

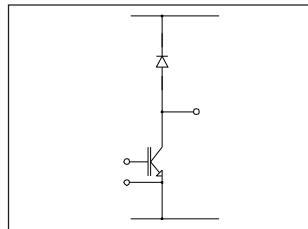
50MT060ULS

"LOW SIDE CHOPPER" IGBT MTP

Ultrafast Speed IGBT

Features

- Gen. 4 Ultrafast Speed IGBT Technology
- HEXFRED™ Diode 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 approved (file E78996)



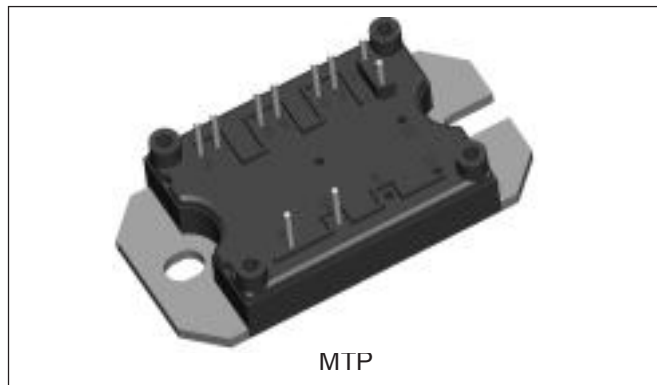
$$V_{CES} = 600V$$

$$I_C = 100A,$$

$$T_C = 25^{\circ}C$$

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



MTP

Absolute Maximum Ratings

Parameters				Max	Units
V_{CES}	Collector-to-Emitter Voltage			600	V
I_C	Continuos Collector Current	@ $T_C = 25^{\circ}C$		100	A
		@ $T_C = 122^{\circ}C$		50	
I_{CM}	Pulsed Collector Current			200	
I_{LM}	Peak Switching Current			200	V
I_F	Diode Continuous Forward Current			48	
I_{FM}	Peak Diode Forward Current			200	
V_{GE}	Gate-to-Emitter Voltage			± 20	W
V_{ISOL}	RMS Isolation Voltage, Any Terminal to Case, $t = 1$ min			2500	
P_D	Maximum Power	IGBT	@ $T_C = 25^{\circ}C$	445	
			@ $T_C = 100^{\circ}C$	175	
	Dissipation	Diode	@ $T_C = 25^{\circ}C$	205	
			@ $T_C = 100^{\circ}C$	83	

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 = 250μA
V _{CE(on)} Collector-to-Emitter Voltage		1.69	2.31		V _{GE} = 15V, I _C = 50A
		1.96	2.55		V _{GE} = 15V, I _C = 100A
		1.88	2.24		V _{GE} = 15V, I _C = 100A, T _J = 150°C
V _{GE(th)} Gate Threshold Voltage	3		6		I _C = 0.5mA
B _{VR} Diode Reverse Breakdown Voltage	600				I _R = 200μA
ΔV _{GE(th)} /ΔT _J Temperature Coeff. of Threshold Voltage		- 13		mV/°C	V _{CE} = V _{GE} , I _C = 500μA
g _{fe} Forward Transconductance	22	29		S	V _{CE} = 50V, I _C = 100A
I _{CES} Collector-to-Emitter Leaking Current			0.25	mA	V _{GE} = 0V, V _{CE} = 600V
			6		V _{GE} = 0V, V _{CE} = 600V, T _J = 150°C
V _{FM} Diode Forward Voltage Drop		1.64	1.82	V	I _F = 100A, V _{GE} = 0V
		1.56	1.74		I _F = 100A, V _{GE} = 0V, T _J = 150°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)		370	555	nC	I _C = 100A
Q _{ge} Gate-Emitter Charge (turn-on)		64	96		V _{CC} = 480V
Q _{gc} Gate-Collector Charge (turn-on)		163	245		V _{GE} = 15V
E _{on} Turn-On Switching Loss		0.7	1.2	mJ	I _C = 50A, V _{CC} = 480V, V _{GE} = 15V,
E _{off} Turn-Off Switching Loss		1.7	2.6		R _g = 5Ω
E _{ts} Total Switching Loss		2.4	3.8		Energy losses include tail and diode reverse recovery
E _{on} Turn-On Switching Loss		1.1	1.7	mJ	I _C = 50A, V _{CC} = 480V, V _{GE} = 15V
E _{off} Turn-Off Switching Loss		2.5	3.8		R _g = 5Ω, T _J = 125°C
E _{ts} Total Switching Loss		3.6	5.5		Energy losses include tail and diode reverse recovery
C _{ies} Input Capacitance		9800	14700		V _{GE} = 0V
C _{oes} Output Capacitance		602	903	pF	V _{CC} = 30V
C _{res} Reverse Transfer Capacitance		121	182		f = 1.0 MHz
C _t Diode Junction Capacitance		118	177		V _r = 600V, f = 1.0 MHz
t _{rr} Diode Reverse Recovery Time		99	150	ns	V _{CC} = 480V, I _C = 50A
I _{rr} Diode Peak Reverse Current		6.5	9.8	A	di/dt = 200A/μs
Q _{rr} Diode Recovery Charge		320	735	nC	R _g = 5Ω
di _(rec) /dt Diode PeakRate of Fall of Recovery During t _b		236		A/μs	

Thermistor Specifications (50MT060ULST only)

Parameters	Min	Typ	Max	Units	Test Conditions
$R_0^{(1)}$ Resistance		30		k Ω	$T_0 = 25^\circ\text{C}$
$\beta^{(1)(2)}$ Sensitivity index of the thermistor material		4000		K	$T_0 = 25^\circ\text{C}$ $T_1 = 85^\circ\text{C}$

(1) T_0, T_1 are thermistor's temperatures

$$(2) \frac{R_0}{R_1} = \exp \left[\beta \left(\frac{1}{T_0} - \frac{1}{T_1} \right) \right], \text{ Temperatures in kelvin}$$

Thermal- Mechanical Specifications

Parameters	Min	Typ	Max	Units
T_J Operating Junction Temperature Range	- 40		150	$^\circ\text{C}$
T_{STG} Storage Temperature Range	- 40		125	
R_{thJC} Junction-to-Case	IGBT	0.18	0.28	$^\circ\text{C}/\text{W}$
	Diode	0.4	0.6	
R_{thCS} Case-to-Sink (Heatsink Compound Thermal Conductivity = 1 W/mK)	Module	0.06		
T Mounting torque to heatsink (3)		$3 \pm 10\%$		Nm
Wt Weight		66		g

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

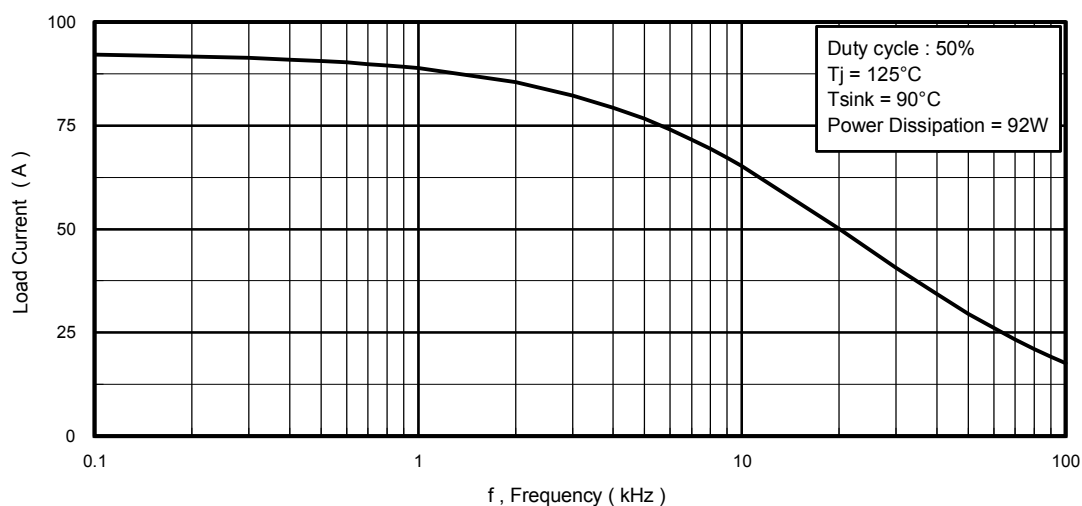
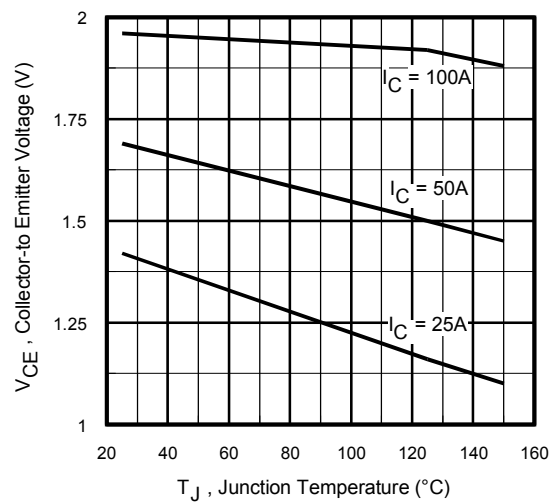
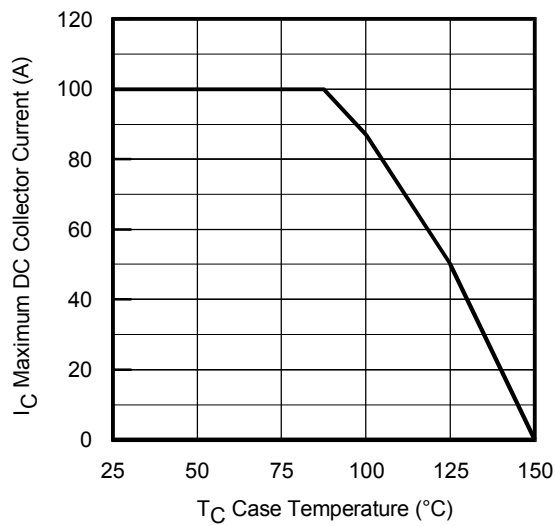
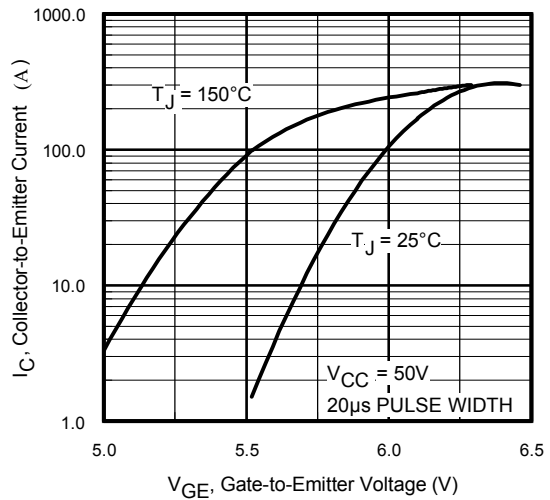
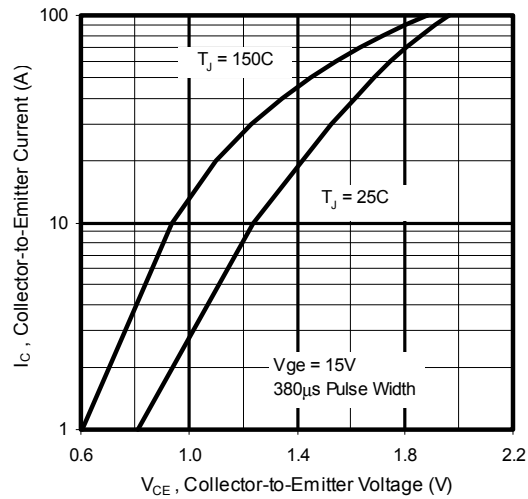


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)



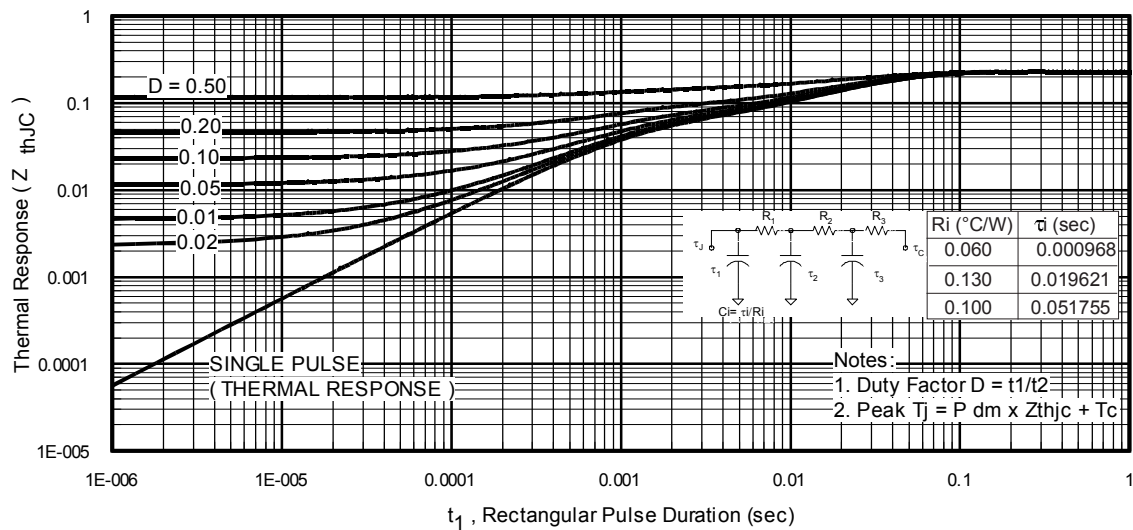


Fig. 6a Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

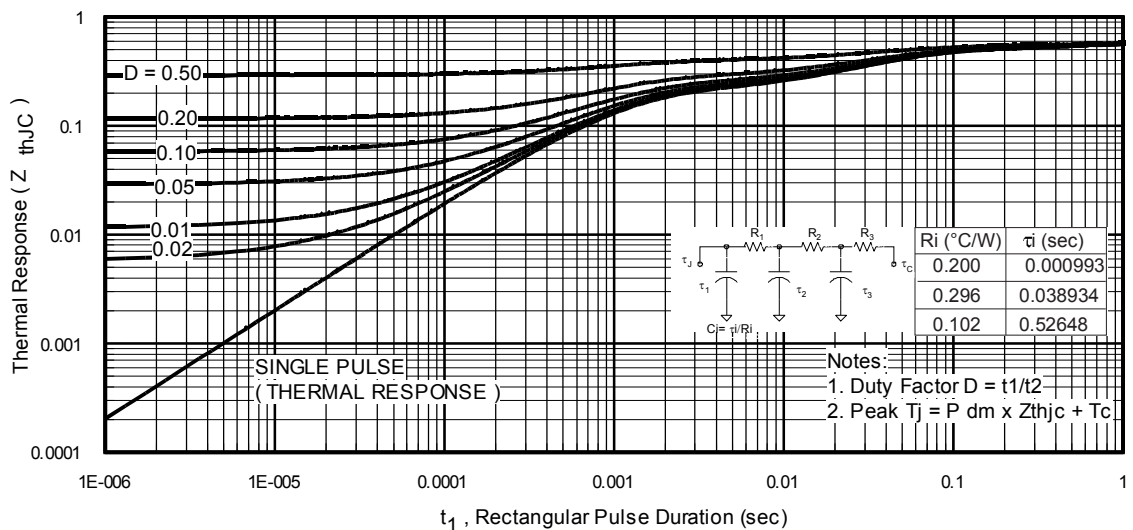
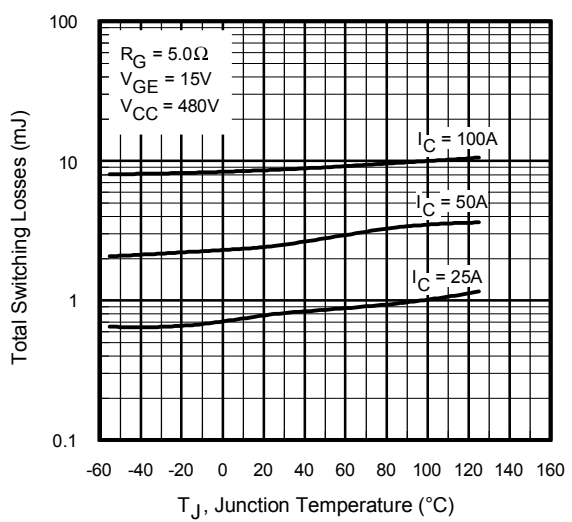
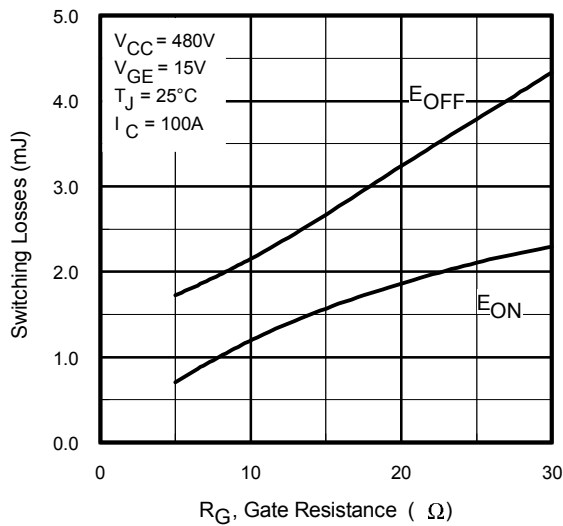
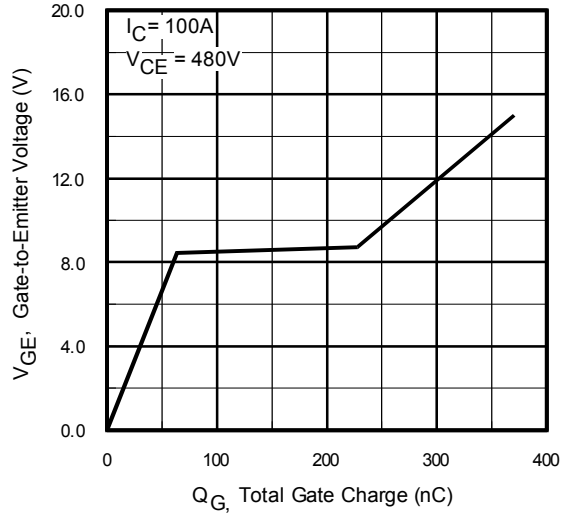
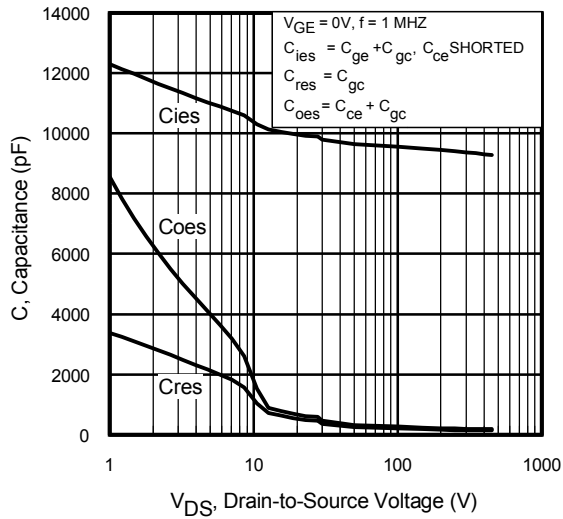


Fig. 6b Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)



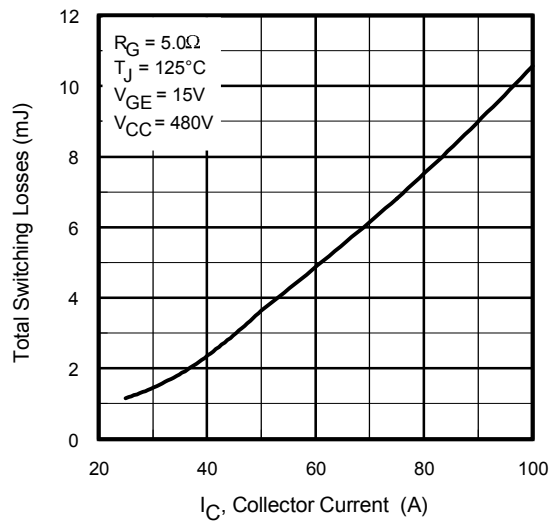


Fig. 11 - Typical Switching Losses vs.
Collector-to-Emitter Current

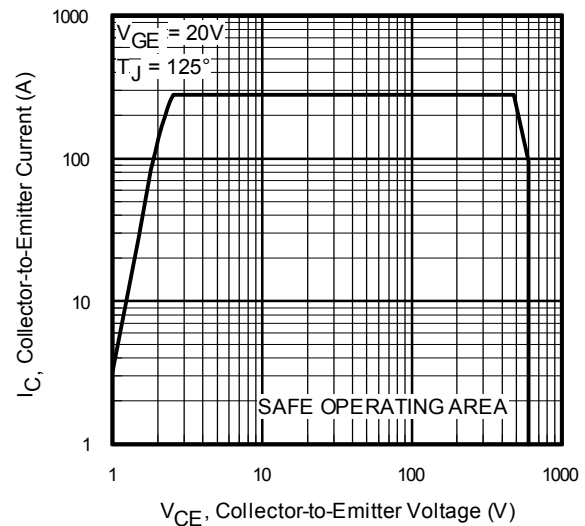


Fig. 12 - Turn-Off SOA

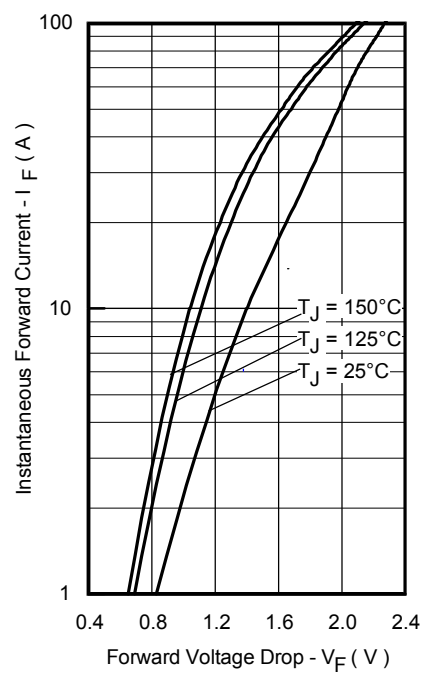


Fig. 13 - Maximum Forward Voltage Drop vs.
Instantaneous Forward Current

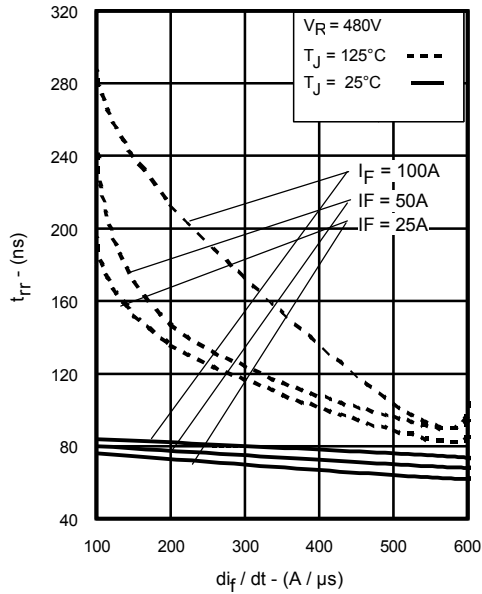


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

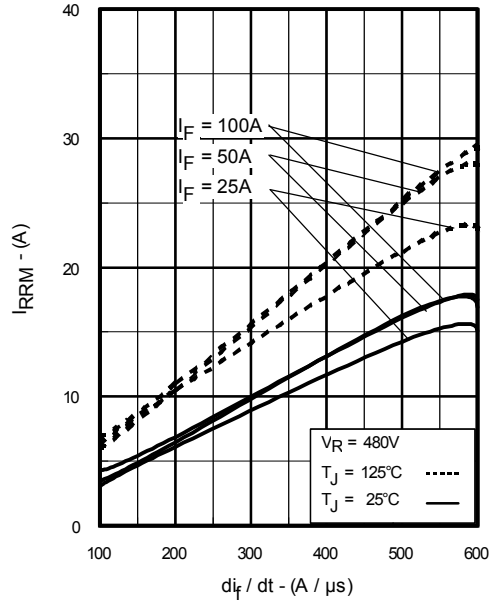


Fig. 15 - Typical Recovery Current vs. di_f/dt

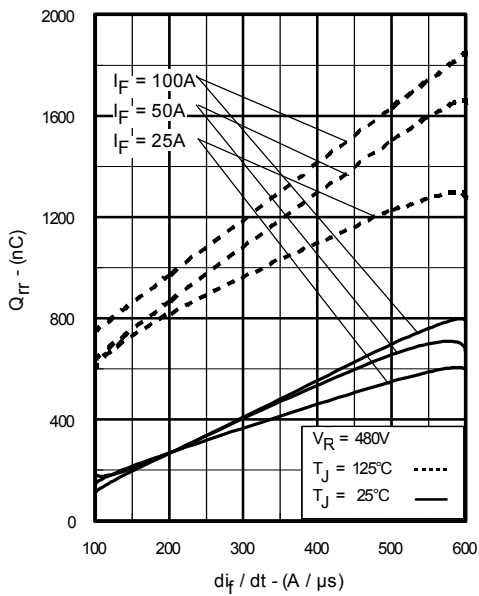


Fig. 16 - Typical Stored Charge vs. di_f/dt

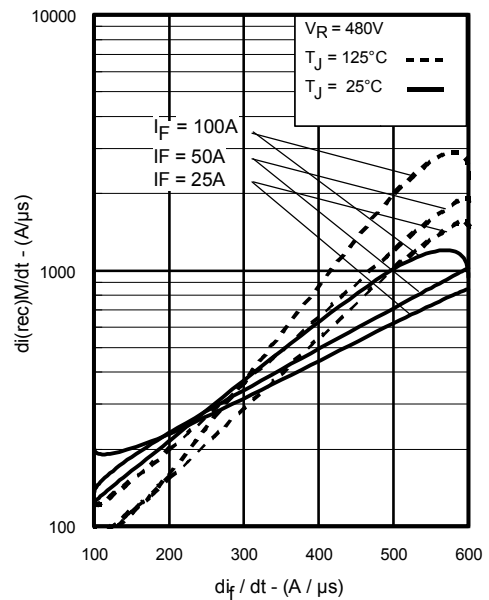
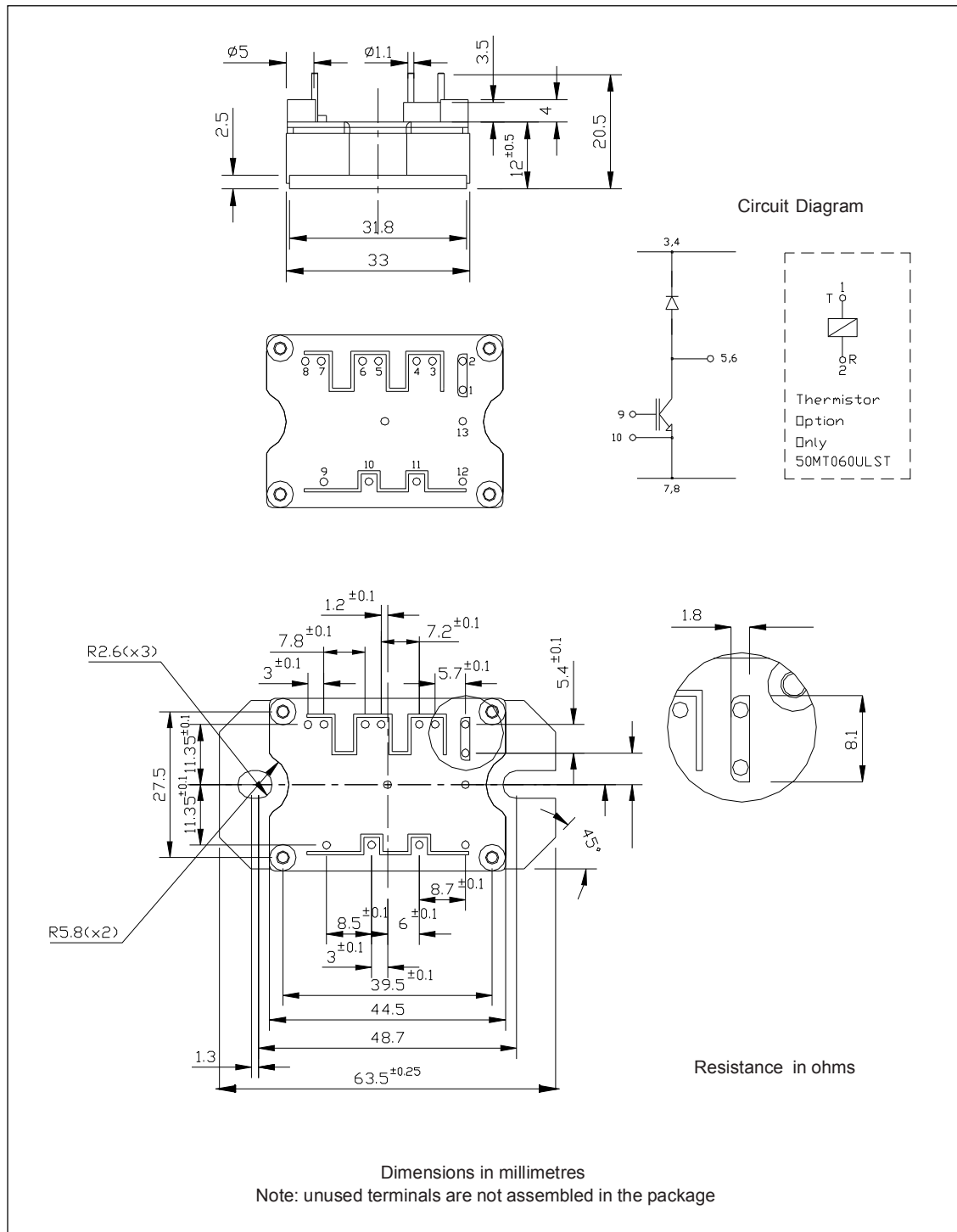


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

Outline Table



Ordering Information Table

Device Code					
	50	MT	060	U	LS -
	①	②	③	④	⑤ ⑥
1	-	Current rating (50 = 50A)			
2	-	Essential Part Number			
3	-	Voltage code (060 = 600V)			
4	-	Speed/ Type (U = Ultra Fast IGBT)			
5	-	Circuit Configuration (LS = Low Side Chopper)			
6	-	Special Option			
		<div>Empty = no special option</div> <div>T = Thermistor</div>			

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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