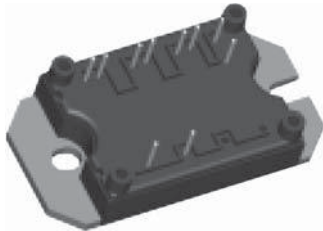


"Low Side Chopper" IGBT MTP (Ultrafast Speed IGBT), 100 A



MTP



FEATURES

- Generation 4 ultrafast speed IGBT technology
- HEXFRED® diode with ultrasoft reverse recovery
- Very low conduction and switching losses
- Optional SMD thermistor (NTC)
- Al₂O₃ DBC
- Very low stray inductance design for high speed operation
- UL approved file E78996
- Speed 8 kHz to 60 kHz > 20 kHz hard switching, > 200 kHz resonant mode
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level

PRODUCT SUMMARY	
V _{CES}	600 V
I _C DC	100 A
V _{CE(on)}	1.68 V

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	100	A
		T _C = 122 °C	50	
Pulsed collector current	I _{CM}		200	
Peak switching current	I _{LM}		200	
Diode continuous forward current	I _F	T _C = 100 °C	48	
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	IGBT	P _D	T _C = 25 °C	445
			T _C = 100 °C	175
	Diode	P _D	T _C = 25 °C	205
			T _C = 100 °C	83



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
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
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 50\text{ A}$	-	1.69	2.31	
		$V_{GE} = 15\text{ V}, I_C = 100\text{ A}$	-	1.96	2.55	
		$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	1.88	2.24	
Gate threshold voltage	$V_{GE(th)}$	$I_C = 0.5\text{ mA}$	3	-	6	
Diode reverse breakdown voltage	V_{BR}	$I_R = 200\text{ }\mu\text{A}$	600	-	-	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}, I_C = 500\text{ }\mu\text{A}$	-	-13	-	mV/ $^\circ\text{C}$
Forward transconductance	g_{fe}	$V_{CE} = 50\text{ V}, I_C = 100\text{ A}$	22	29	-	S
Collector to emitter leaking current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	-	-	0.25	mA
		$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	-	6	
Diode forward voltage drop	V_{FM}	$I_F = 100\text{ A}, V_{GE} = 0\text{ V}$	-	1.64	1.82	V
		$I_F = 100\text{ A}, V_{GE} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	1.56	1.74	
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 250	nA

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	$I_C = 100\text{ A}$ $V_{CC} = 480\text{ V}$ $V_{GE} = 15\text{ V}$	-	370	555	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	64	96	
Gate to collector charge (turn-on)	Q_{gc}		-	163	245	
Turn-on switching loss	E_{on}	$V_{CC} = 480\text{ V}, I_C = 50\text{ A}, V_{GE} = 15\text{ V},$ $R_g = 5\text{ }\Omega, T_J = 25\text{ }^\circ\text{C},$ energy losses include tail and diode reverse recovery	-	0.7	1.2	mJ
Turn-off switching loss	E_{off}		-	1.7	2.6	
Total switching loss	E_{ts}		-	2.4	3.8	
Turn-on switching loss	E_{on}	$V_{CC} = 480\text{ V}, I_C = 50\text{ A}, V_{GE} = 15\text{ V},$ $R_g = 5\text{ }\Omega, T_J = 125\text{ }^\circ\text{C},$ energy losses include tail and diode reverse recovery	-	1.1	1.7	
Turn-off switching loss	E_{off}		-	2.5	3.8	
Total switching loss	E_{ts}		-	3.6	5.5	
Input capacitance	C_{ies}	$V_{GE} = 0\text{ V}$ $V_{CC} = 30\text{ V}$ $f = 1.0\text{ MHz}$	-	9800	14 700	pF
Output capacitance	C_{oes}		-	602	903	
Reverse transfer capacitance	C_{res}		-	121	182	
Diode junction capacitance	C_t		$V_R = 600\text{ V}, f = 1.0\text{ MHz}$	-	118	
Diode reverse recovery time	t_{rr}	$V_{CC} = 480\text{ V}, I_C = 50\text{ A}$ $di/dt = 200\text{ A}/\mu\text{s}$ $R_g = 5\text{ }\Omega$	-	99	150	ns
Diode peak reverse current	I_{rr}		-	6.5	9.8	A
Diode recovery charge	Q_{rr}		-	320	735	nC
Diode peak rate of fall of recovery during t_b	$dl_{(rec)M}/dt$		-	236	-	A/ μs



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

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	T _J		- 40	-	150	°C
Storage temperature range	T _{Stg}		- 40	-	125	
Junction to case	R _{thJC}	IGBT	-	-	0.28	°C/W
		Diode	-	-	0.6	
Case to sink per module	R _{thCS}	Heatsink compound thermal conductivity = 1 W/mK	-	0.06	-	
Mounting torque to heatsink ± 10 %		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			Nm
Weight			66			g

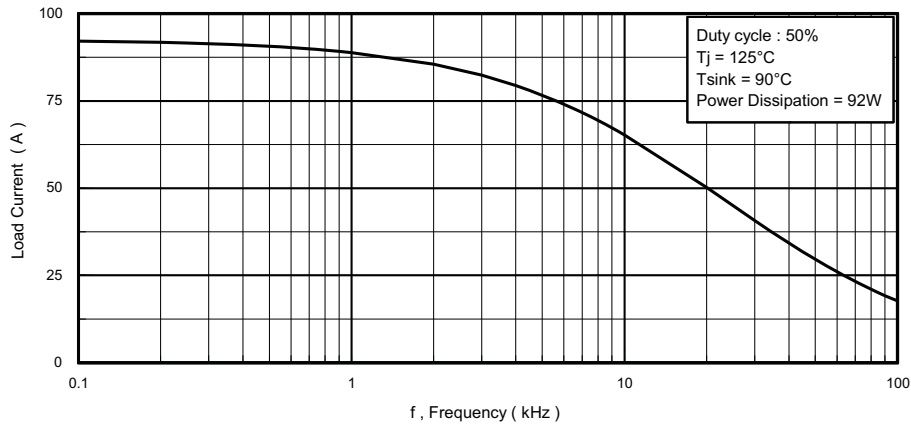


Fig. 1 - Typical Load Current vs. Frequency (Load Current = I_{RMS} of Fundamental)

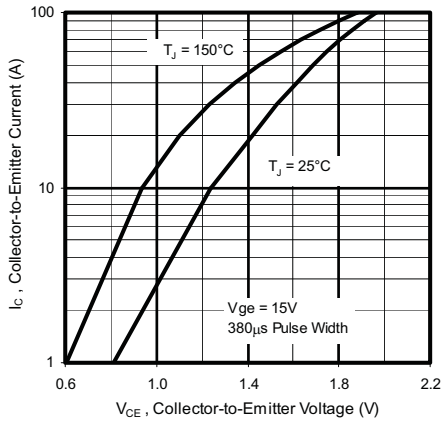


Fig. 2 - Typical Output Characteristics

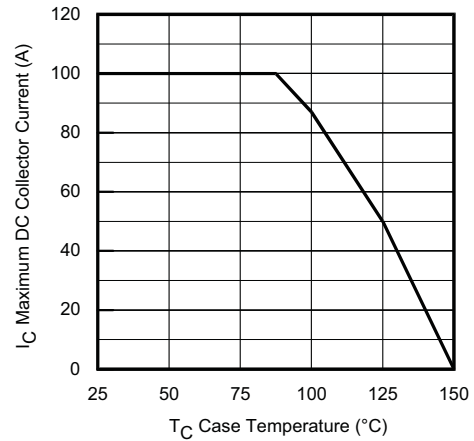


Fig. 4 - Maximum Collector Current vs. Case Temperature

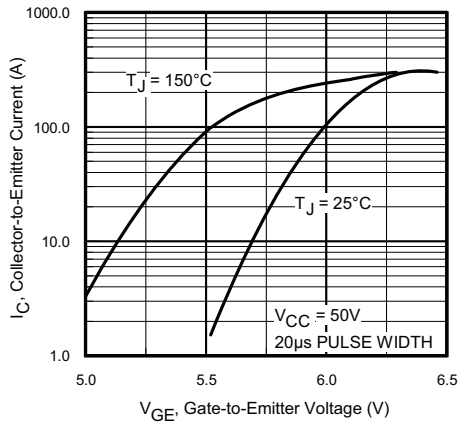


Fig. 3 - Typical Transfer Characteristics

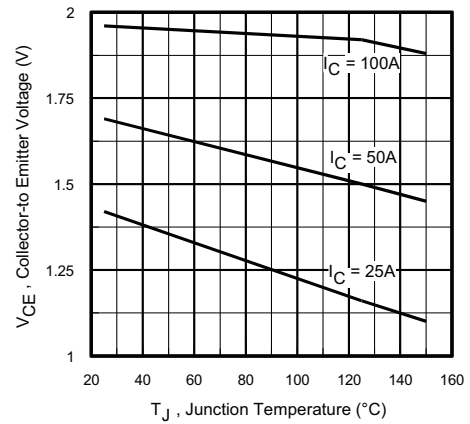


Fig. 5 - Typical Collector to Emitter Voltage vs. Junction Temperature

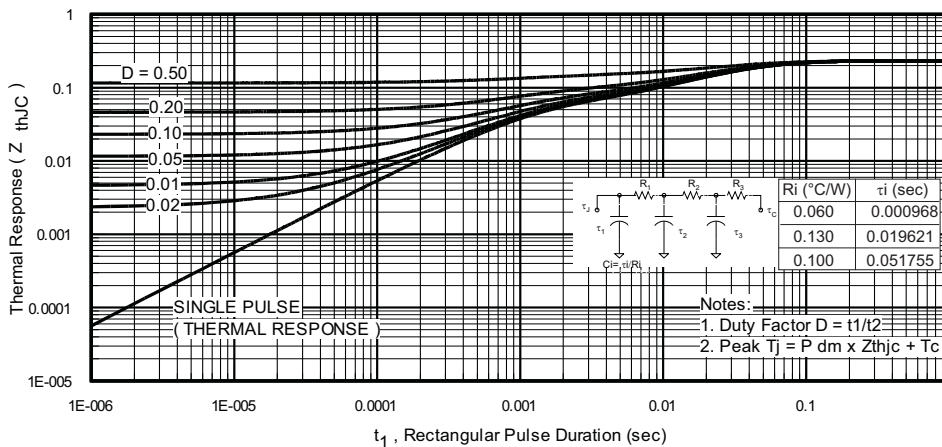


Fig. 6 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

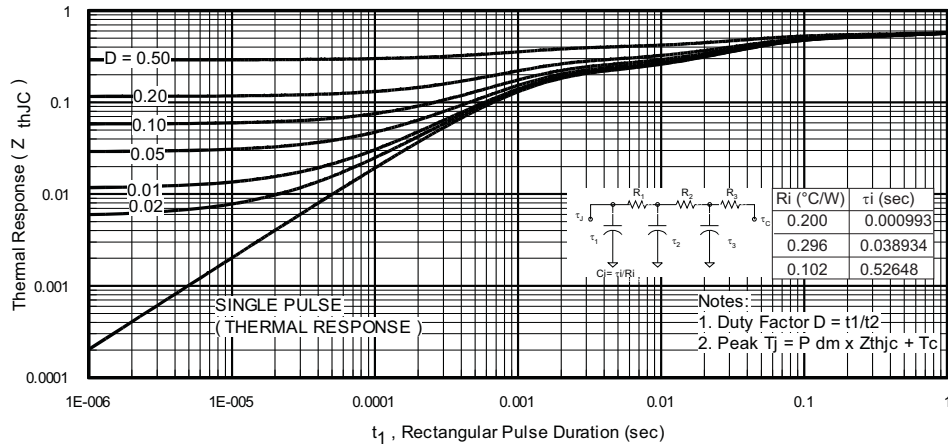


Fig. 7 - Maximum Transient Thermal Impedance, Junction to Case (Diode)

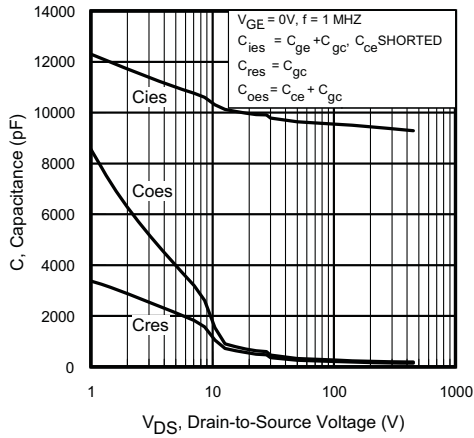


Fig. 8 - Typical Capacitance vs. Collector to Emitter Voltage

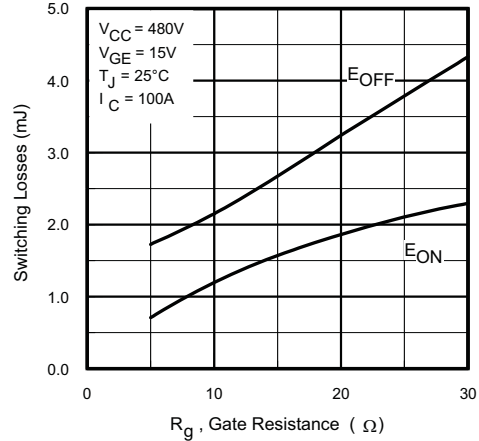


Fig. 10 - Typical Switching Losses vs. Gate Resistance

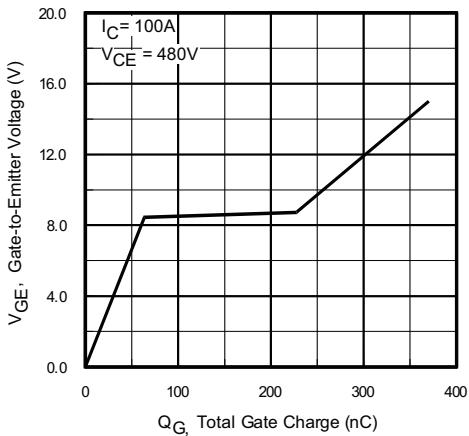


Fig. 9 - Typical Gate Charge vs. Gate to Emitter Voltage

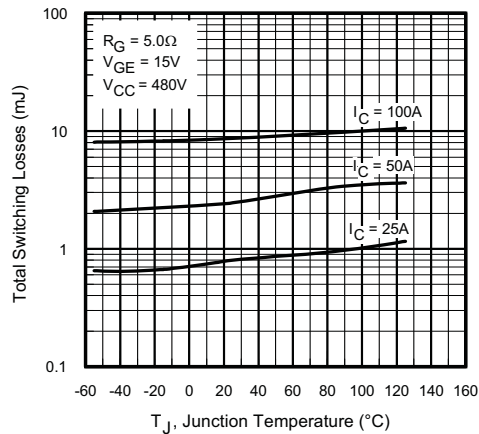


Fig. 11 - Typical Switching Losses vs. Junction Temperature

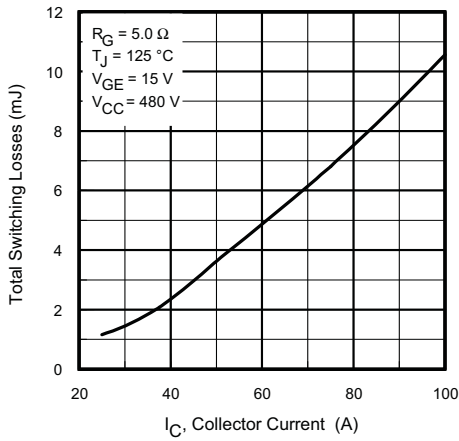


Fig. 12 - Typical Switching Losses vs. Collector to Emitter Current

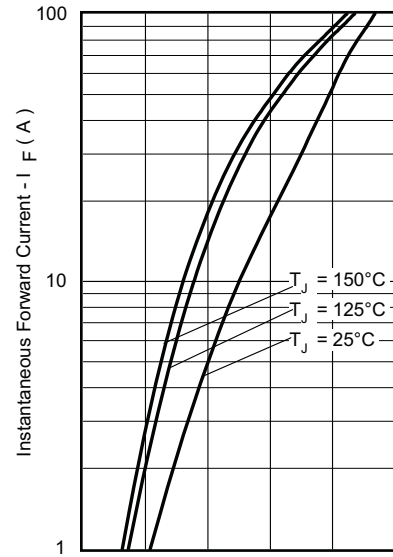


Fig. 14 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

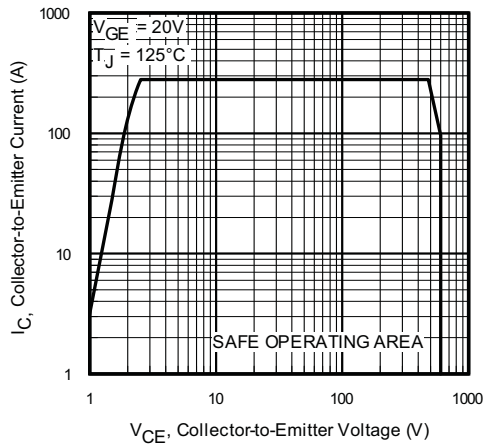


Fig. 13 - Turn-Off SOA

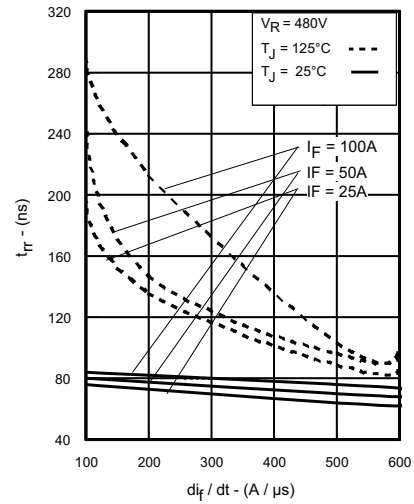


Fig. 15 - Typical Reverse Recovery Time vs. di_F/dt

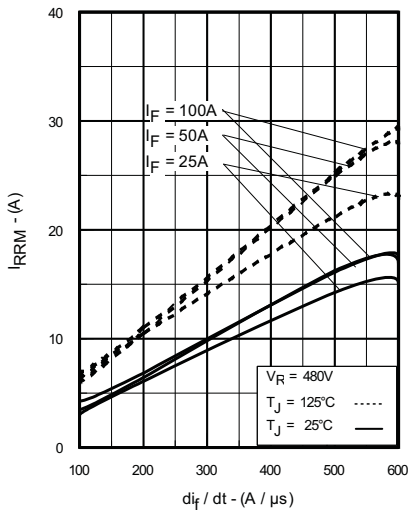


Fig. 16 - Typical Recovery Current vs. di_F/dt

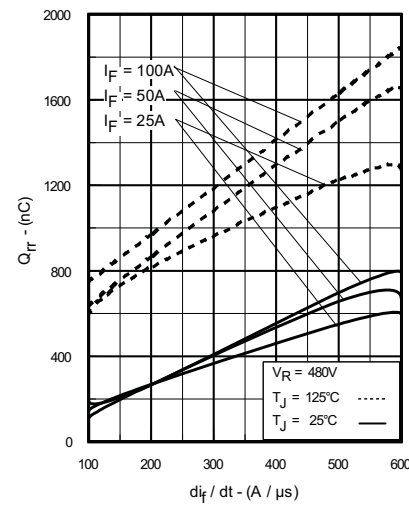


Fig. 17 - Typical Stored Charge vs. di_F/dt

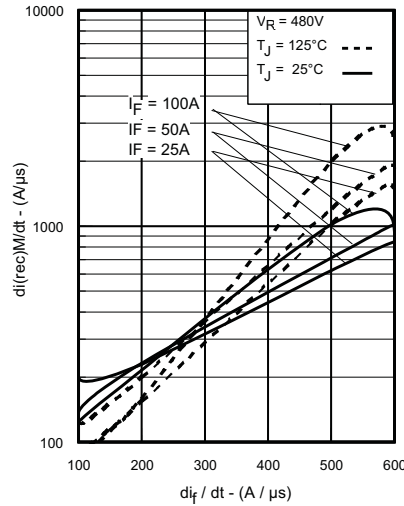


Fig. 18 - Typical $dI_{(rec)M}/dt$ vs. di_F/dt

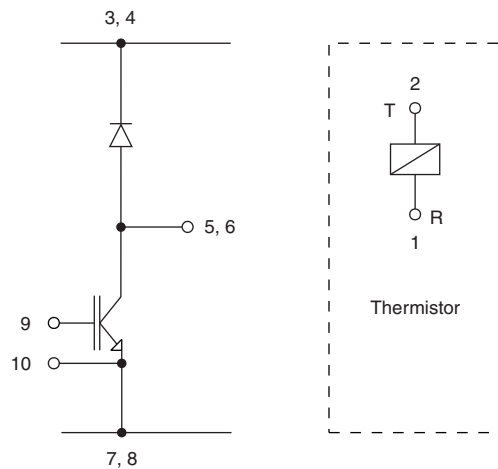
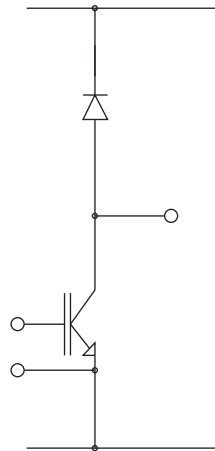


Fig. 19 - Electrical diagram

ORDERING INFORMATION TABLE

Device code	50	MT	060	U	LS	T	A	PbF
	1	2	3	4	5	6	7	8

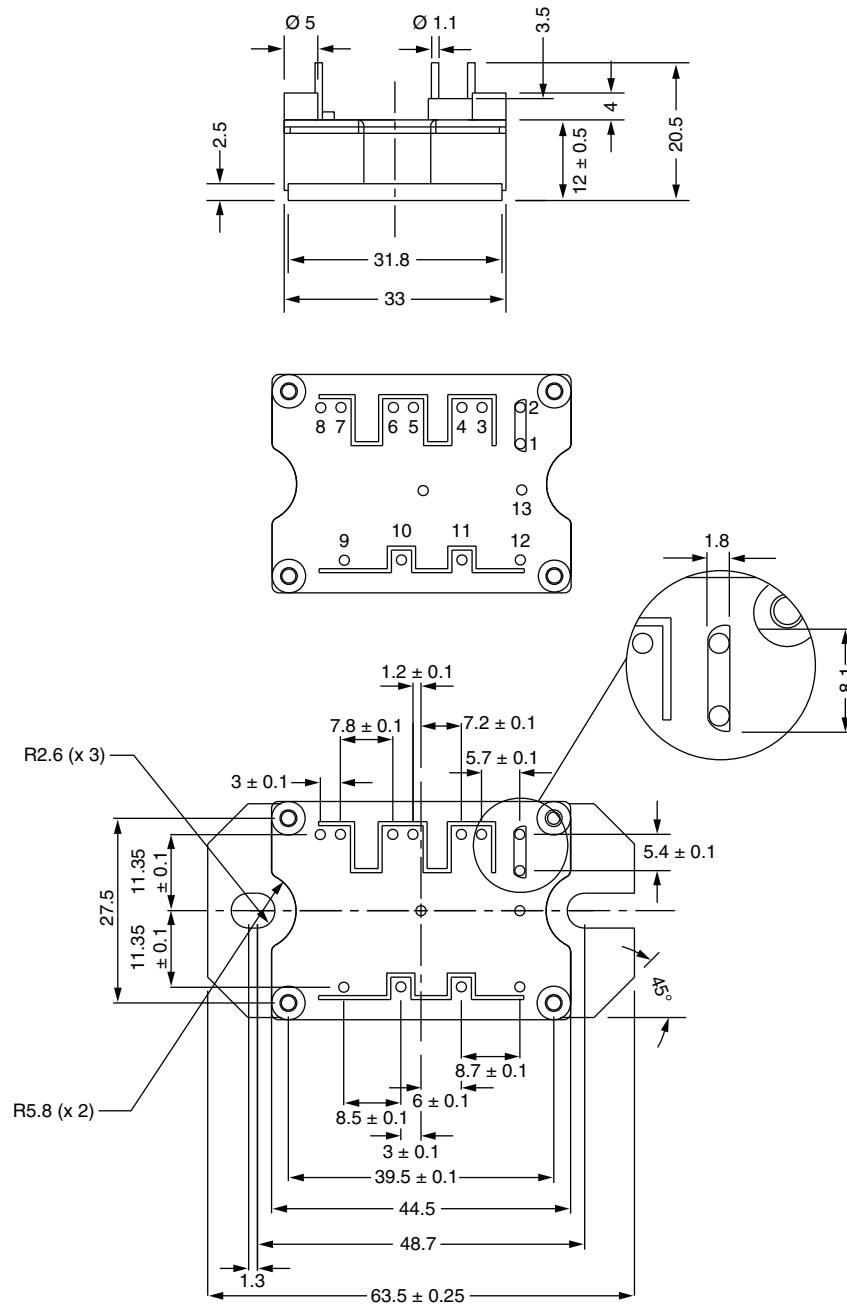
- | | | |
|----------|---|--|
| 1 | - | Current rating (50 = 50 A) |
| 2 | - | Essential part number |
| 3 | - | Voltage rating (060 = 600 V) |
| 4 | - | Speed/type (U = Ultrafast IGBT) |
| 5 | - | Circuit configuration (LS = Low side chopper) |
| 6 | - | Special option: <ul style="list-style-type: none"> • None = No special option • T = Thermistor |
| 7 | - | A = Al ₂ O ₃ DBC substrate |
| 8 | - | PbF = Lead (Pb)-free |

CIRCUIT CONFIGURATION

LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?95175
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MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package



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