

International
IR Rectifier

SAFEIR Series 16TTS..S

SURFACE MOUNTABLE PHASE CONTROL SCR

Description/Features

The 16TTS..S **SAFEIR** series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125° C junction temperature.

Typical applications are in input rectification (soft start) and these products are designed to be used with International Rectifier input diodes, switches and output rectifiers which are available in identical package outlines.

	$V_T < 1.4V @ 10A$
	$I_{TSM} = 200A$
	$V_{RRM} = 800 \text{ to } 1600V$

Output Current in Typical Applications

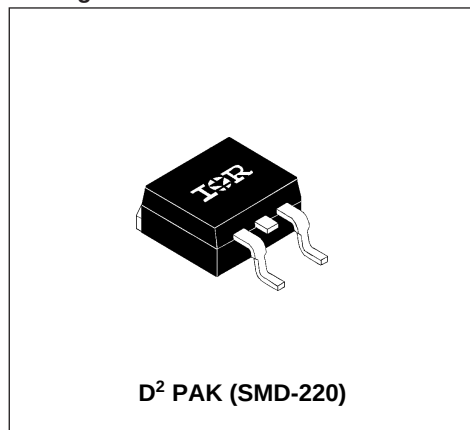
Applications	Single-phase Bridge	Three-phase Bridge	Units
NEMA FR-4 or G10 glass fabric-based epoxy with 4 oz (140µm) copper	2.5	3.5	A
Aluminum IMS, $R_{thCA} = 15^\circ C/W$	6.3	9.5	
Aluminum IMS with heatsink, $R_{thCA} = 5^\circ C/W$	14.0	18.5	

$T_A = 55^\circ C$, $T_J = 125^\circ C$, footprint 300mm²

Major Ratings and Characteristics

Characteristics	16TTS..S	Units
$I_{T(AV)}$ Sinusoidal waveform	10	A
I_{RMS}	16	A
V_{RRM}/V_{DRM}	up to 1600	V
I_{TSM}	200	A
$V_T @ 10 A, T_J = 25^\circ C$	1.4	V
dv/dt	500	V/µs
di/dt	150	A/µs
T_J	-40 to 125	°C

Package Outline



Voltage Ratings

Part Number	V_{RRM} , maximum peak reverse voltage V	V_{DRM} , maximum peak direct voltage V	I_{RRM}/I_{DRM} 125°C mA
16TTS08S	800	800	10
16TTS12S	1200	1200	
16TTS16S	1600	1600	

Absolute Maximum Ratings

Parameters	16TTS..S	Units	Conditions
$I_{T(AV)}$ Max. Average On-state Current	10	A	@ $T_C = 98^\circ\text{C}$, 180° conduction half sine wave
I_{RMS} Max. RMS On-state Current	16		
I_{TSM} Max. Peak One Cycle Non-Repetitive Surge Current	170 200		10ms Sine pulse, rated V_{RRM} applied 10ms Sine pulse, no voltage reapplied
I^2t Max. I^2t for fusing	144 200	A^2s	10ms Sine pulse, rated V_{RRM} applied 10ms Sine pulse, no voltage reapplied
$I^2\sqrt{t}$ Max. $I^2\sqrt{t}$ for fusing	2000	$A^2\sqrt{s}$	$t = 0.1$ to 10ms, no voltage reapplied
V_{TM} Max. On-state Voltage Drop	1.4	V	@ 10A, $T_J = 25^\circ\text{C}$
r_t On-state slope resistance	24.0	$m\Omega$	$T_J = 125^\circ\text{C}$
$V_{T(TO)}$ Threshold Voltage	1.1	V	
I_{RM}/I_{DM} Max.Reverse and Direct Leakage Current	0.5 10	mA	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
			$V_R = \text{rated } V_{RRM} / V_{DRM}$
I_H Holding Current	Typ. -- 100	Max. 100 150	mA Anode Supply = 6V, Resistive load, Initial $I_T = 1A$ 16TTS08S, 16TTS12S 16TTS16S
I_L Max. Latching Current	200	mA	
dv/dt Max. Rate of Rise of off-state Voltage	500	V/ μs	
di/dt Max. Rate of Rise of turned-on Current	150	A/ μs	

Triggering

Parameters	16TTS..S	Units	Conditions
P_{GM} Max. peak Gate Power	8.0	W	
$P_{G(AV)}$ Max. average Gate Power	2.0		
$+I_{GM}$ Max. peak positive Gate Current	1.5	A	
$-V_{GM}$ Max. peak negative Gate Voltage	10	V	
I_{GT} Max. required DC Gate Current to trigger	90	mA	Anode supply = 6V, resistive load, $T_J = -10^\circ\text{C}$
	60		Anode supply = 6V, resistive load, $T_J = 25^\circ\text{C}$
	35		Anode supply = 6V, resistive load, $T_J = 125^\circ\text{C}$
V_{GT} Max. required DC Gate Voltage to trigger	3.0	V	Anode supply = 6V, resistive load, $T_J = -10^\circ\text{C}$
	2.0		Anode supply = 6V, resistive load, $T_J = 25^\circ\text{C}$
	1.0		Anode supply = 6V, resistive load, $T_J = 125^\circ\text{C}$
V_{GD} Max. DC Gate Voltage not to trigger	0.25		$T_J = 125^\circ\text{C}$, $V_{DRM} = \text{rated value}$
I_{GD} Max. DC Gate Current not to trigger	2.0	mA	$T_J = 125^\circ\text{C}$, $V_{DRM} = \text{rated value}$

Switching

Parameters	16TTS..S	Units	Conditions
t_{gt} Typical turn-on time	0.9	μs	$T_J = 25^\circ\text{C}$
t_{rr} Typical reverse recovery time	4		$T_J = 125^\circ\text{C}$
t_q Typical turn-off time	110		

Thermal-Mechanical Specifications

Parameters	16TTS..S	Units	Conditions
T_J Max. Junction Temperature Range	-40 to 125	$^\circ\text{C}$	
T_{stg} Max. Storage Temperature Range	-40 to 125	$^\circ\text{C}$	
Soldering Temperature	240	$^\circ\text{C}$	for 10 seconds (1.6mm from case)
R_{thJC} Max. Thermal Resistance Junction to Case	1.3	$^\circ\text{C/W}$	DC operation
R_{thJA} Typ. Thermal Resistance Junction to Ambient (PCB Mount)**	40	$^\circ\text{C/W}$	
wt Approximate Weight	2 (0.07)	g (oz.)	
T Case Style	D ² Pak (SMD-220)		

**When mounted on 1" square (650mm²) PCB of FR-4 or G-10 material 4 oz (140 μm) copper 40 $^\circ\text{C/W}$
For recommended footprint and soldering techniques refer to application note #AN-994

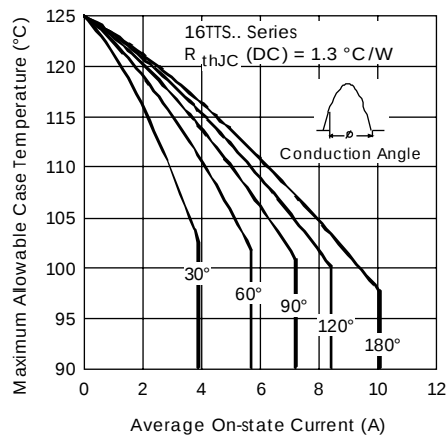


Fig. 1 - Current Rating Characteristics

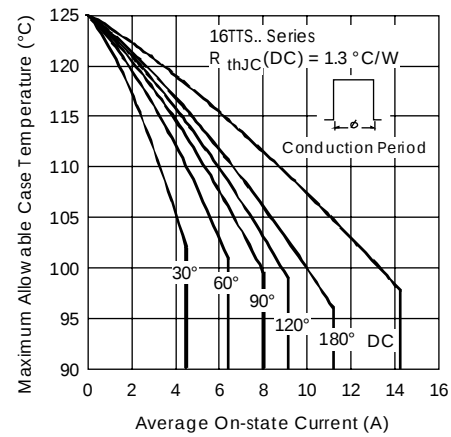


Fig. 2 - Current Rating Characteristics

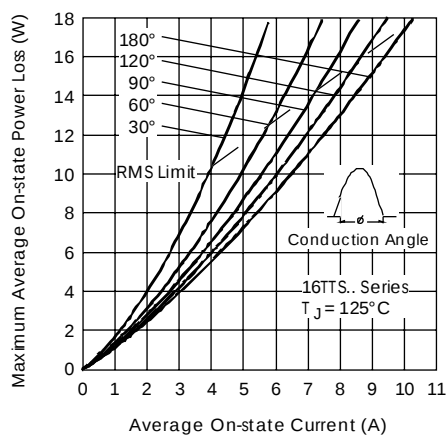


Fig. 3 - On-state Power Loss Characteristics

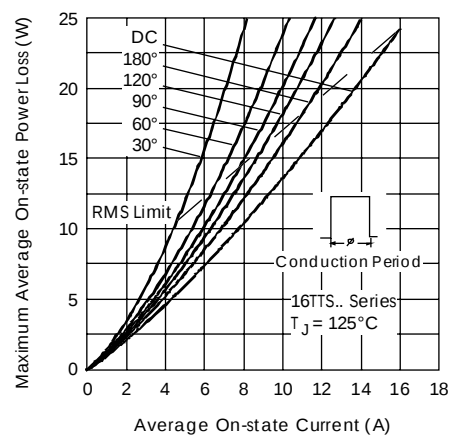


Fig. 4 - On-state Power Loss Characteristics

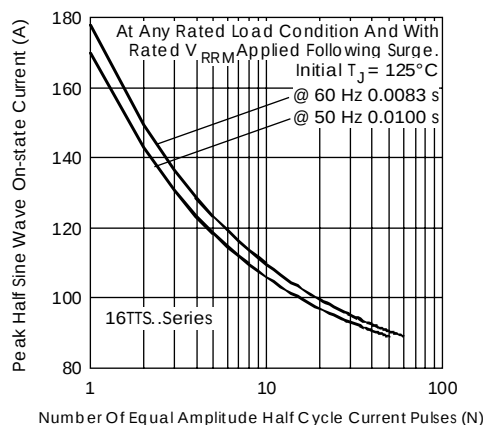


Fig. 6 - Maximum Non-Repetitive Surge Current

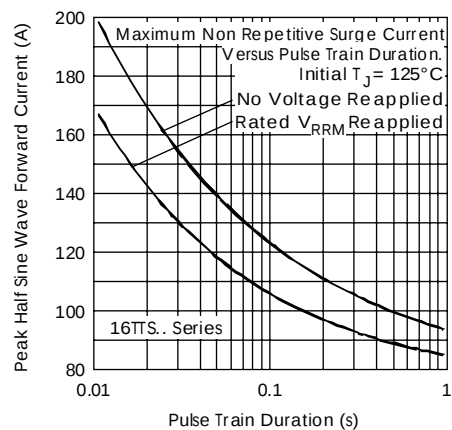


Fig. 7 - Maximum Non-Repetitive Surge Current

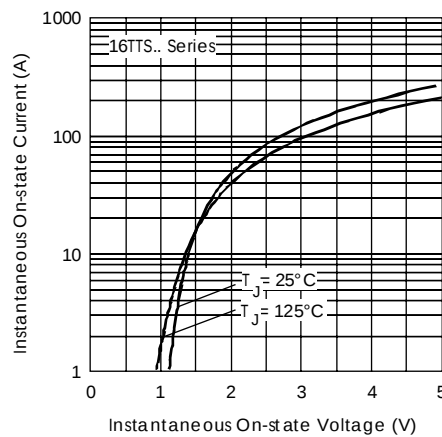


Fig. 7 - On-state Voltage Drop Characteristics

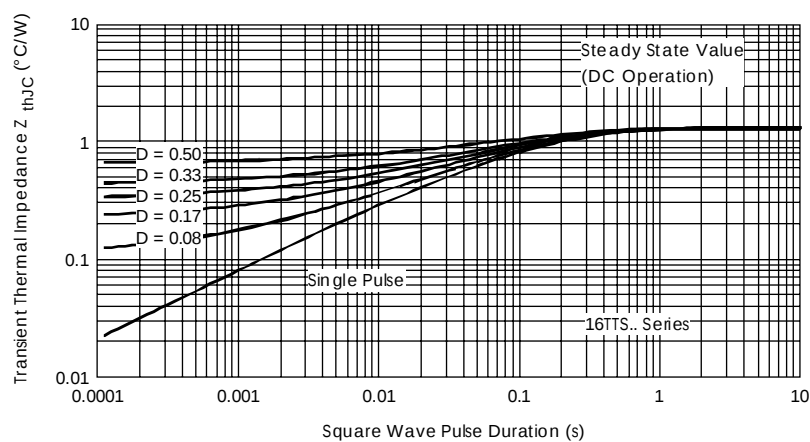


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

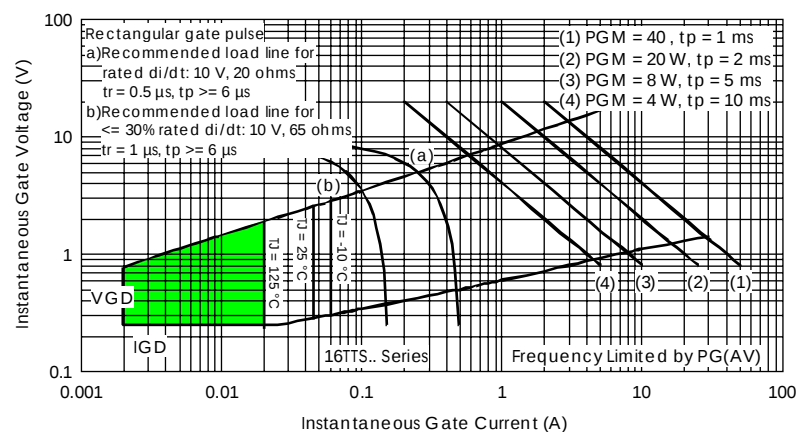


Fig. 9 - Gate Characteristics

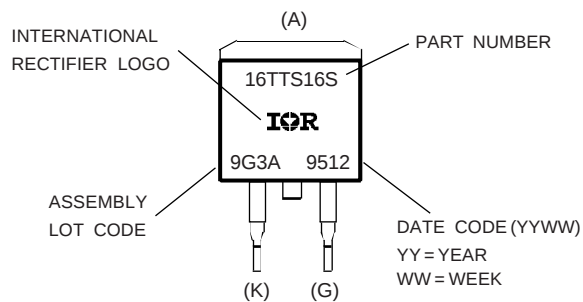
16TTS.. S *SAFEIR* Series

Bulletin I2105 rev. D 12/98

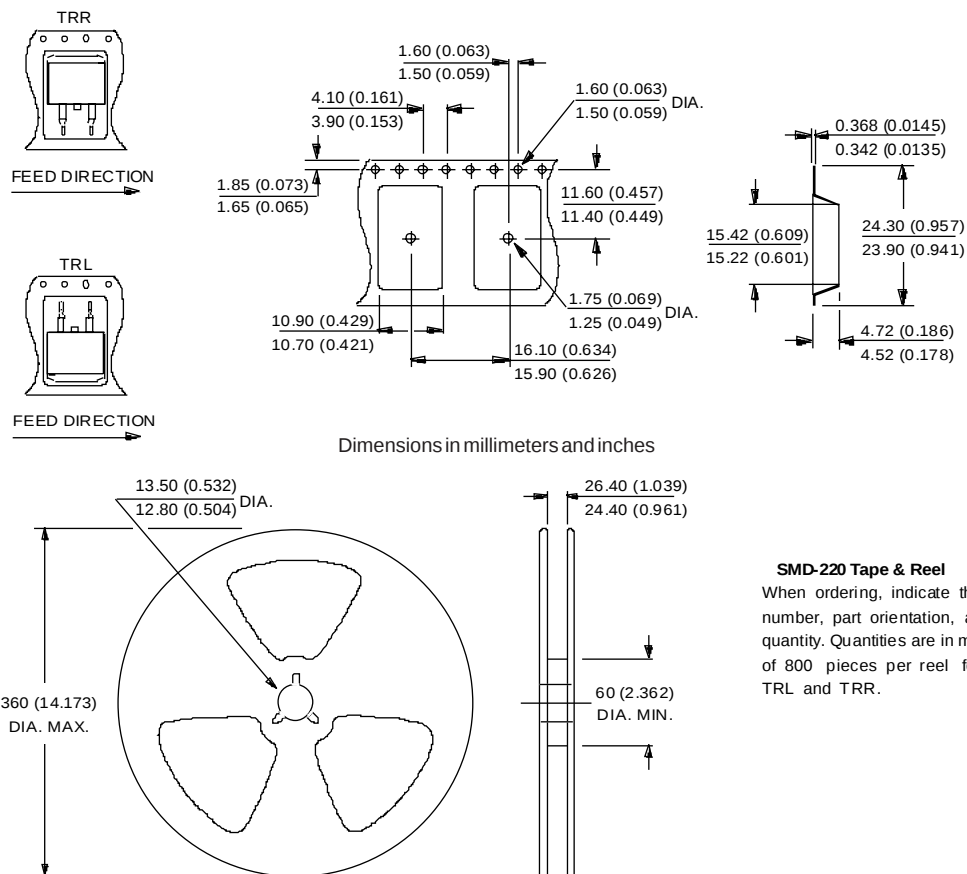
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Marking Information

EXAMPLE: THIS IS AN 16TTS16S



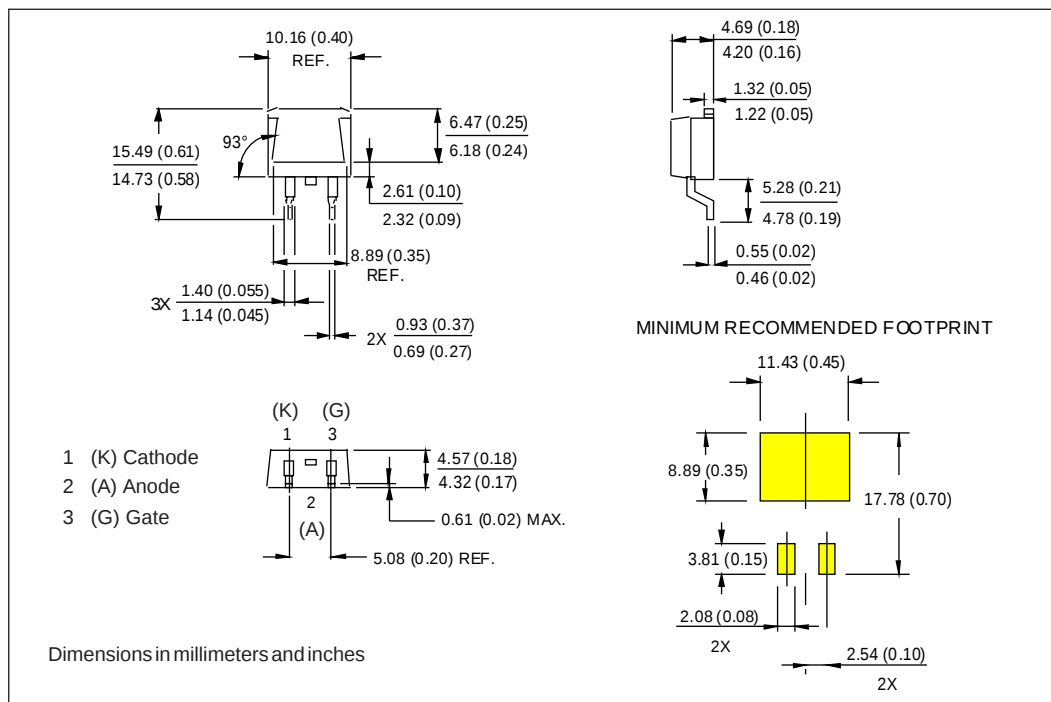
Tape & Reel Information



SMD-220 Tape & Reel

When ordering, indicate the part number, part orientation, and the quantity. Quantities are in multiples of 800 pieces per reel for both TRL and TRR.

Outline Table



Ordering Information Table

Device Code						
16	T	T	S	16	S	TRL
①	②	③	④	⑤	⑥	⑦
1	- Current Rating, RMS value					
2	- Circuit Configuration					
	T = Single Thyristor					
3	- Package					
	T = TO-220AC					
4	- Type of Silicon					
	S = Converter Grade					
5	- Voltage code: Code x 100 = V_{RRM}					
6	- S = TO-220 D ² Pak (SMD 220) Version					
7	- Tape and Reel Option					
	TRL = Left Reel					
	TRR = Right Orientation Reel					

08	= 800V
12	= 1200V
16	= 1600V

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245 U.S.A. Tel: (310) 322 3331. Fax: (310) 322 3332.
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, U.K. Tel: ++ 44 1883 732020. Fax: ++ 44 1883 733408.
IR CANADA: 15 Lincoln Court, Brampton, Markham, Ontario L6T3Z2. Tel: (905) 453 2200. Fax: (905) 475 8801.
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg. Tel: ++ 49 6172 96590. Fax: ++ 49 6172 965933.
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino. Tel: ++ 39 11 4510111. Fax: ++ 39 11 4510220.
IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo, Japan 171. Tel: 81 3 3983 0086.
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994. Tel: ++ 65 838 4630.
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