

S Series Power MOSFET

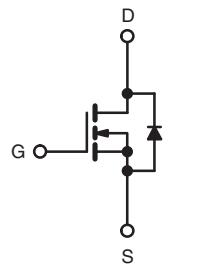
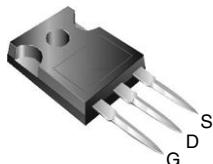
PRODUCT SUMMARY	
V _{DS} (V) at T _J max.	650
R _{DS(on)} max. at 25 °C (Ω)	V _{GS} = 10 V 0.07
Q _g max. (nC)	216
Q _{gs} (nC)	39
Q _{gd} (nC)	57
Configuration	Single

FEATURES

- Generation One
- Low Figure-of-Merit R_{on} x Q_g
- 100 % Avalanche Tested
- Ultra Low Gate Charge
- Ultra Low R_{on}
- Compliant to RoHS Directive 2002/95/EC


RoHS
COMPLIANT

TO-247AC



N-Channel MOSFET

APPLICATIONS

- PFC Power Supply Stages
- Hard Switching Topologies
- Solar Inverters
- UPS
- Motor Control
- Server Telecom

ORDERING INFORMATION

Package	TO-247AC
Lead (Pb)-free	SiHG47N60S-E3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	600	V
Gate-Source Voltage	V _{GS}	± 20	
Gate-Source Voltage AC (f > 1 Hz)		30	
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 10 V	T _C = 25 °C	A
		T _C = 100 °C	
Pulsed Drain Current ^a	I _{DM}	47	A
		30	
Linear Derating Factor		140	W/°C
Avalanche Energy (repetitive)	E _{AR}	3.3	
Single Pulse Avalanche Energy ^b	E _{AS}	0.42	mJ
Maximum Power Dissipation	P _D	1800	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	417	W
Drain-Source Voltage Slope	T _J = 125 °C	- 55 to + 150	°C
Reverse Diode dV/dt ^d	dV/dt	37	V/ns
Soldering Recommendations (Peak Temperature) ^c	for 10 s	8.5	
		300	°C

Notes

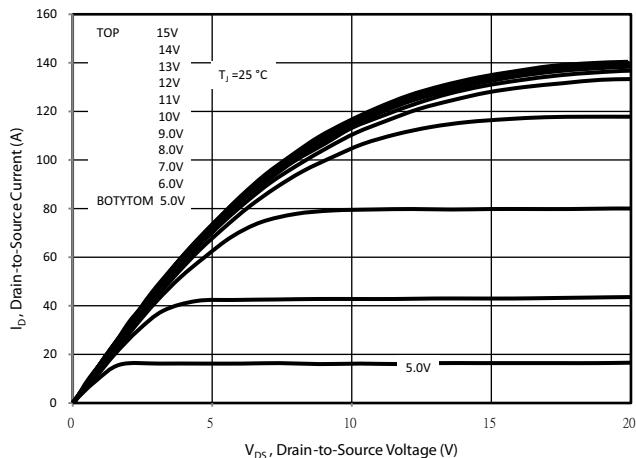
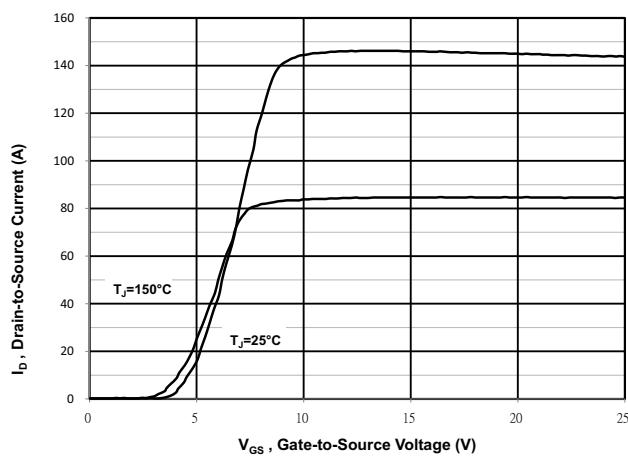
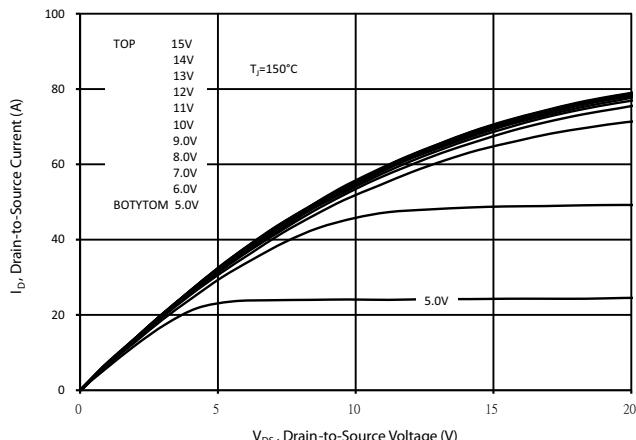
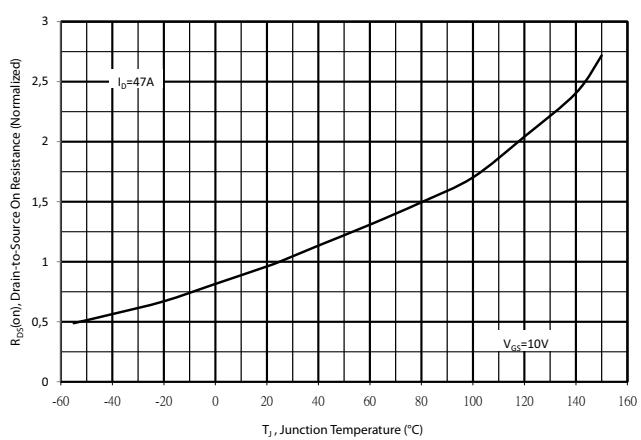
- Repetitive rating; pulse width limited by maximum junction temperature.
- V_{DD} = 50 V, starting T_J = 25 °C, L = 73.5 mH, R_g = 25 Ω, I_{AS} = 7 A.
- 1.6 mm from case.
- I_{SD} ≤ I_D, dI/dt = 100 A/μs, starting T_J = 25 °C.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	$^{\circ}\text{C/W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.3	

SPECIFICATIONS ($T_J = 25^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$	$I_D = 250\text{ }\mu\text{A}$	600	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1\text{ mA}$		-	0.7	-	$\text{V}/^{\circ}\text{C}$	
Gate-Source Threshold Voltage (N)	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		2	-	4	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	1	μA	
		$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 150^{\circ}\text{C}$		-	-	10		
Drain-Source On-State Resistance	$R_{DS(\text{on})}$	$V_{GS} = 10\text{ V}$	$I_D = 24\text{ A}$	-	0.057	0.07	Ω	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 8\text{ V}$, $I_D = 3\text{ A}$		-	7.5	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$		-	6630	-	pF	
Output Capacitance	C_{oss}			-	220	-		
Reverse Transfer Capacitance	C_{rss}			-	7	-		
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$, $V_{DS} = 400\text{ V}$	-	180	216	nC	
Gate-Source Charge	Q_{gs}			-	39	-		
Gate-Drain Charge	Q_{gd}			-	57	-		
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = 380\text{ V}$, $I_D = 47\text{ A}$, $R_g = 4.4\text{ }\Omega$, $V_{GS} = 13\text{ V}$		-	30	60	ns	
Rise Time	t_r			-	12	25		
Turn-Off Delay Time	$t_{d(\text{off})}$			-	115	175		
Fall Time	t_f			-	9	20		
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain		-	0.62	-	Ω	
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	47	A	
Pulsed Diode Forward Current	I_{SM}			-	-	140		
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}$, $I_S = 47\text{ A}$, $V_{GS} = 0\text{ V}$		-	-	1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}$, $I_F = I_S$, $dl/dt = 100\text{ A}/\mu\text{s}$, $V_R = 25\text{ V}$		-	750	1125	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			-	18	36	μC	
Body Diode Reverse Recovery Current	I_{RRM}			-	39	80	A	

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics (TO-247)

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics (TO-247)

Fig. 4 - Normalized On-Resistance vs. Temperature

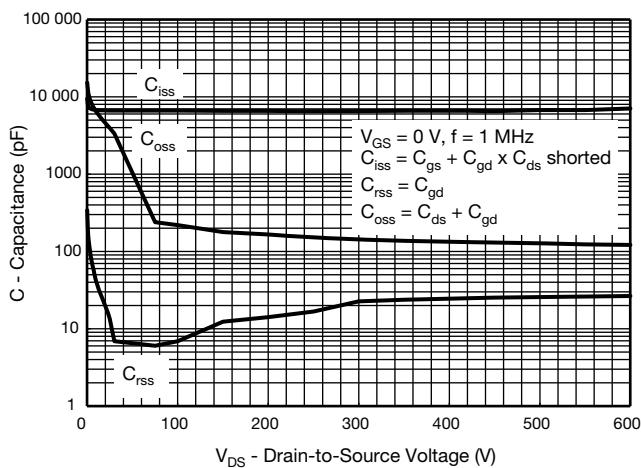


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

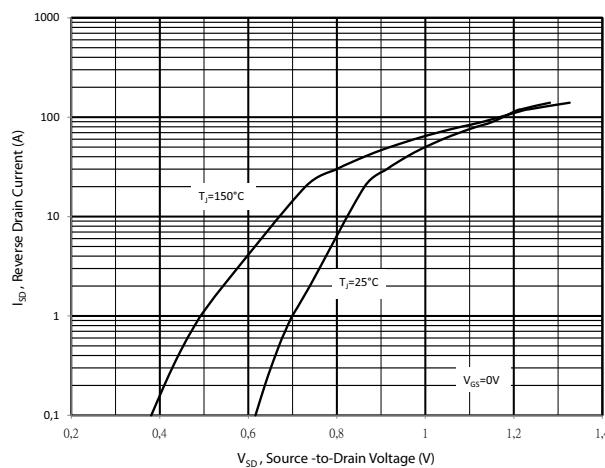


Fig. 7 - Typical Source-Drain Diode Forward Voltage

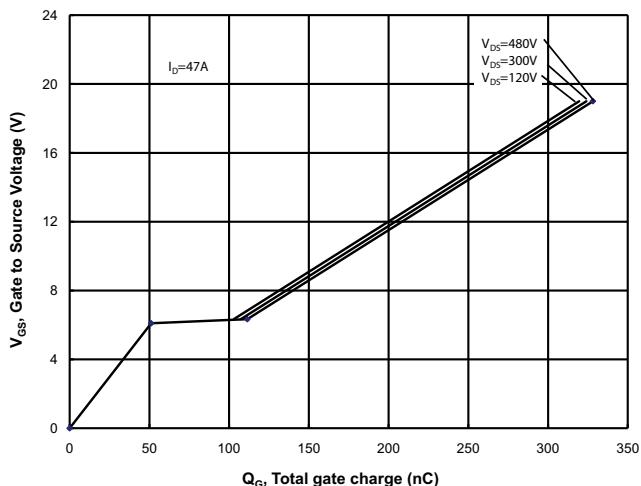


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

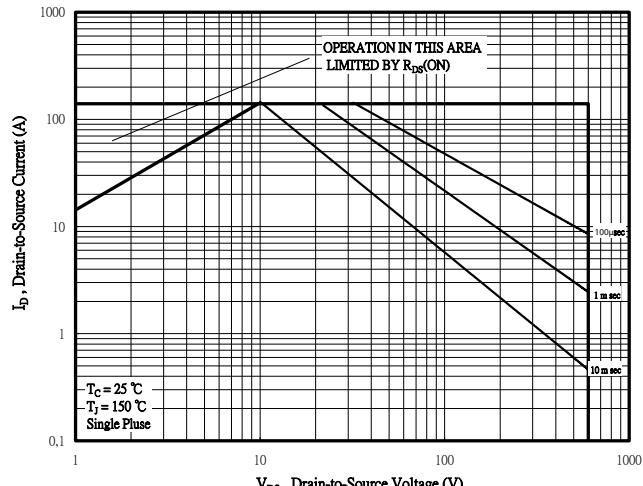


Fig. 8 - Maximum Safe Operating Area

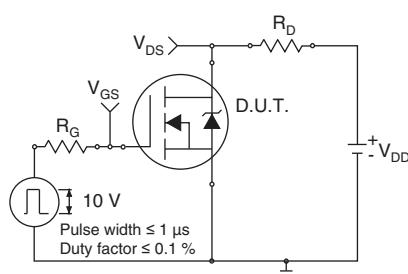


Fig. 9a - Switching Time Test Circuit

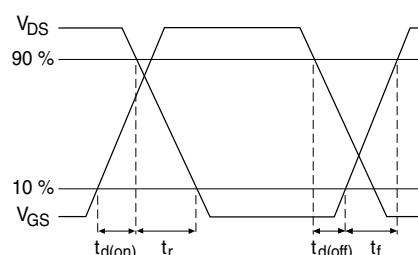


Fig. 9b - Switching Time Waveforms

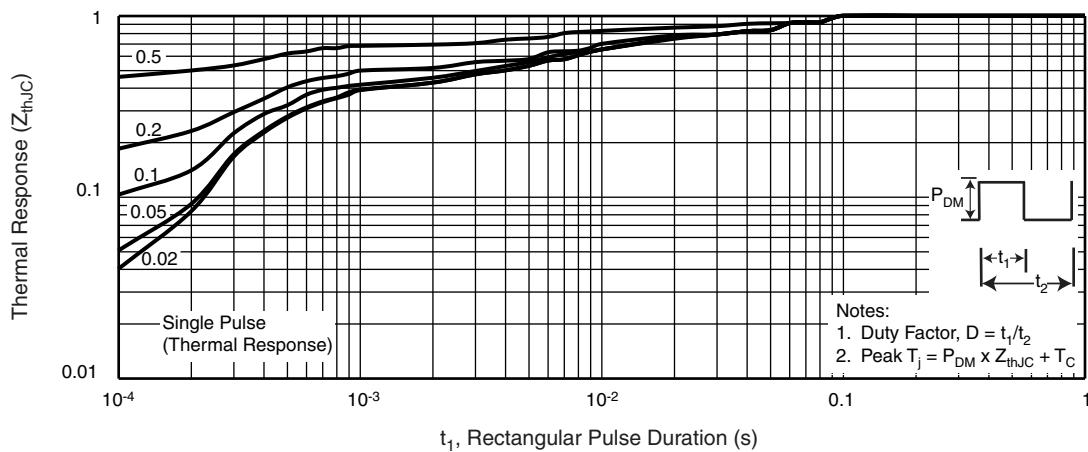


Fig. 10 - Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-247AC)

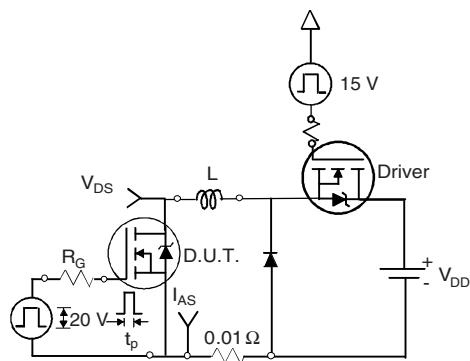


Fig. 11a - Unclamped Inductive Test Circuit

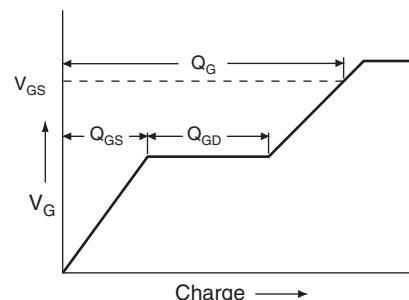


Fig. 12a - Basic Gate Charge Waveform

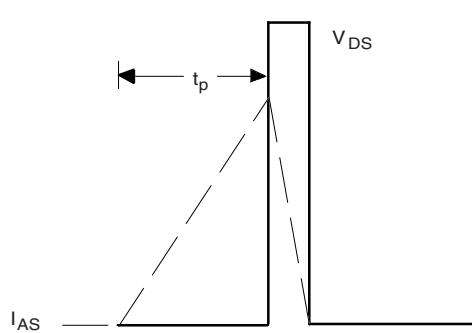


Fig. 11b - Unclamped Inductive Waveforms

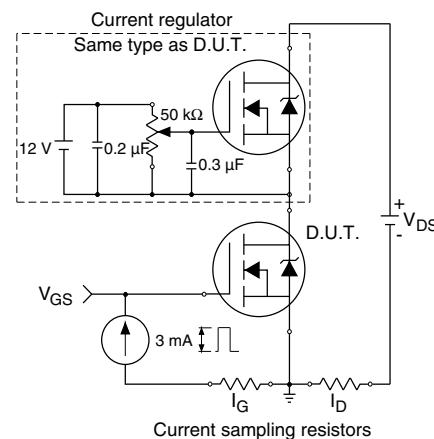


Fig. 12b - Gate Charge Test Circuit

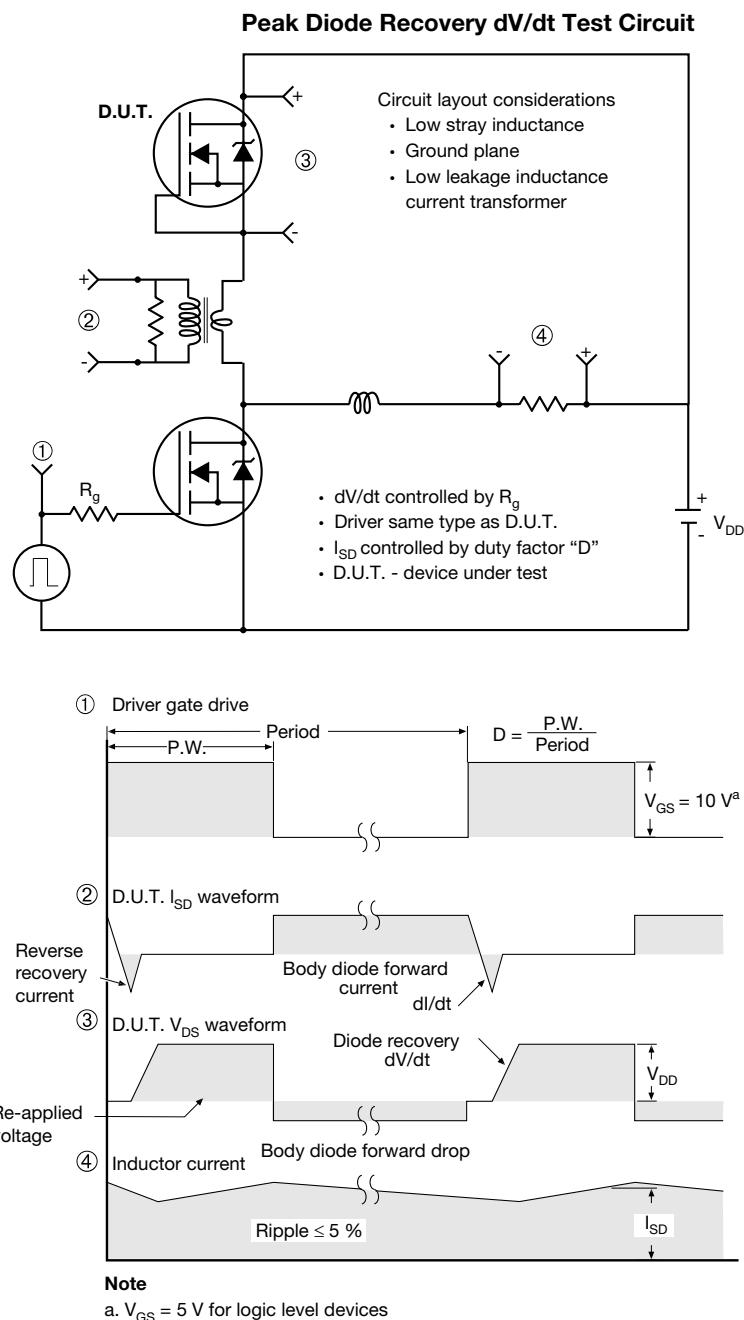


Fig. 13 - For N-Channel

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?91341.

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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.