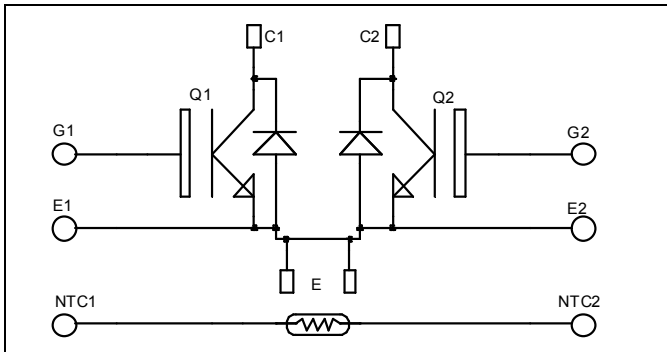


## Dual common source NPT IGBT Power Module

**$V_{CES} = 600V$   
 $I_C = 90A @ T_c = 80^\circ C$**

### Application

- AC Switches
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

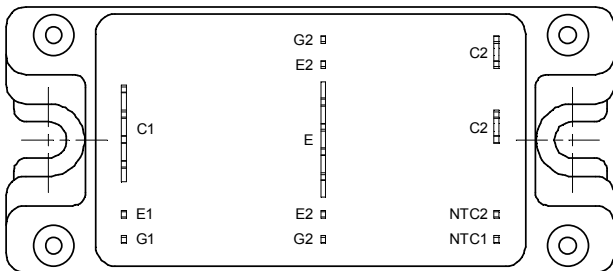


### Features

- Non Punch Through (NPT) THUNDERBOLT IGBT®
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- 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
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Easy paralleling due to positive TC of VCEsat
- Low profile



### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	110
		$T_c = 80^\circ C$	90
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	315
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	416
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	315A @ 600V

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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

## Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$BV_{CES}$	Collector - Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 100\mu A$	600			V
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0V$			100	$\mu A$
		$V_{CE} = 600V$			1000	
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15V$		2.0	2.5	V
		$I_C = 90A$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1mA$	3		5	V
$I_{GES}$	Gate - Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			$\pm 150$	nA

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		4300		pF	
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		470			
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		400			
$Q_g$	Total gate Charge	$V_{GS} = 15V$		330		nC	
$Q_{ge}$	Gate - Emitter Charge	$V_{Bus} = 300V$		290			
$Q_{gc}$	Gate - Collector Charge	$I_C = 90A$		200			
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15V$ $V_{Bus} = 400V$ $I_C = 90A$ $R_G = 5\Omega$		26		ns	
$T_r$	Rise Time			25			
$T_{d(off)}$	Turn-off Delay Time			150			
$T_f$	Fall Time			30			
$E_{on}$	Turn-on Switching Energy ①				3.35		mJ
$E_{off}$	Turn-off Switching Energy ②				2.85		
$T_{d(on)}$	Turn-on Delay Time		Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15V$ $V_{Bus} = 400V$ $I_C = 90A$ $R_G = 5\Omega$		26		ns
$T_r$	Rise Time			25			
$T_{d(off)}$	Turn-off Delay Time			170			
$T_f$	Fall Time			40			
$E_{on}$	Turn-on Switching Energy ①				4.3		mJ
$E_{off}$	Turn-off Switching Energy ②				3.5		

## Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle $T_c = 70^\circ\text{C}$		60		A
$V_F$	Diode Forward Voltage	$I_F = 60A$		1.6	1.8	V
		$I_F = 120A$		1.9		
		$I_F = 60A$	$T_j = 125^\circ\text{C}$		1.4	
$t_{rr}$	Reverse Recovery Time	$I_F = 60A$	$T_j = 25^\circ\text{C}$	85		ns
		$V_R = 400V$ $di/dt = 400A/\mu s$	$T_j = 125^\circ\text{C}$	160		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 60A$	$T_j = 25^\circ\text{C}$	260		nC
		$V_R = 400V$ $di/dt = 400A/\mu s$	$T_j = 125^\circ\text{C}$	1400		

①  $E_{on}$  includes diode reverse recovery

② In accordance with JEDEC standard JESD24-1

**Thermal and package characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case	IGBT		0.3	°C/W
		Diode		0.65	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			V
T <sub>J</sub>	Operating junction temperature range	-40		150	°C
T <sub>STG</sub>	Storage Temperature Range	-40		125	
T <sub>C</sub>	Operating Case Temperature	-40		100	
Torque	Mounting torque	To Heatsink	M5		4.7 N.m
Wt	Package Weight			160	g

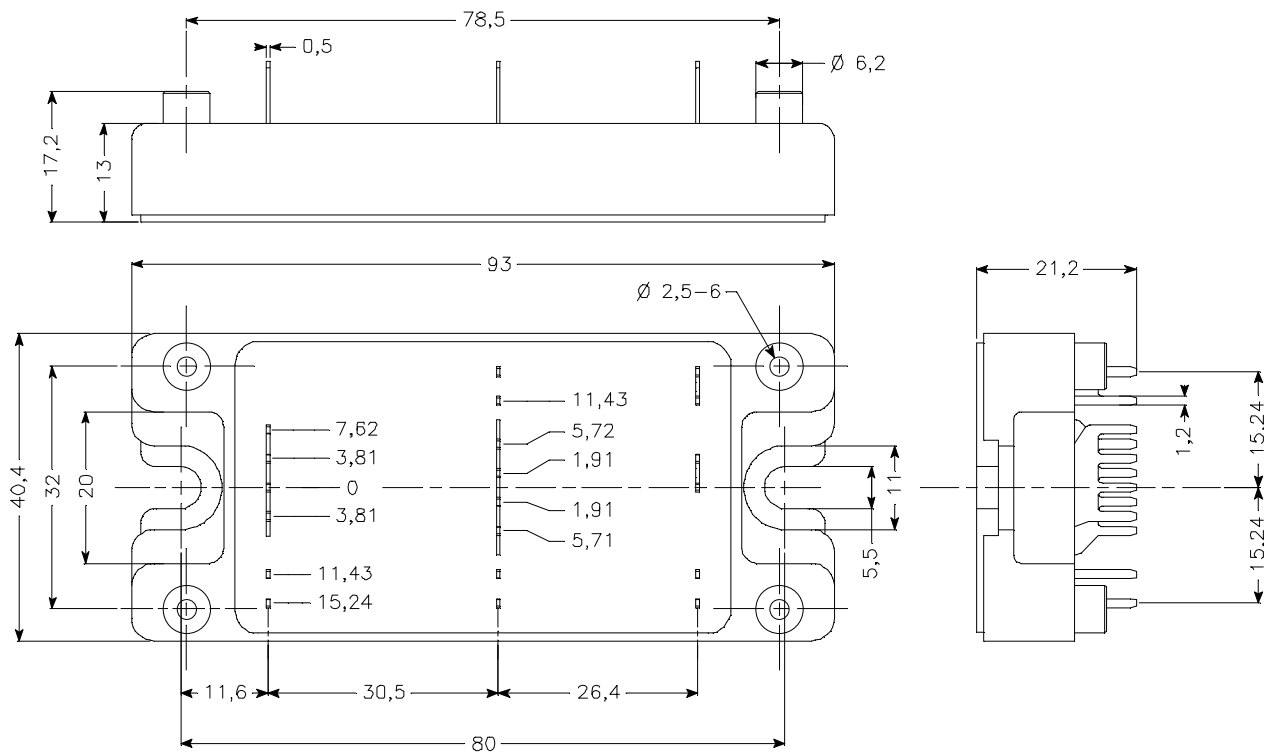
**Temperature sensor NTC**

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		68		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.16 K		4080		K

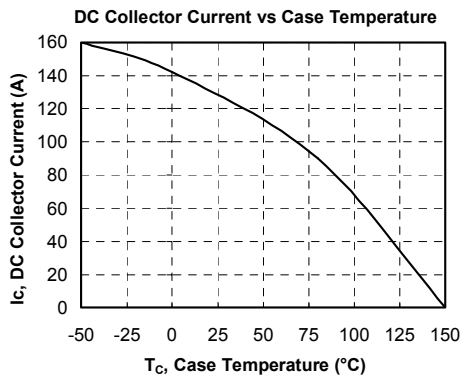
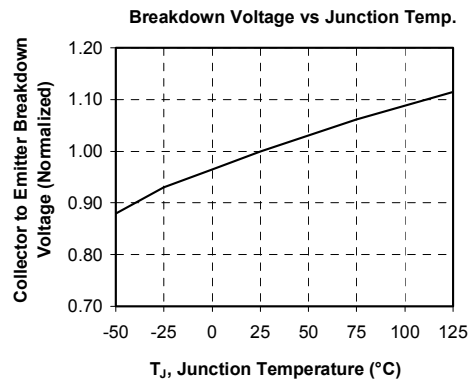
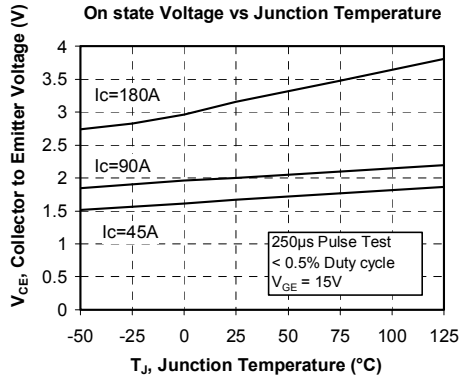
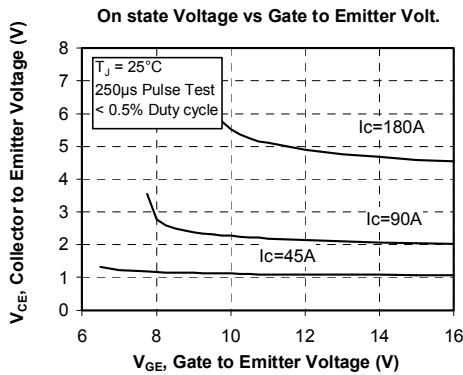
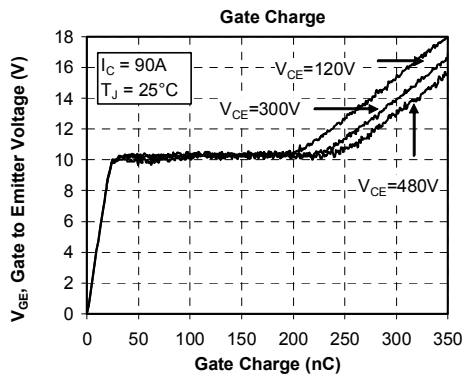
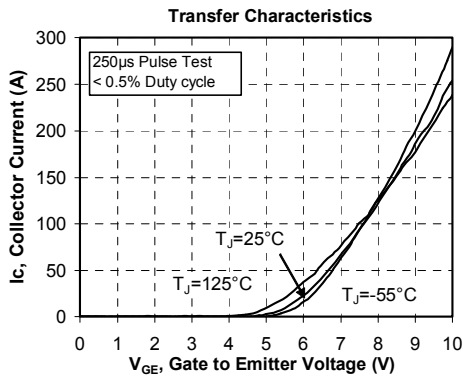
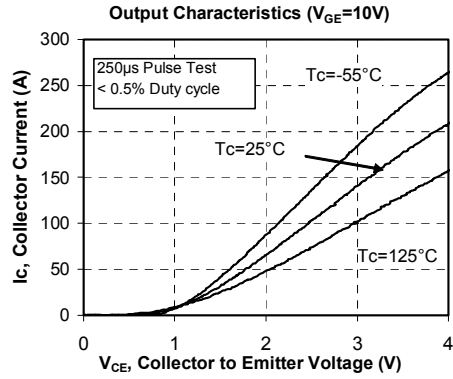
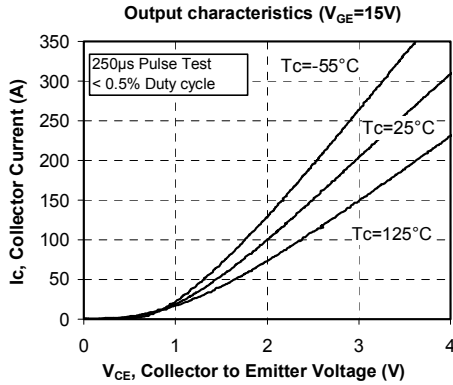
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

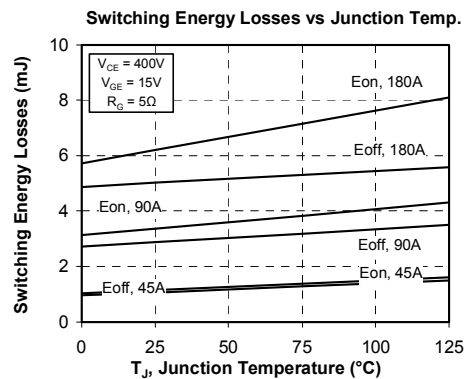
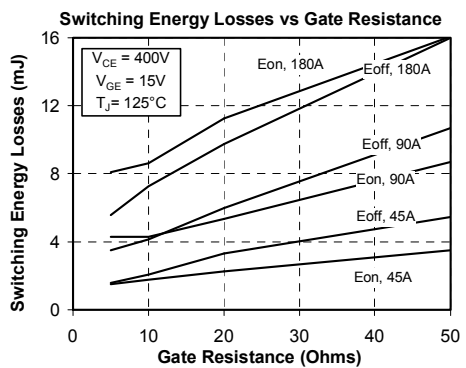
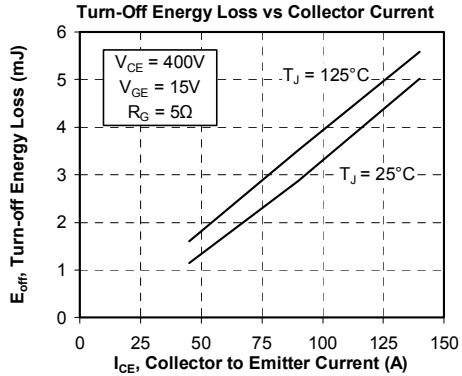
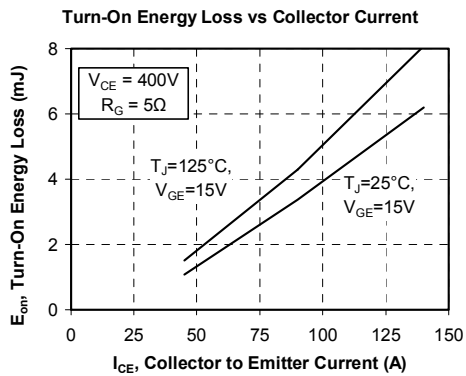
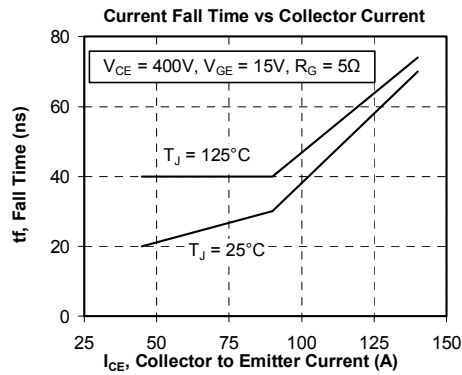
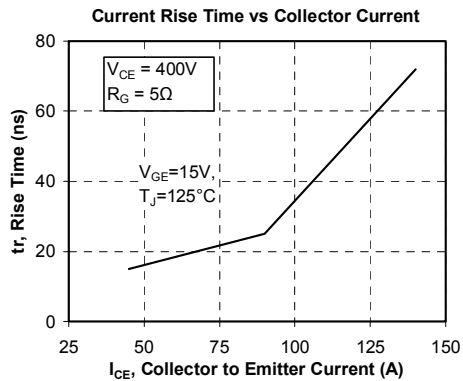
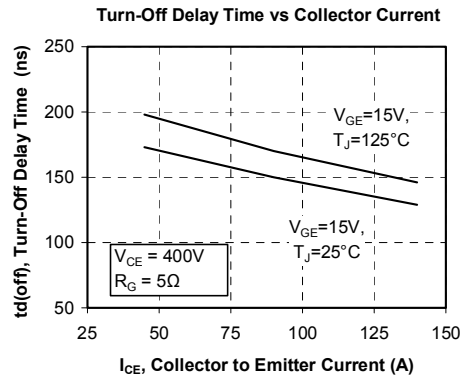
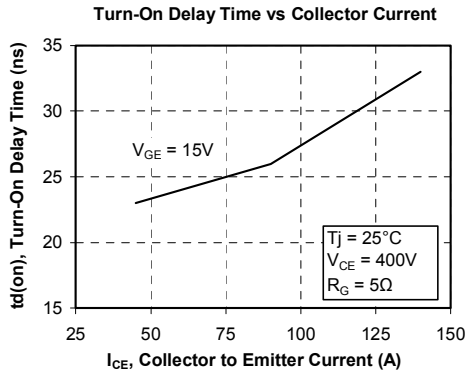
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

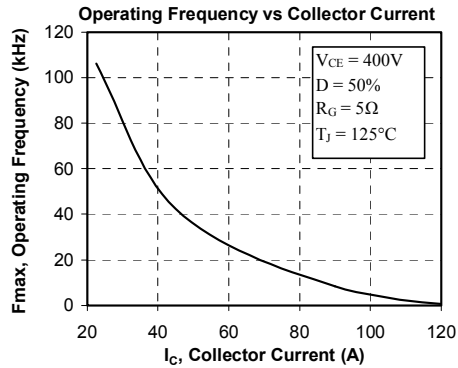
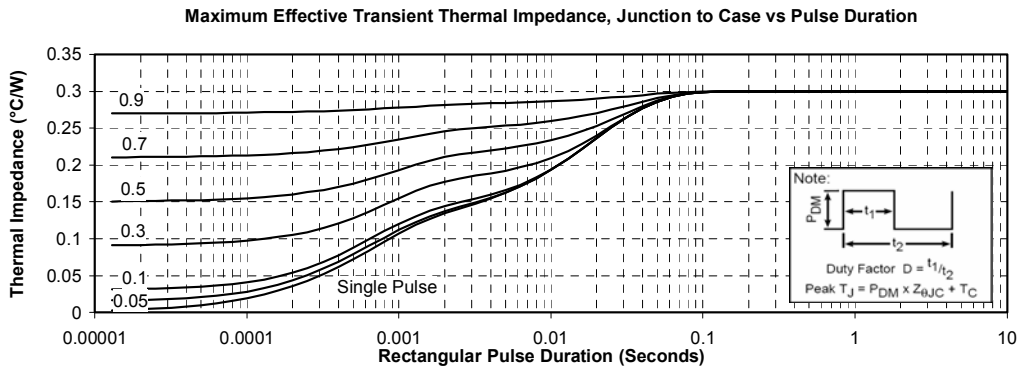
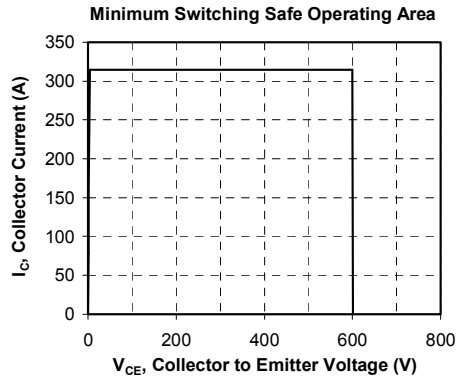
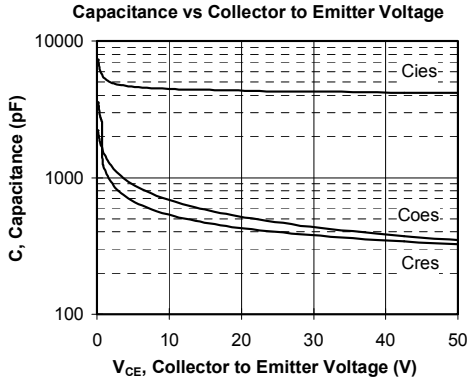
**Package outline**



**Typical Performance Curve**







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