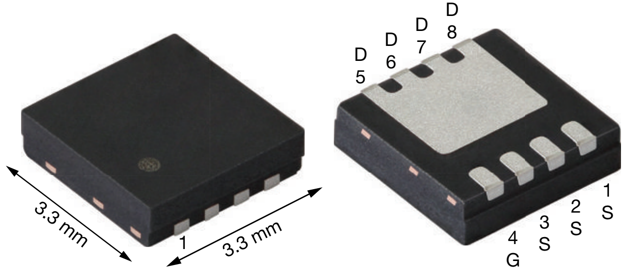
Automotive N-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® 1212-8SLW



Top View

Bottom View

Marking code: Q050

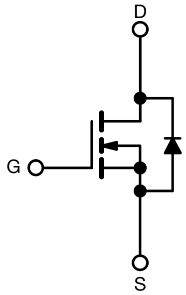
FEATURES

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

- TrenchFET® Gen IV power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Wettable flank terminals
- Low thermal resistance with 0.75 mm profile
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.0065
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0045
I_D (A) [e]	86
Configuration	Single

ORDERING INFORMATION

Package	PowerPAK® 1212-8SLW
Lead (Pb)-free and halogen-free	SQS142ELNW (for detailed order number please see www.vishay.com/doc?79771)

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current [e]	T_C = 25 °C	I_D	86	A
	T_C = 125 °C		63	
Continuous source current (diode conduction) [e]		I_S	64	
Pulsed drain current [a, e]		I_{DM}	271	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	22.5	
Single pulse avalanche energy		E_{AS}	25.3	mJ
Maximum power dissipation [a]	T_C = 25 °C	P_D	70	W
	T_C = 125 °C		23	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [b]	R_{thJA}	54	°C/W
Junction-to-case (drain) [d]		R_{thJC}	2.1	

Notes

a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %

b. When mounted on 1" square PCB (FR4 material)

c. See solder profile (www.vishay.com/doc?73257). A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection

d. As per on JESD51-14

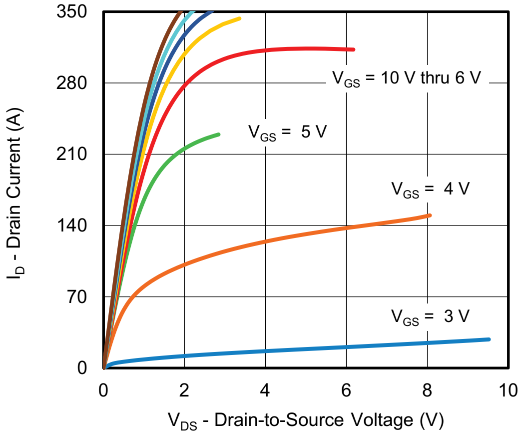
e. Values based on R_{thJC} and T_C 25 °C. Actual values achievable will be dependent on the thermal characteristics of the complete system

SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = 250 μA		40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA		1.2	1.7	2.5	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 40 V	-	-	1	μA
		V_{GS} = 0 V	V_{DS} = 40 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 40 V, T_J = 175 °C	-	-	150	
On-state drain current [a]	$I_{D(on)}$	V_{GS} = 10 V	$V_{DS} \geq 5$ V	20	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 4.5 V	I_D = 10 A	-	0.0050	0.0065	Ω
		V_{GS} = 10 V		-	0.0034	0.0045	
		V_{GS} = 10 V	I_D = 10 A, T_J = 125 °C	-	-	0.0078	
		V_{GS} = 10 V	I_D = 10 A, T_J = 175 °C	-	-	0.0095	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 10 A		-	70	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	1744	2442	pF
Output capacitance	C_{oss}			-	442	619	
Reverse transfer capacitance	C_{rss}			-	39	55	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 20 V, I_D = 3 A	-	32	48	nC
Gate-source charge [c]	Q_{gs}			-	6	-	
Gate-drain charge [c]	Q_{gd}			-	6	-	
Gate resistance	R_g	f = 1 MHz		0.7	1.4	2.1	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 6.67 Ω $I_D \cong 3$ A, V_{GEN} = 10 V, R_g = 1 Ω		-	11	17	ns
Rise time [c]	t_r			-	4	8	
Turn-off delay time [c]	$t_{d(off)}$			-	25	38	
Fall time [c]	t_f			-	6	9	
Source-Drain Diode Ratings and Characteristic [b]							
Pulsed current [a]	I_{SM}			-	-	271	A
Forward voltage	V_{SD}	I_F = 10 A, V_{GS} = 0 V		-	0.82	1.1	V
Body diode reverse recovery time	t_{rr}	V_{DD} = 32 V, I_{FM} = 3 A, di/dt = 100 A/μs, R = 10 Ω, L = 0.3 mH, pulse width = 2 μs		-	27	54	ns
Body diode reverse recovery charge	Q_{rr}			-	19	38	nC
Reverse recovery fall time	t_a			-	14	-	ns
Reverse recovery rise time	t_b			-	14	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.2	-	A

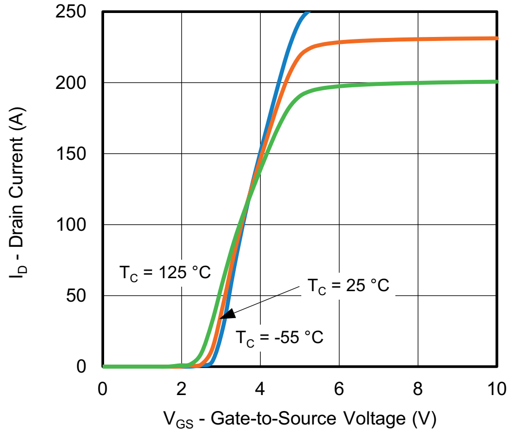
Notes

a. Pulse test; pulse width $\leq$ 300 μs, duty cycle $\leq$ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

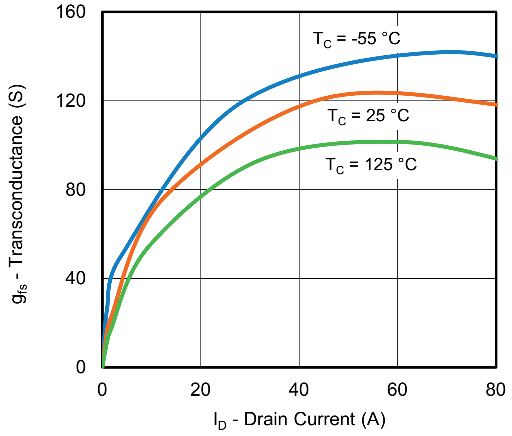
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



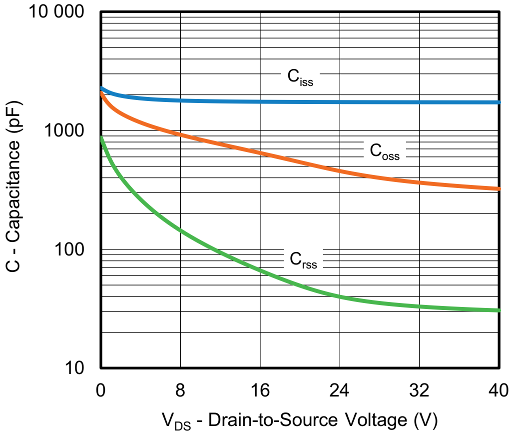
Output Characteristics



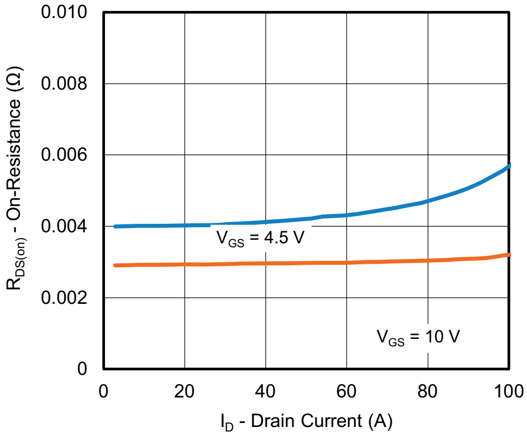
Transfer Characteristics



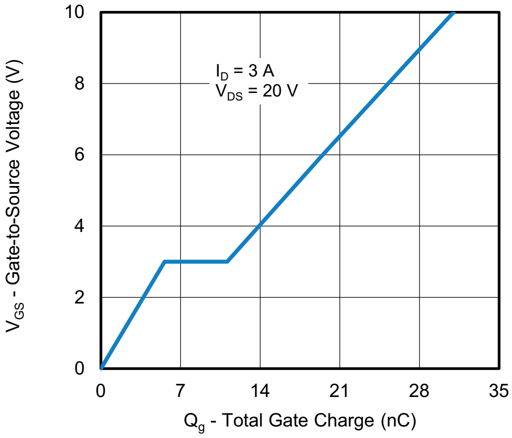
Transconductance



Capacitance

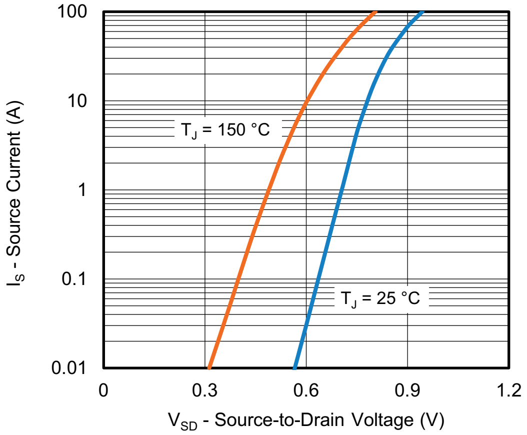


On-Resistance vs. Drain Current

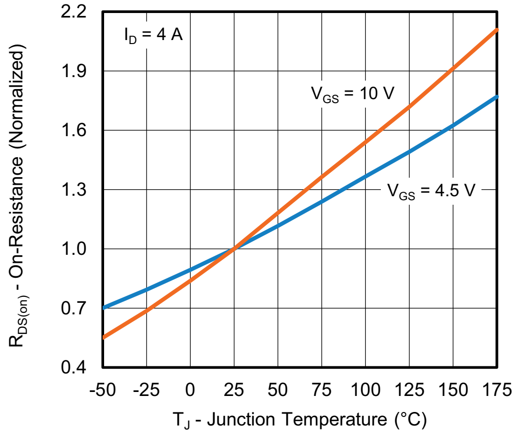


Gate Charge

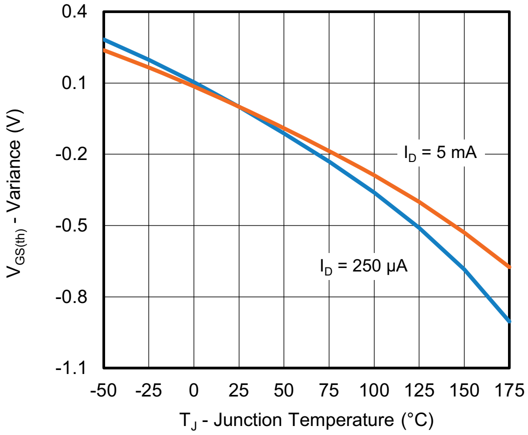
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



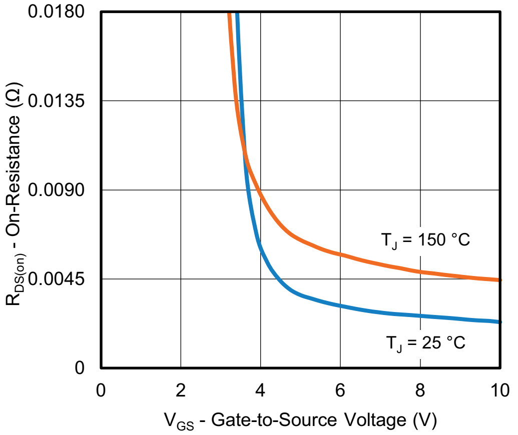
Source Drain Diode Forward Voltage



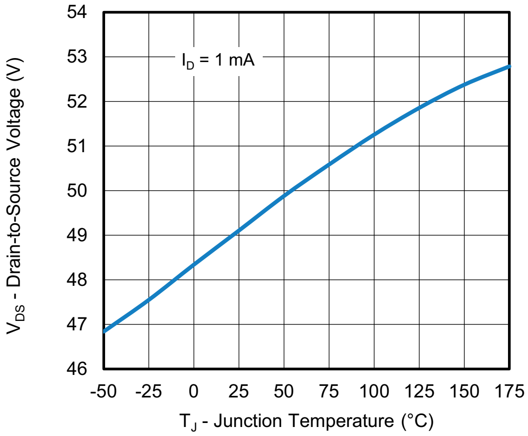
On-Resistance vs. Junction Temperature



Threshold Voltage

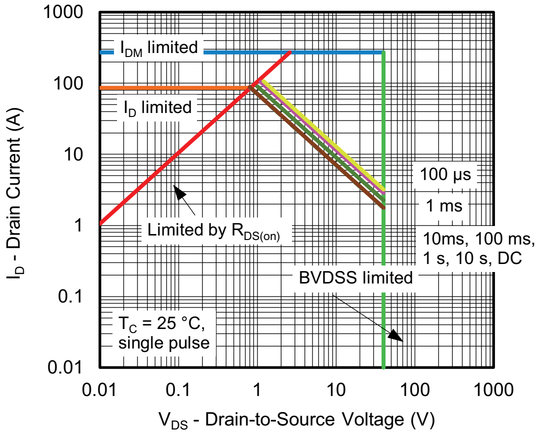


On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

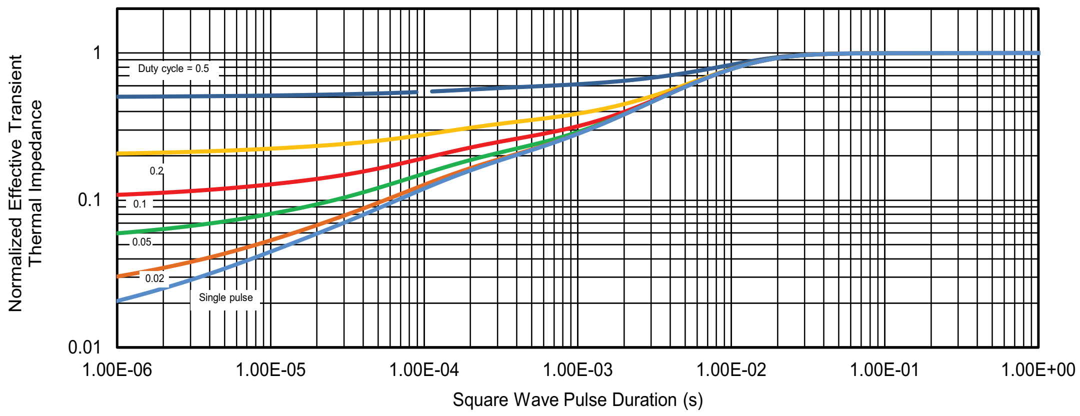


Safe Operating Area

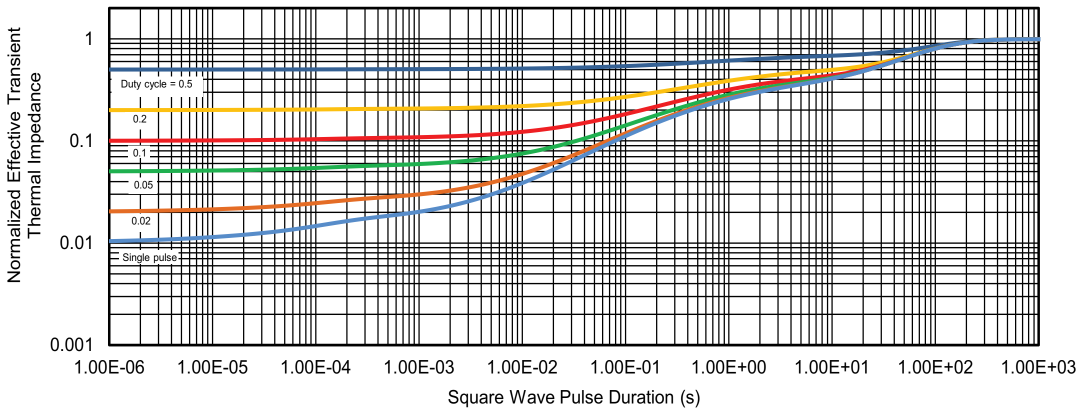
Note

a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Ambient

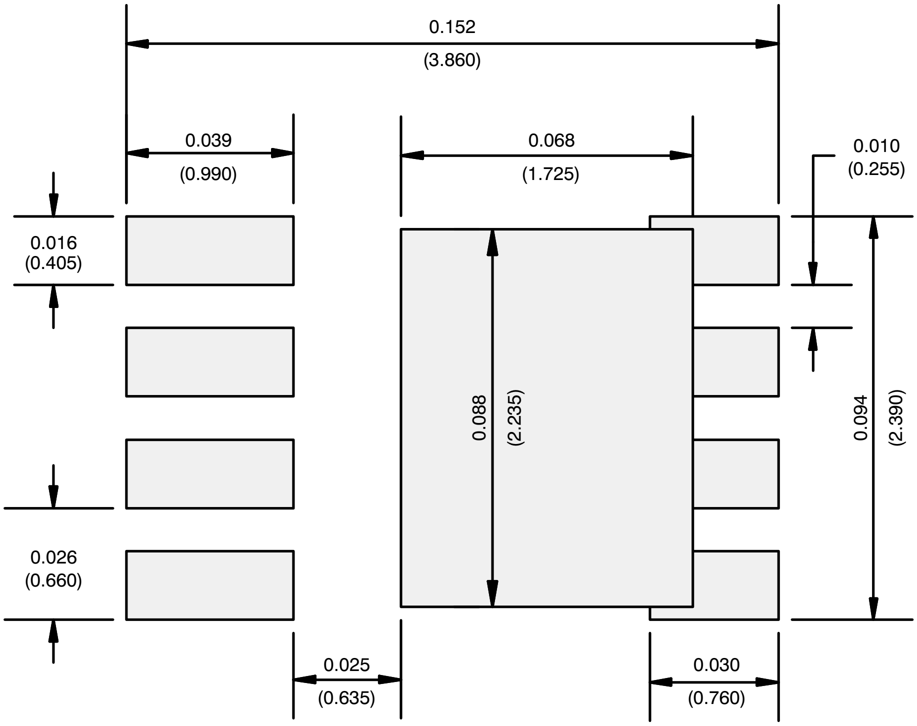
Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?63170.

RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

Return to Index

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.

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.