Full Bridge IGBT and MOSFET MTP Power Module

MTP

FEATURES

- Generation 4 warp speed IGBT and power MOSFET technology
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- Very low conduction and switching losses
- Operating frequency up to 100 kHz
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

BENEFITS

- Optimized for welding, UPS and SMPS applications
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Very low stray inductance design for high speed operation

PRODUCT SUMMARY	
HALF BRIDGE POWER MOSFET	
V_{DSS}	650 V
$R_{DS(on)}$ typical at I_D = 40 A	35 mΩ
I_D at T_C = 80 °C	41 A
HALF BRIDGE WARP IGBT	
V_{CES}	600 V
$V_{CE(on)}$ typical at I_C = 25 A	2.18 V
I_C at T_C = 80 °C	46 A

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS		MAX.	UNITS
Operating junction temperature	T_J			150	°C
Storage temperature range	T_{Stg}			- 40 to 150	
V_{RMS} Insulation voltage	V_{ISOL}	AC 1.2 s		3500	V
Q1, Q2 POWER MOSFET					
Drain to source voltage	V_{DSS}			650	V
Gate to source voltage	V_{GS}			25	
Pulsed drain current	I_{DM} (1)			270	A
Single pulse avalanche energy	E_{AS}	T_C = 25 °C; I_D = I_{AR}, V_{DD} = 50 V		2000	mJ
Avalanche current repetitive	I_{AR}	pulsed width limited by T_J max.		15	A
Peak diode recovery voltage slope	dV/dt (2)			15	V/µs
Continuous drain current	I_D	T_C = 25 °C	V_{GS} = 10 V	52	A
		T_C = 80 °C		41	
Power dissipation	P_D	T_C = 25 °C		284	W
		T_C = 80 °C		159	
Q3, Q4 WARP IGBT					
Collector to emitter voltage	V_{CES}			600	V
Gate to emitter voltage	V_{GES}			20	
Pulsed collector current	I_{CM}			200	A
Clamped inductive load current	I_{LM}			200	
Continuous collector current	I_C	T_C = 25 °C		67	
		T_C = 80 °C		43	
Power dissipation	P_D	T_C = 25 °C		211	W
		T_C = 80 °C		118	

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MAX.**	**UNITS**
D1, D2, AP DIODE OF WARP IGBT				
Repetitive peak reverse voltage	V_{RRM}		600	V
Diode continuous forward current	I_F	T_C = 25 °C	73	A
		T_C = 80 °C	48	
Peak diode forward current	I_{FSM}	T_C = 25 °C	260	
Power dissipation	P_D	T_C = 25 °C	143	W
		T_C = 80 °C	80	
SOURCE DRAIN (MOSFET BODY DIODE)				
Continuous source current	I_S	T_C = 25 °C	52	A
Pulsed source current	I_{SM}	T_C = 25 °C	360	

Notes

(1) Pulse width limited by safe operating area

(2) I_{SD} < 69 A, dI/dt = 400 A/µs, peak V_{SD} < $V_{(BR)DSS}$

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Q1, Q2 POWER MOSFET						
Drain to source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA	650	-	-	V
Static drain to source on resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 50 A	-	35	44	mΩ
		V_{GS} = 10 V, I_D = 50 A, T_J = 150 °C	-	-	104	mΩ
Gate threshold voltage	$V_{GS(th)}$	V_{GE} = V_{GS}, I_D = 0.25 mA	2.8	4	5.4	V
Drain to source leakage current	I_{DSS}	V_{DS} = 650 V, V_{GS} = 0 V	-	-	50	µA
		V_{DS} = 650 V, V_{GS} = 0 V, T_J = 150 °C	-	-	5.0	mA
Gate to source forward leakage	I_{GSS}	V_{GS} = 25 V	-	-	100	nA
Gate to source reverse leakage		V_{GS} = - 25 V	-	-	- 100	
Intrinsic gate resistance	R_g	f = 1 MHz, open drain	-	1.2	-	Ω
Total gate charge	Q_g	I_D = 35 A	-	200	-	nC
Gate to source charge	Q_{gs}	V_{DD} = 520 V	-	60	-	
Gate to drain (Miller) charge	Q_{gd}	V_{GS} = 10 V	-	70	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 325 V	-	165	-	ns
Rise time	t_r	L = 500 µH, I_D = 40 A	-	44	-	
Turn-off delay time	$t_{d(off)}$	R_g = 5 Ω, V_{GS} = 10 V, T_J = 125 °C	-	148	-	
Fall time	t_f		-	30	-	
Input capacitance	C_{iss}	V_{GS} = 0 V	-	9800	-	pF
Output capacitance	C_{oss}	V_{DS} = 100 V, f = 1 MHz	-	200	-	
SOURCE DRAIN (MOSFET BODY DIODE)						
Forward voltage	V_{SD}	I_S = 34 A, V_{GS} = 0 V	-	-	1.0	V
Q3, Q4 WARP IGBT						
Collector to emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 250 µA	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_D = 25 A	-	2.18	2.83	
		V_{GE} = 15 V, I_C = 25 A T_J = 150 °C	-	1.75	2.34	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.25 mA	2.8	4.9	6.2	V
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	- 12	-	mV/°C
Forward transconductance	g_{fe}	V_{CE} = 20 V, I_C = 25 A	-	49	-	S
Zero gate voltage collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	-	250	µA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C	-	-	5.0	mA
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V, V_{CE} = 0 V	-	-	± 100	nA
D1, D2, AP DIODE OF WARP IGBT						
Forward voltage drop	V_{FM}	I_F = 25 A	-	1.3	1.41	V
		I_F = 25 A, T_J = 150 °C	-	1.11	1.29	

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Q3, Q4 WARP IGBT						
Total gate charge (turn-on)	Q_g	I_C = 25 A V_{CC} = 400 V V_{GE} = 15 V	-	175	-	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	27	-	
Gate to collector charge (turn-on)	Q_{gc}		-	71	-	
Turn-on switching loss	E_{on}	I_C = 25 A V_{CC} = 400 V, V_{GE} = 15 V R_g = 5 Ω , L = 500 µH	-	0.21	-	mJ
Turn-off switching loss	E_{off}		-	0.15	-	
Total switching loss	E_{tot}		-	0.36	-	
Turn-on switching loss	E_{on}	I_C = 25 A V_{CC} = 400 V, V_{GE} = 15 V R_g = 5 Ω , T_J = 125 °C , L = 500 µH	-	0.33	-	mJ
Turn-off switching loss	E_{off}		-	0.36	-	
Total switching loss	E_{tot}		-	0.69	-	
D1, D2, AP DIODE OF WARP IGBT						
Diode reverse recovery time	t_{rr}	V_{RR} = 400 V I_F = 25 A, T_J = 125 °C dI/dt = 200 A/µs	-	118	-	ns
Diode peak reverse current	I_{rr}		-	13.5	-	A
Diode recovery charge	Q_{rr}		-	760	-	nC
SOURCE DRAIN (MOSFET BODY DIODE)						
Diode reverse recovery time	t_{rr}	I_{SD} = 34.5 A V_{DD} = 100 V dI/dt = 100 A/µs	-	563	-	ns
Diode reverse current	I_{rr}		-	35	-	A
Diode recovery charge	Q_{rr}		-	9500	-	nC

THERMISTOR ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**TYP.**	**UNITS**
Resistance	R	T_J = 25 °C	5000	Ω
B Value	B	T_J = 125 °C/50 °C	3375	K

MECHANICAL SPECIFICATIONS					
PARAMETER	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Junction to case Q1, Q2 POWER MOSFET thermal resistance (per switch)	R_{thJC}	-	-	0.44	°C/W
Junction to case Q3, Q4 WARP IGBT thermal resistance (per switch)		-	-	0.59	
Junction to case D1, D2, AP diode of WARP IGBT thermal resistance (per diode)		-	-	0.87	
Case to sink, flat, greased surface (per module)	R_{thCS}	-	0.05	-	
Mounting torque ± 10 % to heatsink (1)		-	-	4	Nm
Weight		-	65	-	g

Note

(1) A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

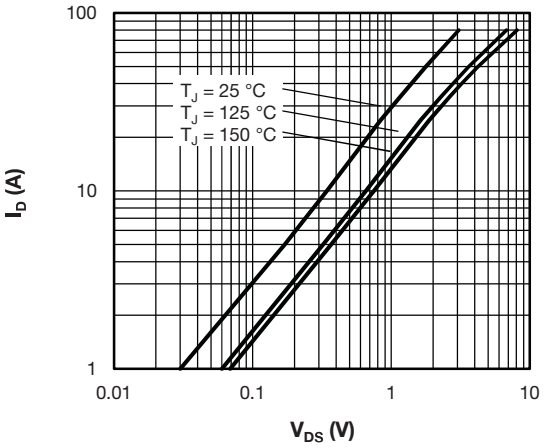


Fig. 1 - Power MOSFET Q1 - Q2 Typical Output Characteristics, V_{GS} = 10 V

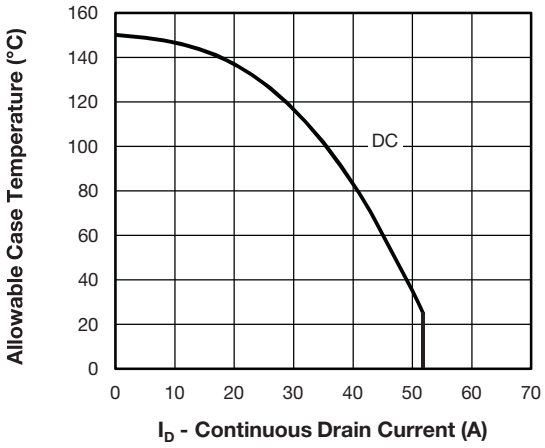


Fig. 4 - Power MOSFET Q1 - Q2 Maximum Continuous Drain Current vs. Case Temperature, V_{GS} = 10 V

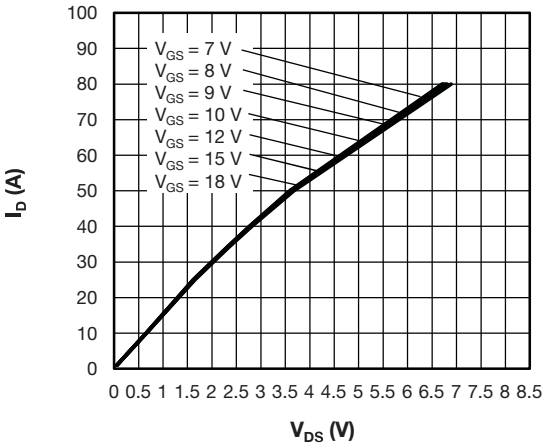


Fig. 2 - Power MOSFET Q1 - Q2 Typical Output Characteristics, T_J = 125 °C

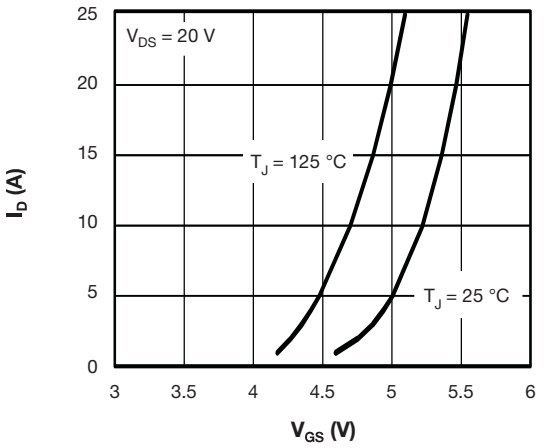


Fig. 5 - Power MOSFET Q1 - Q2 Typical Transfer Characteristics

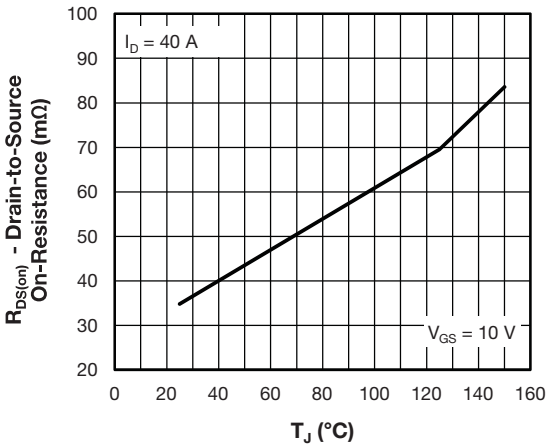


Fig. 3 - Power MOSFET Q1 - Q2 Typical Drain-to-Source On-Resistance vs. Temperature

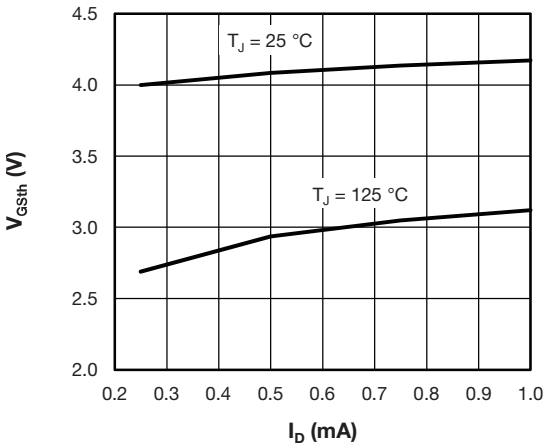


Fig. 6 - Power MOSFET Q1 - Q2 Typical Gate Threshold Voltage

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

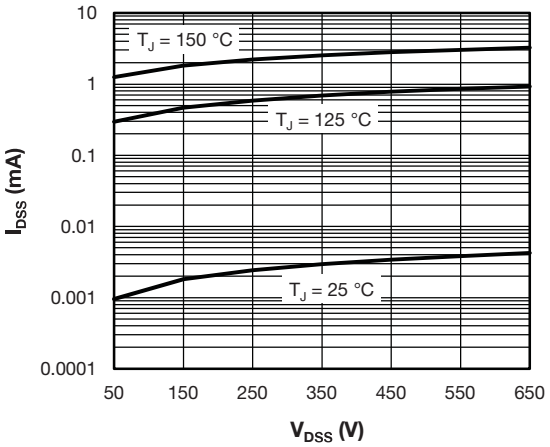


Fig. 7 - Power MOSFET Q1 - Q2 Typical Zero Gate Voltage Drain Current

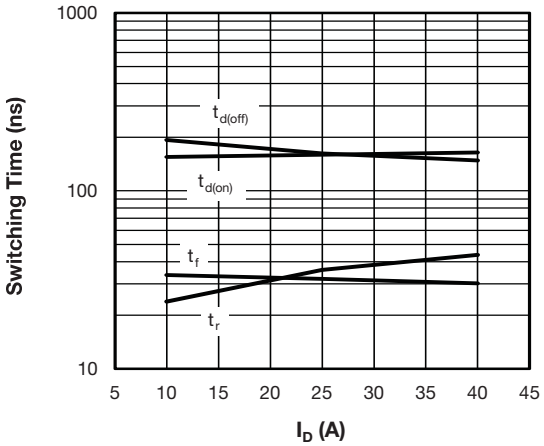


Fig. 9 - Power MOSFET Q1 - Q2 Typical Switching Time vs. I_D (with freewheeling diode 15ETH06),
T_J = 125 °C, V_{DD} = 325 V, R_g = 5 Ω, V_{GS} = 10 V, L = 500 µH

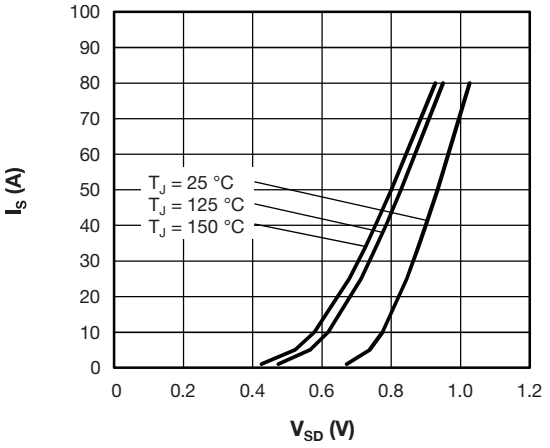


Fig. 8 - Power MOSFET Q1 - Q2 Typical Bodydiode Source-to-Drain Current Characteristics

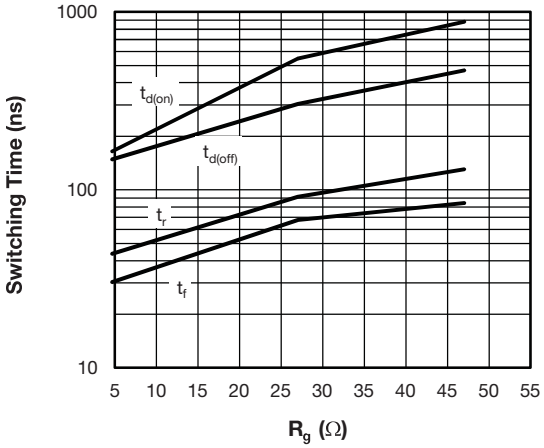


Fig. 10 - Power MOSFET Q1 - Q2 Typical Switching Time vs. R_g (with freewheeling diode 15ETH06),
T_J = 125 °C, V_{DD} = 325 V, I_D = 40 A, V_{GS} = 10 V, L = 500 µH

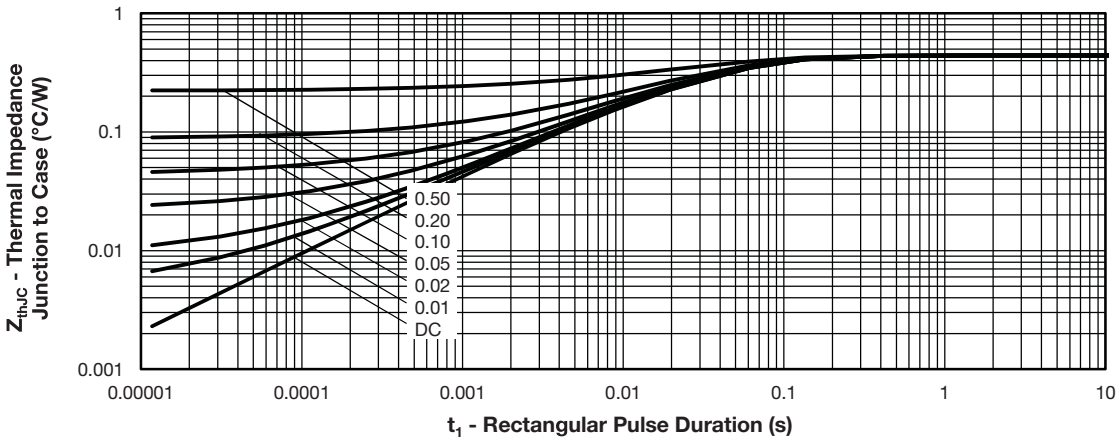


Fig. 11 - Maximum Thermal Impedance Z_{thJC} Characteristics (Q1 - Q2 Power MOSFET)

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI
Downloaded From Oneyac.com
w.vishay.com/doc?91000

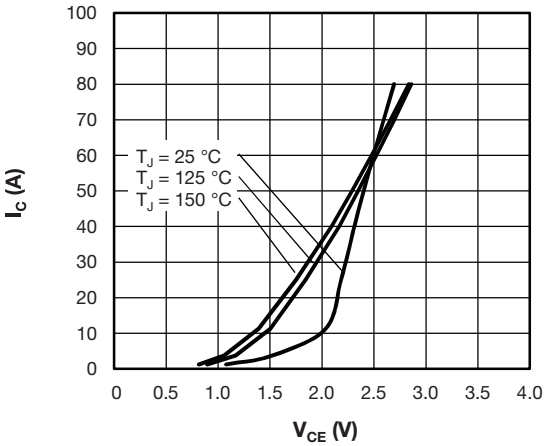


Fig. 12 - Q3 - Q4 IGBT Typical Output Characteristics, V_{GE} = 15 V

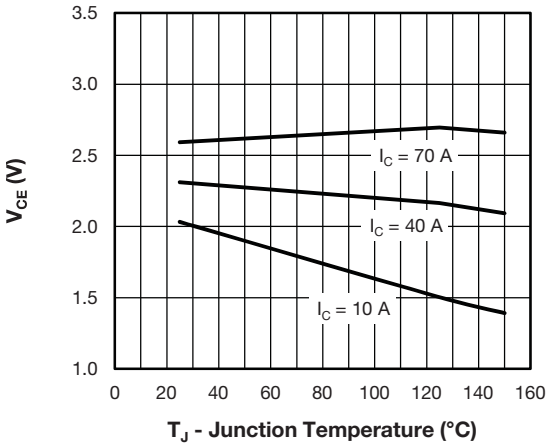


Fig. 15 - Q3 - Q4 IGBT Typical Collector to Emitter Voltage vs. Junction Temperature, V_{GE} = 15 V

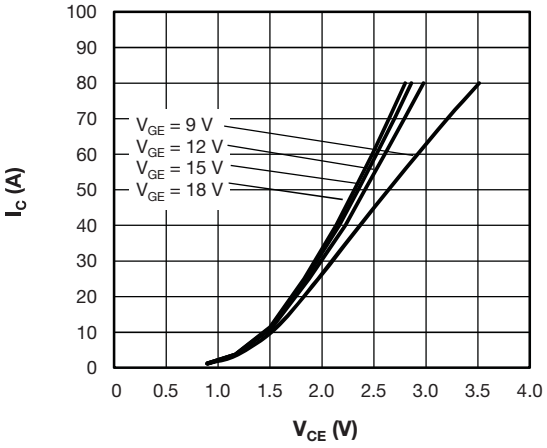


Fig. 13 - Q3 - Q4 IGBT Typical Output Characteristics, T_J = 125 °C

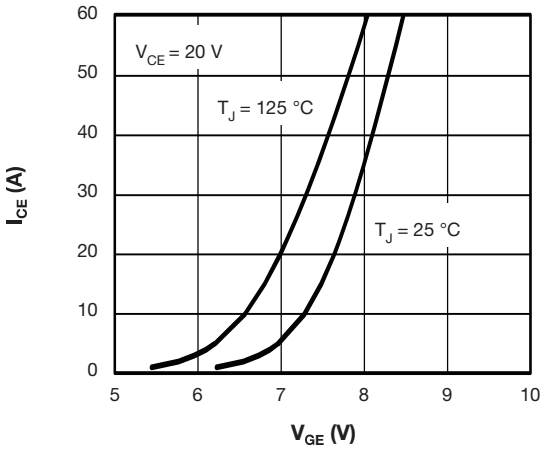


Fig. 16 - Q3 - Q4 IGBT Typical Transfer Characteristics

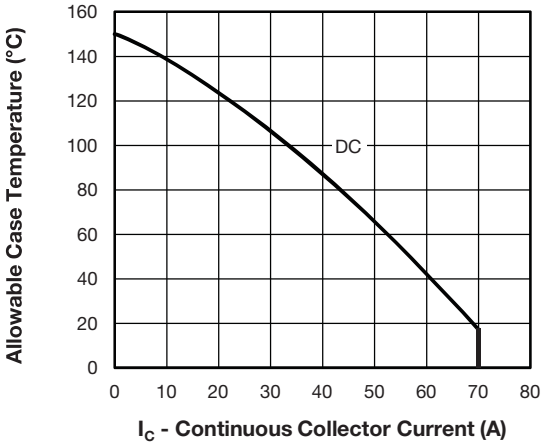


Fig. 14 - Q3 - Q4 IGBT Maximum Continuous Collector Current vs. Case Temperature

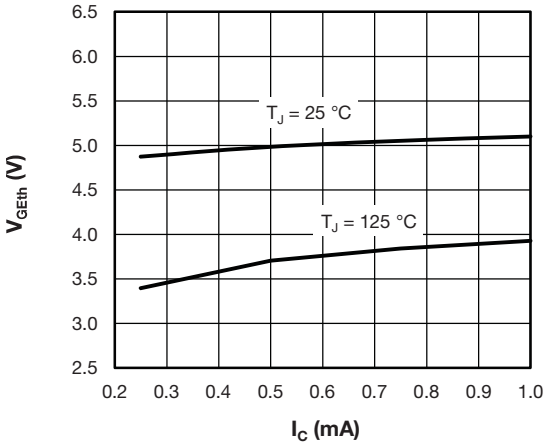


Fig. 17 - Q3 - Q4 IGBT Typical Gate Threshold Voltage

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

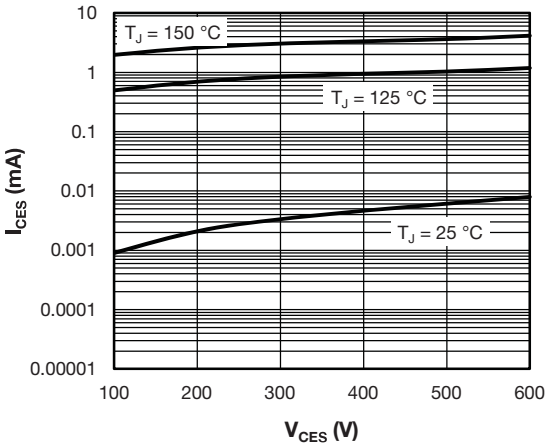


Fig. 18 - Q3 - Q4 IGBT Typical Trench Zero Gate Voltage Collector Current

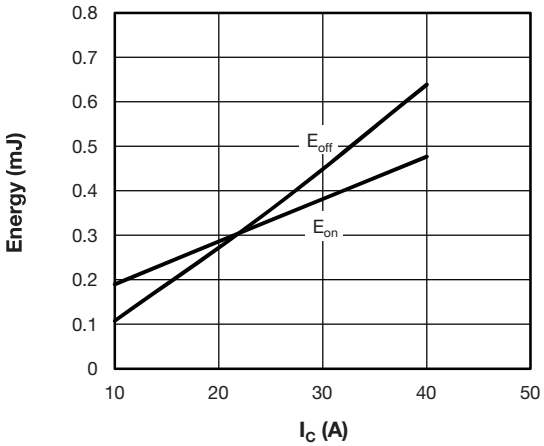


Fig. 21 - Q3 - Q4 IGBT Typical Energy Loss vs. I_C (with freewheeling D1 - D2 antiparallel diode), T_J = 125 °C, V_{CC} = 400 V, R_g = 5 Ω, V_{GE} = 15 V, L = 500 µH

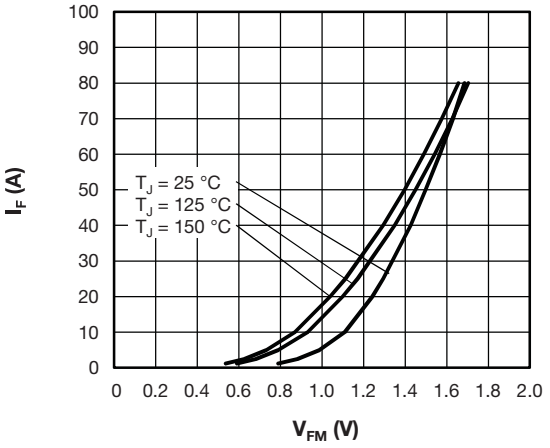


Fig. 19 - D1 - D2 Antiparallel Diode Typical Forward Characteristics

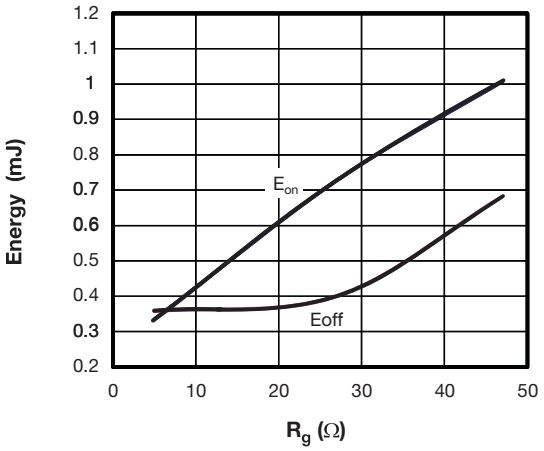


Fig. 22 - Q3 - Q4 IGBT Typical Energy Loss vs. R_g (with freewheeling D1 - D2 antiparallel diode), T_J = 125 °C, V_{CC} = 400 V, V_{GE} = 15 V, L = 500 µH, I_C = 25 A

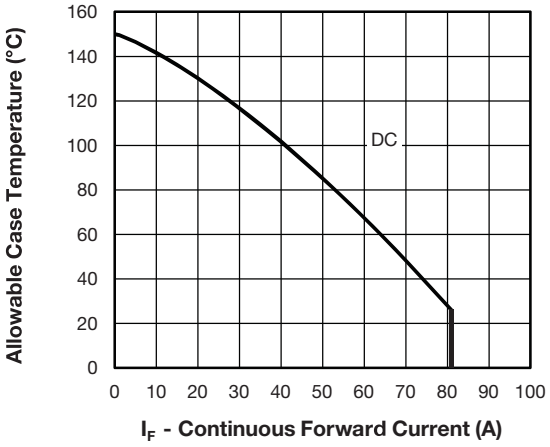


Fig. 20 - D1 - D2 Antiparallel Diode Maximum Forward Current vs. Case Temperature

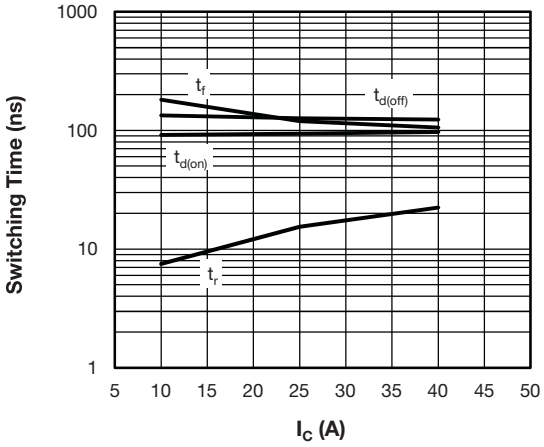


Fig. 23 - Q3 - Q4 IGBT Typical Switching Time vs. I_C (with freewheeling D1 - D2 antiparallel diode), T_J = 125 °C, V_{CC} = 400 V, R_g = 5 Ω, V_{GE} = 15 V, L = 500 µH

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

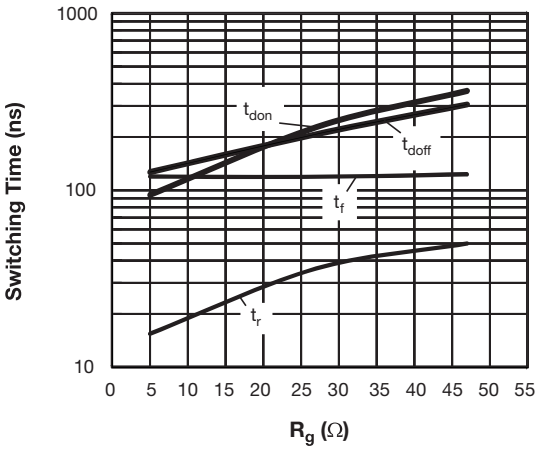


Fig. 24 - Q3 - Q4 IGBT Typical Switching Time vs. R_g (with freewheeling D1 - D2 antiparallel diode), T_J = 125 °C, V_{CC} = 400 V, V_{GE} = 15 V, L = 500 µH, I_C = 25 A

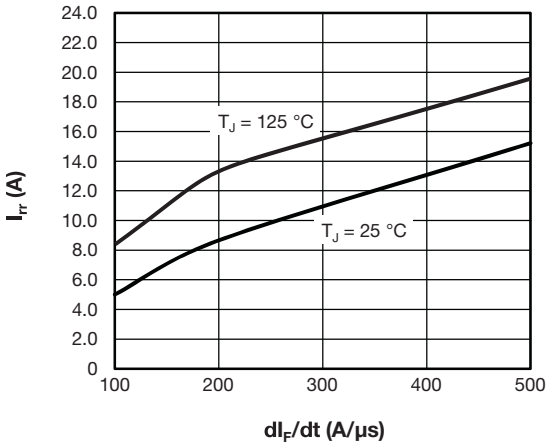


Fig. 26 - D1 - D2 Antiparallel Diode Typical Reverse Recovery Current vs. dI_F/dt, V_{RR} = 400 V, I_F = 25 A

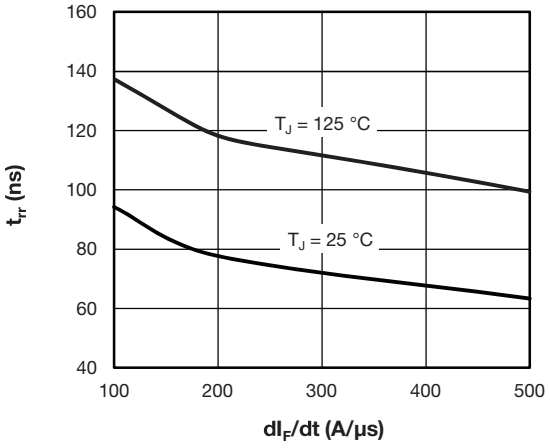


Fig. 25 - D1 - D2 Antiparallel Diode Typical Reverse Recovery Time vs. dI_F/dt, V_{RR} = 400 V, I_F = 25 A

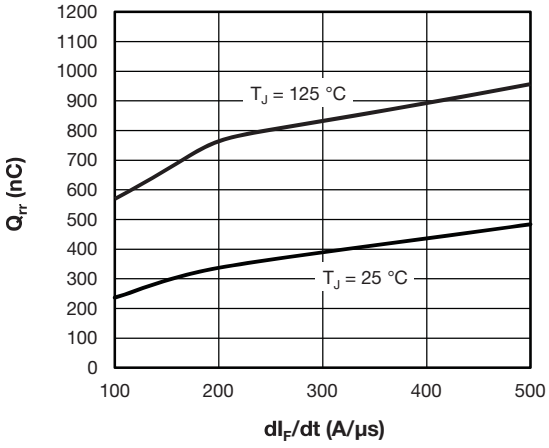


Fig. 27 - D1 - D2 Antiparallel Diode Typical Reverse Recovery Charge vs. dI_F/dt, V_{RR} = 400 V, I_F = 25 A

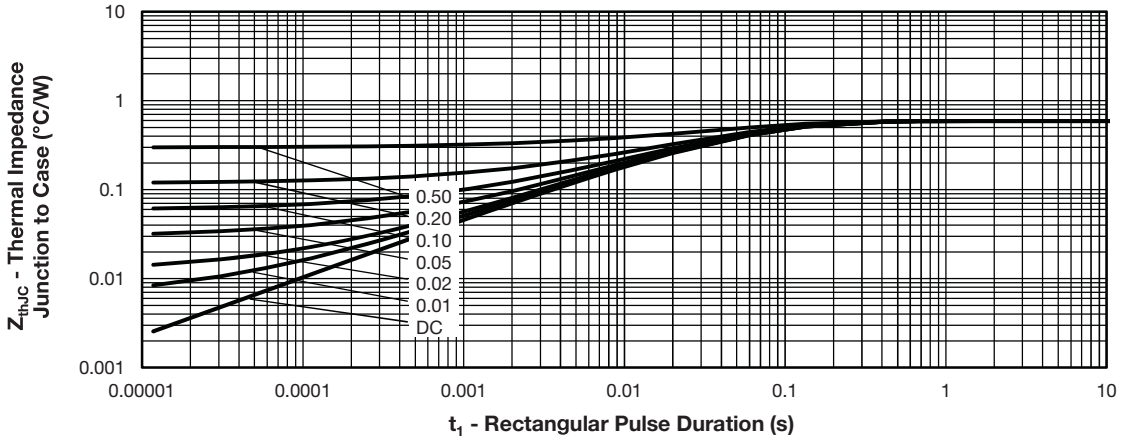


Fig. 28 - Maximum Thermal Impedance Z_{thJC} Characteristics (Q1 - Q2 WARP IGBT)

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

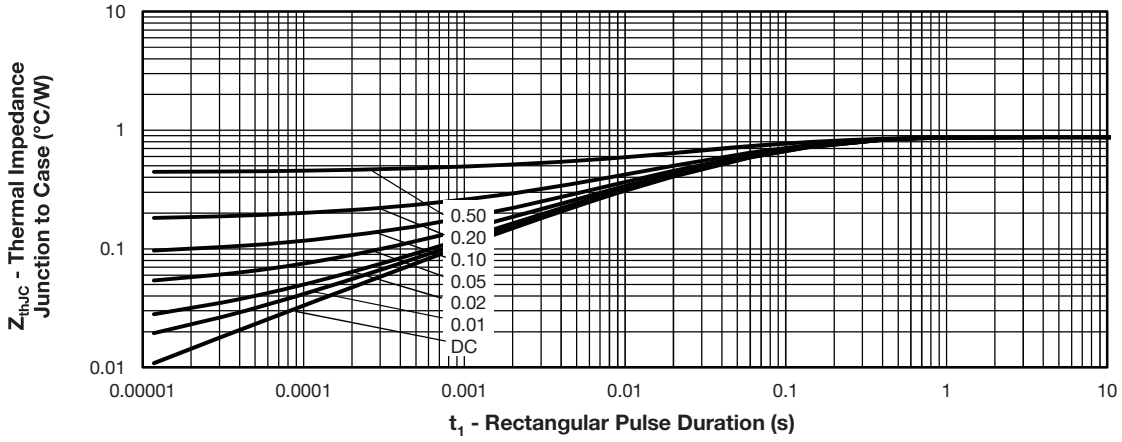


Fig. 29 - Maximum Thermal Impedance Z_{thJC} Characteristics (D1 - D2 Antiparallel Diode)

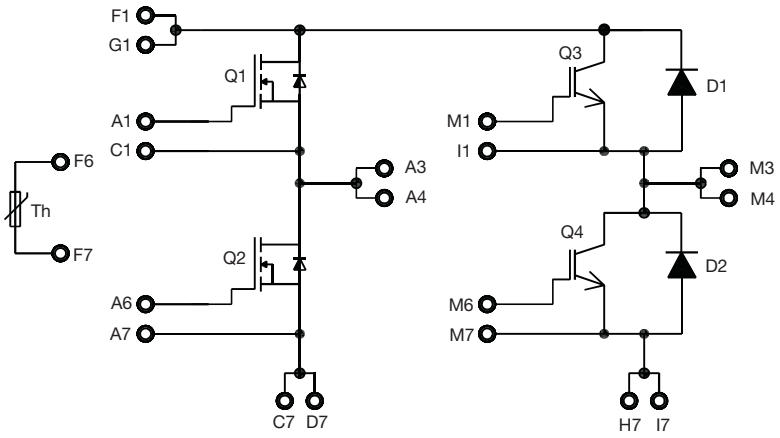
ORDERING INFORMATION TABLE

Device code

VS-	40	MT	060	W	FH	T
1	2	3	4	5	6	7

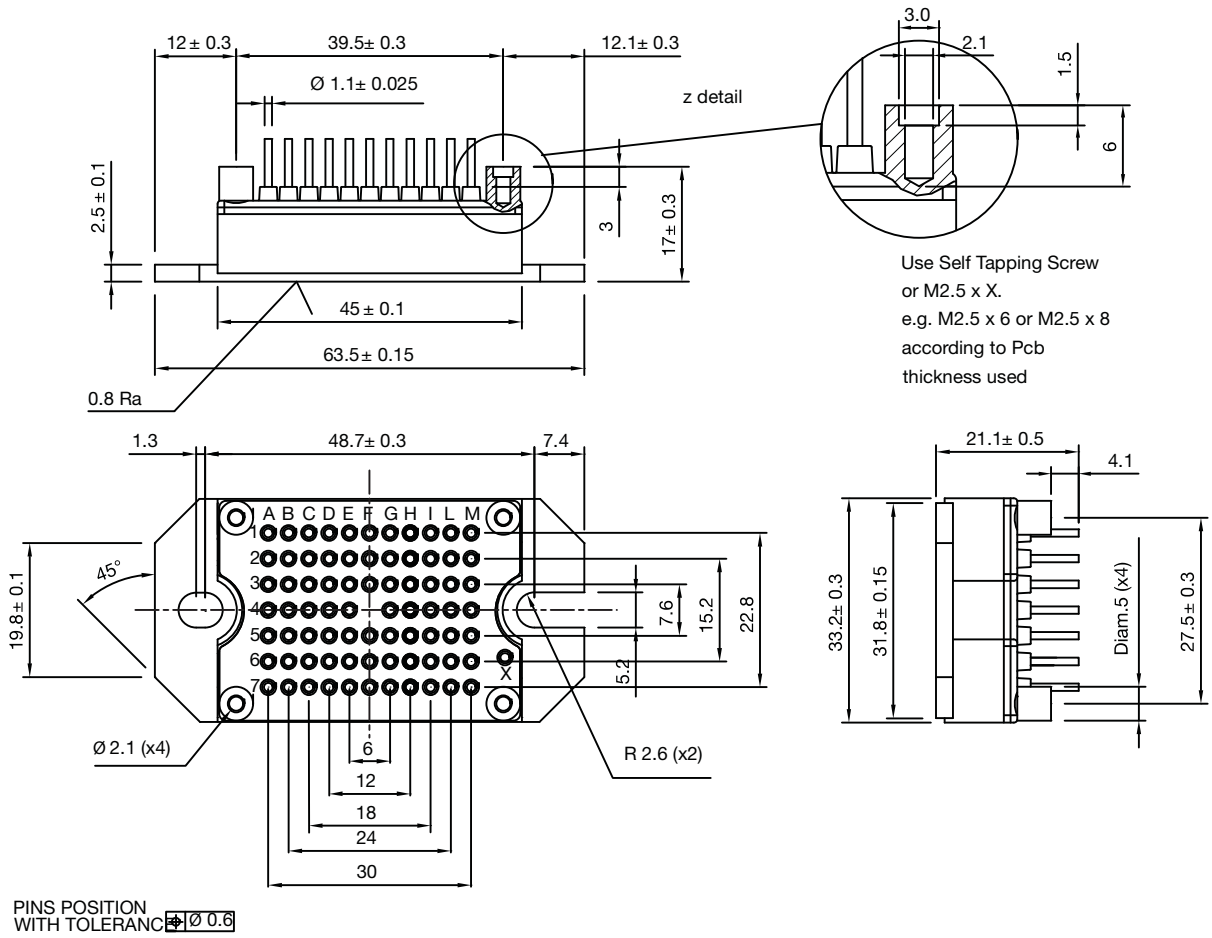
1	-	Vishay Semiconductors Product
2	-	Current rating (40 = 40 A)
3	-	MTP package
4	-	Voltage code (060 = 600 V)
5	-	Speed/type (W = Warp IGBT)
6	-	Circuit configuration (FH = Full bridge MOSFET, IGBT)
7	-	Thermistor

CIRCUIT CONFIGURATION

CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Full bridge MOSFET, IGBT	FH	

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI
Downloaded From Oneyac.com
w.vishay.com/doc?91000

DIMENSIONS in millimeters



For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFI Downloaded From Oneyac.com w.vishay.com/doc?91000

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.

Downloaded From Oneyac.com

单击下面可查看定价，库存，交付和生命周期等信息

>>Vishay(威世)

Downloaded From Oneyac.com