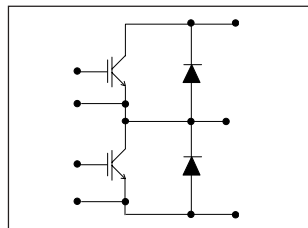


Features

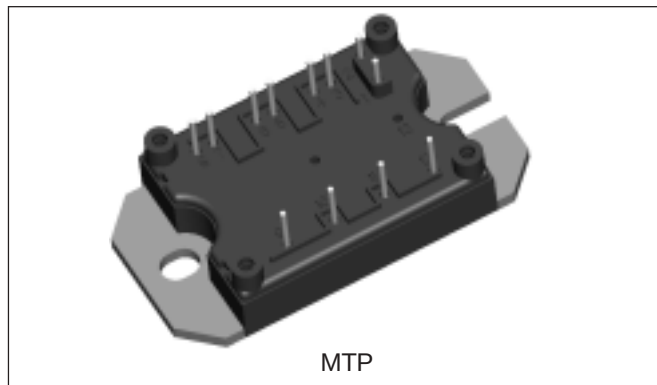
- Gen. 4 Warp Speed IGBT Technology
- HEXFRED™ Antiparallel Diodes with UltraSoft Reverse Recovery
- Very Low Conduction and Switching Losses
- Optional SMT Thermistor (NTC)
- Aluminum Nitride DBC
- Very Low Stray Inductance Design for High Speed Operation
- UL E78996 approved



$V_{CES} = 600V$
 $V_{CE(on) typ.} = 2.3V @$
 $V_{GE} = 15V, I_C = 50A$
 $T_C = 25^\circ C$

Benefits

- Optimized for Welding, UPS and SMPS Applications
- Operating Frequencies > 20 kHz Hard Switching, >200 kHz Resonant Mode
- Low EMI, requires Less Snubbing
- Direct Mounting to Heatsink
- PCB Solderable Terminals
- Very Low Junction-to-Case Thermal Resistance



Absolute Maximum Ratings

Parameters	Max	Units
V_{CES} Collector-to-Emitter Voltage	600	V
I_C Continuous Collector Current	@ $T_C = 25^\circ C$	114
	@ $T_C = 109^\circ C$	50
I_{CM} Pulsed Collector Current	350	
I_{LM} Peak Switching Current	350	
I_F Diode Continuous Forward Current	@ $T_C = 109^\circ C$	34
I_{FM} Peak Diode Forward Current	200	
V_{GE} Gate-to-Emitter Voltage	± 20	V
V_{ISOL} RMS Isolation Voltage, Any Terminal to Case, $t = 1$ min	2500	
P_D Maximum Power Dissipation	@ $T_C = 25^\circ C$	658
	@ $T_C = 100^\circ C$	263

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Parameters	Min	Typ	Max	Units	Test Conditions
V _{(BR)CES} Collector-to-Emitter Breakdown Voltage	600			V	V _{GE} = 0V, I _C = 500μA
V _{CE(on)} Collector-to-Emitter Voltage		2.3	3.15		V _{GE} = 15V, I _C = 50A
		2.5	3.2		V _{GE} = 15V, I _C = 100A
		1.72	2.17		V _{GE} = 15V, I _C = 50A, T _J = 150°C
V _{GE(th)} Gate Threshold Voltage	3		6		I _C = 0.5mA
I _{CES} Collector-to-Emitter Leaking Current			0.4	mA	V _{GE} = 0V, V _{CE} = 600V
			10		V _{GE} = 0V, V _{CE} = 600V, T _J = 150°C
V _{FM} Diode Forward Voltage Drop		1.58	1.80	V	I _F = 50A, V _{GE} = 0V
		1.49	1.68		I _F = 50A, V _{GE} = 0V, T _J = 150°C
		1.9	2.17		I _F = 100A, V _{GE} = 0V, T _J = 25°C
I _{GES} Gate-to-Emitter Leakage Current			± 250	nA	V _{GE} = ± 20V

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

Parameters	Min	Typ	Max	Units	Test Conditions
Q _g Total Gate Charge (turn-on)		331	385	nC	I _C = 52A V _{CC} = 400V V _{GE} = 15V
Q _{ge} Gate-Emitter Charge (turn-on)		44	52		
Q _{gc} Gate-Collector Charge (turn-on)		133	176		
E _{on} Turn-On Switching Loss		0.26		mJ	Internal gate resistors (see Electrical Diagram) I _C = 50A, V _{CC} = 480V, V _{GE} = 15V, L = 200μH Energy losses include tail and diode reverse recovery
E _{off} Turn-Off Switching Loss		1.2			
E _{ts} Total Switching Loss		1.46			
E _{on} Turn-On Switching Loss		0.73		mJ	Internal gate resistors (see Electrical diagram) I _C = 50A, V _{CC} = 480V, V _{GE} = 15V, L = 200μH Energy losses include tail and diode reverse recovery, T _J = 150°C
E _{off} Turn-Off Switching Loss		1.66			
E _{ts} Total Switching Loss		2.39			
C _{ies} Input Capacitance		7100		pF	V _{GE} = 0V V _{CC} = 30V f = 1.0 MHz
C _{oes} Output Capacitance		510			
C _{res} Reverse Transfer Capacitance		140			
t _{rr} Diode Reverse Recovery Time		82	97	ns	V _{CC} = 200V, I _C = 50A di/dt = 200A/μs
I _{rr} Diode Peak Reverse Current		8.3	10.6	A	
Q _{rr} Diode Recovery Charge		340	514	nC	
t _{rr} Diode Reverse Recovery Time		137	153	ns	V _{CC} = 200V, I _C = 50A di/dt = 200A/μs T _J = 125°C
I _{rr} Diode Peak Reverse Current		12.7	14.8	A	
Q _{rr} Diode Recovery Charge		870	1132	nC	

Thermistor Specifications

Parameters	Min	Typ	Max	Units	Test Conditions
R ₀ ⁽¹⁾ Resistance		30		kΩ	T ₀ = 25°C
β ⁽¹⁾⁽²⁾ Sensitivity index of the thermistor material		4000		K	T ₀ = 25°C T ₁ = 85°C

⁽¹⁾ T₀, T₁ are thermistor's temperatures

$$\frac{R_0}{R_1} = \exp \left[\beta \left(\frac{1}{T_0} - \frac{1}{T_1} \right) \right]$$

Thermal- Mechanical Specifications

Parameters			Min	Typ	Max	Units
T _J	Operating Junction	IGBT, Diode	- 40		150	°C
	Temperature Range	Thermistor	- 40		125	
T _{STG}	Storage Temperature Range		- 40		125	
R _{thJC}	Junction-to-Case	IGBT			0.38	°C/ W
		Diode			0.8	
R _{thCS}	Case-to-Sink	Module		0.06		
	(Heatsink Compound Thermal Conductivity = 1 W/mK)					
	Clearance ⁽³⁾ (external shortest distance in air between two terminals)		5.5			mm
	Creepage ⁽³⁾ (shortest distance along the external surface of the insulating material between 2 terminals)		8			
T	Mounting torque to heatsink ⁽⁴⁾		3 ± 10%			Nm
Wt	Weight		66			g

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

(4) A mounting compound is recommended and the torque should be checked after 3 hours to allow for the spread of the compound. Lubricated threads

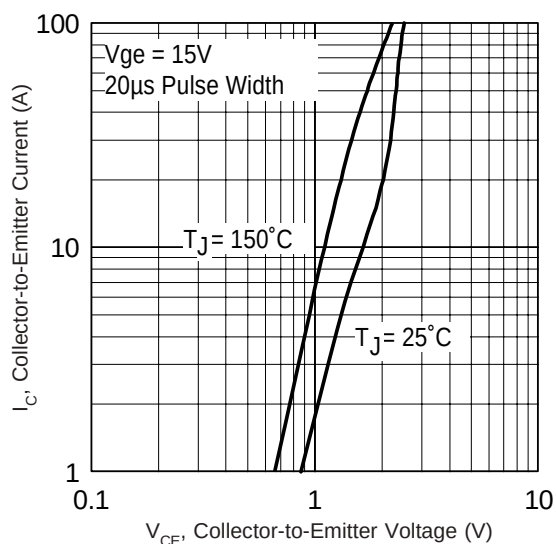


Fig. 1 - Typical Output Characteristics

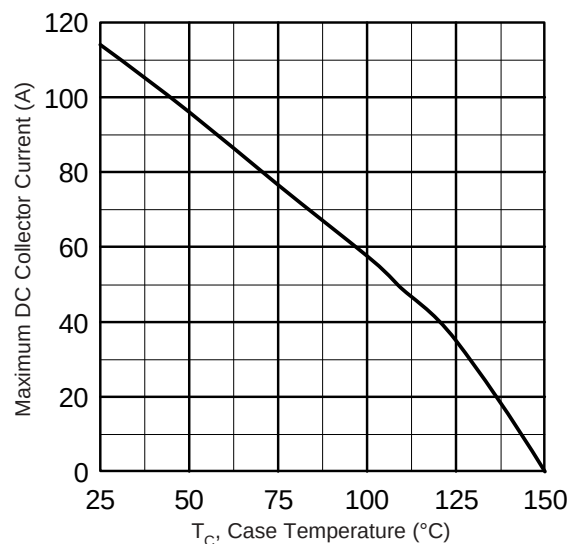


Fig. 2 - Maximum Collector Current vs. Case Temperature

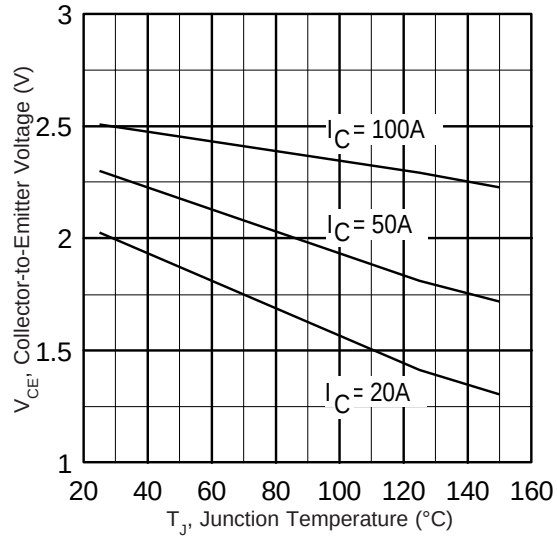


Fig. 3 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

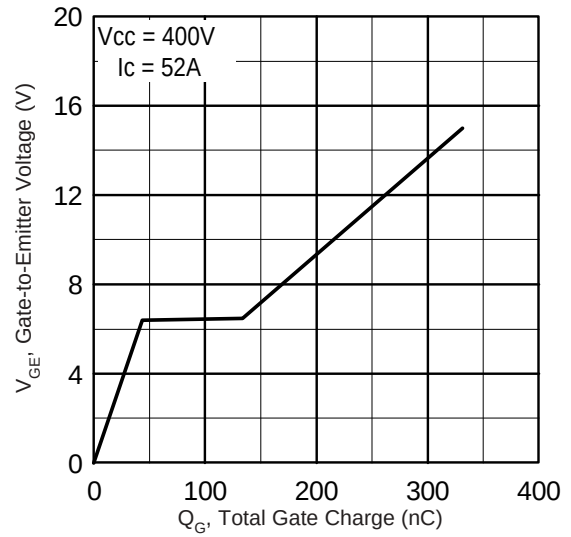


Fig. 4 - Typical Gate Charge vs. Gate-to-Emitter Voltage

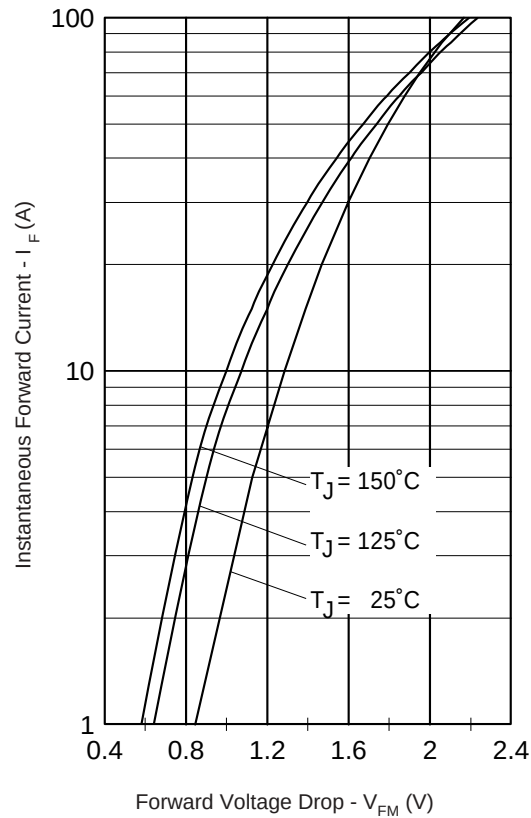


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

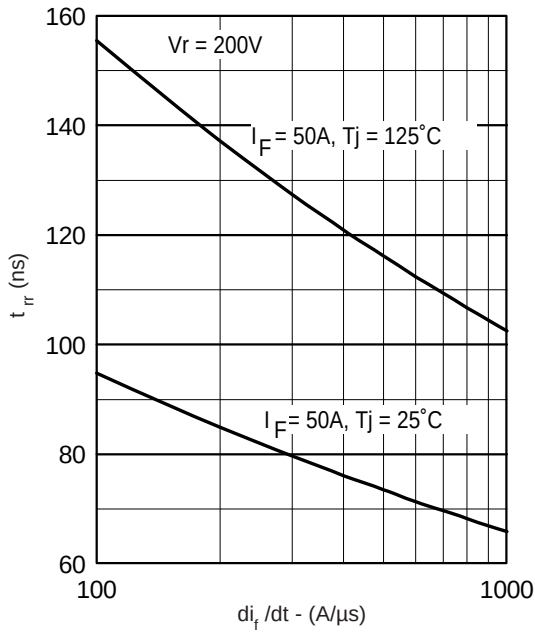


Fig. 6 - Typical Reverse Recovery vs. di_f/dt

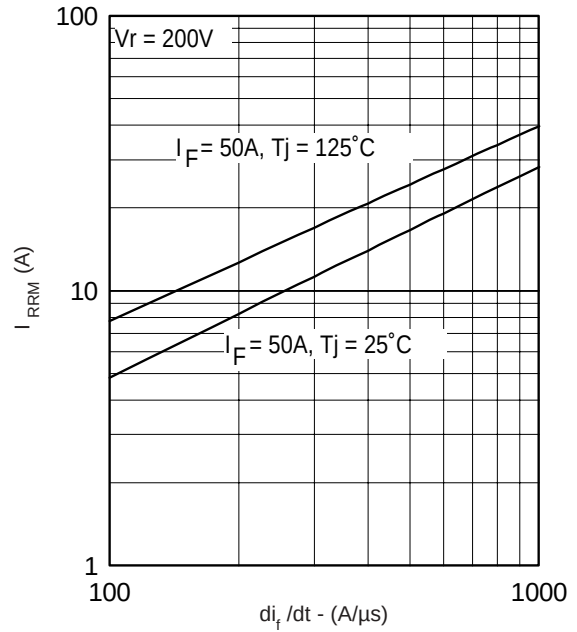


Fig. 7 - Typical Reverse Recovery Current vs. di_f/dt

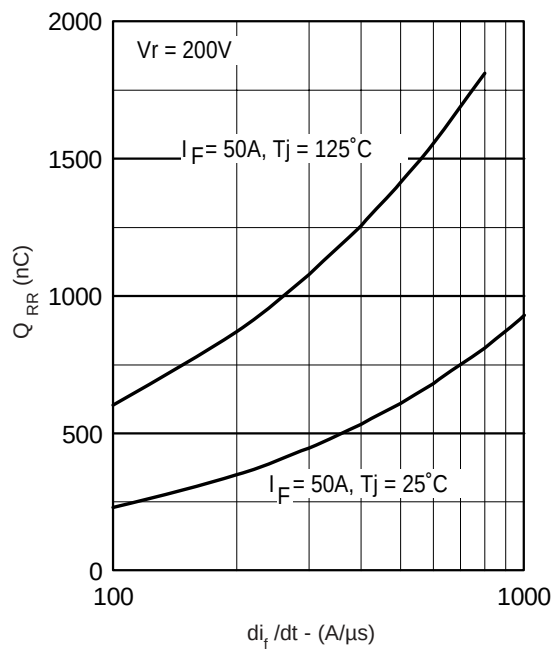


Fig. 8 - Typical Stored Charge vs. di_f/dt

Functional Diagram

3,4
11
12
9
10
5,6
7,8

Thermistor
Option
Only
50MT060WHT

Electrical Diagram

3,4
11
12
9
10
5,6
7,8

Resistance in ohms

Dimensions in millimetres

Note: unused terminals are not assembled in the package

Ordering Information Table

Device Code					
	50	MT	060	W	H -
	1	2	3	4	5 6
1	-	Current rating	(50 = 50A)		
2	-	Essential Part Number			
3	-	Voltage code	(060 = 600V)		
4	-	Speed/ Type	(W = Warp IGBT)		
5	-	Circuit Configuration	(H = Half Bridge)		
6	-	Special Option			
					Empty = no special option T = Thermistor

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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