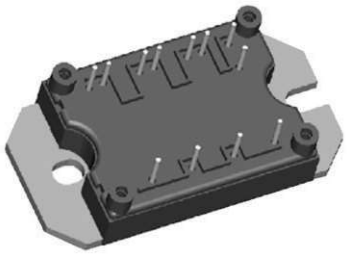
"Half Bridge" IGBT MTP (Warp 2 Speed IGBT), 70 A



MTP

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
$V_{CE(on)}$ typical at V_{GE} = 15 V	2.1 V
I_C at T_C = 78 °C	70 A
Speed	30 kHz to 150 kHz
Package	MTP
Circuit configuration	Half bridge

FEATURES

- NPT warp 2 speed IGBT technology with positive temperature coefficient
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- SMD thermistor (NTC)
- Al_2O_3 BDC
- Very low stay inductance design for high speed operation
- UL approved file E78996
- 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
- Lower conduction losses and switching losses
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		600	V
Continuous collector current	I_C	T_C = 25 °C	100	A
		T_C = 78 °C	70	
Pulsed collector current	I_{CM}		300	
Peak switching current	I_{LM}		300	
Diode continuous forward current	I_F	T_C = 78 °C	53	
Peak diode forward current	I_{FM}		200	
Gate to emitter voltage	V_{GE}		± 20	V
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	
Maximum power dissipation, IGBT	P_D	T_C = 25 °C	347	W
		T_C = 100 °C	139	

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 500 µA	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 70 A	-	2.1	2.4	V
		V_{GE} = 15 V, I_C = 140 A	-	2.8	3.4	
		V_{GE} = 15 V, I_C = 70 A, T_J = 150 °C	-	2.7	3	
Gate threshold voltage	$V_{GE(th)}$	I_C = 0.5 mA	3	-	6	
Collector to emitter leaking current	I_{CES}	V_{GE} = 0 V, I_C = 600 V	-	-	0.7	mA
		V_{GE} = 0 V, I_C = 600 V, T_J = 150 °C	-	-	10	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 250	nA

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 70 A V_{CC} = 480 V V_{GE} = 15 V	-	460	690	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	160	250	
Gate to collector charge (turn-on)	Q_{gc}		-	70	130	
Turn-on switching loss	E_{on}	R_g = 10 Ω I_C = 70 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH energy losses include tail and diode reverse recovery, T_J = 25 °C	-	1.1	-	mJ
Turn-off switching loss	E_{off}		-	0.9	-	
Total switching loss	E_{ts}		-	2	-	
Turn-on switching loss	E_{on}	R_g = 10 Ω I_C = 70 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH energy losses include tail and diode reverse recovery, T_J = 150 °C	-	1.27	-	
Turn-off switching loss	E_{off}		-	1.13	-	
Total switching loss	E_{ts}		-	2.4	-	
Turn-on delay time	td_{on}	R_g = 10 Ω I_C = 70 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH energy losses include tail and diode reverse recovery	-	314	-	ns
Rise time	t_r		-	49	-	
Turn-off delay time	td_{off}		-	308	-	
Fail time	t_f		-	68	-	
Turn-on delay time	td_{on}	R_g = 10 Ω I_C = 70 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH energy losses include tail and diode reverse recovery, T_J = 150 °C	-	312	-	
Rise time	t_r		-	50	-	
Turn-off delay time	td_{off}		-	320	-	
Fail time	t_f		-	78	-	
Input capacitance	C_{ies}	V_{GE} = 0 V V_{CC} = 30 V f = 1.0 MHz	-	8000	-	pF
Output capacitane	C_{oes}		-	790	-	
Reverse transfer capacitance	C_{res}		-	110	-	
Reverse BIAS safe operating area	RBSOA	T_J = 150 °C, I_C = 300 A V_{CC} = 400 V, V_P = 600 V R_g = 22 Ω, V_{GE} = + 15 V to 0 V	Fullsquare			

THERMISTOR SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Resistance	R_0 (1)	T_0 = 25 °C	-	30	-	kΩ
Sensitivity index of the thermistor material	β (1)(2)	T_0 = 25 °C T_1 = 85 °C	-	4000	-	K

Notes

(1) T_0, T_1 are thermistor´s temperatures

(2) $\frac{R_0}{R_1} = \exp\left[\beta\left(\frac{1}{T_0} - \frac{1}{T_1}\right)\right]$, temperature in Kelvin

DIODE SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Diode forward voltage drop	V_{FM}	I_C = 70 A, V_{GE} = 0 V	-	1.64	2.1	V
		I_C = 140 A, V_{GE} = 0 V	-	2.1	2.4	
		I_C = 70 A, V_{GE} = 0 V, T_J = 150 °C	-	1.69	1.9	
Diode reverse recovery time	t_{rr}	V_{CC} = 200 V, I_C = 70 A dI/dt = 200 A/µs	-	96	126	ns
Diode peak reverse current	I_{rr}		-	9.4	12.8	A
Diode recovery charge	Q_{rr}		-	440	750	nC
Diode reverse recovery time	t_{rr}	V_{CC} = 200 V, I_C = 70 A dI/dt = 200 A/µs T_J = 125 °C	-	140	194	ns
Diode peak reverse current	I_{rr}		-	14	19	A
Diode recovery charge	Q_{rr}		-	950	1700	nC

THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	IGBT, Diode	T_J		-40	-	150	°C
	Thermistor			-40	-	125	
Storage temperature range		T_{Stg}		-40	-	125	
Junction to case	IGBT	R_{thJC}		-	-	0.36	°C/W
	Diode			-	-	0.8	
Case to sink per module		R_{thCS}	Heatsink compound thermal conductivity = 1 W/mK	-	0.06	-	
Mounting torque to heatsink			A mounting compound is recommended and the torque should be checked after 3 hours to allow for the spread of the compound. Lubricated threads.	3 ± 10 %			Nm
Weight				66			g

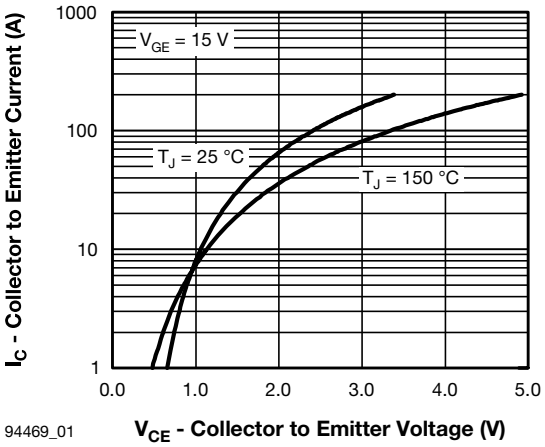


Fig. 1 - Typical Output Characteristics

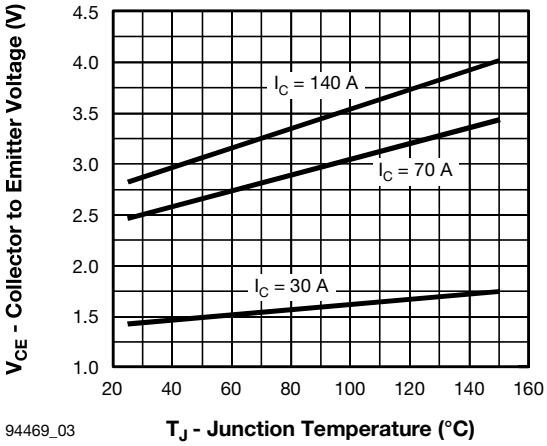


Fig. 3 - Typical Collector to Emitter Voltage vs. Junction Temperature

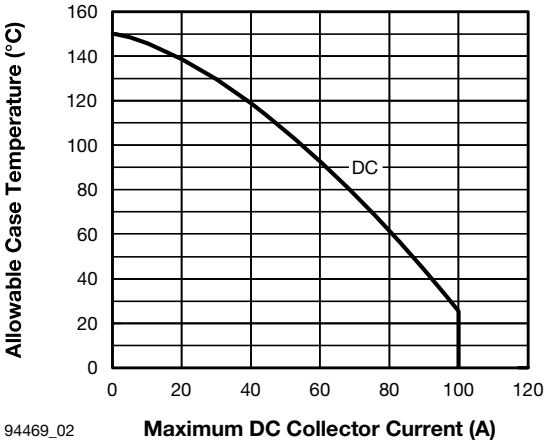


Fig. 2 - Maximum Collector Current vs. Case Temperature

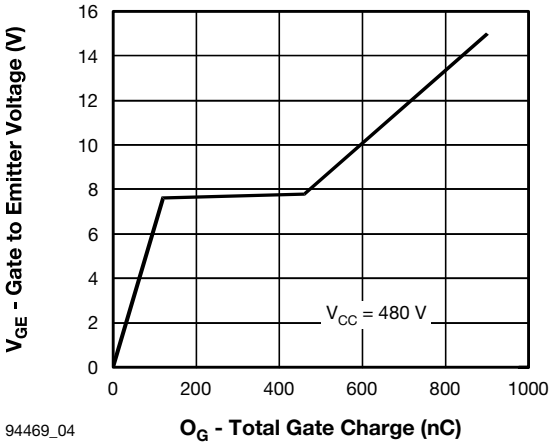


Fig. 4 - Typical Gate Charge vs. Gate to Emitter Votlage

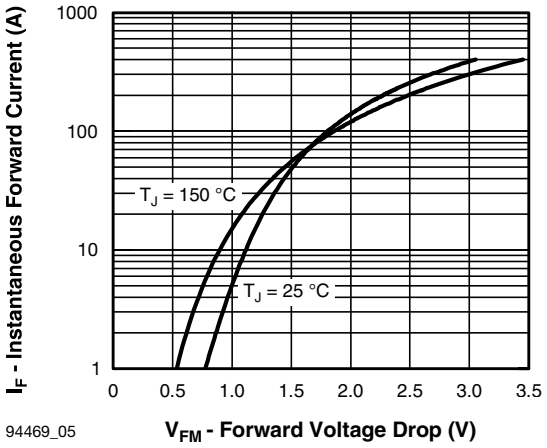


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

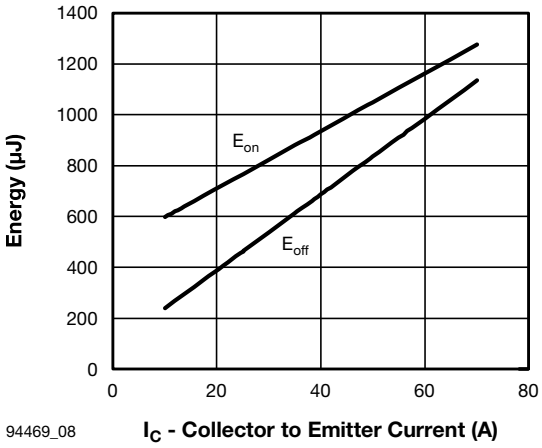


Fig. 8 - Typical Energy Losses vs. I_C (T_J = 150 °C)

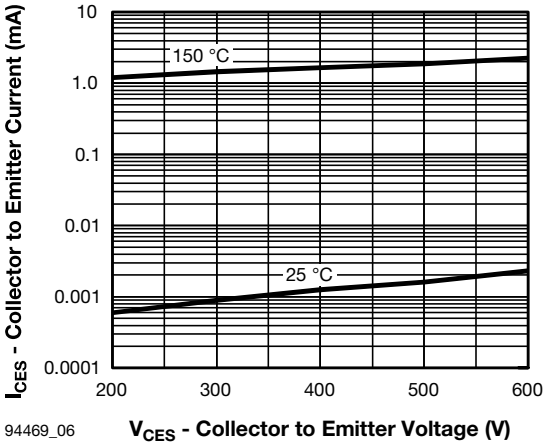


Fig. 6 - Typical Zero Gate Voltage Collector Current

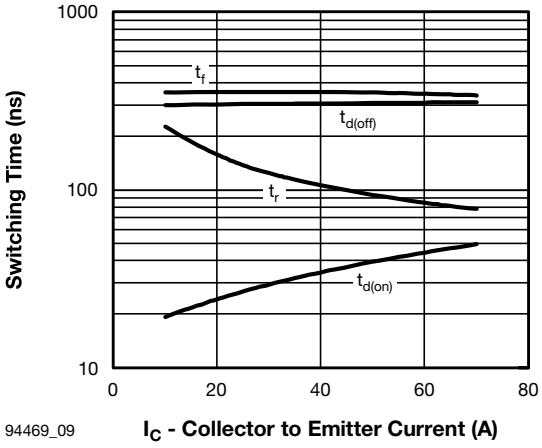


Fig. 9 - Switching Time vs. I_C

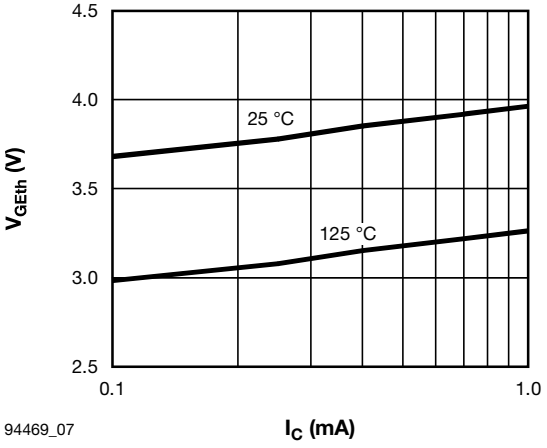


Fig. 7 - Typical Gate Threshold Voltage

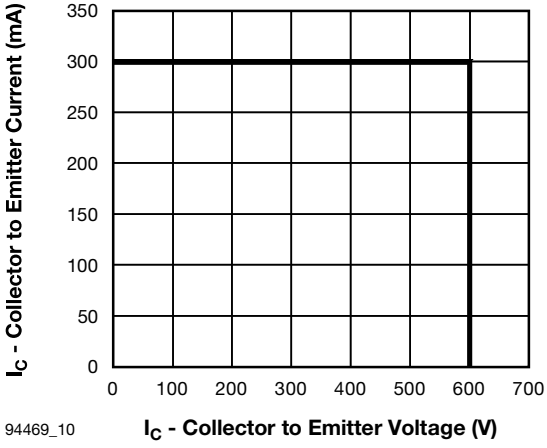


Fig. 10 - Reverse BIAS SOA, T_J = 150 °C

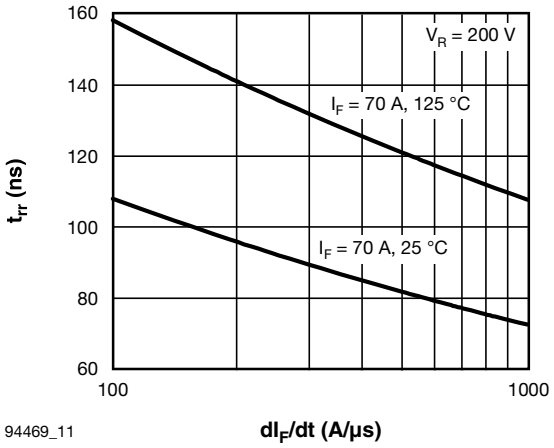


Fig. 11 - Typical Reverse Recovery Time vs. dI_F/dt

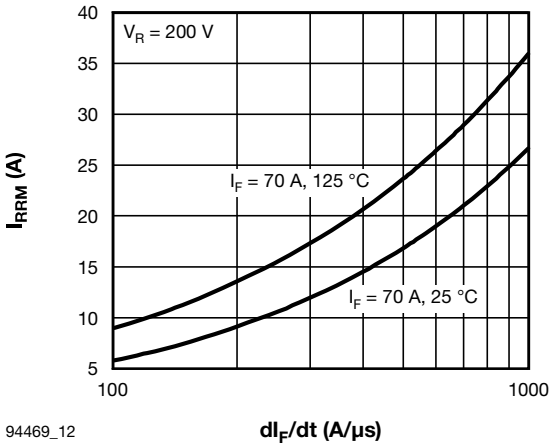


Fig. 12 - Typical Reverse Recovery Current vs. dI_F/dt

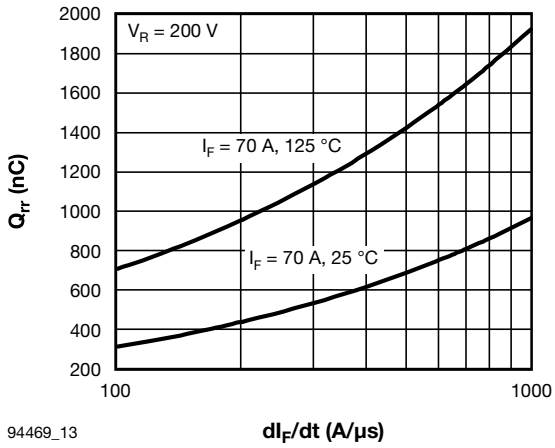


Fig. 13 - Typical Stored Charge vs. dI_F/dt

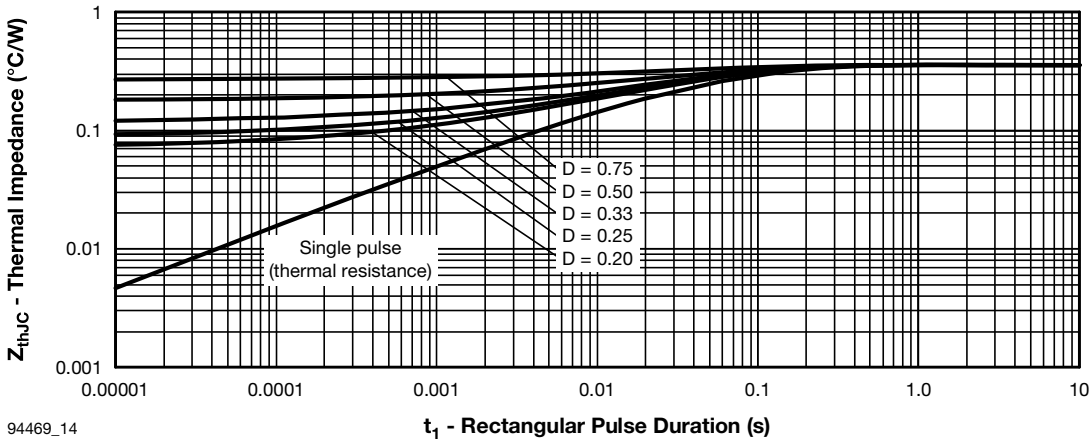


Fig. 14 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

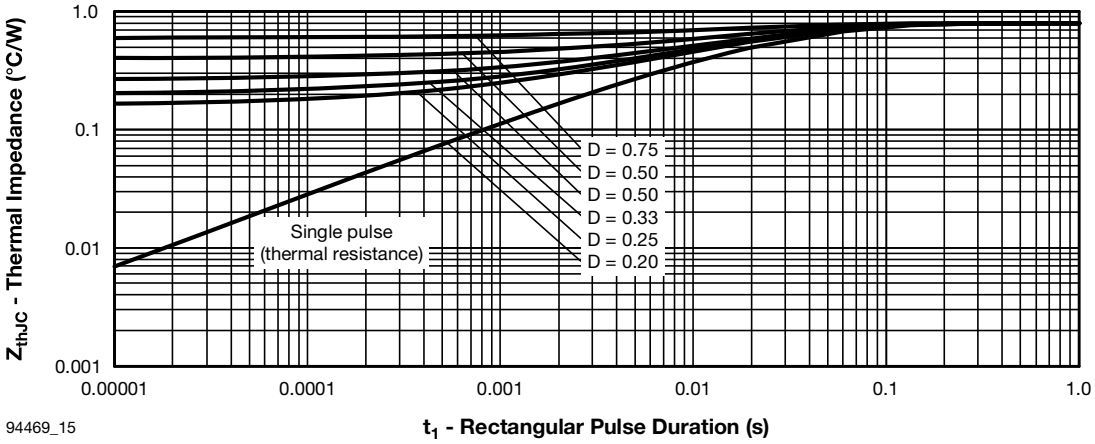


Fig. 15 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)

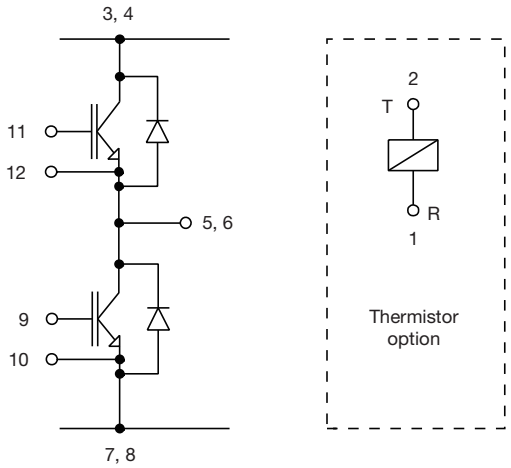


Fig. 16 - Electrical Diagram

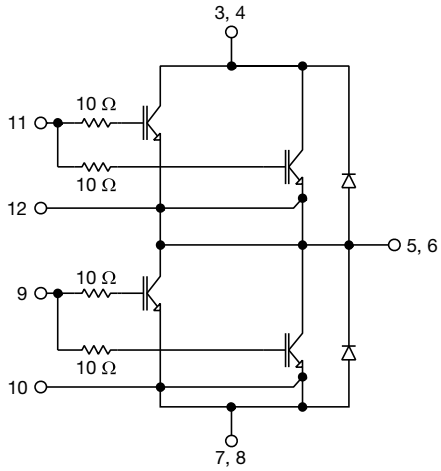


Fig. 17 - Functional Diagram

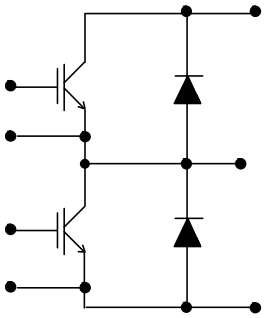
ORDERING INFORMATION TABLE

Device code

VS-	70	MT	060	W	H	T	A	PbF
1	2	3	4	5	6	7	8	9

1	-	Vishay Semiconductors product
2	-	Current rating (70 = 70 A)
3	-	Essential part number
4	-	Voltage rating (060 = 600 V)
5	-	Speed/type (W = warp IGBT)
6	-	Circuit configuration (H = half bridge)
7	-	T = thermistor
8	-	A = Al_2O_3 DBC substrate
9	-	Lead (Pb)-free

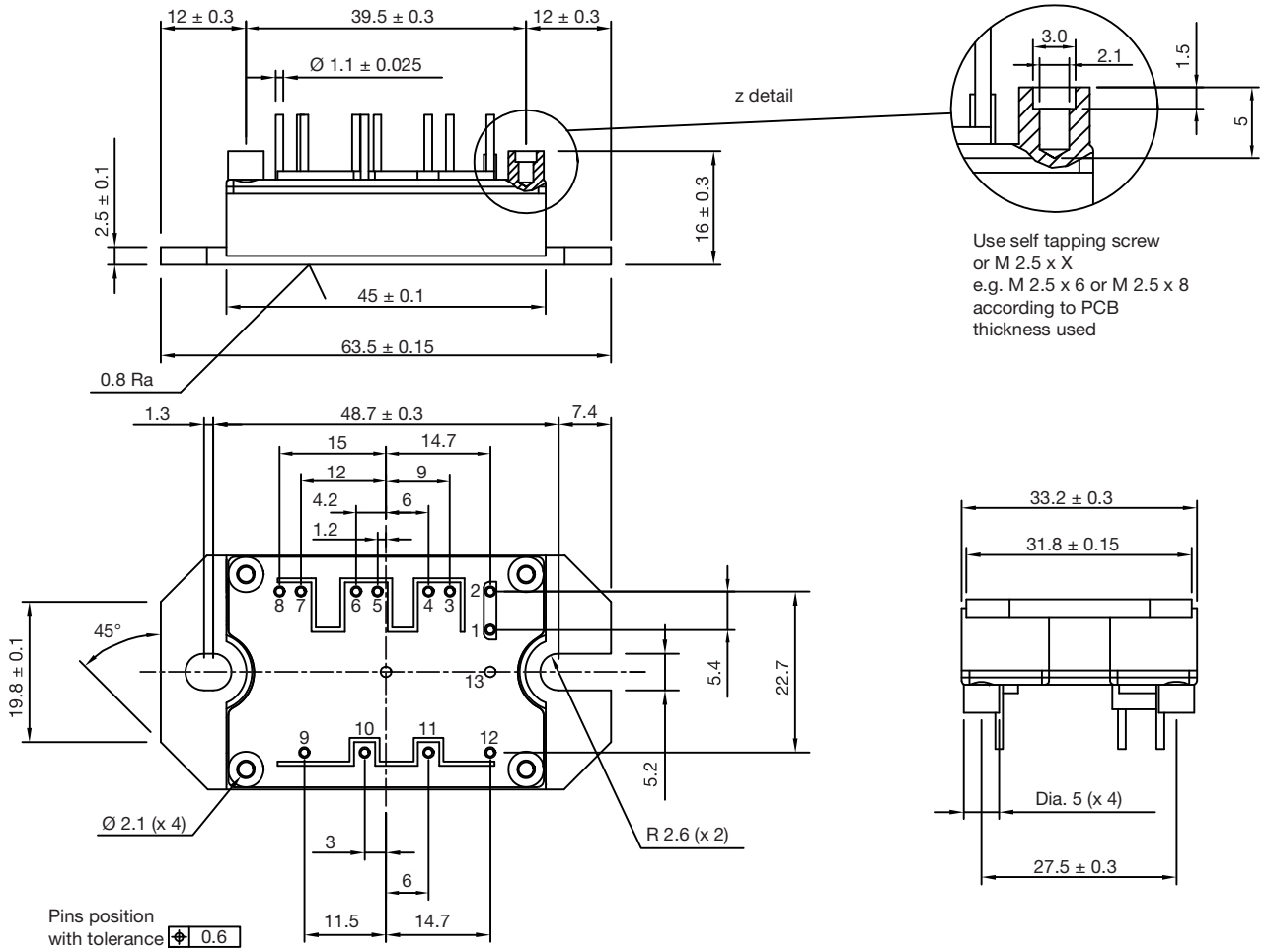
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95175

MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package

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.