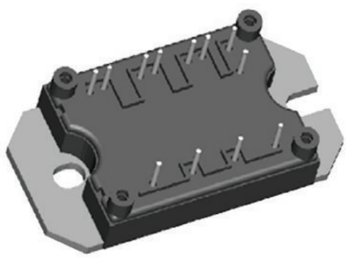
“Half Bridge” IGBT MTP (Warp 2 Speed IGBT), 70 A



MTP

PRODUCT SUMMARY	
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
Package	MTP
Circuit	Half bridge

FEATURES

Pb-free RoHS COMPLIANT

- 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 pending
- Speed 60 kHz to 150 kHz
- UL approved file E78996
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

BENEFITS

- Optimized for welding, UPS and SMPS applications
- Lower coduction 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

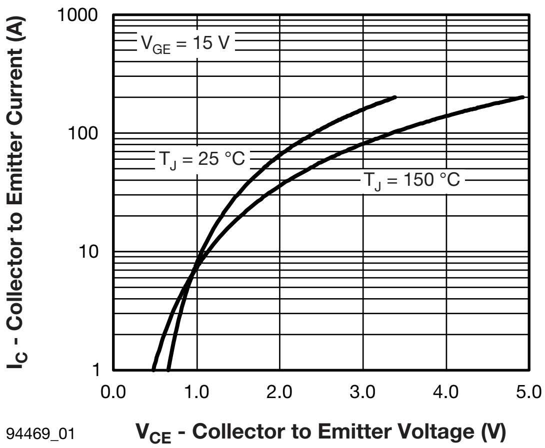


Fig. 1 - Typical Output Characteristics

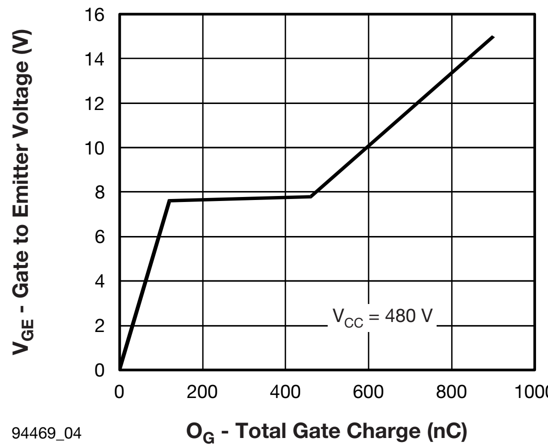


Fig. 4 - Typical Gate Charge vs. Gate to Emitter Votlage

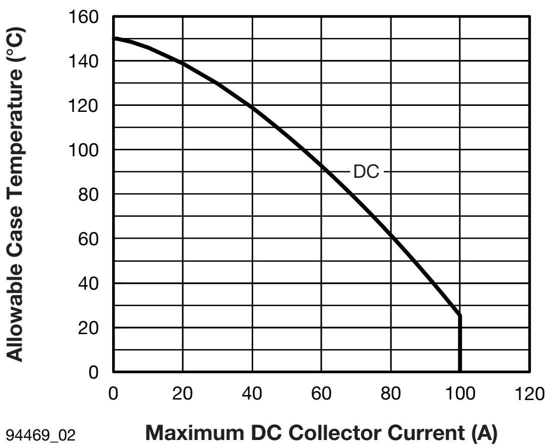


Fig. 2 - Maximum Collector Current vs. Case Temperature

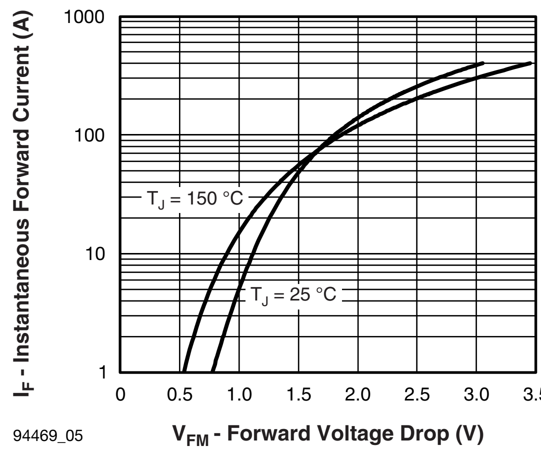


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

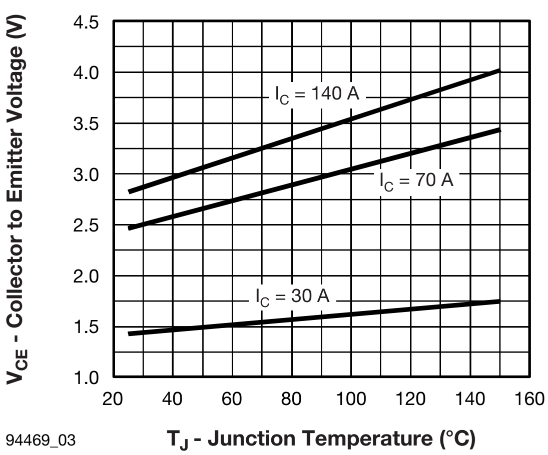


Fig. 3 - Typical Collector to Emitter Voltage vs. Junction Temperature

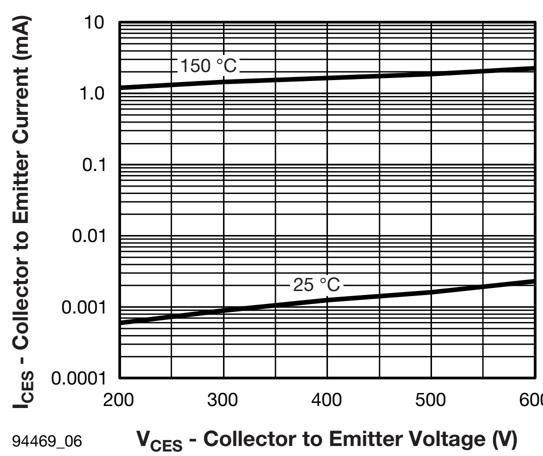


Fig. 6 - Typical Zero Gate Voltage Collector Current

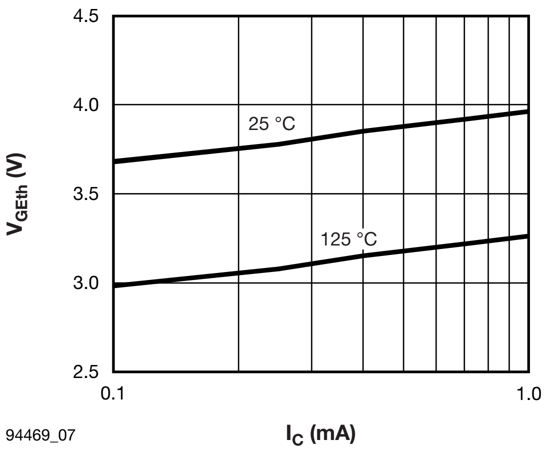


Fig. 7 - Typical Gate Threshold Voltage

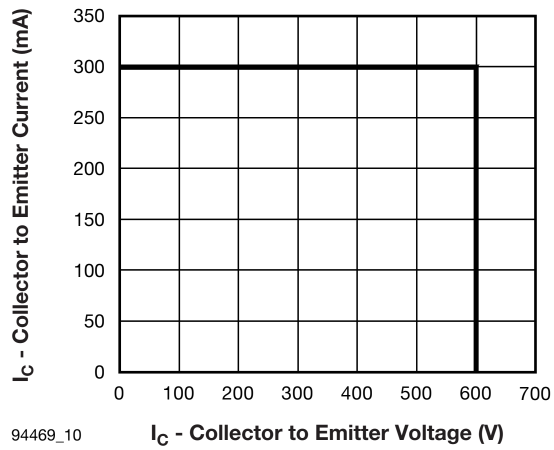


Fig. 10 - Reverse BIAS SOA, T_J = 150 °C

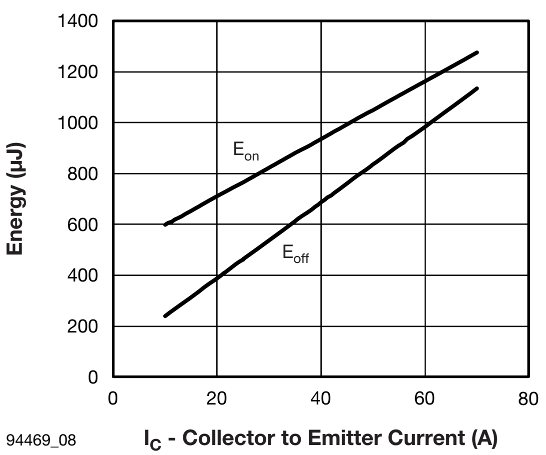


Fig. 8 - Typical Energy Losses vs. I_C (T_J = 150 °C)

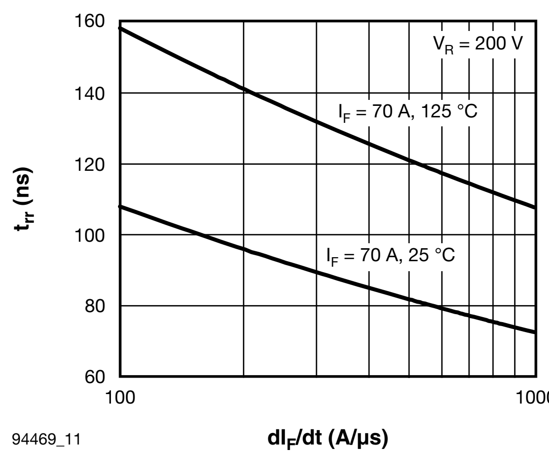


Fig. 11 - Typical Reverse Recovery Time vs. dI_F/dt

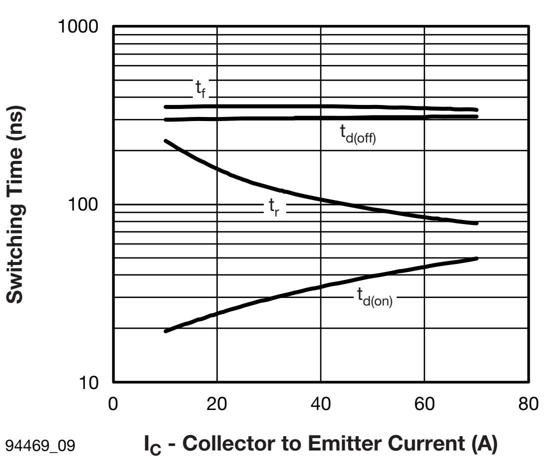


Fig. 9 - Switching Time vs. I_C

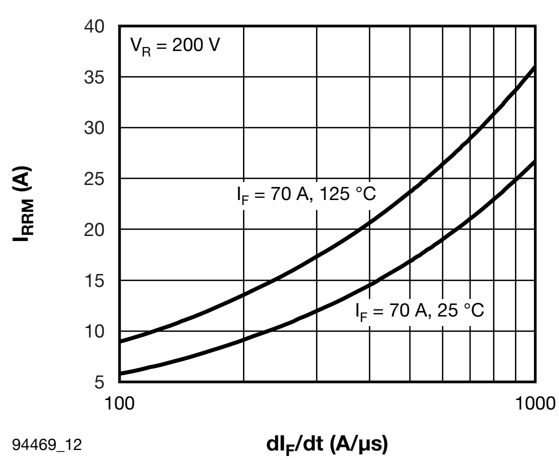


Fig. 12 - Typical Reverse Recovery Current vs. dI_F/dt

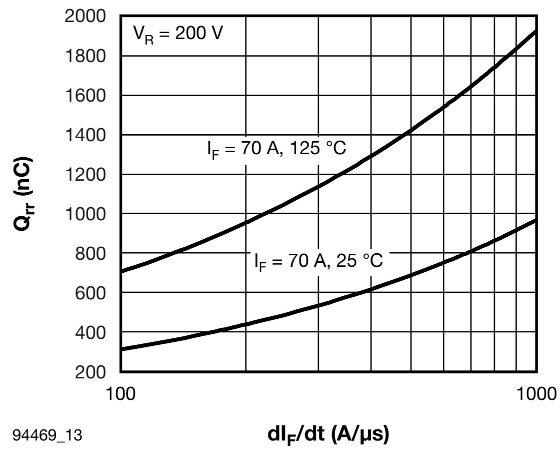


Fig. 13 - Typical Stored Charge vs. dI_F/dt

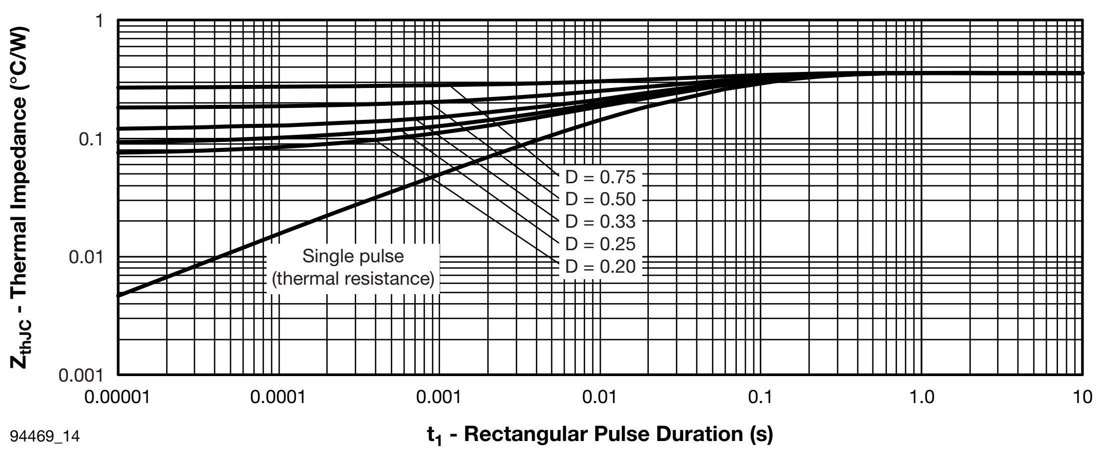


Fig. 14 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

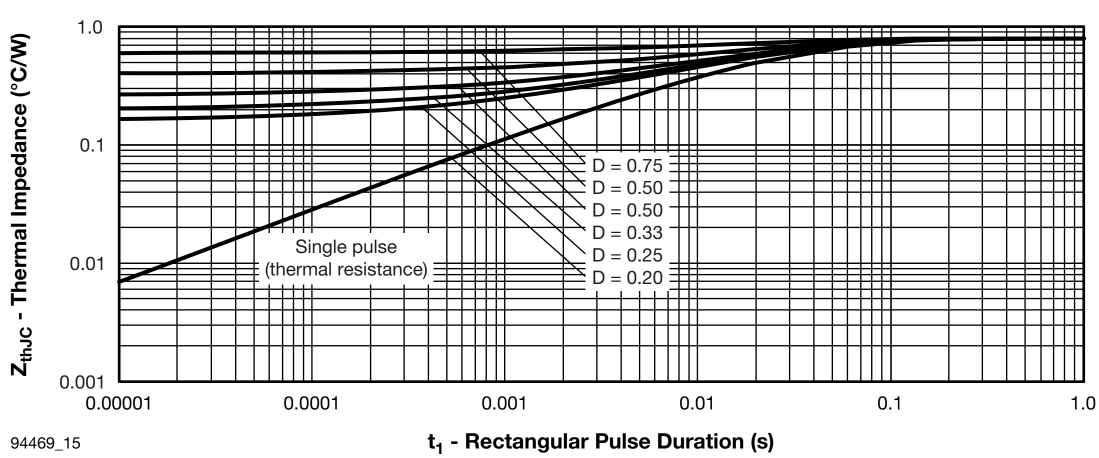


Fig. 15 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)

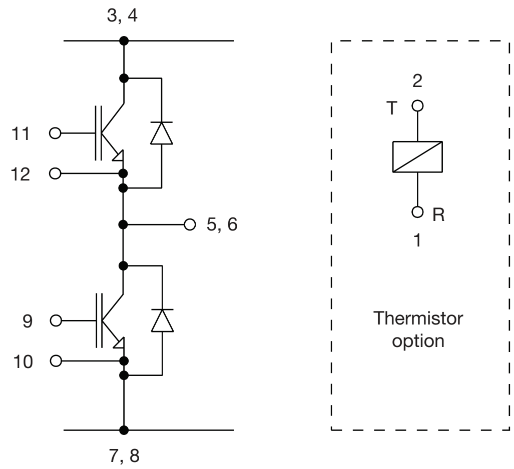


Fig. 16 - Electrical Diagram

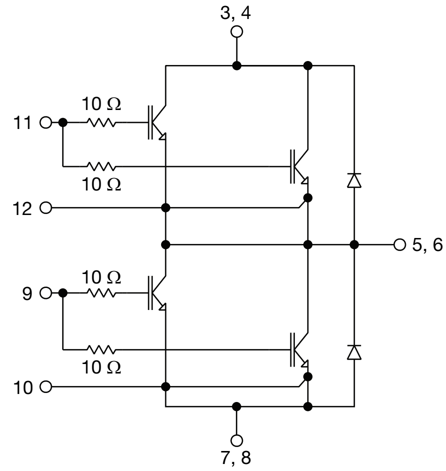


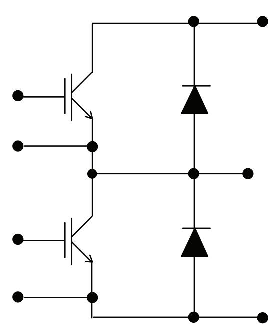
Fig. 17 - Functional Diagram

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

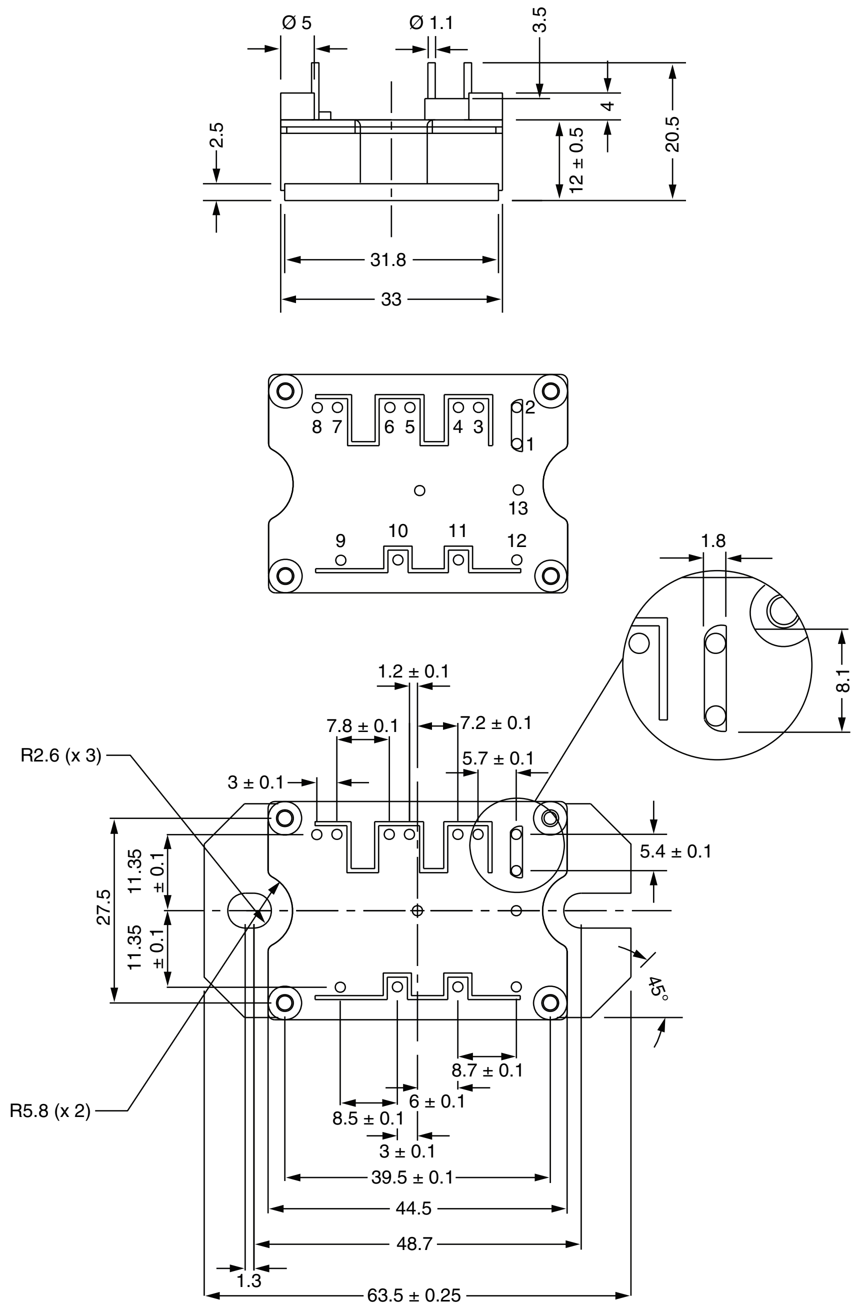
CIRCUIT CONFIGURATION



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

MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package

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