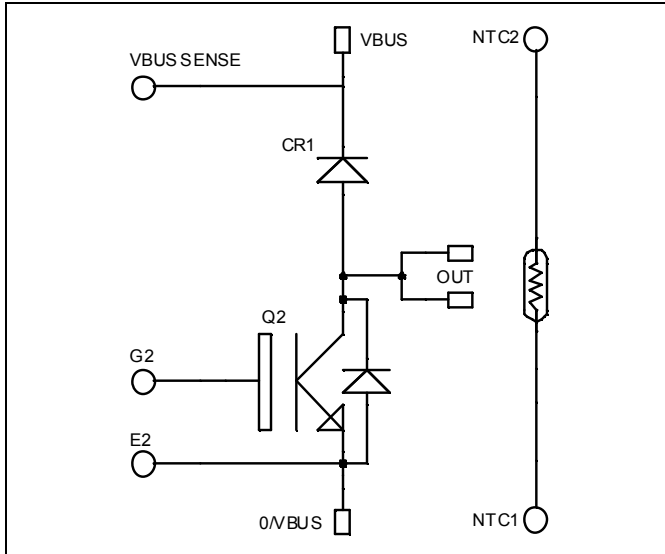


## Boost chopper NPT IGBT Power Module

$V_{CES} = 1200V$   
 $I_C = 100A @ T_c = 80^\circ C$



### Application

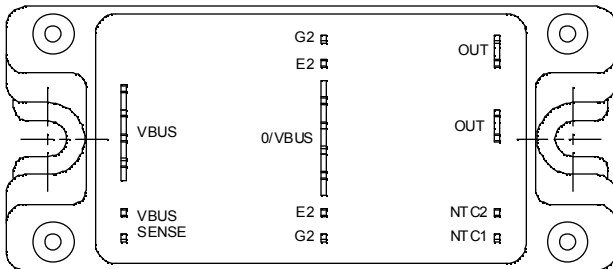
- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

### 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
  - 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  $T_c$  of  $V_{CESat}$
- Low profile
- RoHS compliant



### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	1200	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	135
		$T_c = 80^\circ C$	100
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	300
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	568
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	200A @ 1200V

**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
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	$T_j = 25^\circ\text{C}$		750	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		3750	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 100\text{A}$	$T_j = 25^\circ\text{C}$	3.2	3.7	V
			$T_j = 125^\circ\text{C}$		4.0	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2\text{ mA}$	4.5		6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{V}$			150	nA

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		6900		pF	
$C_{oes}$	Output Capacitance			660			
$C_{res}$	Reverse Transfer Capacitance			440			
$Q_g$	Total gate Charge	$V_{GS} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$		660		nC	
$Q_{gc}$	Gate – Emitter Charge			70			
$Q_{gc}$	Gate – Collector Charge			400			
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$ $R_G = 2.5\ \Omega$		35		ns	
$T_r$	Rise Time			65			
$T_{d(off)}$	Turn-off Delay Time			320			
$T_f$	Fall Time			30			
$E_{on}$	Turn-on Switching Energy				10.8		mJ
$E_{off}$	Turn-off Switching Energy				4.6		
$T_{d(on)}$	Turn-on Delay Time		Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$ $R_G = 2.5\ \Omega$		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				13.9		mJ
$E_{off}$	Turn-off Switching Energy				6.1		

## Chopper diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 1200\text{V}$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		600	
$I_F$	DC Forward Current			120		A
$V_F$	Diode Forward Voltage	$I_F = 120\text{A}$		2.0	2.5	V
		$I_F = 240\text{A}$		2.3		
		$I_F = 120\text{A}$	$T_j = 125^\circ\text{C}$		1.8	
$t_{rr}$	Reverse Recovery Time	$I_F = 120\text{A}$ $V_R = 800\text{V}$	$T_j = 25^\circ\text{C}$		400	ns
			$T_j = 125^\circ\text{C}$		470	
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		2400	nC
			$T_j = 125^\circ\text{C}$		8000	

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.22	°C/W	
		Diode		0.46		
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	1.5	4.7	N.m
Wt	Package Weight			160		g

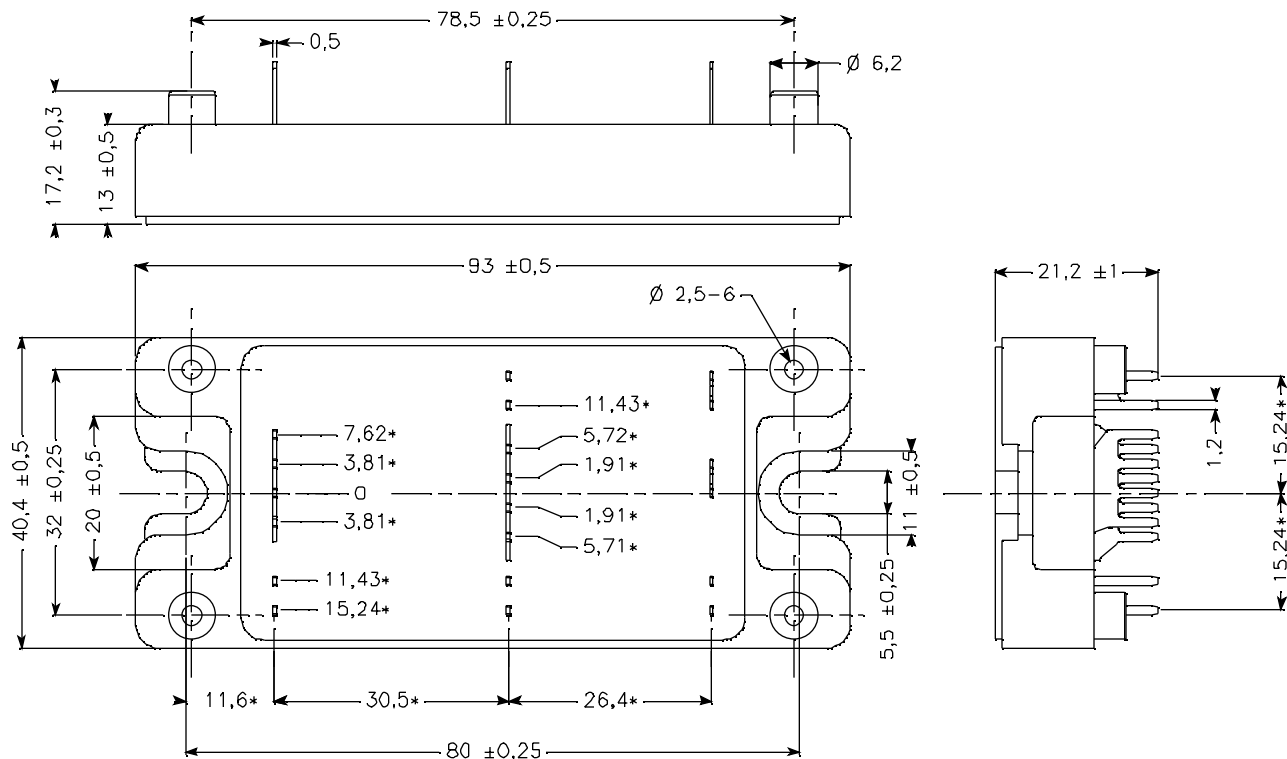
## Temperature sensor NTC (see application note APT0406 on www.advancedpower.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K

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

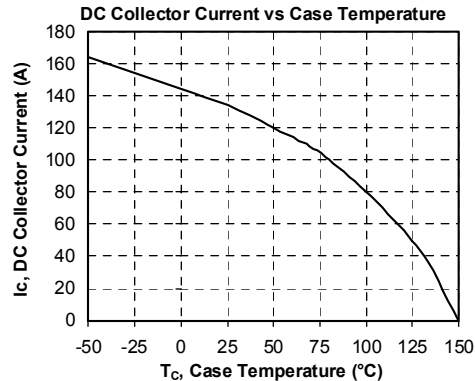
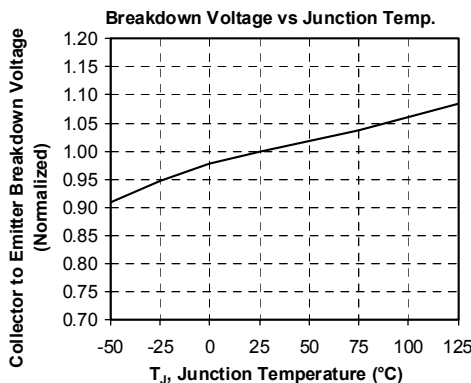
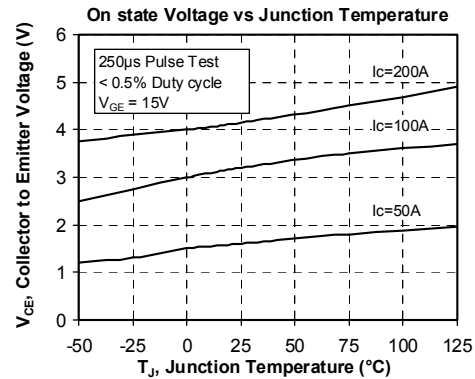
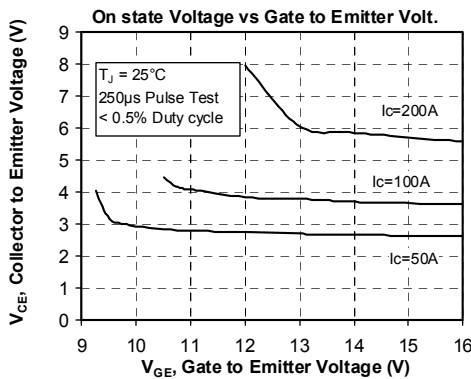
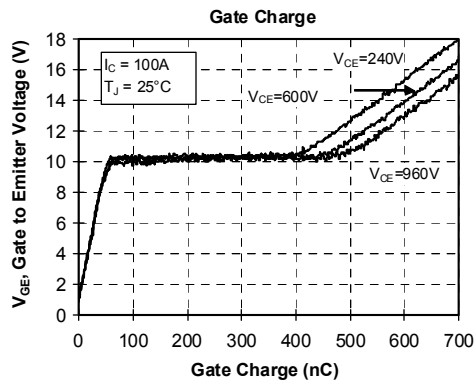
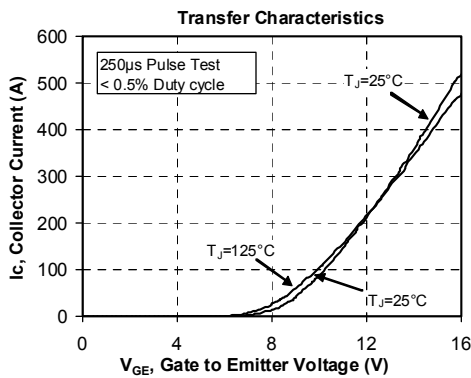
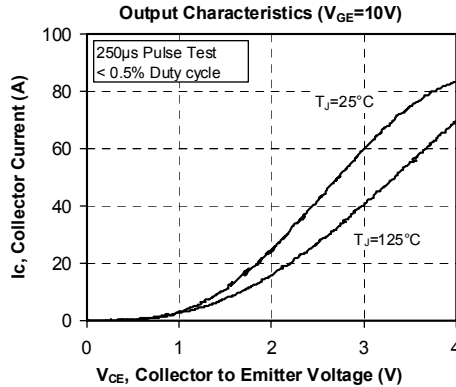
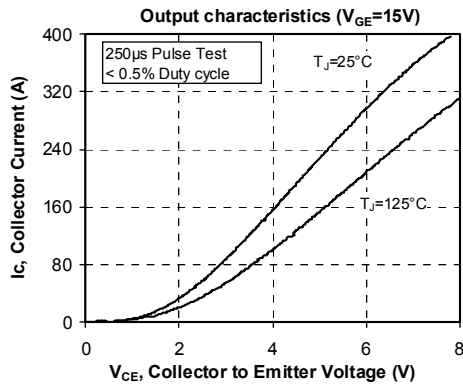
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

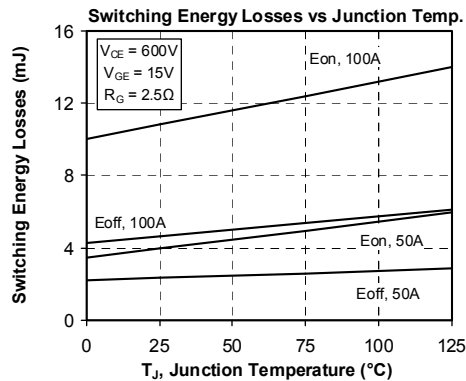
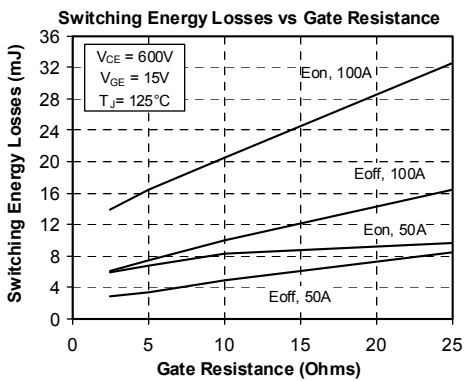
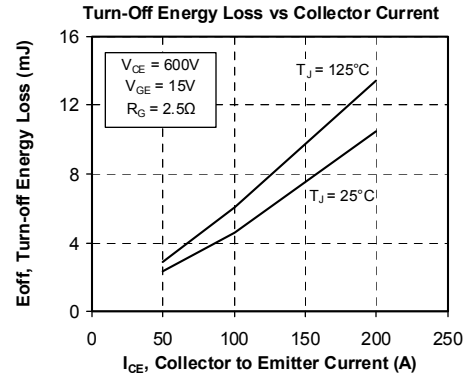
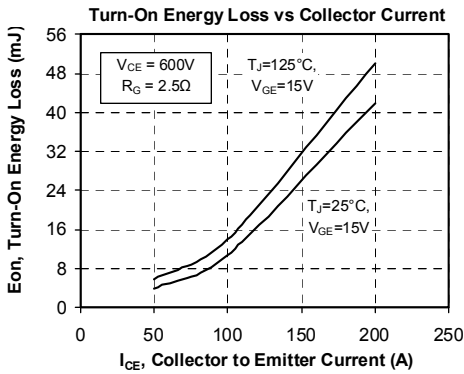
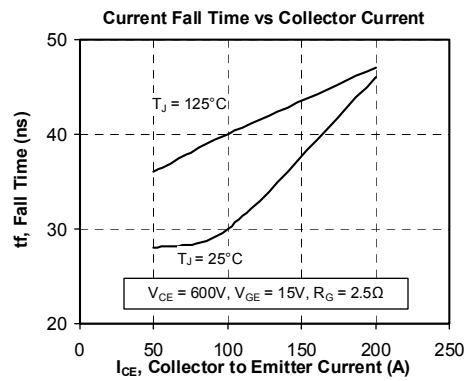
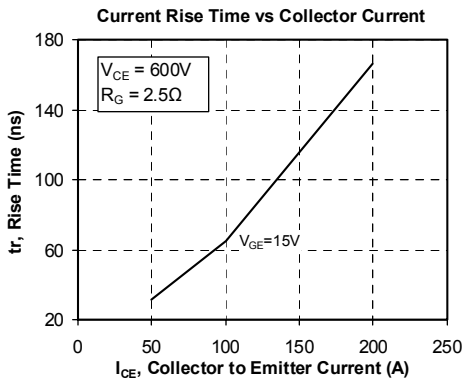
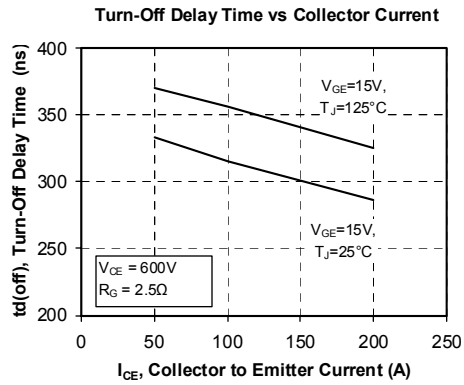
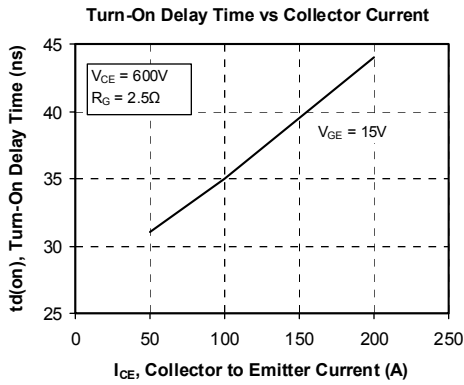
## SP4 Package outline (dimensions in mm)

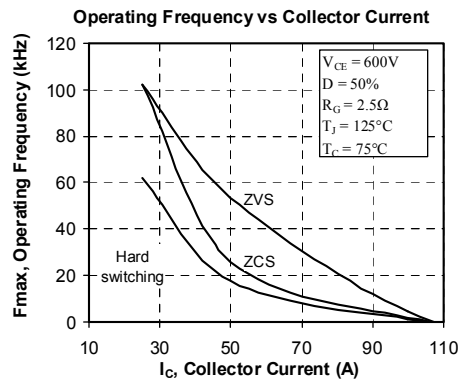
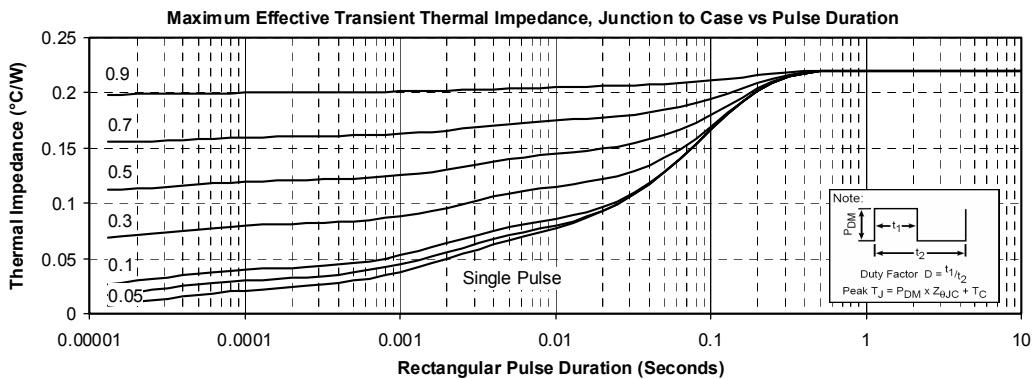
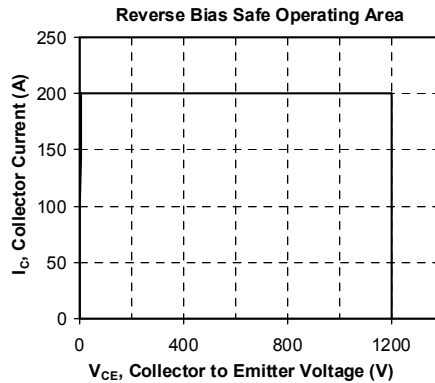
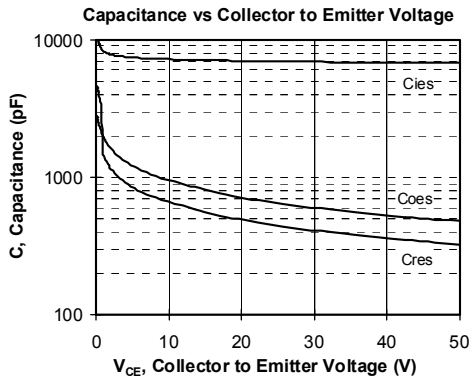


ALL DIMENSIONS MARKED "\*" ARE TOLERENCED AS:  $\pm 0.1$

## Typical Performance Curve







APT reserves the right to change, without notice, the specifications and information contained herein

APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.