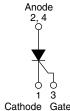


www.vishay.com

Vishay Semiconductors

# **Thyristor Surface Mount, Phase Control SCR, 16 A**





D<sup>2</sup>PAK (TO-263AB)

PRIMARY CHARACTERISTICS				
I <sub>T(AV)</sub> 16 A				
V <sub>DRM</sub> /V <sub>RRM</sub>	1600 V			
$V_{TM}$	1.25 V			
I <sub>GT</sub>	45 mA			
$T_J$	-40 to +125 °C			
Package	D <sup>2</sup> PAK (TO-263AB)			
Circuit configuration	Single SCR			

#### **FEATURES**

 Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C



 Designed and qualified according JEDEC®-JESD 47

 Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

#### **APPLICATIONS**

- · Input rectification (soft start)
- Vishay input diodes, switches and output rectifiers which are available in identical package outlines

#### **DESCRIPTION**

The VS-25TTS16S-M3 of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125 °C junction temperature.

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. (140 μm) copper	3.5	5.5					
Aluminum IMS, R <sub>thCA</sub> = 15 °C/W	8.5	13.5	А				
Aluminum IMS with heatsink, R <sub>thCA</sub> = 5 °C/W	16.5	25.0					

#### Note

•  $T_A = 55$  °C,  $T_J = 125$  °C, footprint 300 mm<sup>2</sup>

MAJOR RATINGS AND CHARACTERISTICS					
PARAMETER	TEST CONDITIONS	VALUES	UNITS		
I <sub>T(AV)</sub>	Sinusoidal waveform	16	^		
I <sub>RMS</sub>		25	A		
V <sub>RRM</sub> /V <sub>DRM</sub>		1600	V		
I <sub>TSM</sub>		350	Α		
$V_{T}$	16 A, T <sub>J</sub> = 25 °C	1.25	V		
dV/dt		500	V/µs		
dl/dt		150	A/µs		
T <sub>J</sub>		-40 to +125	°C		

<b>VOLTAGE RATINGS</b>			
PART NUMBER	V <sub>RRM</sub> , MAXIMUM PEAK REVERSE VOLTAGE V	V <sub>DRM</sub> , MAXIMUM PEAK DIRECT VOLTAGE V	I <sub>RRM</sub> /I <sub>DRM</sub> , AT 125 °C mA
VS-25TTS16S-M3	1600	1600	10



ABSOLUTE MAXIMUM RATINGS								
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES			
PARAMETER	STINIBUL	159	I CONDITIONS	TYP.	MAX.	UNITS		
Maximum average on-state current	I <sub>T(AV)</sub>	T <sub>C</sub> = 93 °C, 180° c	onduction half sine wave	1	6			
Maximum RMS on-state current	I <sub>RMS</sub>			2	5	Α		
Maximum peak, one-cycle,	L	10 ms sine pulse, r	ated V <sub>RRM</sub> applied	30	00	^		
non-repetitive surge current	I <sub>TSM</sub>	10 ms sine pulse, r	no voltage reapplied	3	50	1		
Maximum I <sup>2</sup> t for fusing	l <sup>2</sup> t	10 ms sine pulse, r	ated V <sub>RRM</sub> applied	4	50	A <sup>2</sup> s		
Waxiiiidiiii Eloi lusiiig	1 (	10 ms sine pulse, no voltage reapplied		630		A-9		
Maximum I <sup>2</sup> √t for fusing	I²√t	t = 0.1 ms to 10 ms	s, no voltage reapplied	63	00	A²√s		
Maximum on-state voltage drop	$V_{TM}$	16 A, T <sub>J</sub> = 25 °C			25	V		
On-state slope resistance	r <sub>t</sub>	T <sub>.1</sub> = 125 °C		12	2.0	mΩ		
Threshold voltage	V <sub>T(TO)</sub>	1J = 123 C		1.	.0	V		
Maximum reverse and direct leakage current	I <sub>RM</sub> /I <sub>DM</sub>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = rated V <sub>RRM</sub> /V <sub>DRM</sub>	0	.5			
Maximum reverse and direct leakage current	'RM' 'DM	T <sub>J</sub> = 125 °C	VR = Tated VRRM/ VDRM	1	0			
Holding current	I <sub>H</sub>	Anode supply = 6 V, resistive load, initial $I_T$ = 1 A, $T_J$ = 25 °C		ı	150	mA		
Maximum latching current	ΙL	Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C		Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C		20	00	
Maximum rate of rise of off-state voltage	dV/dt	$T_J = T_J \text{ max., linear}$	to 80 %, V <sub>DRM</sub> = R <sub>g</sub> - k = open	50	00	V/µs		
Maximum rate of rise of turned-on current	dl/dt			15	50	A/µs		

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P <sub>GM</sub>		8.0	W
Maximum average gate power	P <sub>G(AV)</sub>		2.0	VV
Maximum peak positive gate current	+ I <sub>GM</sub>		1.5	Α
Maximum peak negative gate voltage	- V <sub>GM</sub>		10	V
		Anode supply = 6 V, resistive load, T <sub>J</sub> = -10 °C	60	
Maximum required DC gate current to trigger	$I_{GT}$	Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C	45	mA
		Anode supply = 6 V, resistive load, T <sub>J</sub> = 125 °C	20	
		Anode supply = 6 V, resistive load, T <sub>J</sub> = -10 °C	2.5	
Maximum required DC gate voltage to trigger	$V_{GT}$	Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C	2.0	V
		Anode supply = 6 V, resistive load, T <sub>J</sub> = 125 °C	1.0	V
Maximum DC gate voltage not to trigger	$V_{GD}$	T 105 °C V reted value	0.25	
Maximum DC gate current not to trigger	I <sub>GD</sub>	T <sub>J</sub> = 125 °C, V <sub>DRM</sub> = rated value	2.0	mA

SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical turn-on time	t <sub>gt</sub>	T <sub>J</sub> = 25 °C	0.9	
Typical reverse recovery time	t <sub>rr</sub>	T <sub>.I</sub> = 125 °C	4	μs
Typical turn-off time	t <sub>q</sub>	1j = 125 C	110	

### www.vishay.com

## Vishay Semiconductors

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-40 to +125	°C	
Maximum thermal resistance, junction to case	R <sub>thJC</sub>	DC operation	1.1	°C/W	
Typical thermal resistance, junction to ambient (PCB mount)	R <sub>thJA</sub> <sup>(1)</sup>		40	C/VV	
Approximate weight			2	g	
Approximate weight			0.07	OZ.	
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	25TT	S16S	

#### Note

<sup>(1)</sup> When mounted on 1" square (650 mm²) PCB of FR-4 or G-10 material 4 oz. (140 µm] copper 40 °C/W. For recommended footprint and soldering techniques refer to application note #AN-994

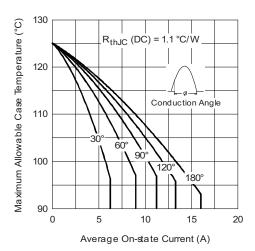


Fig. 1 - Current Rating Characteristics

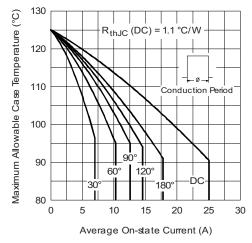


Fig. 2 - Current Rating Characteristics

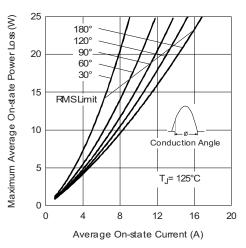


Fig. 3 - On-State Power Loss Characteristics

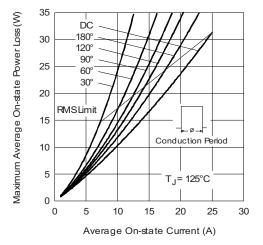


Fig. 4 - On-State Power Loss Characteristics

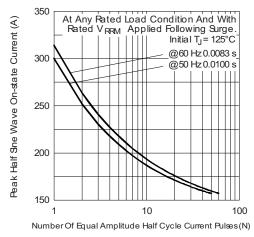


Fig. 5 - Maximum Non-Repetitive Surge Current

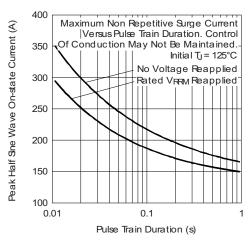


Fig. 6 - Maximum Non-Repetitive Surge Current

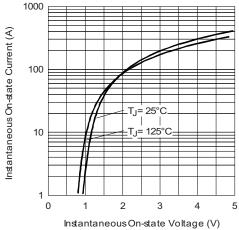


Fig. 7 - On-State Voltage Drop Characteristics

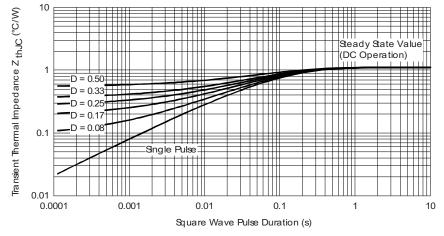


Fig. 8 - Gate Characteristics

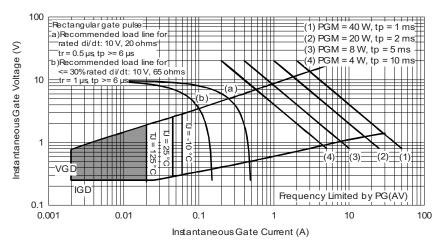


Fig. 9 - Thermal Impedance  $Z_{thJC}$  Characteristics

### **ORDERING INFORMATION TABLE**

Device code	vs-	25	т	Т	S	16	s	TRL	-M3
	1	2	3	4	5	6	7	8	9
	1 -	Visl	nay Sen	nicondu	ctors pro	oduct			
	2	Cur	rent rati	ng (25 =	25 A)				
	3		cuit conf single t	iguration hyristor	n:				
	4		kage: D <sup>2</sup> PAK	(TO-263	BAB)				
	5	Тур	e of silid	-		ifier			
	6			ing: Volt	-		) = V <sub>RRI</sub>	м	16 = 1
	7 -	· S=	surface	mounta	able				

• None = tube

	<ul> <li>IRL = tape and reel (left oriented)</li> </ul>
	<ul> <li>TRR = tape and reel (right oriented)</li> </ul>
9 -	-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)							
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION				
VS-25TTS16S-M3	50	1000	Antistatic plastic tubes				
VS-25TTS16STRR-M3	800	800	13" diameter reel				
VS-25TTS16STRL-M3	800	800	13" diameter reel				

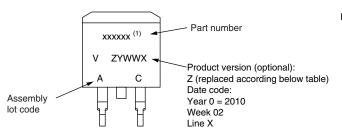
LINKS TO RELATED DOCUMENTS				
Dimensions www.vishay.com/doc?96164				
Part marking information	www.vishay.com/doc?95444			
Packaging information	www.vishay.com/doc?96424			



# **Part Marking Information**

Vishay Semiconductors

## D<sup>2</sup>PAK



Example: This is a xxxxxx <sup>(1)</sup> with assembly lot code AC, assembled on WW 02, 2010

#### Note

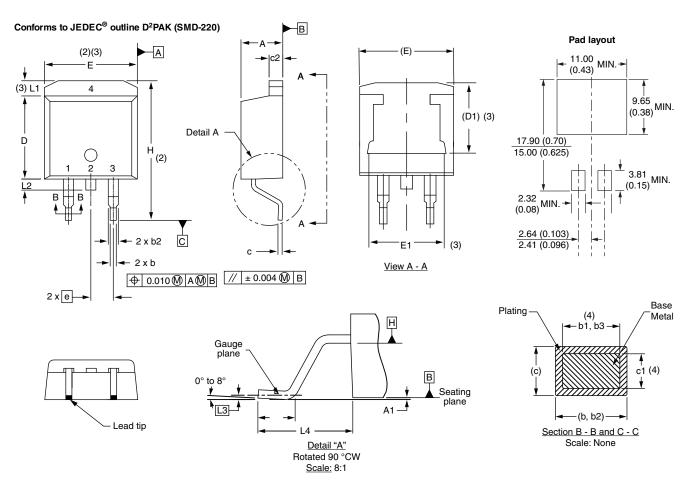
(1) If part number contain "H" as last digit, product is AEC-Q101 qualified

ENVIRONMENTAL NAMING CODE (Z)	PRODUCT DEFINITION					
А	Termination lead (Pb)-free					
В	Totally lead (Pb)-free					
E	RoHS-compliant and termination lead (Pb)-free					
F	RoHS-compliant and totally lead (Pb)-free					
M	Halogen-free, RoHS-compliant, and termination lead (Pb)-free					
N	Halogen-free, RoHS-compliant, and totally lead (Pb)-free					
G	G Green					



## D<sup>2</sup>PAK

### **DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	NOTES	STWIDOL	MIN.	MAX.	MIN.	MAX.	NOTES
Α	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	е	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		Н	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
С	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065		L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2	L4	4.78	5.28	0.188	0.208	

#### Notes

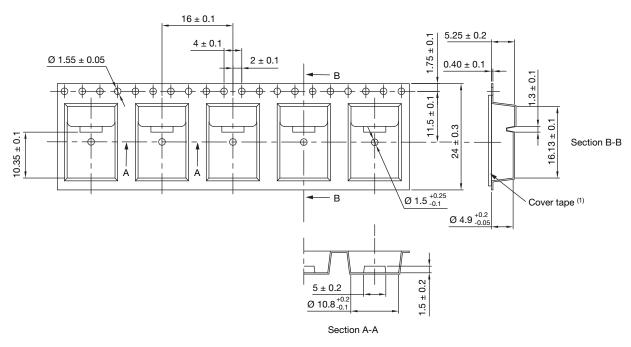
- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inches
- (7) Outline conforms to JEDEC® outline TO-263AB

Revision: 13-Jul-17 Document Number: 96164



# D<sup>2</sup>PAK (TO-263AB)

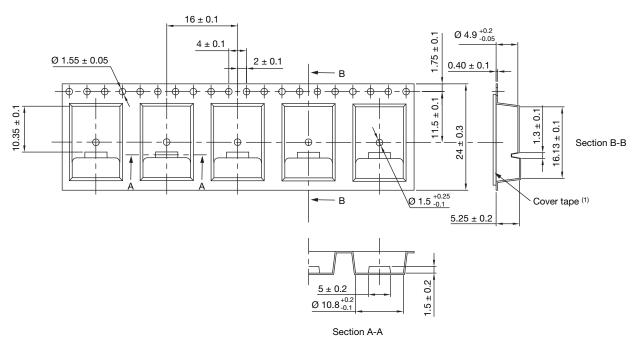
### **CARRIER TAPE FOR TAPE AND REEL LEFT** in millimeters



#### Note

(1) For dimensions, see next pages

### **CARRIER TAPE FOR TAPE AND REEL RIGHT** in millimeters

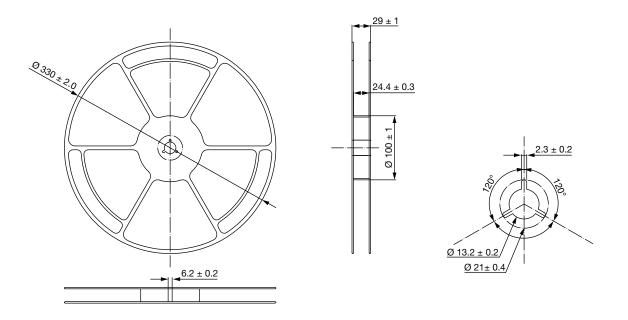


### Note

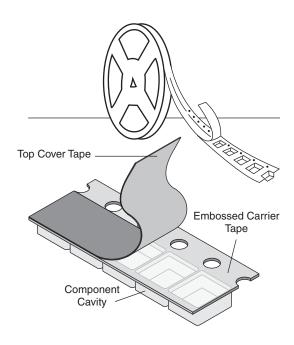
(1) For dimensions, see next pages



### **REEL FOR CARRIER TAPE** in millimeters



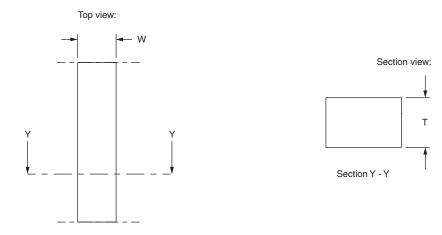
### CARRIER TAPE AND REEL PACKAGING D<sup>2</sup>PAK (TO-263AB)



# **Packaging Information**

Vishay Semiconductors

### **COVER TAPE FOR CARRIER TAPE** in millimeters



APPLICATION	COVER TAPE WIDTH W	COVER TAPE THICKNESS T	CARRIER TAPE WIDTH	MATERIAL	
D <sup>2</sup> PAK (TO-263AB)	21.3 ± 0.1	0.060 ± 0.01	24	Antistatic/treated/transparent/polyester	



## **Legal Disclaimer Notice**

Vishay

## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.