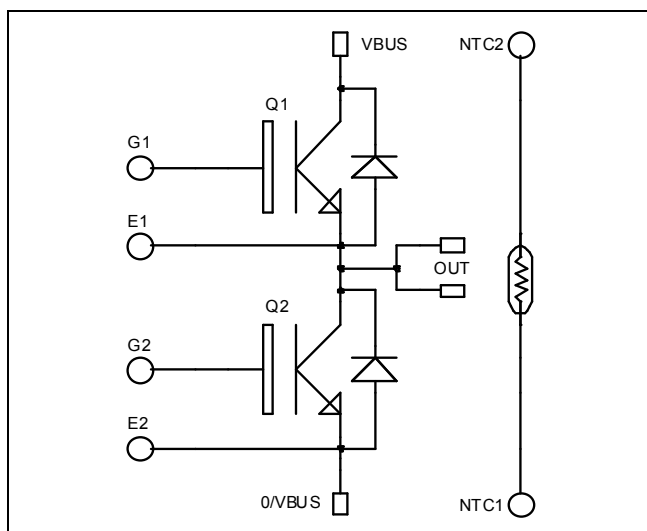


Phase leg PT IGBT Power Module

$V_{CES} = 600V$
 $I_C = 140A @ T_c = 80^\circ C$

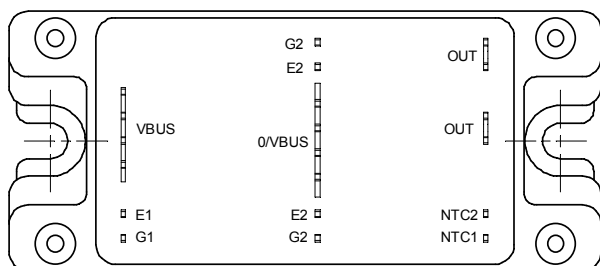


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 7[®] Punch Through (PT) IGBT
 - Low conduction loss
 - Ultra fast tail current shutoff
 - Low gate charge
 - Switching frequency capability in the 200kHz range
 - Soft recovery parallel diodes
 - Low diode VF
- Kelvin emitter for easy drive
- Very low stray inductance
 - Symmetrical design
 - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration



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
- RoHS Compliant

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	600	V
I_C	Continuous Collector Current	$T_c = 25^\circ C$ 200	A
		$T_c = 80^\circ C$ 140	
I_{CM}	Pulsed Collector Current	$T_c = 25^\circ C$ 420	
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$ 735	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$ 420A @ 600V	

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	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$			500 5000	μA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 140\text{A}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$		2.2 2.1	2.7	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 4\text{mA}$		3		6	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$				± 200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$			18.4		nF
C_{oes}	Output Capacitance	$V_{CE} = 25\text{V}$			1.6		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$			0.1		
Q_g	Total gate Charge	$V_{GE} = 15\text{V}$			540		nC
Q_{ge}	Gate – Emitter Charge	$V_{Bus} = 300\text{V}$			120		
Q_{gc}	Gate – Collector Charge	$I_C = 140\text{A}$			160		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 140\text{A}$ $R_G = 1.25\Omega$			20		ns
T_r	Rise Time				29		
$T_{d(off)}$	Turn-off Delay Time				64		
T_f	Fall Time				45		
E_{on1}	Turn-on Switching Energy				1540		μJ
E_{on2}	Turn-on Switching Energy ❶				2576		
E_{off}	Turn-off Switching Energy				1408		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 140\text{A}$ $R_G = 1.25\Omega$			20		ns
T_r	Rise Time				29		
$T_{d(off)}$	Turn-off Delay Time				89		
T_f	Fall Time				69		
E_{on1}	Turn-on Switching Energy				1540		μJ
E_{on2}	Turn-on Switching Energy ❶				3888		
E_{off}	Turn-off Switching Energy				2460		

Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I _{F(AV)}	Maximum Average Forward Current	50% duty cycle	T _C = 85°C		120		A
V _F	Diode Forward Voltage	I _F = 120A				2.7	V
		I _F = 240A			2.7		
		I _F = 120A	T _j = 150°C		1.5		
t _{rr}	Reverse Recovery Time	I _F = 120A V _R = 400V di/dt =800A/μs	T _j = 25°C		74		ns
			T _j = 100°C		74		
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		492		nC
			T _j = 100°C		1152		

❶ E_{on2} includes diode reverse recovery

Thermal and package characteristics

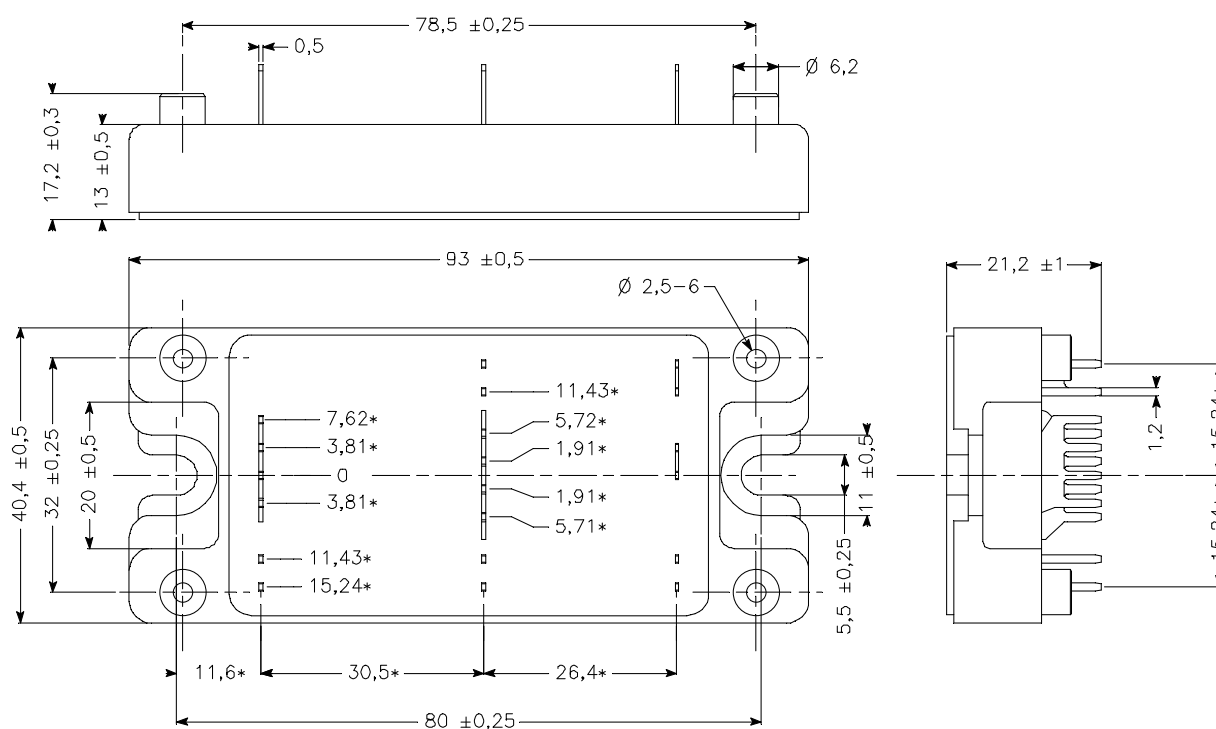
Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance			IGBT		0.17	°C/W
				Diode		0.32	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I isol<1mA, 50/60Hz			4000			V
T _J	Operating junction temperature range			-40		150	°C
T _{STG}	Storage Temperature Range			-40		125	
T _C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M5	1.5		4.7	N.m
Wt	Package Weight					160	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		%

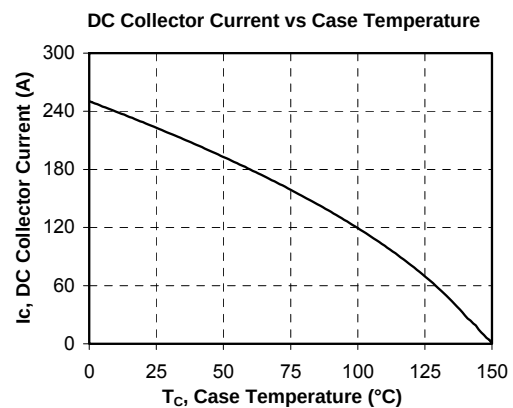
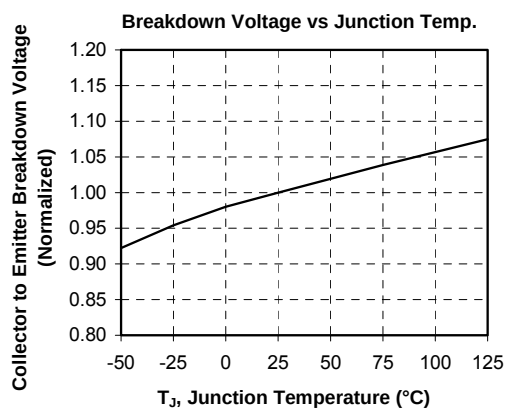
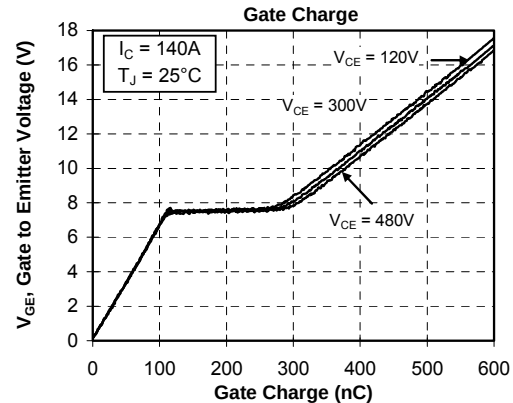
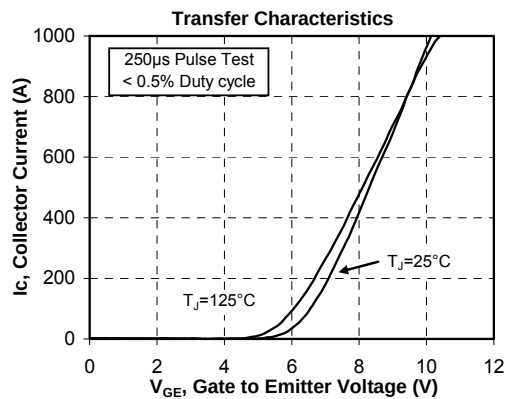
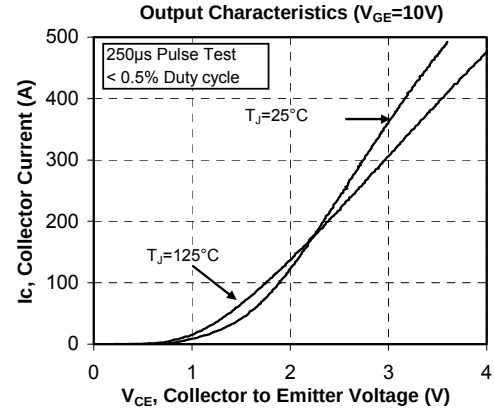
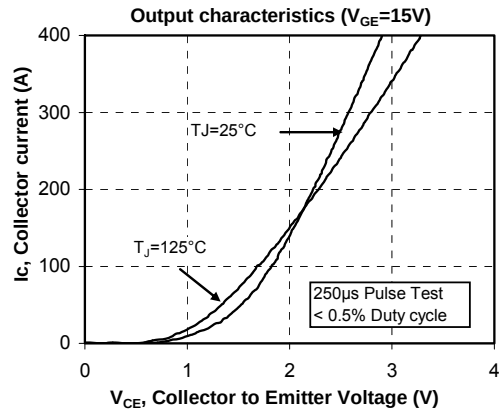
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

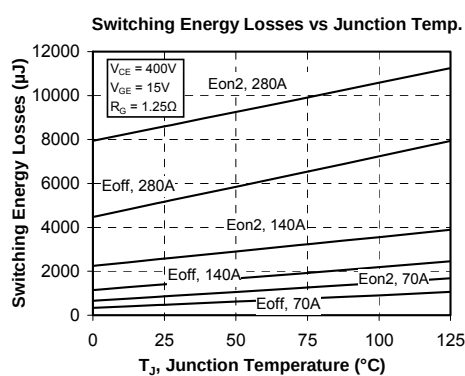
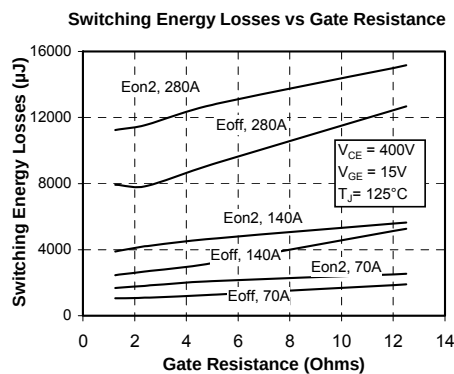
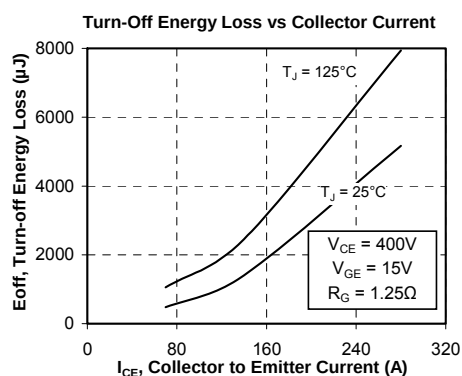
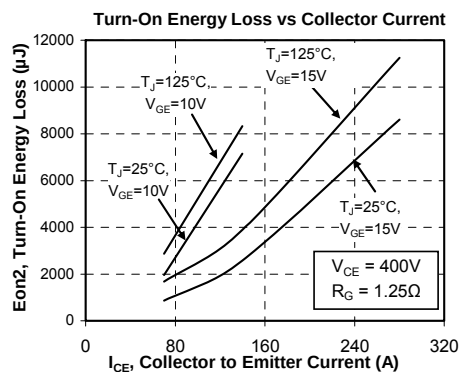
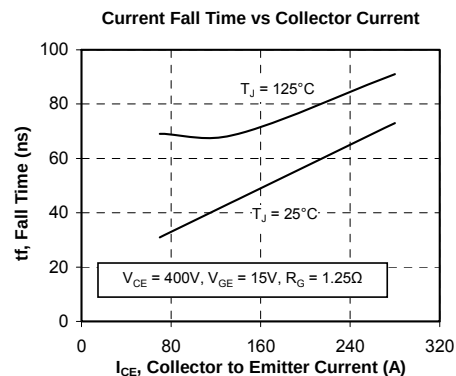
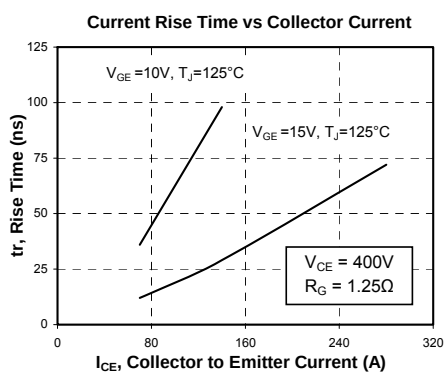
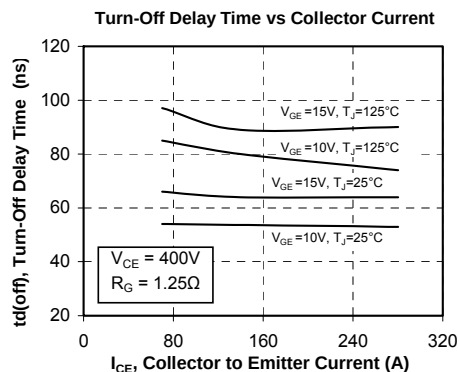
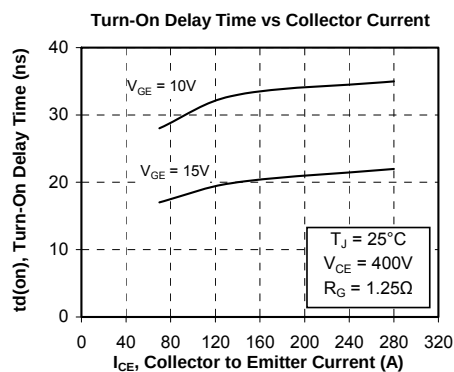
T: Thermistor temperature
R_T: Thermistor value at T

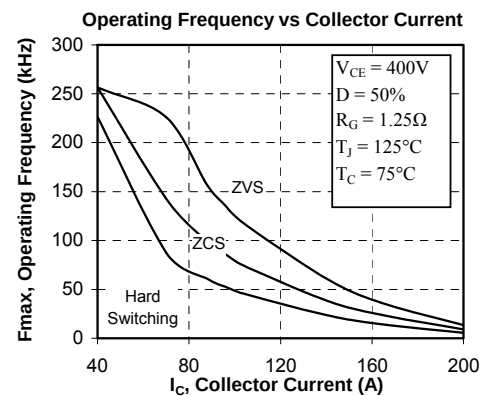
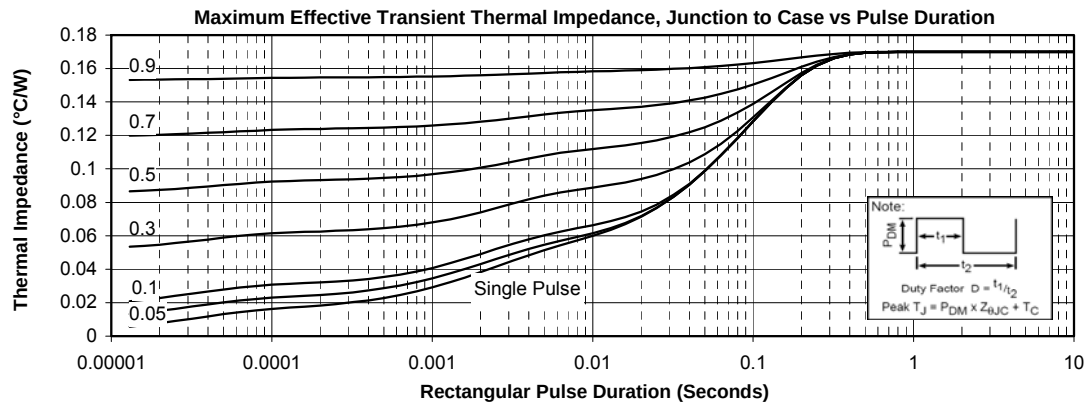
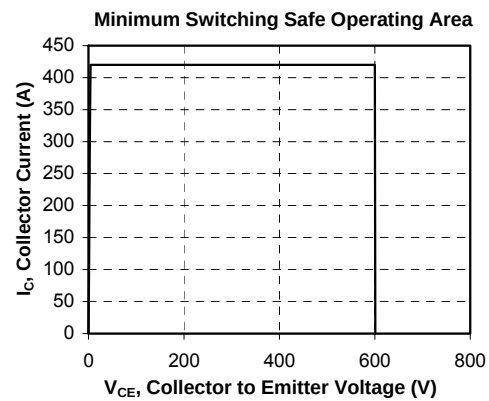
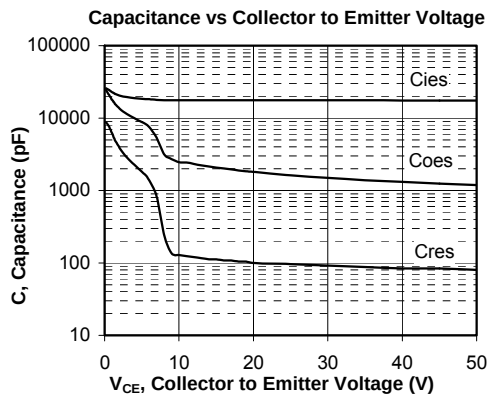
SP4 Package outline (dimension in mm)

 ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: ± 0.1

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical Performance Curve







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