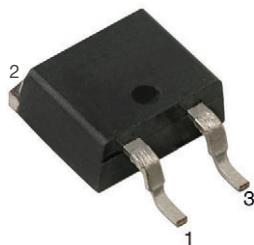
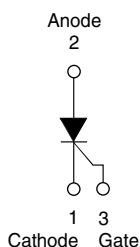


Thyristor Surface-Mount, Phase Control SCR, 16 A


D²PAK 2L (TO-263AB 2L)


FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according JEDEC®-JESD 47
- Meets JESD 201 class 2 whisker test
- Flexible solution for reliable AC power rectification
- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

LINKS TO ADDITIONAL RESOURCES



APPLICATIONS

- On-board and off-board EV / HEV battery chargers
- Renewable energy inverters

DESCRIPTION

The VS-25TTS16S2L-M3 high voltage series of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications.

MECHANICAL DATA

Case: D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

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

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	A
Aluminum IMS, $R_{thCA} = 15$ °C/W	8.5	13.5	
Aluminum IMS with heatsink, $R_{thCA} = 5$ °C/W	16.5	25.0	

Note

- $T_A = 55$ °C, $T_J = 125$ °C, footprint 300 mm²

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	16	A
I_{RMS}		25	
V_{RRM}/V_{DRM}		1600	V
I_{TSM}		350	A
V_T	16 A, $T_J = 25$ °C	1.25	V
dV/dt		500	V/µs
dI/dt		150	A/µs
T_J		-40 to +125	°C

VOLTAGE RATINGS			
PART NUMBER	V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V	V_{DRM} , MAXIMUM PEAK DIRECT VOLTAGE V	I_{RRM}/I_{DRM} , AT 125 °C mA
VS-25TTS16SL-M3	1600	1600	10

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES		UNITS
				TYP.	MAX.	
Maximum average on-state current	I _{T(AV)}	T _C = 93 °C, 180° conduction half sine wave		16		A
Maximum RMS on-state current	I _{RMS}			25		
Maximum peak, one-cycle, non-repetitive surge current	I _{TSM}	10 ms sine pulse, rated V _{RRM} applied		300		
		10 ms sine pulse, no voltage reapplied		350		
Maximum I ² t for fusing	I ² t	10 ms sine pulse, rated V _{RRM} applied		450		A ² s
		10 ms sine pulse, no voltage reapplied		630		
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied		6300		A ² √s
Maximum on-state voltage drop	V _{TM}	16 A, T _J = 25 °C		1.25		V
On-state slope resistance	r _t	T _J = 125 °C		12.0		mΩ
Threshold voltage	V _{T(TO)}			1.0		V
Maximum reverse and direct leakage current	I _{RM} /I _{DM}	T _J = 25 °C	V _R = Rated V _{RRM} /V _{DRM}	0.5		mA
		T _J = 125 °C		10		
Holding current	I _H	Anode supply = 6 V, resistive load, initial I _T = 1 A, T _J = 25 °C		-	150	
Maximum latching current	I _L	Anode supply = 6 V, resistive load, T _J = 25 °C		200		
Maximum rate of rise of off-state voltage	dV/dt	T _J = T _J max., linear to 80 %, V _{DRM} = R _g - k = Open		500		V/μs
Maximum rate of rise of turned-on current	dI/dt			150		A/μs

TRIGGERING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum peak gate power	P _{GM}		8.0	W	
Maximum average gate power	P _{G(AV)}		2.0		
Maximum peak positive gate current	+ I _{GM}		1.5	A	
Maximum peak negative gate voltage	- V _{GM}		10	V	
Maximum required DC gate current to trigger	I _{GT}	Anode supply = 6 V, resistive load, T _J = - 10 °C	60	mA	
		Anode supply = 6 V, resistive load, T _J = 25 °C	45		
		Anode supply = 6 V, resistive load, T _J = 125 °C	20		
Maximum required DC gate voltage to trigger	V _{GT}	Anode supply = 6 V, resistive load, T _J = - 10 °C	2.5	V	
		Anode supply = 6 V, resistive load, T _J = 25 °C	2.0		
		Anode supply = 6 V, resistive load, T _J = 125 °C	1.0		
Maximum DC gate voltage not to trigger	V _{GD}	T _J = 125 °C, V _{DRM} = Rated value	0.25		mA
Maximum DC gate current not to trigger	I _{GD}		2.0		

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical turn-on time	t_{gt}	$T_J = 25\text{ }^{\circ}\text{C}$	0.9	μs
Typical reverse recovery time	t_{rr}	$T_J = 125\text{ }^{\circ}\text{C}$	4	
Typical turn-off time	t_q		110	

**THERMAL AND MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}		-40 to +125	°C
Soldering temperature	T_S	For 10 s (1.6 mm from case)	260	
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	1.1	°C/W
Typical thermal resistance, junction to ambient (PCB mount)	$R_{thJA}^{(1)}$		40	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D ² PAK 2L (TO-263AB 2L)	25TTS16S	

Note

(1) When mounted on 1" square (650 mm²) PCB of FR-4 or G-10 material 4 oz. (140 μm) copper 40 °C/W

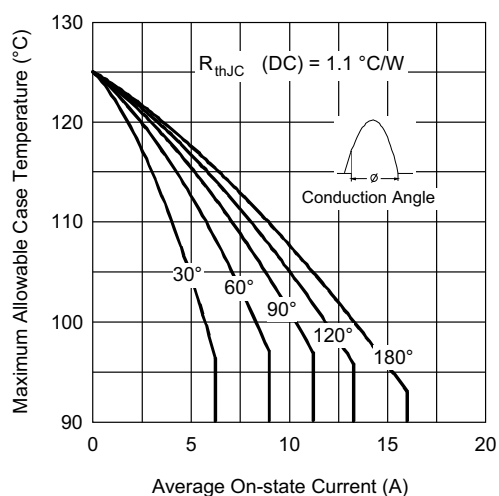


Fig. 1 - Current Rating Characteristics

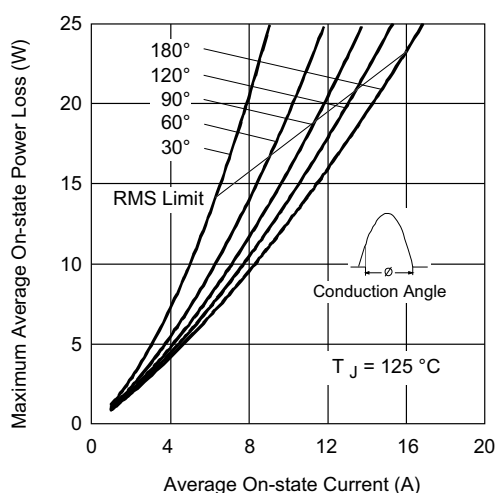


Fig. 3 - On-State Power Loss Characteristics

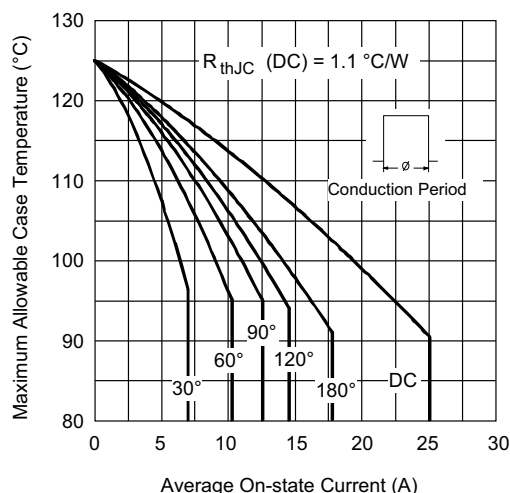


Fig. 2 - Current Rating Characteristics

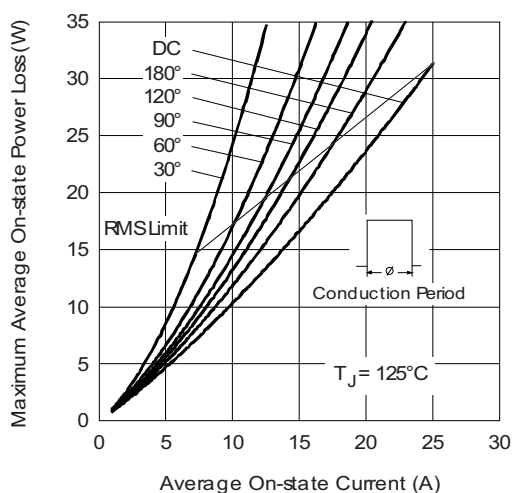


Fig. 4 - On-State Power Loss Characteristics

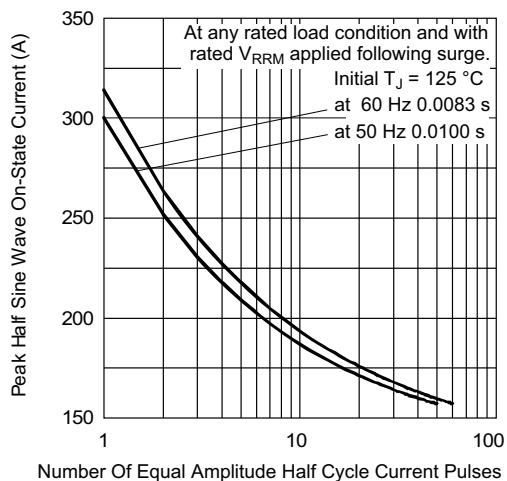


Fig. 5 - Maximum Non-Repetitive Surge Current

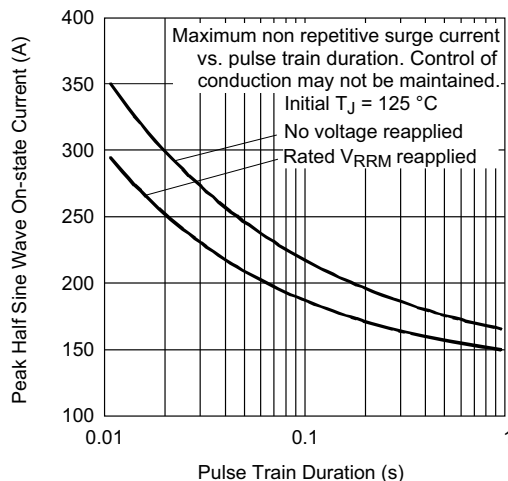


Fig. 6 - Maximum Non-Repetitive Surge Current

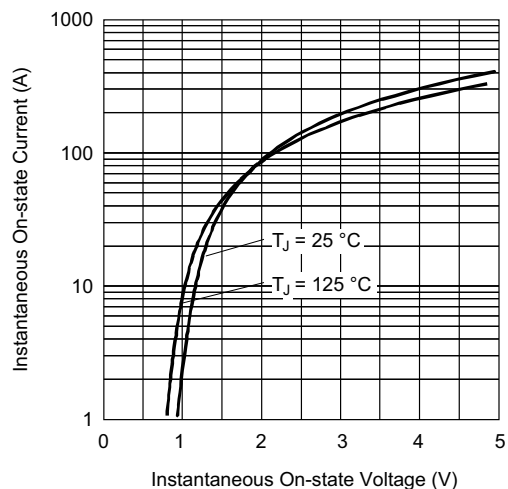
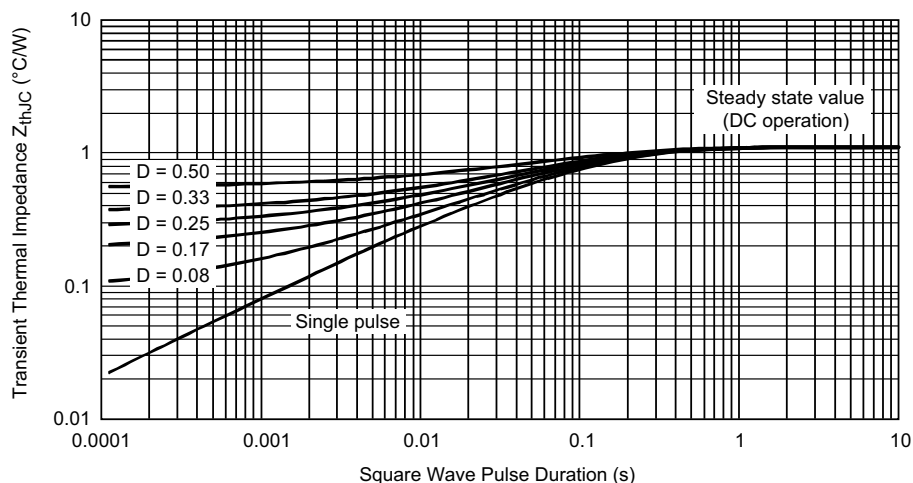


Fig. 7 - On-State Voltage Drop Characteristics


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

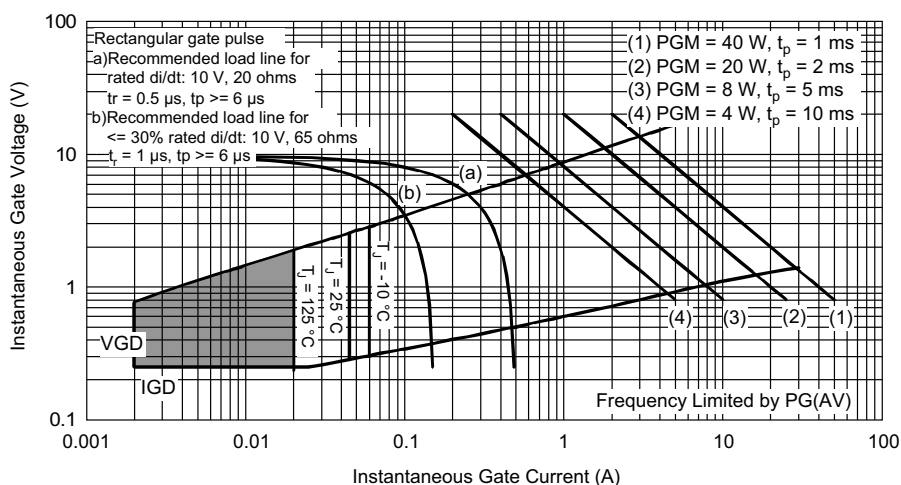


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	25	T	T	S	16	S	2	L	-M3
------------	-----------	----------	----------	----------	-----------	----------	----------	----------	------------

Diagram illustrating the device code structure (VS-25TT S16SL-M3) and its corresponding parameters:

- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 3** - Circuit configuration:
T = single thyristor
- 4** - Package:
T = D²PAK (TO-263AB)
- 5** - Type of silicon:
S = standard recovery rectifier
- 6** - Voltage rating: Voltage code x 100 = V_{RRM} — **16 = 1600 V**
- 7** - S = surface mountable
- 8** - 2 = true 2 pin D²PAK
- 9** - L = tape and reel (left oriented), for different orientation contact factory
- 10** - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)

PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-25TTS16S2L-M3	800	800	13" diameter reel

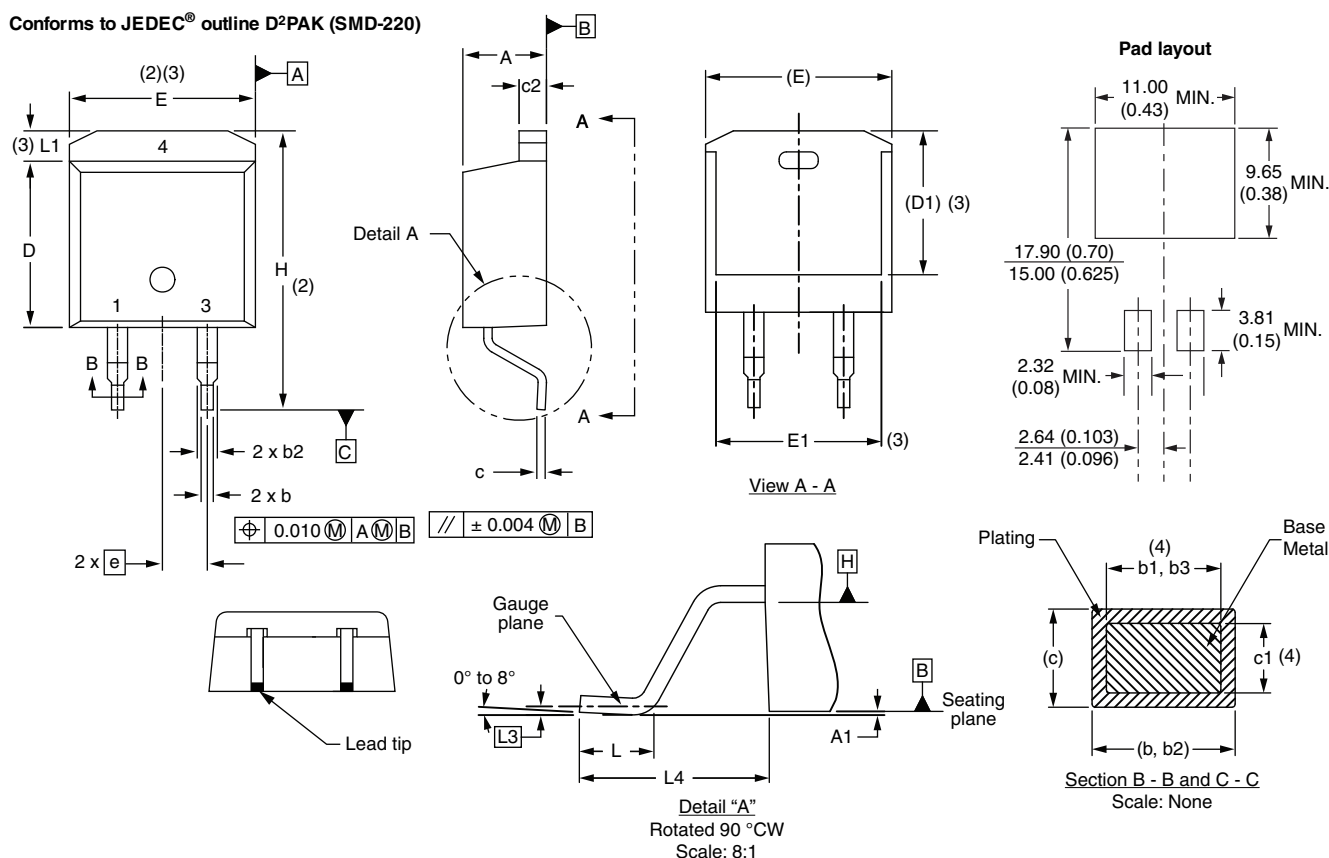
LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?96683
Part marking information	www.vishay.com/doc?96693
Packaging information	www.vishay.com/doc?96317

D²PAK 2L (TO-263AB 2L)

DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D²PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L3	0.25 BSC		0.010 BSC		
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: inch
- (7) Outline conforms to JEDEC® outline TO-263AB



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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. 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.