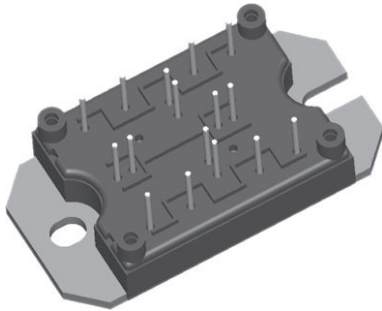


“Full Bridge” IGBT MTP (Warp Speed IGBT), 50 A



MTP

FEATURES

- Gen 4 warp speed IGBT technology
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- Very low conduction and switching losses
- Optional SMT thermistor
- Al₂O₃ DBC
- Very low stray inductance design for high speed operation
- Speed 8 kHz to 30 kHz > 20 kHz hard switching, > 200 kHz resonant mode
- UL approved file E78996 
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

V _{CES}	600 V
I _C DC	69 A
V _{CE(on)}	2.22 V
Speed	8 kHz to 30 kHz
Package	MTP
Circuit configuration	Full bridge

BENEFITS

- Optimized for welding, UPS and SMPS applications
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Very low junction to case thermal resistance

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	69	A
		T _C = 80 °C	46	
Pulsed collector current	I _{CM}		200	
Peak switching current	I _{LM}		200	
Diode continuous forward current	I _F	T _C = 100 °C	25	
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 minute	2500	
Maximum power dissipation per single IGBT	P _D	T _C = 25 °C	195	W
		T _C = 100 °C	78	



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0\text{ V}$, $I_C = 250\text{ }\mu\text{A}$	600	-	-	V
Temperature coefficient of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	$V_{GE} = 0\text{ V}$, $I_C = 4\text{ mA}$ ($25\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$)	-	+0.6	-	V/ $^{\circ}\text{C}$
Collector to emitter saturation voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}$, $I_C = 25\text{ A}$	-	2.22	3.14	V
		$V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$	-	2.43	3.25	
		$V_{GE} = 15\text{ V}$, $I_C = 25\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$	-	1.65	1.93	
		$V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$	-	2.08	2.45	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$	3	-	6	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$ ($25\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$)	-	-17	-	mV/ $^{\circ}\text{C}$
Transconductance	g_{fe}	$V_{CE} = 100\text{ V}$, $I_C = 25\text{ A}$, $PW = 80\text{ }\mu\text{s}$	-	43	-	S
Zero gate voltage collector current	$I_{CES(1)}$	$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$, $T_J = 25\text{ }^{\circ}\text{C}$	-	-	250	μA
		$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	-	-	10	mA
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 250	nA
Diode forward voltage drop	V_{FM}	$I_C = 25\text{ A}$	-	1.36	1.64	V
		$I_C = 50\text{ A}$	-	1.57	1.93	
		$I_C = 25\text{ A}$; $T_J = 150\text{ }^{\circ}\text{C}$	-	1.19	1.42	
		$I_C = 50\text{ A}$; $T_J = 150\text{ }^{\circ}\text{C}$	-	1.48	1.80	

Note(1) I_{CES} includes also opposite leg overall leakage

SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q_g	$I_C = 25\text{ A}$ $V_{CC} = 480\text{ V}$ $V_{GE} = 15\text{ V}$	-	175	263	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	27	41	
Gate to collector charge (turn-on)	Q_{gc}		-	71	107	
Turn-on switching loss	E_{on}	$R_g = 5\text{ }\Omega$, $I_C = 25\text{ A}$ $V_{CC} = 480\text{ V}$ $V_{GE} = \pm 15\text{ V}$, $T_J = 25\text{ }^{\circ}\text{C}$	-	0.13	0.20	mJ
Turn-off switching loss	E_{off}		-	0.42	0.62	
Total switching loss	E_{tot}		-	0.55	0.82	
Turn-on switching loss	E_{on}	$R_g = 5\text{ }\Omega$, $I_C = 25\text{ A}$ $V_{CC} = 480\text{ V}$ $V_{GE} = \pm 15\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	0.39	0.59	
Turn-off switching loss	E_{off}		-	0.49	0.74	
Total switching loss	E_{tot}		-	0.88	1.32	
Input capacitance	C_{ies}	$V_{GE} = 0\text{ V}$ $V_{CC} = 30\text{ V}$ $f = 1.0\text{ MHz}$	-	3610	5415	pF
Output capacitance	C_{oes}		-	714	1071	
Reverse transfer capacitance	C_{res}		-	58	87	
Diode reverse recovery time	t_{rr}	$V_R = 200\text{ V}$; $I_C = 25\text{ A}$; $di/dt = 200\text{ A}/\mu\text{s}$	-	50	-	ns
Diode peak reverse current	I_{rr}		-	4.5	-	A
Diode Recovery charge	Q_{rr}		-	112	-	nC
Diode peak rate of fall of recovery during t_b	$di_{(rec)M}/dt$		-	250	-	A/ μs

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	T_J		-40	-	150	$^{\circ}\text{C}$
Storage temperature range	T_{Stg}		-40	-	125	
Junction to case	R_{thJC}	IGBT	-	-	0.64	$^{\circ}\text{C}/\text{W}$
		Diode	-	-	0.9	
Case to sink per module	R_{thCS}	Heatsink compound thermal conductivity = $1\text{ W}/\text{mK}$	-	0.06	-	
Clearance ⁽¹⁾		External shortest distance in air between 2 terminals	5.5	-	-	mm
Creepage ⁽¹⁾		Shortest distance along external surface of the insulating material between 2 terminals	8	-	-	
Weight			66			g

Note

(1) Standard version only i.e. without optional thermistor

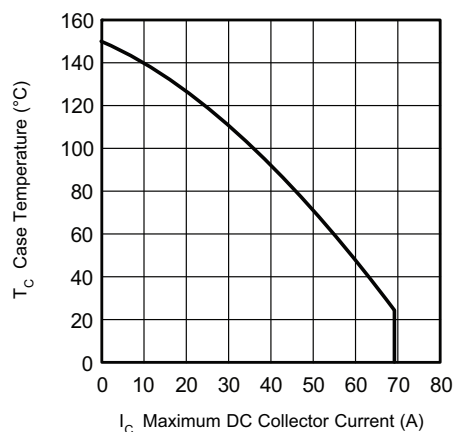


Fig. 1 - Maximum Collector Current vs. Case Temperature

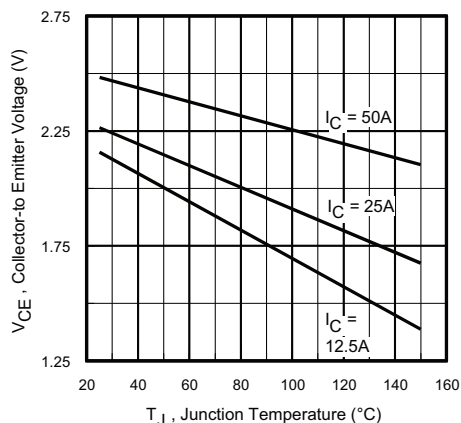


Fig. 2 - Typical Collector to Emitter Voltage vs. Junction Temperature

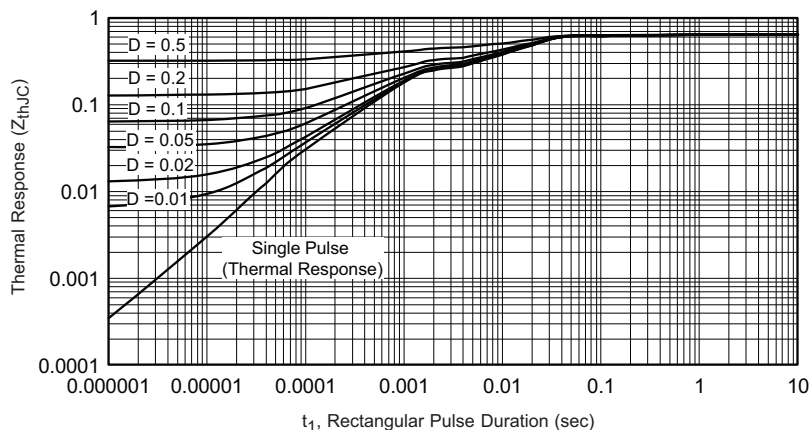


Fig. 3 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

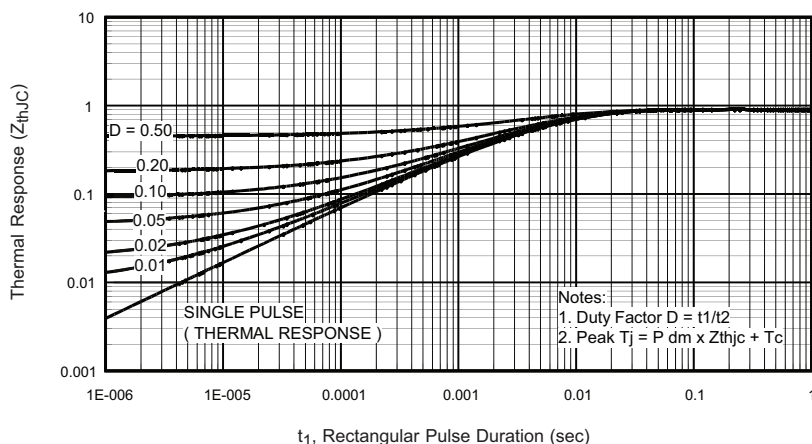


Fig. 4 - Maximum Transient Thermal Impedance, Junction to Case (Diode)

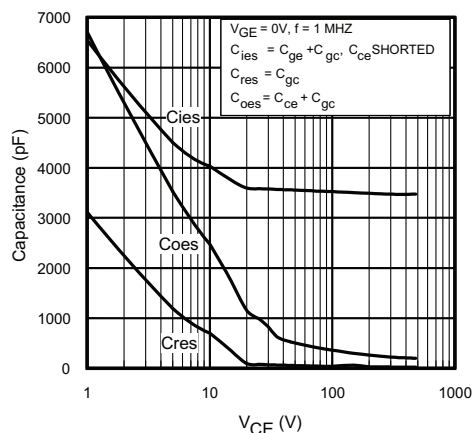


Fig. 5 - Typical Capacitance vs. Collector to Emitter Voltage

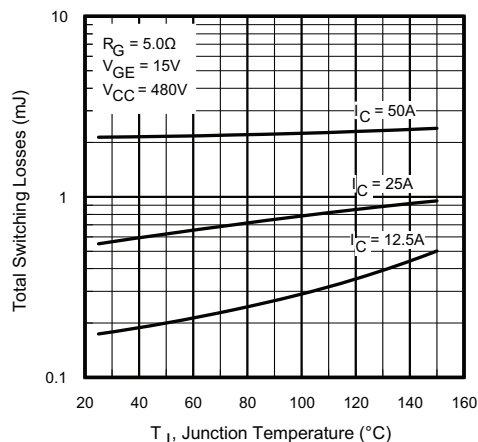


Fig. 8 - Typical Switching Losses vs. Junction Temperature

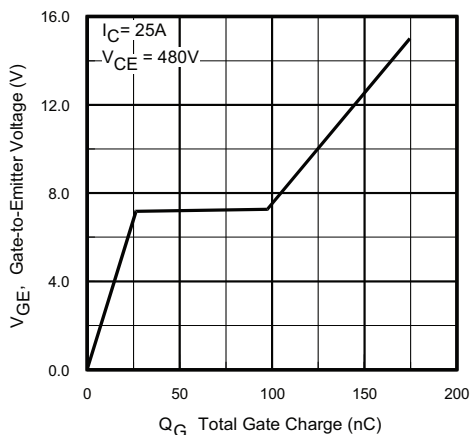


Fig. 6 - Typical Gate Charge vs. Gate to Emitter Voltage

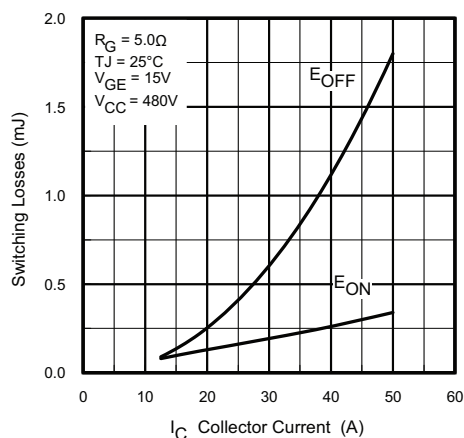


Fig. 9 - Typical Switching Losses vs. Collector to Emitter Current

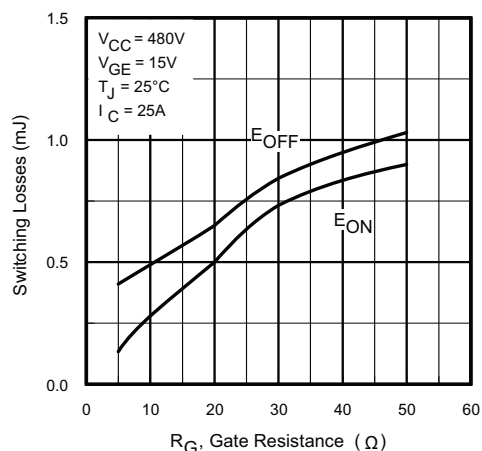


Fig. 7 - Typical Switching Losses vs. Gate Resistance

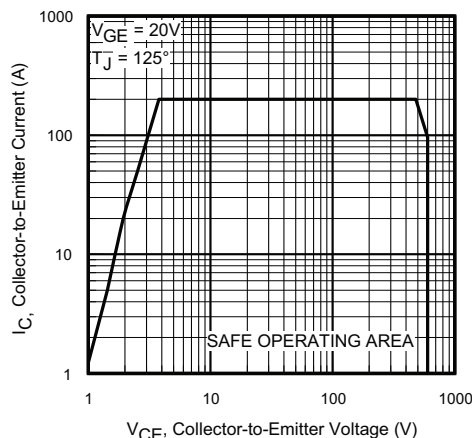


Fig. 10 - Turn-Off SOA

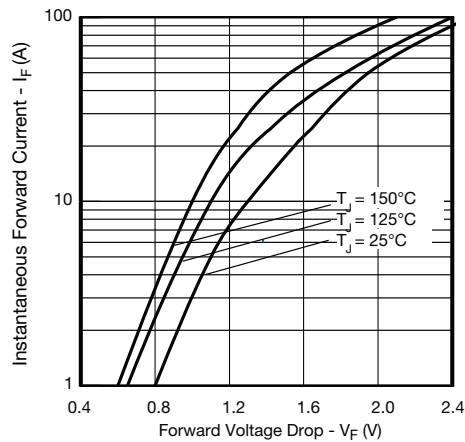


Fig. 11 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

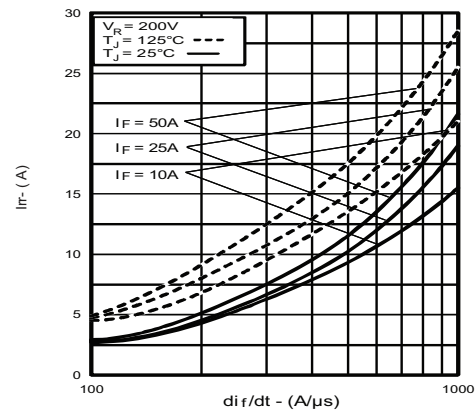


Fig. 13 - Typical Reverse Recovery Current vs. dI_F/dt

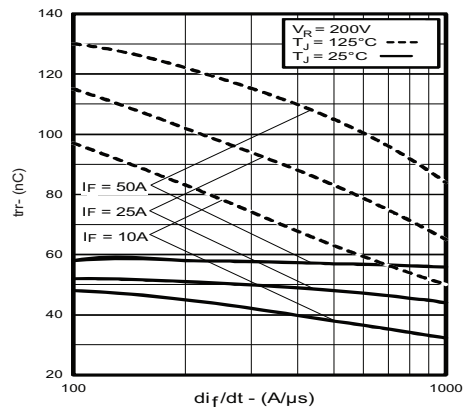


Fig. 12 - Typical Reverse Recovery Time vs. dI_F/dt

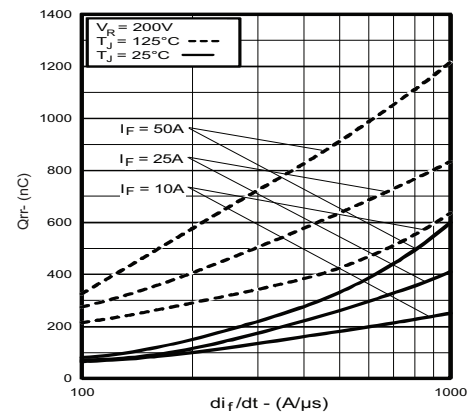


Fig. 14 - Typical Stored Charge vs. dI_F/dt

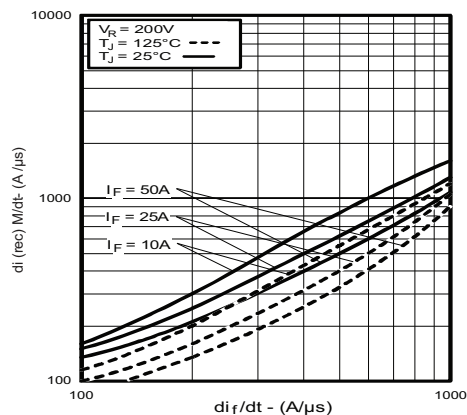


Fig. 15 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

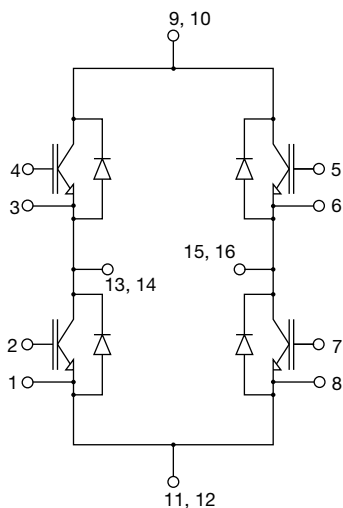


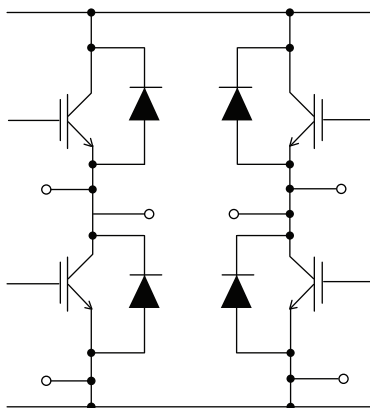
Fig. 16 - Electrical diagram

ORDERING INFORMATION TABLE

Device code	VS-	25	MT	060	W	F	A	PbF
	1	2	3	4	5	6	7	8

- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 3** - Essential part number
- 4** - Voltage code (060 = 600 V)
- 5** - Speed / type (W = warp IGBT)
- 6** - Circuit configuration (F = full bridge)
- 7** - A = Al₂O₃ DBC substrate
- 8** - PbF = lead (Pb)-free

CIRCUIT CONFIGURATION



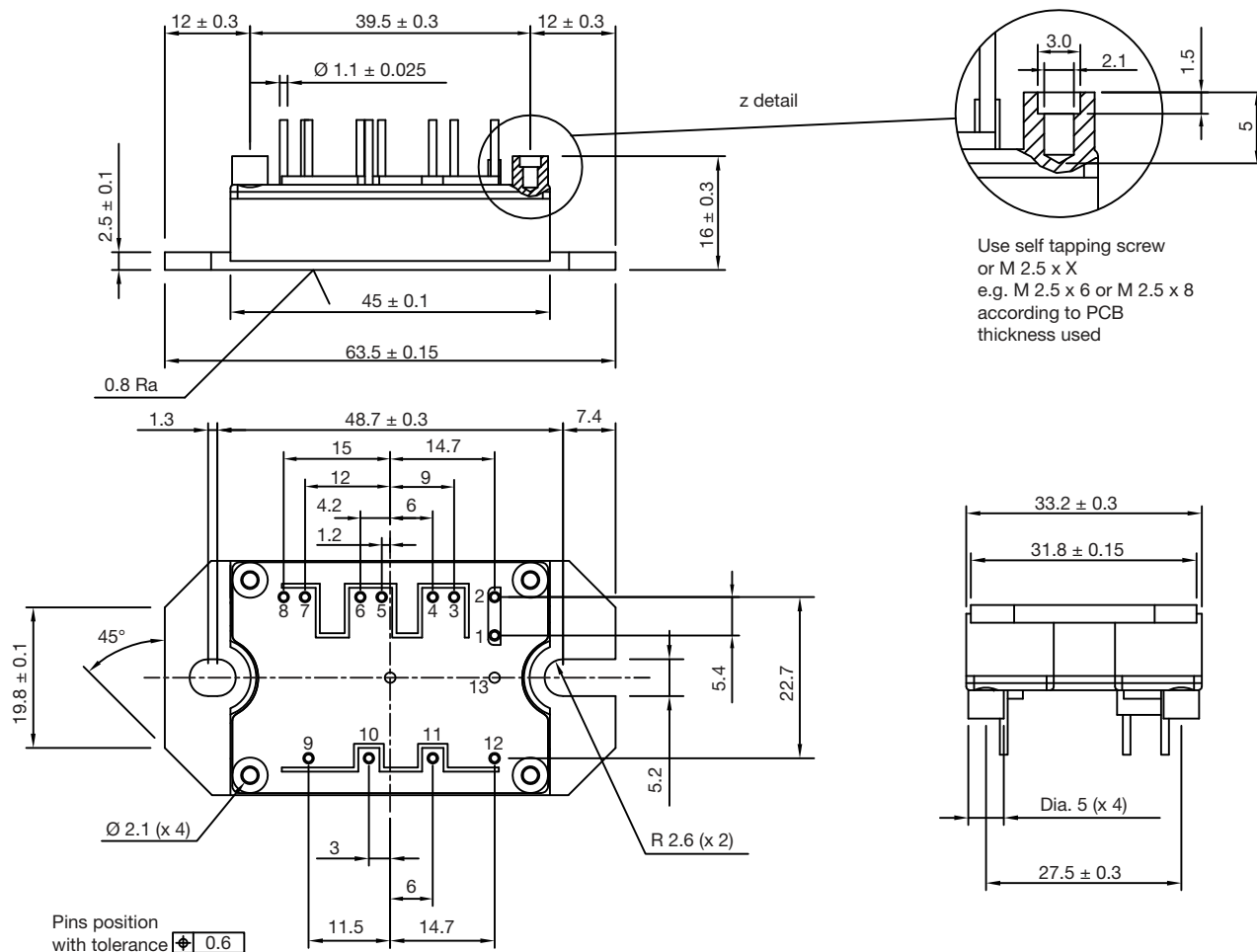
LINKS TO RELATED DOCUMENTS

Dimensions

www.vishay.com/doc?95245

MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package



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