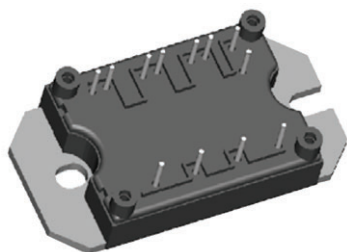


“Half Bridge” IGBT MTP (Warp 2 Speed IGBT), 70 A



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 stray 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/doc299912


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}	$V_{GE} = \pm 20$ 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	-	1.1	-	mJ
Turn-off switching loss	E _{off}	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	-	0.9	-	
Total switching loss	E _{ts}		-	2	-	
Turn-on switching loss	E _{on}	R _g = 10 Ω	-	1.27	-	
Turn-off switching loss	E _{off}	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	-	1.13	-	
Total switching loss	E _{ts}		-	2.4	-	ns
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	-	
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	-	8000	-	pF
Output capacitance	C _{oes}	V _{CC} = 30 V	-	790	-	
Reverse transfer capacitance	C _{res}	f = 1.0 MHz	-	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

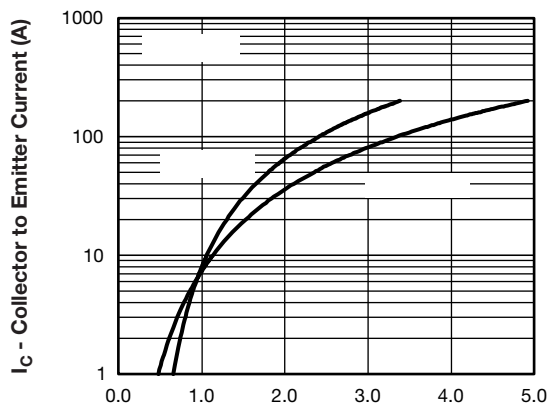
Notes(1) T₀, T₁ are thermistor's temperatures(2) $\frac{R_0}{R_1} = \exp\left[\beta\left(\frac{1}{T_0} - \frac{1}{T_1}\right)\right]$, temperature in Kelvin

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

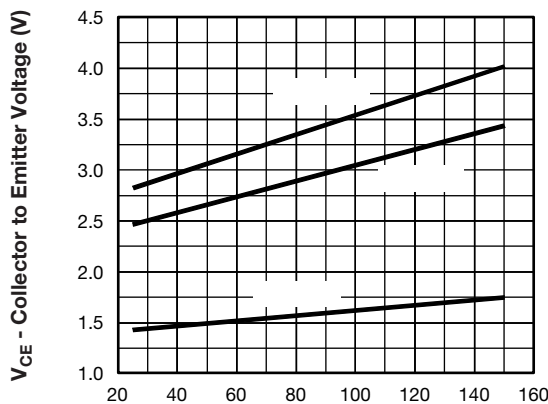
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	IGBT, Diode	T_J		-40	-	150	°C
	Thermistor			-40	-	125	
Storage temperature range		T_{Stg}		-40	-	125	
Junction to case	IGBT	R_{thJC}		-	-	0.36	°C/W
	Diode			-	-	0.8	
Case to sink per module		R_{thCS}	Heatsink 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.	$3 \pm 10 \%$			Nm
Weight				66			g



94469_01

V_{CE} - Collector to Emitter Voltage (V)

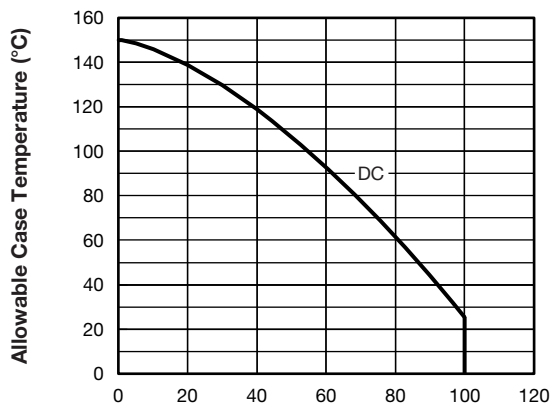
Fig. 1 - Typical Output Characteristics



94469_03

T_J - Junction Temperature (°C)

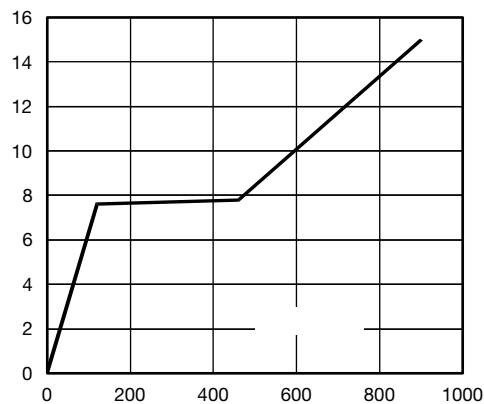
Fig. 3 - Typical Collector to Emitter Voltage vs. Junction Temperature



94469_02

Maximum DC Collector Current (A)

Fig. 2 - Maximum Collector Current vs. Case Temperature



94469_04

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

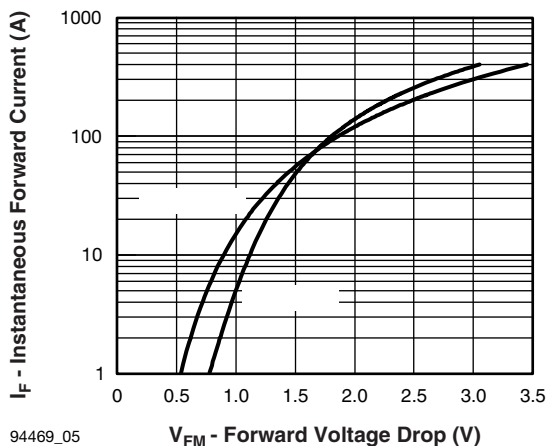


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

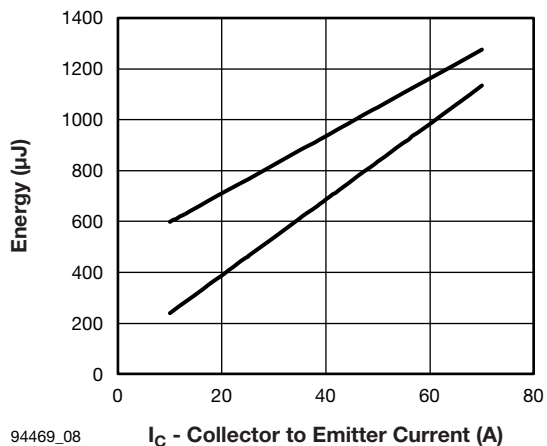


Fig. 8 - Typical Energy Losses vs. I_C ($T_J = 150\text{ }^{\circ}\text{C}$)

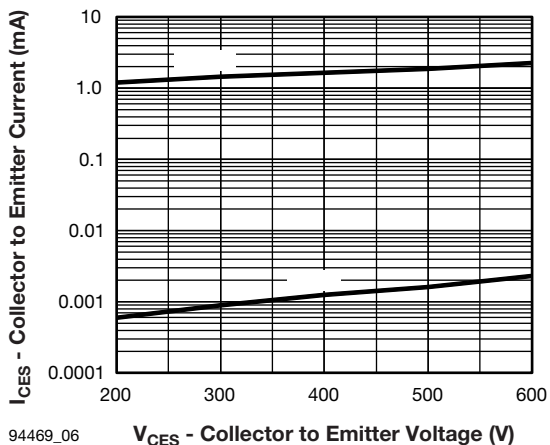


Fig. 6 - Typical Zero Gate Voltage Collector Current

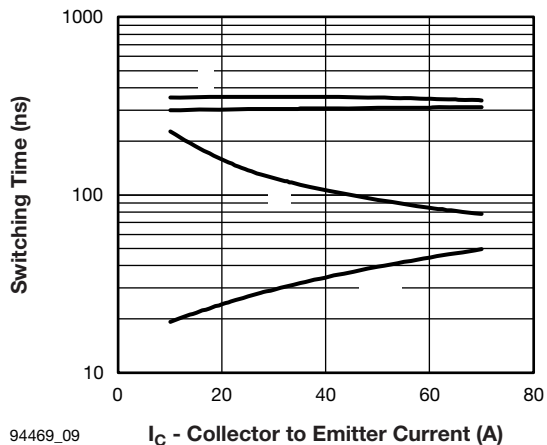


Fig. 9 - Switching Time vs. I_C

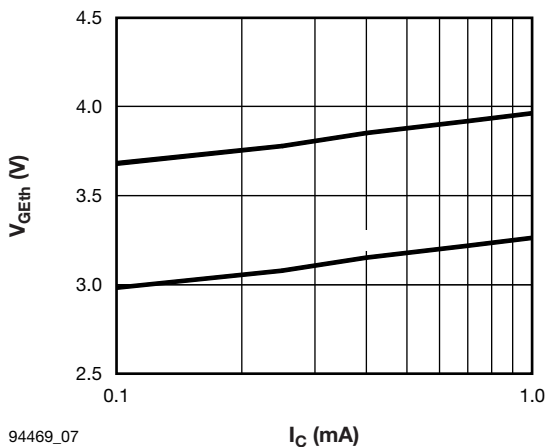


Fig. 7 - Typical Gate Threshold Voltage

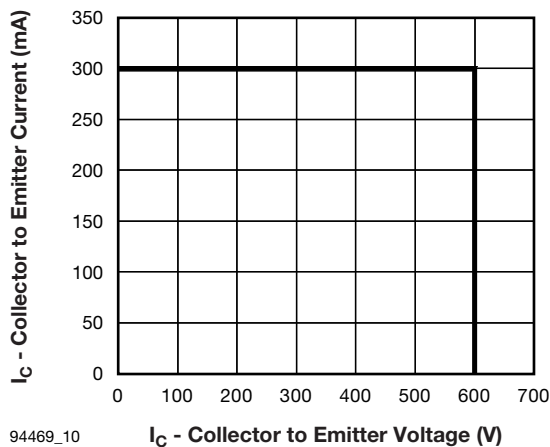
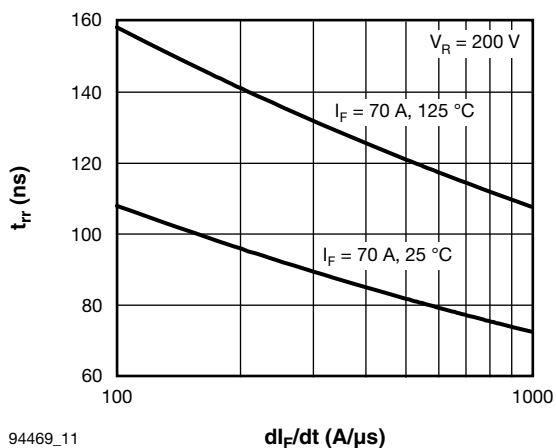
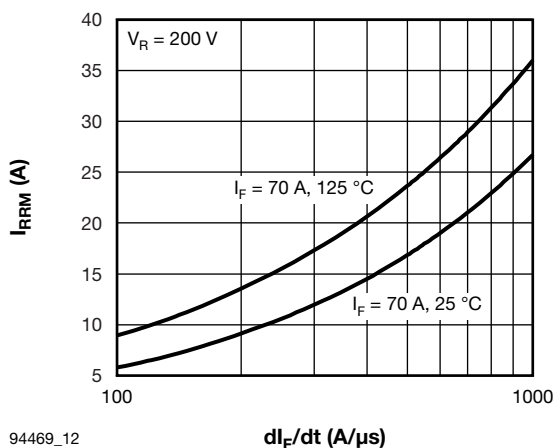
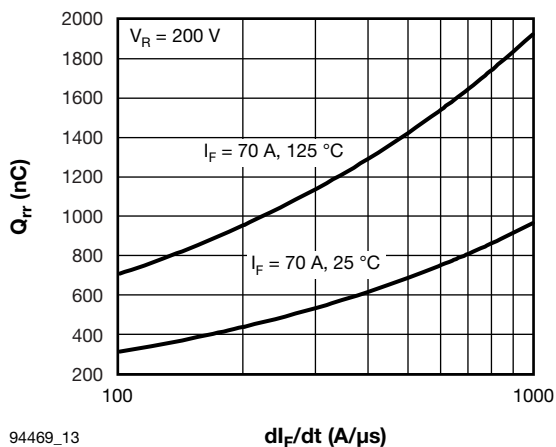
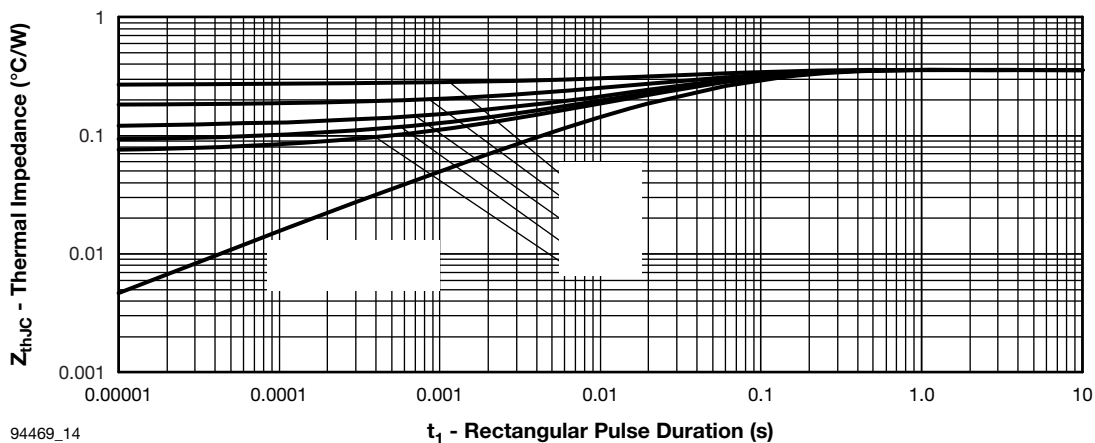


Fig. 10 - Reverse BIAS SOA, $T_J = 150\text{ }^{\circ}\text{C}$


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)

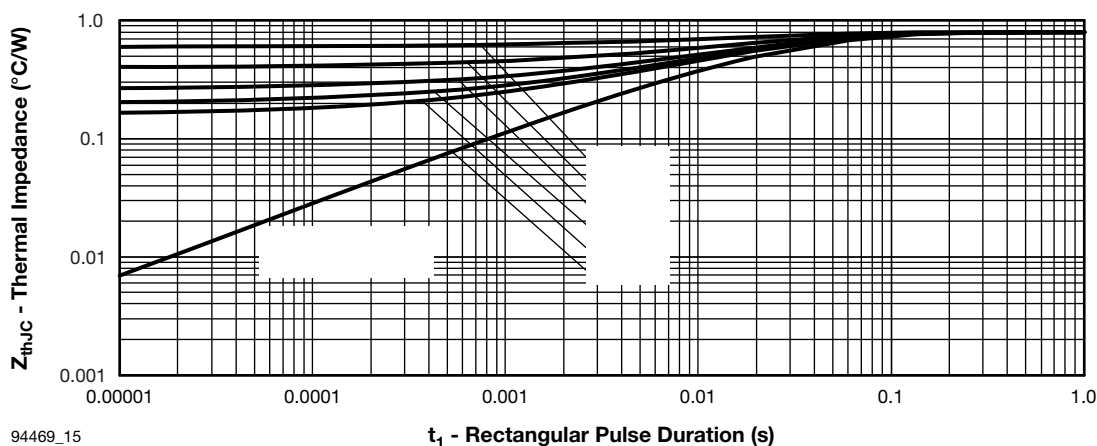
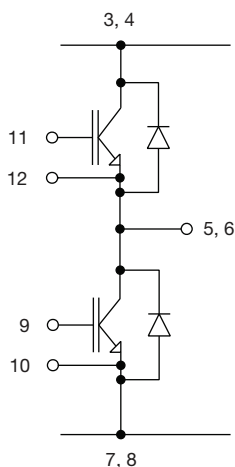

Fig. 15 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)


Fig. 16 - Electrical Diagram

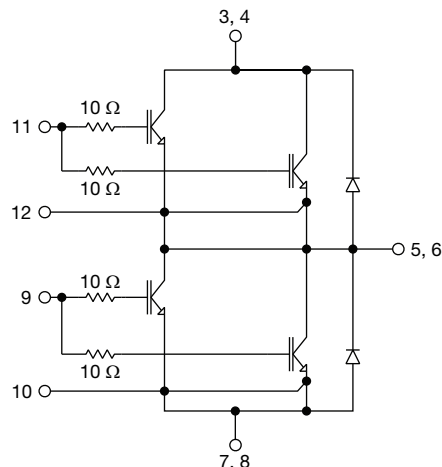


Fig. 17 - Functional Diagram

ORDERING INFORMATION TABLE

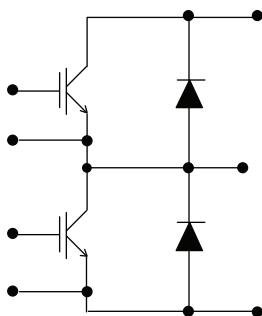
Device code

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

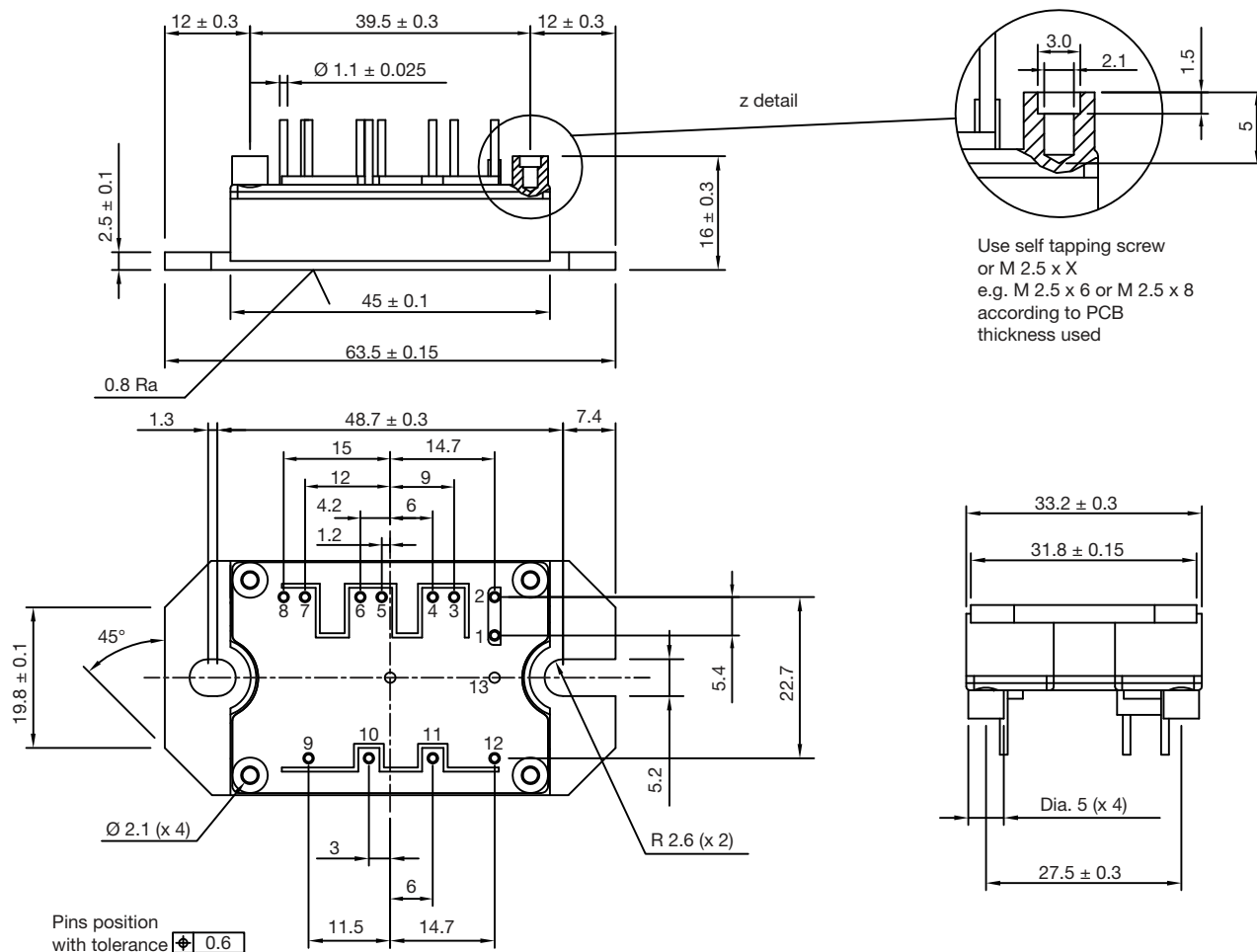


LINKS TO RELATED DOCUMENTS

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

MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package



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