Characteristics V_{gt} (Typical)

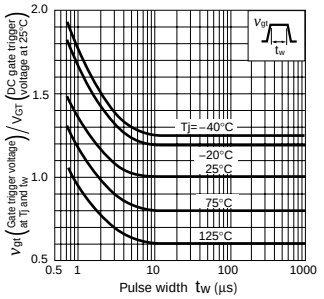
(MODE−Ⅰ)



(MODE−Ⅱ)

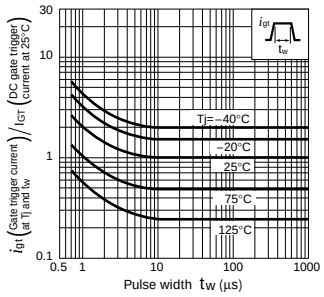


(MODE−Ⅲ)

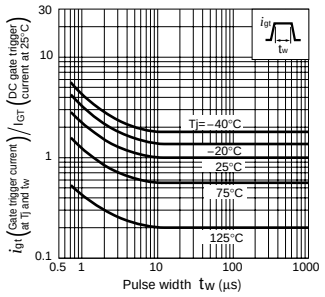


Pulse trigger temperature Characteristics i_{gt} (Typical)

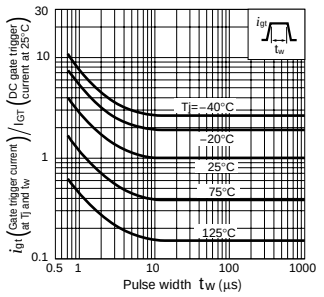
(MODE−Ⅰ)



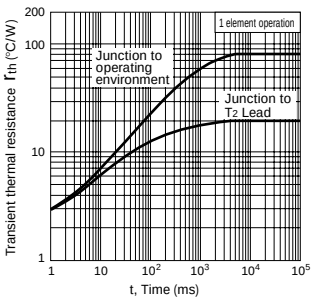
(MODE−Ⅱ)



(MODE−Ⅲ)



Transient thermal resistance Characteristics



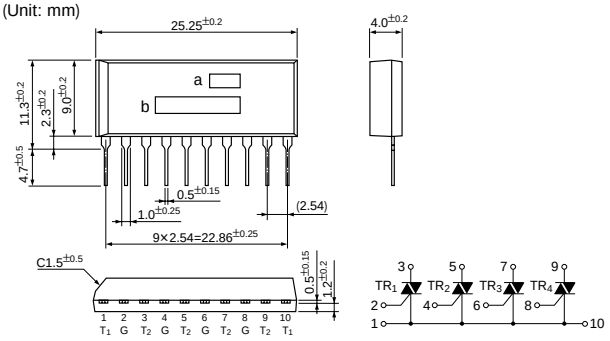
1A 4 circuits Triac Array

STA221A

■Features

- ●1A 4 Triacs combined one package
- ●Repetitive peak off-state voltage: V_{DRM}=400V
- ●RMS on-state current: $I_{T(RMS)}$=1A
- ●Gate trigger current: I_{GT}=3mA max (MODE Ⅰ, Ⅱ, Ⅲ)

External Dimensions
(Unit: mm)



a. Part Number
b. Lot Number

Weight: Approx. 2.6g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	400	V	−40°C to +125°C
RMS on-state current	$I_{T(RMS)}$	1.0	A	Conduction angle 360°, Tc=97°C
Surge on-state current	I_{TSM}	10	A	50Hz full-cycle sinewave, Peak value, Non-repetitive, Tj=125°C
Peak forward gate voltage	V_{GM}	6	V	f≧50Hz, duty≦10%
Peak forward gate current	I_{GM}	0.5	A	f≧50Hz, duty≦10%
Peak gate power loss	P_{GM}	1.0	W	f≧50Hz, duty≦10%
Average gate power loss	$P_{G(AV)}$	0.1	W	
Junction temperature	Tj	−40 to +125	°C	
Storage temperature	Tstg	−40 to +125	°C	

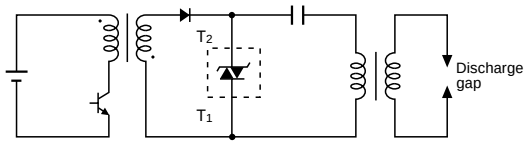
■Electrical Characteristics

Parameter		Symbol	Ratings			Unit	Conditions	
			min	typ	max			
Off-state current		I_{DRM}		0.1	1.0	mA	V_D=V_{DRM}, R_{GK}=∞, Tj=125°C	
					0.1		V_D=V_{DRM}, R_{GK}=∞, Tj=25°C	
On-state voltage		V_{TM}			1.6	V	I_{TM}=1.6A, Tc=25°C	
Gate trigger voltage	Ⅰ	V_{GT}		1.7	3.5	V	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			0.7	1.2			T_2^+, G^-
	Ⅲ			0.8	1.2			T_2^-, G^-
	Ⅳ			2.0				T_2^-, G^+
Gate trigger current	Ⅰ	I_{GT}		2.0	3.0	mA	V_D=6V, R_L=10Ω, T_C=25°C	T_2^+, G^+
	Ⅱ			1.8	3.0			T_2^+, G^-
	Ⅲ			2.3	3.0			T_2^-, G^-
	Ⅳ			13.0				T_2^-, G^+
Gate non-trigger voltage		V_{GD}	0.1			V	V_D=1/2×V_{DRM}, Tj=125°C	
Thermal resistance		I_H			20	°C/W	Junction to Lead, 1 element operation	
		Rth			80		junction to operating environment, 1 element operation	

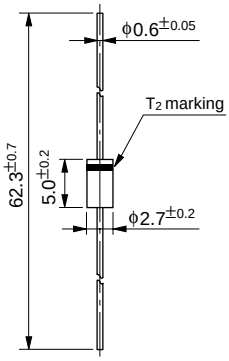
PNPN Switch

ET013, ET015, ET020

Example of application circuit (ignition)



External Dimensions
(Unit: mm)



Weight: Approx. 2.6g

■Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		ET013	ET015	ET020		
Repetitive peak off-state voltage	V_{DRM}	90	115	170	V	
RMS on-state current	$I_{T(RMS)}$	0.6			A	DC, Tℓ≦112°C
Surge on-state current	I_{TSM}	80			A	Ta=25°C, Wp=10μS, Full-cycle sinewave,1cycle, Peak value, f=50Hz
Rate-of-rise of on-state current	di_T/dt	30			A/μsec.	
Junction temperature	Tj	−40 to +125			°C	
Storage temperature	Tstg	−40 to +125			°C	

■Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		ET013	ET015	ET020		
Breakeover voltage	V_{BO}	120 to 138	142 to 157	190 to 210	V	
Breakeover current	I_{BO}	150max	100max		μA	
On-state voltage	V_T	±2.5			V	I_T=±10A

List of Discontinued Parts

■Discontinued Parts

Product series	Part Number	Replacement Parts
Thyristors	TGH340M	—
	TF325P	—
	TF320M	TF321M
	TF320M-A	TF321M-A
	TF620M	TF861M
	TF640M	TF841M
	TFD312M	TFD312S series
	TFH341S	—
	TFH361S	—
Triacs	TM1041M-L	TM1041S-L
	TM1061M-L	TM1061S-L
	TM1241M-L	TM1241S-L
	TM1261M-L	TM1261S-L
	TM1641M-L	TM1641S-L
	TM1661M-L	TM1661S-L
	TM1262B-R	—
PNPN Switch	ET014	—

MEMO

MEMO

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PRINTED in JAPAN H1-D03ED0-0110010TA