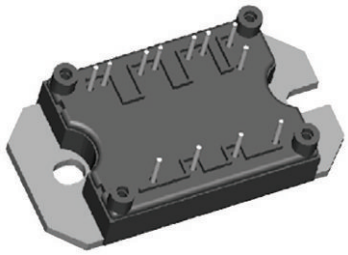
"Half Bridge" IGBT MTP (Warp Speed IGBT), 114 A



MTP

FEATURES

- Generation 4 warp speed IGBT technology
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- Very low conduction and switching losses
- Optional SMD thermistor (NTC)
- Very low junction to case thermal resistance
- UL approved file E78996
- Speed 60 kHz to 100 kHz
- 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
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Very low stray inductance design for high speed operation

PRODUCT SUMMARY	
V_{CES}	600 V
$V_{CE(on)}$ typical at V_{GE} = 15 V	2.3 V
I_C at T_C = 25 °C	114 A
Package	MTP
Circuit	Half bridge

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	114	A
		T_C = 109 °C	50	
Pulsed collector current	I_{CM}		350	
Peak switching current	I_{LM}		350	
Diode continuous forward current	I_F	T_C = 109 °C	34	
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	P_D	T_C = 25 °C	658	W
		T_C = 100 °C	263	

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 = 50 A	-	2.3	3.15	V
		V_{GE} = 15 V, I_C = 100 A	-	2.5	3.2	
		V_{GE} = 15 V, I_C = 50 A, T_J = 150 °C	-	1.72	2.17	
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 A	-	-	0.4	mA
		V_{GE} = 0 V, I_C = 600 A, T_J = 150 °C	-	-	10	
Diode forward voltage drop	V_{FM}	I_F = 50 A, V_{GE} = 0 V	-	1.58	1.80	V
		I_F = 50 A, V_{GE} = 0 V, T_J = 150 °C	-	1.49	1.68	
		I_F = 100 A, V_{GE} = 0 V, T_J = 25 °C	-	1.9	2.17	
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 = 52 A V_{CC} = 400 V V_{GE} = 15 V	-	331	385	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	44	52	
Gate to collector charge (turn-on)	Q_{gc}		-	133	176	
Turn-on switching loss	E_{on}	Internal gate resistors (see electrical diagram) I_C = 50 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH Energy losses include tail and diode reverse recovery, T_J = 25 °C	-	0.26	-	mJ
Turn-off switching loss	E_{off}		-	1.2	-	
Total switching loss	E_{ts}		-	1.46	-	
Turn-on switching loss	E_{on}	Internal gate resistors (see electrical diagram) I_C = 50 A, V_{CC} = 480 V, V_{GE} = 15 V, L = 200 µH Energy losses include tail and diode reverse recovery, T_J = 150 °C	-	0.73	-	mJ
Turn-off switching loss	E_{off}		-	1.66	-	
Total switching loss	E_{ts}		-	2.39	-	
Input capacitance	C_{ies}	V_{GE} = 0 V V_{CC} = 30 V f = 1.0 MHz	-	7100	-	pF
Output capacitance	C_{oes}		-	510	-	
Reverse transfer capacitance	C_{res}		-	140	-	
Diode reverse recovery time	t_{rr}	V_{CC} = 200 V, I_C = 50 A dI/dt = 200 A/µs	-	82	97	ns
Diode peak reverse current	I_{rr}		-	8.3	10.6	A
Diode recovery charge	Q_{rr}		-	340	514	nC
Diode reverse recovery time	t_{rr}	V_{CC} = 200 V, I_C = 50 A dI/dt = 200 A/µs T_J = 125 °C	-	137	153	ns
Diode peak reverse current	I_{rr}		-	12.7	14.8	A
Diode recovery charge	Q_{rr}		-	870	1132	nC

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

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}		-	-	0.38	°C/W
	Diode			-	-	0.8	
Case to sink per module		R_{thCS}	Heatsink compound thermal conductivity = 1 W/mK	-	0.06	-	
Clearance (1)			External shortest distance in air between 2 terminals	5.5	-	-	mm
Creepage (1)			Shortest distance along the external surface of the insulating material between 2 terminals	8	-	-	
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

Note

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

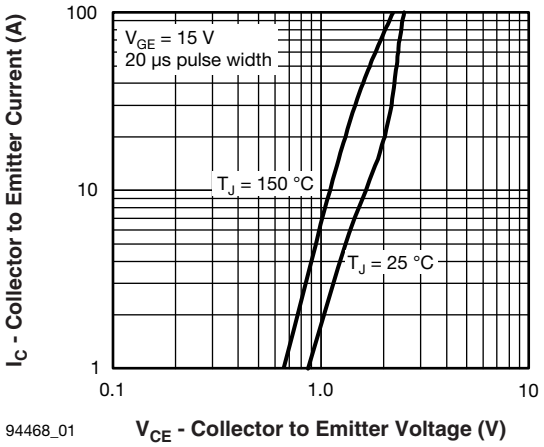


Fig. 1 - Typical Output Characteristics

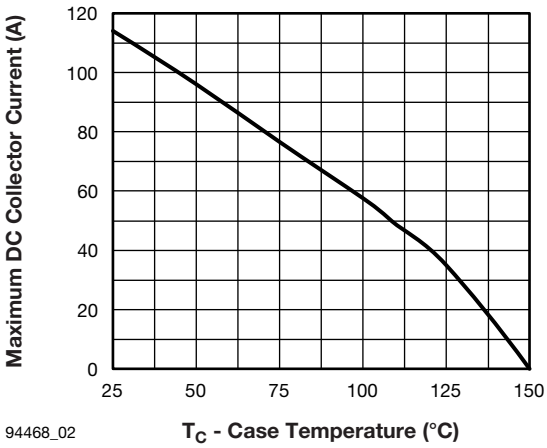


Fig. 2 - Maximum Collector Current vs. Case Temperature

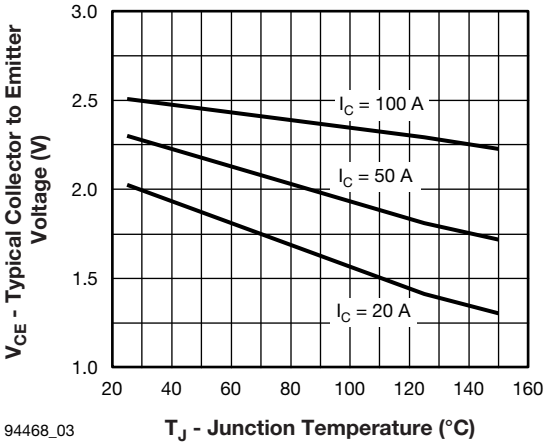


Fig. 3 - Typical Collector to Emitter Voltage vs. Junction Temperature

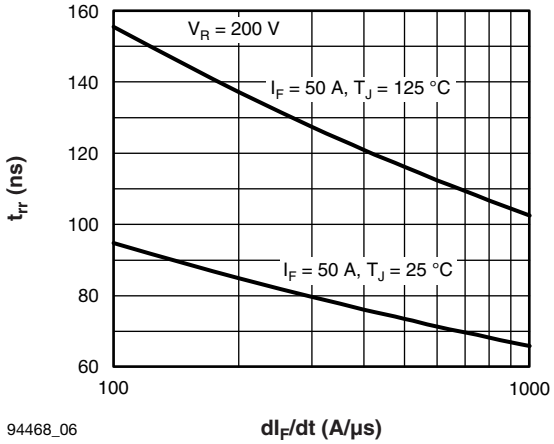


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

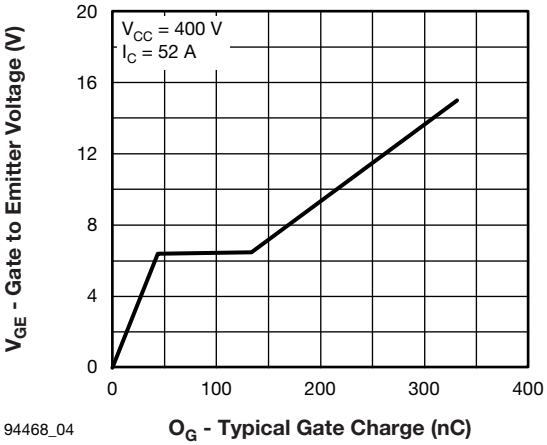


Fig. 4 - Typical Gate Charge vs. Gate to Emitter Votlage

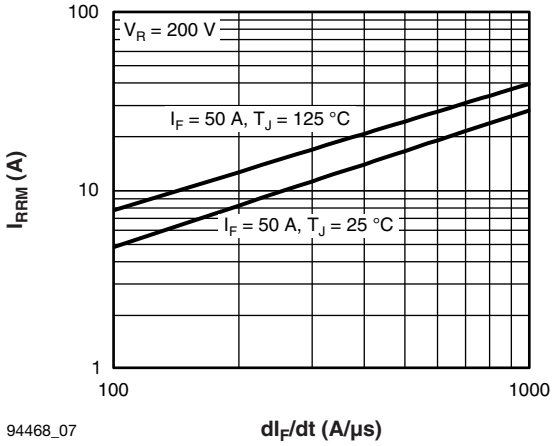


Fig. 7 - Typical Reverse Recovery Current vs. dI_F/dt

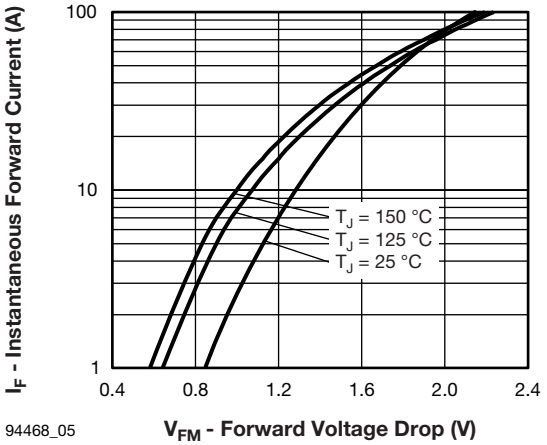


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

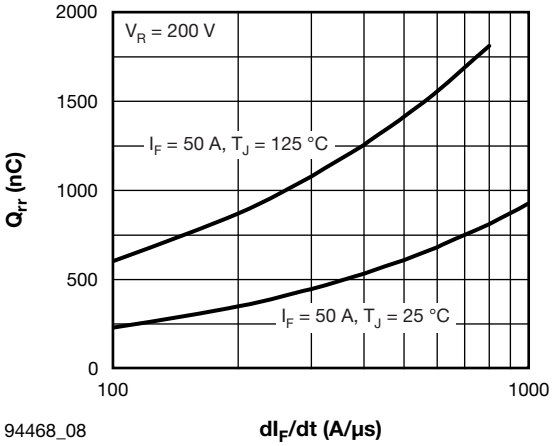


Fig. 8 - Typical Stored Charge vs. dI_F/dt

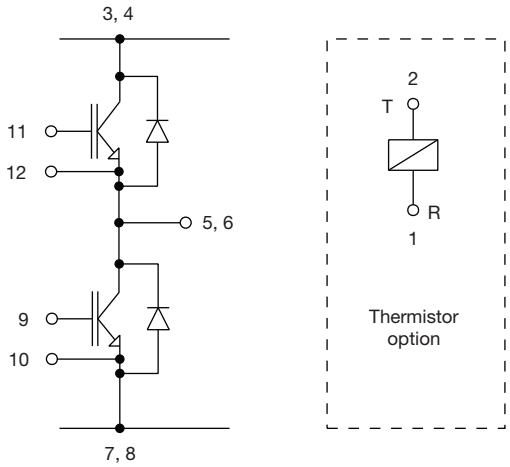


Fig. 9 - Functional Diagram

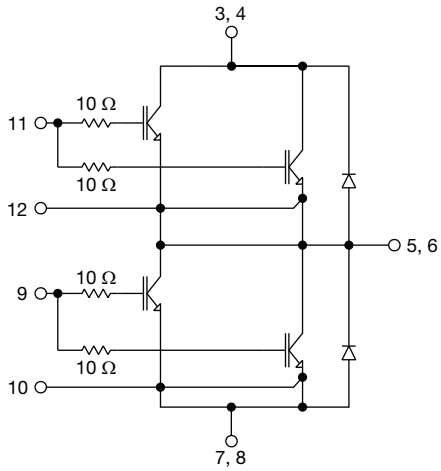


Fig. 10 - Electrical Diagram

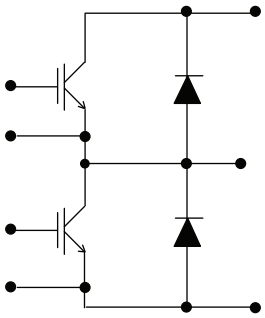
ORDERING INFORMATION TABLE

Device code

VS-	50	MT	060	W	H	T	A	PbF
1	2	3	4	5	6	7	8	9

1	-	Vishay Semiconductors product
2	-	Current rating (50 = 50 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 substrate
9	-	Lead (Pb)-free

CIRCUIT CONFIGURATION



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

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