

Bi-Directional P-Channel MOSFET/Power Switch

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
± 7	0.170 at $V_{GS} = -4.5$ V	± 2.4
	0.240 at $V_{GS} = -2.5$ V	± 2.0

DESCRIPTION

The Si3831DV is a low on-resistance p-channel power MOSFET providing bi-directional blocking and conduction. Bi-directional blocking is facilitated by combining a 4-terminal symmetric p-channel MOSFET with a body bias selector circuit^a. Circuit operation automatically biases the p-channel body to the most positive source/drain potential thereby maintaining a reverse bias across the diode present between the source/drain terminals. Off-state device blocking characteristics are symmetric, facilitating bi-directional blocking for high-side battery switching in portable products. Gate drive is facilitated by negatively biasing the gate relative to the body potential. The off-state is achieved by biasing the gate to the most positive supply voltage or to the body potential. The Si3831DV is available in a 6-pin TSOP-6 package rated for the -25°C to 85°C commercial temperature range.

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Low $R_{DS(on)}$ Symmetrical P-Channel MOSFET
- Integrated Body Bias For Bi-Directional Blocking
- 2.5 V to 5.5 V Operation
- Exceeds ± 2 kV ESD Protected
- Solution for High-Side Battery Disconnect Switching (BDS)
- Supports Battery Switching in Multiple Battery Cell Phones, PDAs and PCS Products
- Low Profile, Small Footprint TSOP-6 Package
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATION CIRCUITS

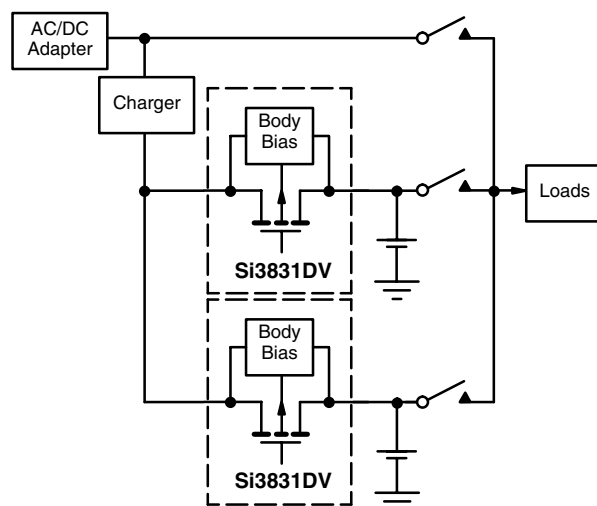


Figure 1. Charger Demultiplexing

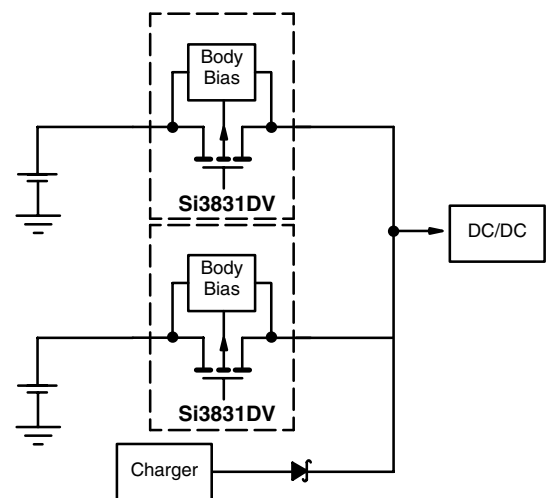


Figure 2. Battery Multiplexing (High-Side Switch)

Note:

a. Patents pending.

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

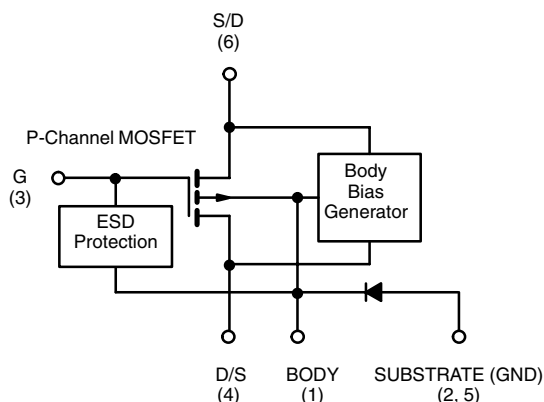


Figure 3.

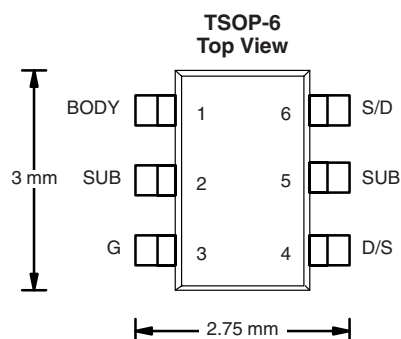


Figure 4.

Ordering Information: Si3831DV-T1-E3 (Lead (Pb)-free)
Si3831DV-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage, Source-Drain Voltage ^a		V _{DS}	- 7.0 to + 7.0	V
Source-Body, Drain-Body, Gate-Body Voltage		V _{SB} , V _{DB} , V _{GB}	0.3 to - 7.0	
Body-Substrate Voltage		V _{BSUB}	+ 7.0 to - 0.3	
Continuous Drain-to-Source Current (T _J = 150 °C) ^{a, b}	T _A = 25 °C	I _D	± 2.4	A
	T _A = 70 °C		± 2.0	
Pulsed Drain-to-Source Current ^a		I _{DM}	± 8	
Maximum Power Dissipation ^b	T _A = 25 °C	P _D	1.5	W
	T _A = 70 °C		1.0	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	°C

RECOMMENDED OPERATING RANGE			
Parameter	Symbol	Range	Unit
Drain-Source Voltage ^a	V_{DS}	- 5.5 to 5.5	V
Gate-Drain, Gate-Source Voltage	V_{GD}, V_{GS}	0 to - 5.5	
Source-Body, Drain-Body, Gate-Body Voltage	V_{SB}, V_{DB}, V_{GB}	0 to - 5.5	
Drain-to-Source Current ^{a, b}	I_{DS}	± 2.4	A
Body-Source Current	I_{BS}	0 to 10	μA

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Maximum Junction-to-Ambient ^b	R_{thJA}	80	$^{\circ}\text{C}/\text{W}$
		125	

Notes:

a. Bi-directional.

b. Surface Mounted on FR4 board, $t \leq 5\text{ s}$.

c. Surface Mounted on FR4 board, Steady-State.

SPECIFICATIONS $V_{BS} = 0\text{ V}$, $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-0.4			V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = -5.5\text{ V to }+0.3\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -5.5\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{SB} = 0\text{ V}$			-1	μA
		$V_{DS} = -5.5\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{SB} = 0\text{ V}$, $T_J = 70\text{ }^{\circ}\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -3\text{ V}$, $V_{GS} = -4.5\text{ V}$	-8			A
		$V_{DS} = -3\text{ V}$, $V_{GS} = -2.5\text{ V}$	-3			
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$, $I_D = -2.4\text{ A}$		0.130	0.170	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -2.0\text{ A}$		0.180	0.240	
Dynamic ^b						
Total Gate Charge	Q_g	$V_{DS} = -5\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -2.4\text{ A}$		2.0	4.0	nC
Gate-Source Charge	Q_{gs}			0.23		
Gate-Drain Charge	Q_{gd}			0.14		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -3\text{ V}$, $R_L = 3\text{ }\Omega$ $I_D \cong -1.0\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 6\text{ }\Omega$		12	25	ns
Rise Time	t_r			55	110	
Turn-Off Delay Time	$t_{d(off)}$			90	180	
Fall Time	t_f			85	170	

Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

GATE BUFFER REFERENCE

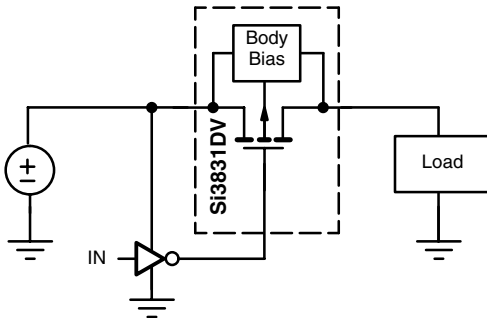


Figure 5. Gate Buffer Referenced to Most Positive Supply

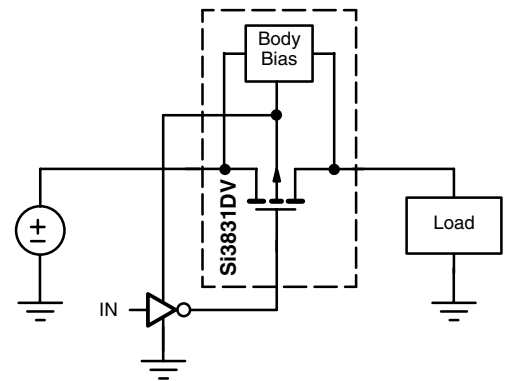
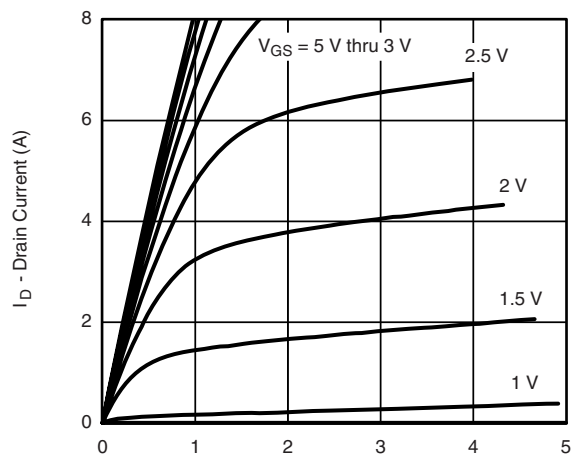
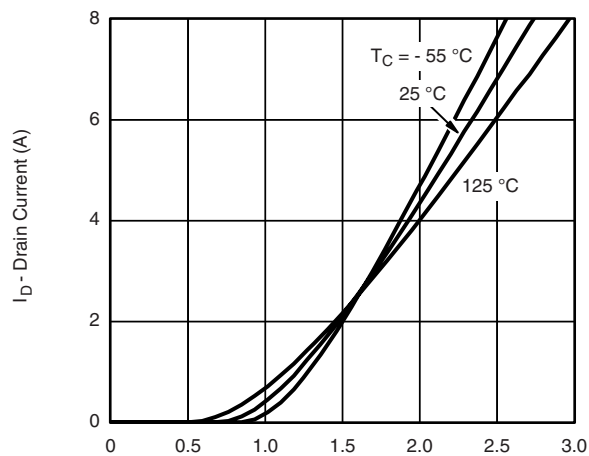


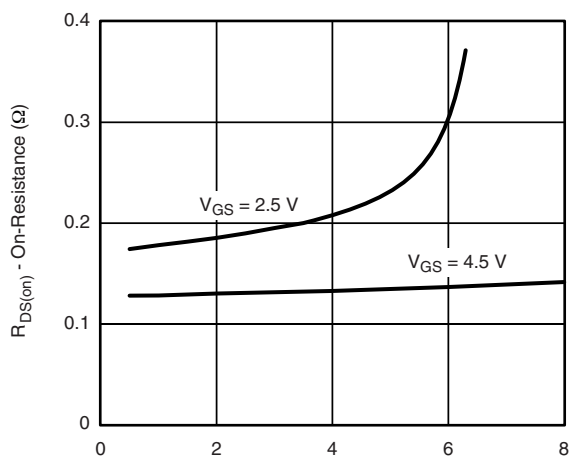
Figure 6. Gate Buffer Referenced to Body Bias Pin

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

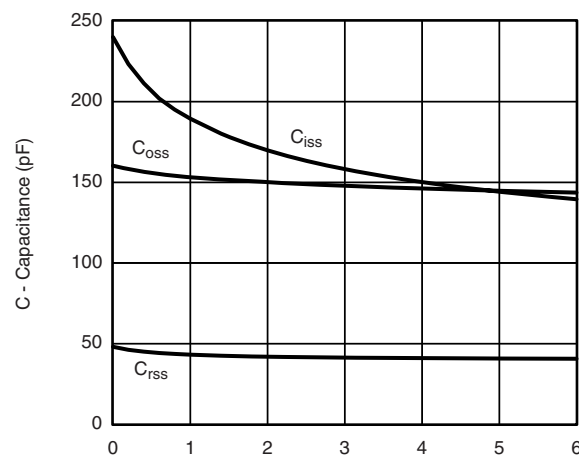
V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



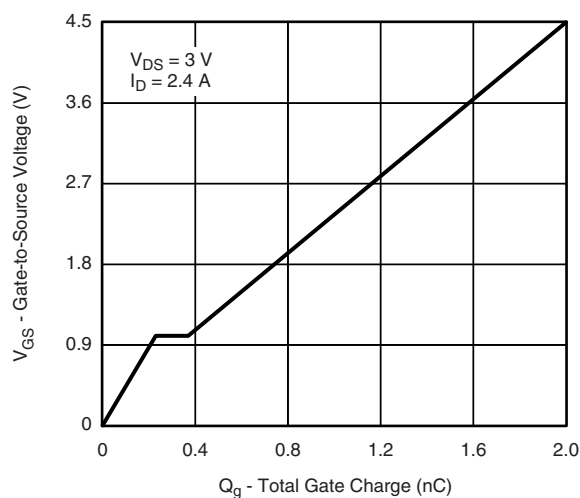
V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics



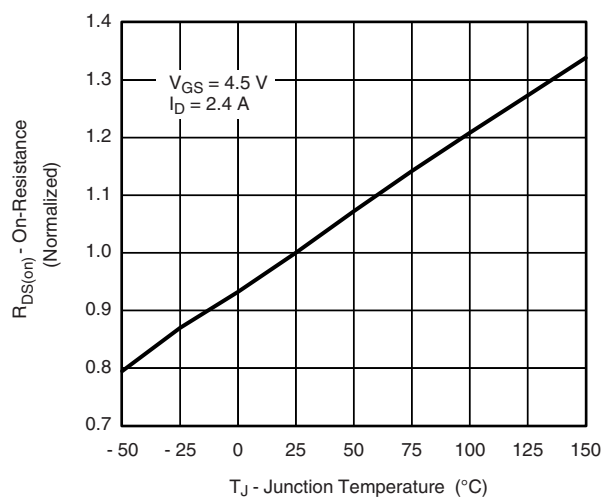
On-Resistance vs. Drain Current



Capacitance

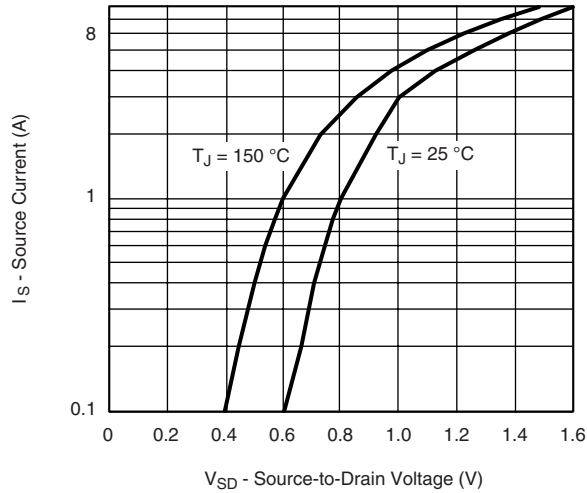


Gate Charge

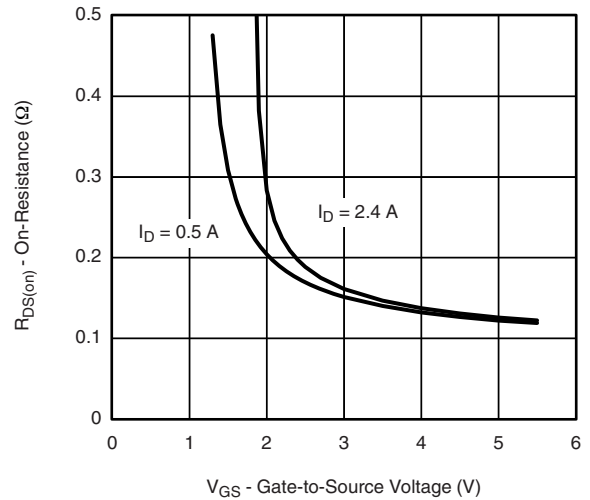


On-Resistance vs. Junction Temperature

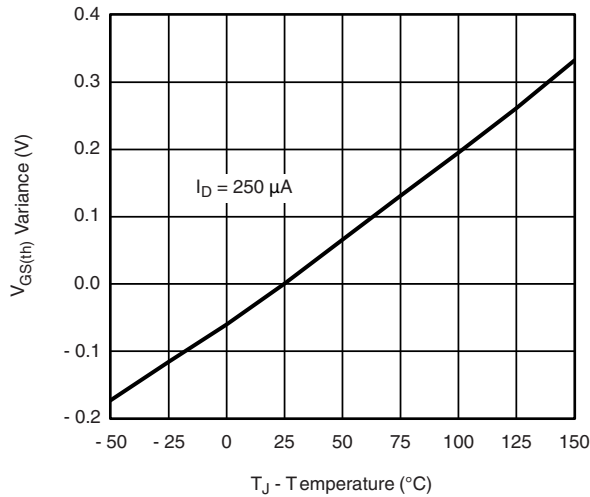
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



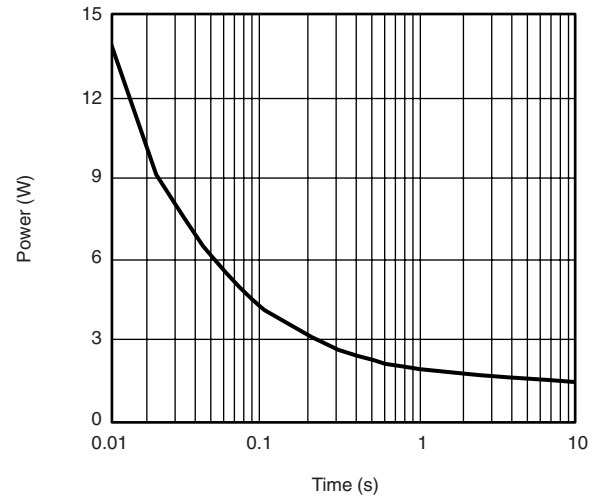
Source-Drain Diode Forward Voltage



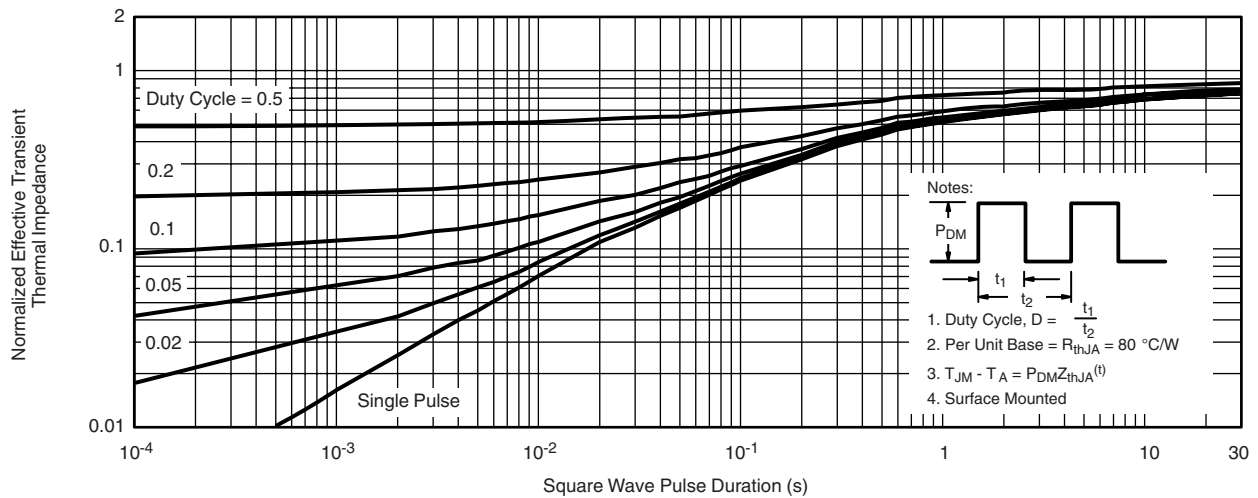
On-Resistance vs. Gate-to-Source Voltage



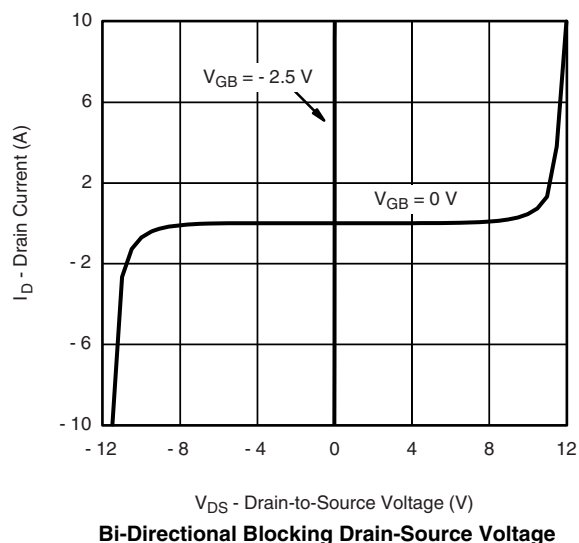
Threshold Voltage



Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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.