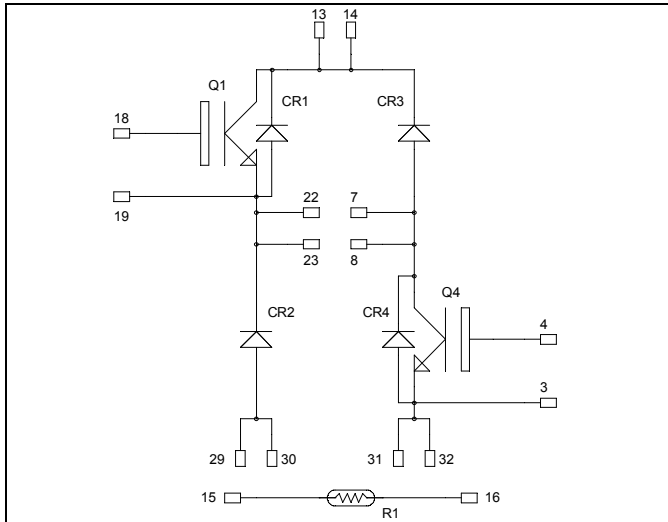


Asymmetrical - Bridge NPT IGBT Power Module

$V_{CES} = 1200V$
 $I_C = 50A @ T_c = 80^\circ C$

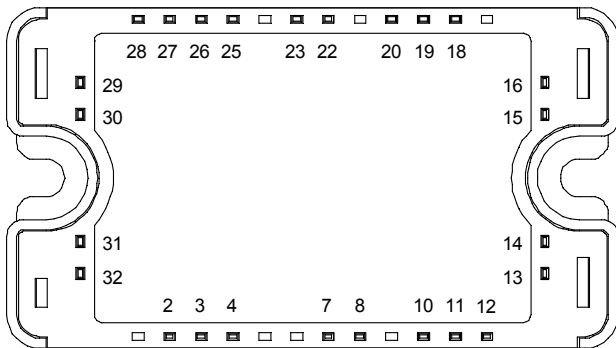


Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- Non Punch Through (NPT) Fast IGBT
 - Low voltage drop
 - Low tail current
 - Switching frequency up to 50 kHz
 - Soft recovery parallel diodes
 - Low diode VF
 - Low leakage current
 - RBSOA and SCSOA rated
 - Symmetrical design
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring



Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- Easy paralleling due to positive TC of VCEsat
- RoHS compliant

All multiple inputs and outputs must be shorted together
 Example: 13/14 ; 29/30 ; 22/23 ...

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	1200	V
I_C	Continuous Collector Current	$T_c = 25^\circ C$	70
		$T_c = 80^\circ C$	50
I_{CM}	Pulsed Collector Current	$T_c = 25^\circ C$	150
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	312
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	100A @ 1200V

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	$T_j = 25^\circ\text{C}$		250	μA
			$T_j = 125^\circ\text{C}$		500	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 50\text{A}$	$T_j = 25^\circ\text{C}$	3.2	3.7	V
			$T_j = 125^\circ\text{C}$		4.0	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE2}$, $I_C = 1\text{ mA}$	4.5		6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20\text{ V}$, $V_{CE} = 0\text{V}$			100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		3450		pF
C_{oes}	Output Capacitance			330		
C_{res}	Reverse Transfer Capacitance			220		
Q_g	Total gate Charge	$V_{GS} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 50\text{A}$		330		nC
Q_{ge}	Gate – Emitter Charge			35		
Q_{gc}	Gate – Collector Charge			200		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 50\text{A}$ $R_G = 5\ \Omega$		35		ns
T_r	Rise Time			65		
$T_{d(off)}$	Turn-off Delay Time			320		
T_f	Fall Time			30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 50\text{A}$ $R_G = 5\ \Omega$		35		ns
T_r	Rise Time			65		
$T_{d(off)}$	Turn-off Delay Time			360		
T_f	Fall Time			40		
E_{on}	Turn-on Switching Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 50\text{A}$ $R_G = 5\ \Omega$	$T_j = 125^\circ\text{C}$		6.9	mJ
E_{off}	Turn-off Switching Energy				3.05	
I_{sc}	Short Circuit data	$V_{GE} \leq 15\text{V}$; $V_{Bus} = 900\text{V}$ $t_b \leq 10\ \mu\text{s}$; $T_j = 125^\circ\text{C}$			300	A

Diode ratings and characteristics (CR2 & CR3)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		1200			V	
I_{RM}	Maximum Reverse Leakage Current	$V_R = 1200\text{V}$	$T_j = 25^\circ\text{C}$		100	μA	
			$T_j = 125^\circ\text{C}$		500		
I_F	DC Forward Current	$T_c = 80^\circ\text{C}$		60		A	
V_F	Diode Forward Voltage	$I_F = 60\text{A}$			2.5	3	V
		$I_F = 120\text{A}$			3		
		$I_F = 60\text{A}$	$T_j = 125^\circ\text{C}$		1.8		
t_{rr}	Reverse Recovery Time	$I_F = 60\text{A}$ $V_R = 800\text{V}$	$T_j = 25^\circ\text{C}$		265	ns	
			$T_j = 125^\circ\text{C}$		350		
Q_{rr}	Reverse Recovery Charge	$di/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		560	nC	
			$T_j = 125^\circ\text{C}$		2890		

CR1 & CR4 are IGBT protection diodes only

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R _{thJC}	Junction to Case Thermal Resistance	IGBT		0.4	°C/W	
		Diode		0.9		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz	2500			V	
T _J	Operating junction temperature range	-40		150	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M4	2.5	4.7	N.m
Wt	Package Weight				110	g

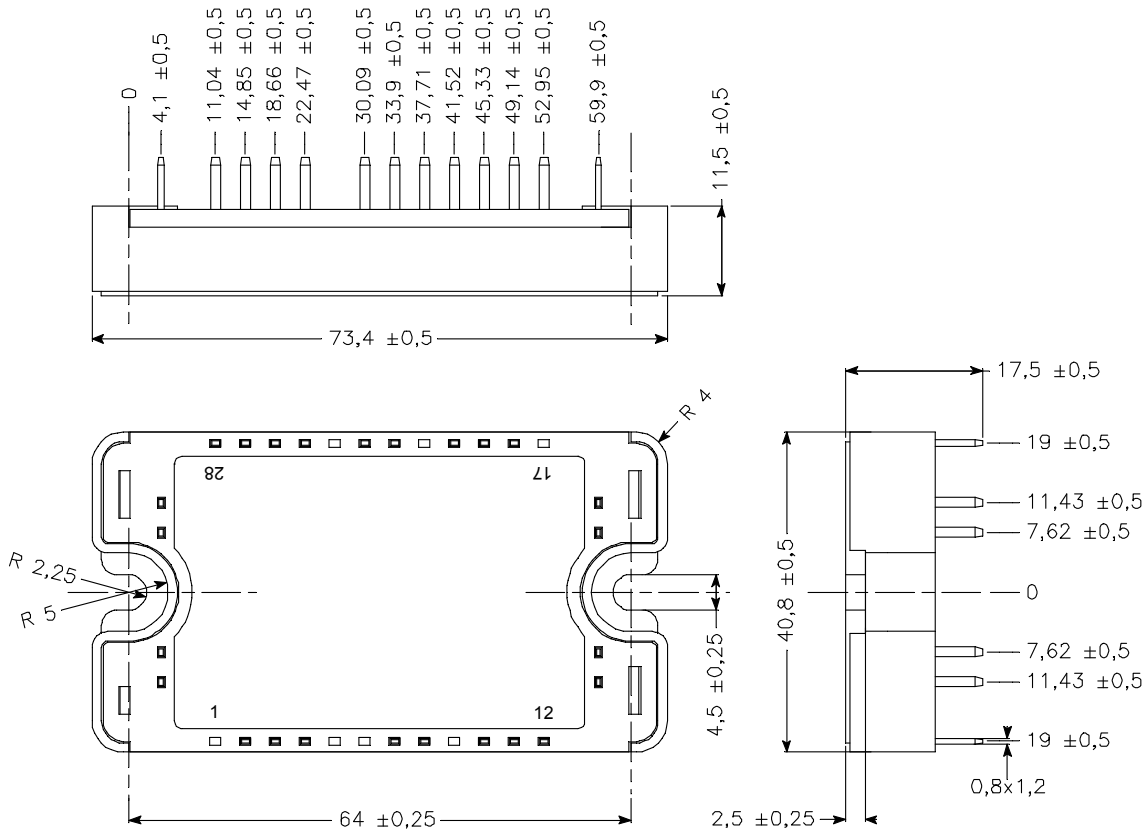
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B	T _C = 100°C		4		%

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

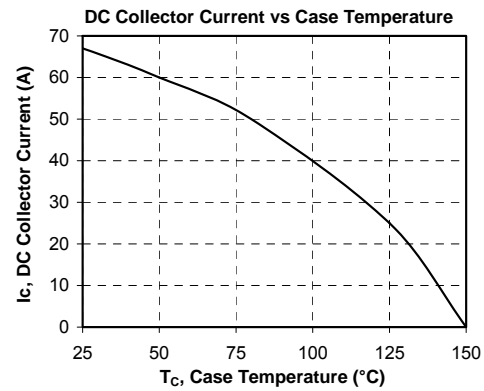
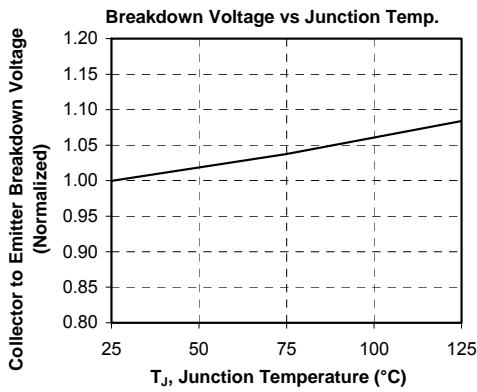
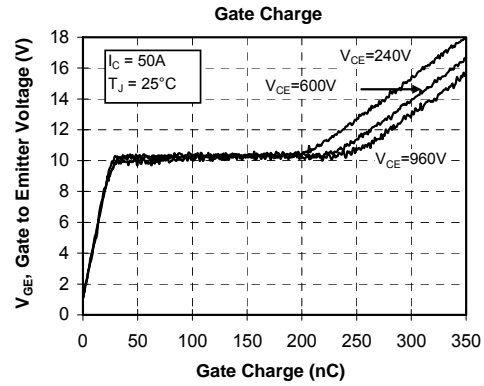
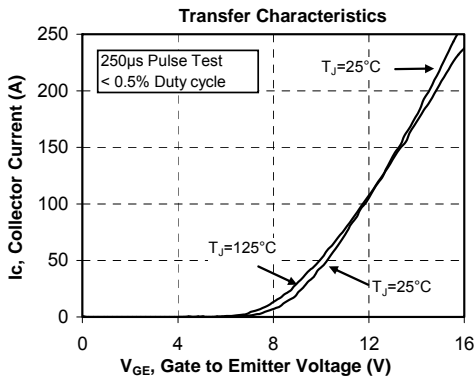
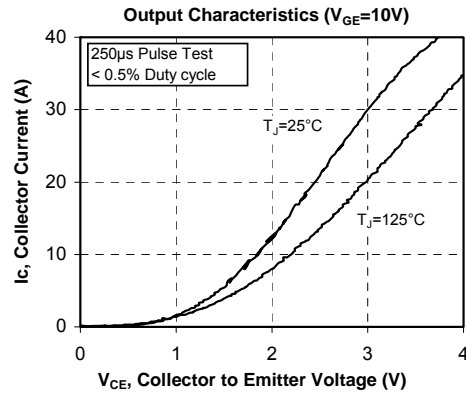
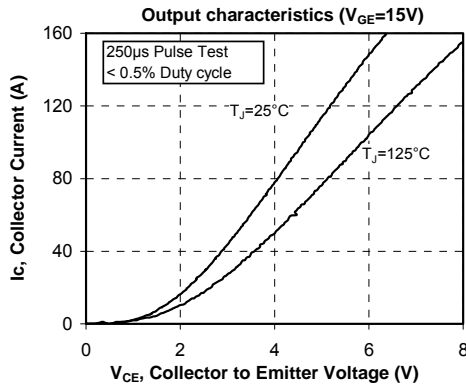
T: Thermistor temperature
 R_T: Thermistor value at T

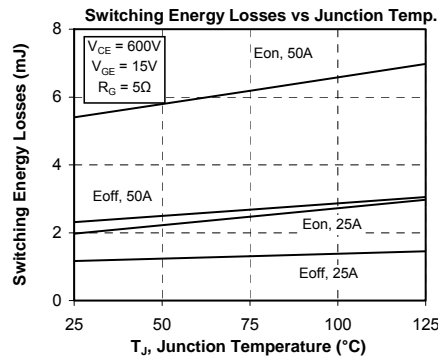
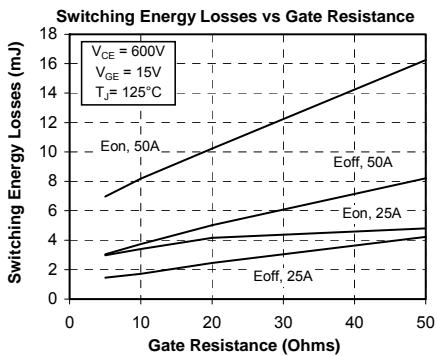
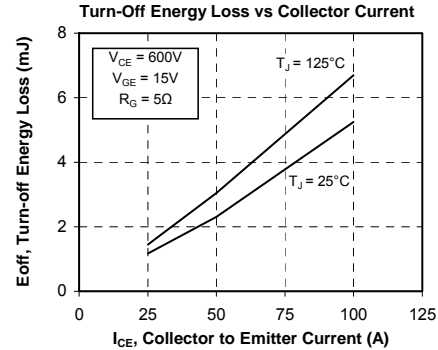
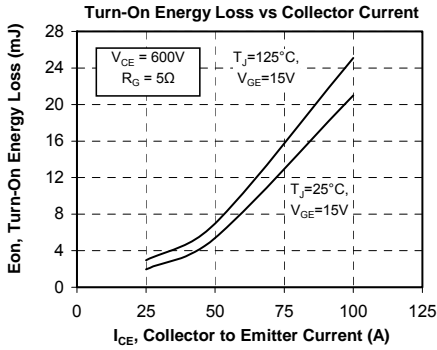
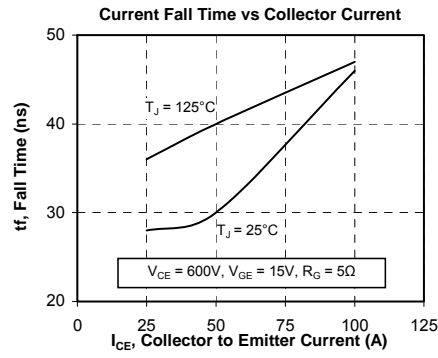
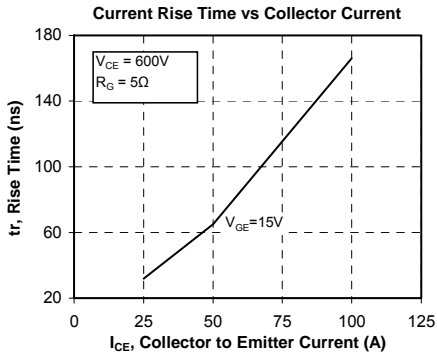
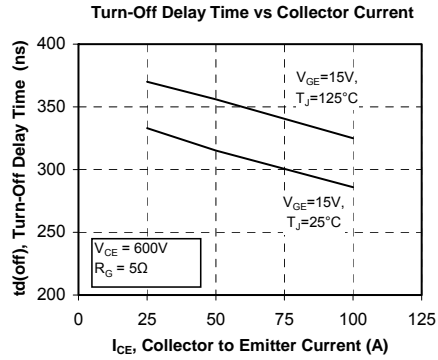
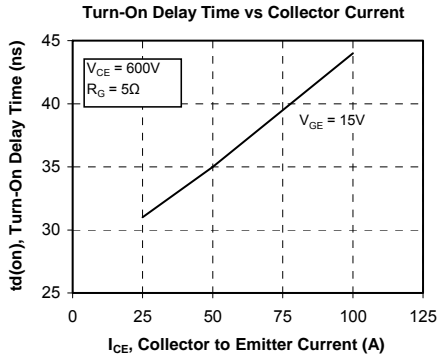
SP3 Package outline (dimensions in mm)

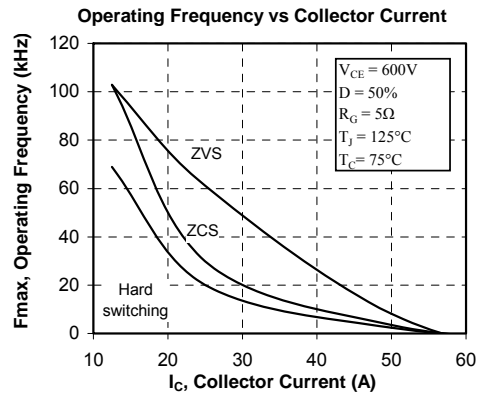
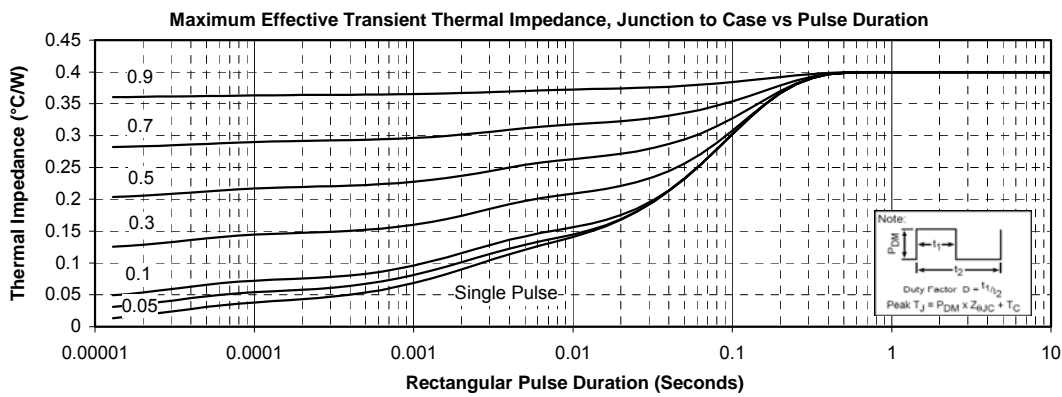
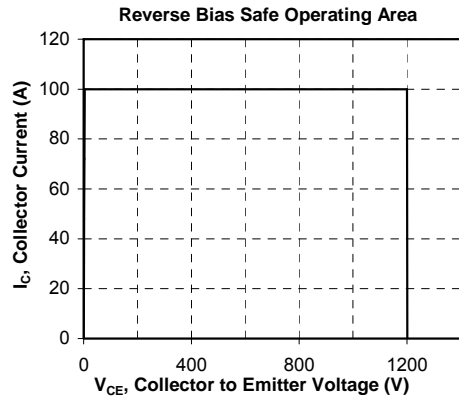
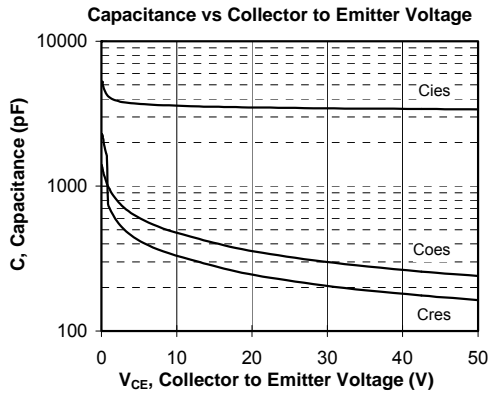


See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

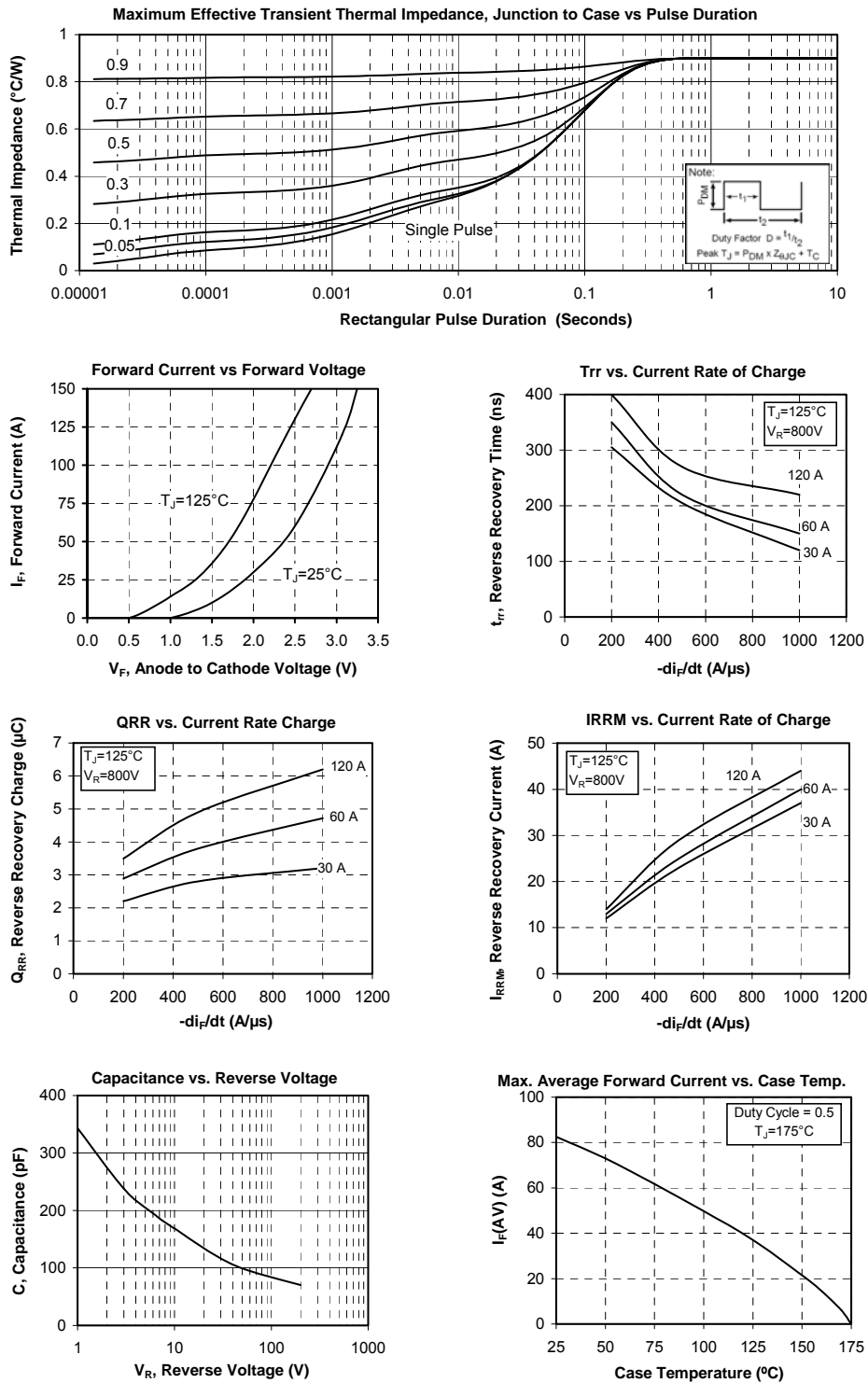
Typical IGBT Performance Curve







Typical diode Performance Curve



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