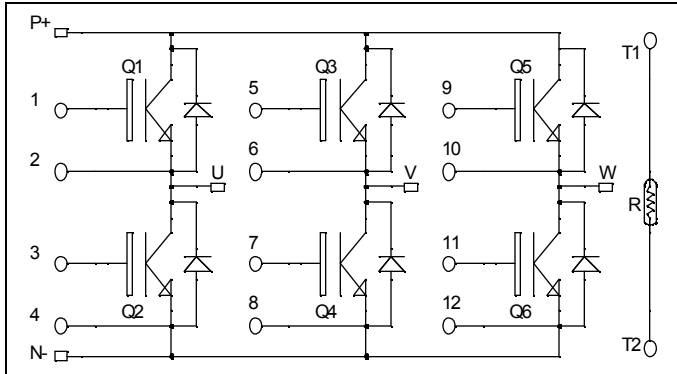


## 3 Phase bridge NPT IGBT Power Module

$V_{CES} = 600V$   
 $I_C = 150A @ T_c = 80^\circ C$



### Application

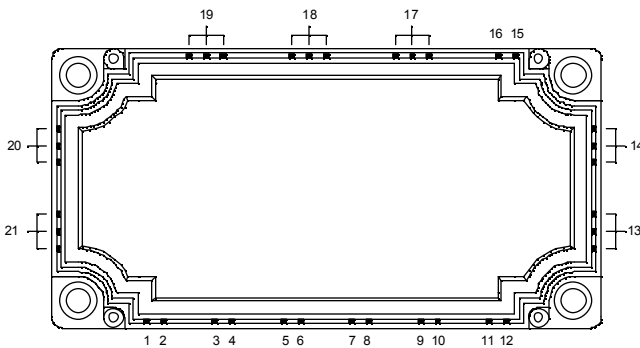
- AC Motor control

### 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
- High level of integration
- Internal thermistor for temperature monitoring


### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- 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	600	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	225
		$T_C = 80^\circ C$	150
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	450
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	700
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	400A@480V

 **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	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$			250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$			500	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 200\text{A}$	$T_j = 25^\circ\text{C}$	1.7	2.0	2.5	V
			$T_j = 125^\circ\text{C}$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 4\text{ mA}$	4.5		6.5	V	
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			400	nA	

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}, V_{CE} = 25\text{V}$		9000		$\mu\text{F}$
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		800		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 200\text{A}$ $R_G = 1.5\Omega$		163		ns
$T_r$	Rise Time			43		
$T_{d(off)}$	Turn-off Delay Time			253		
$T_f$	Fall Time			33		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 200\text{A}$ $R_G = 1.5\Omega$		180		ns
$T_r$	Rise Time			49		
$T_{d(off)}$	Turn-off Delay Time			285		
$T_f$	Fall Time			41		
$E_{on}$	Turn on Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 200\text{A}$ $R_G = 1.5\Omega$	$T_j = 125^\circ\text{C}$	3.7		mJ
$E_{off}$	Turn off Energy		$T_j = 125^\circ\text{C}$	6.3		

## Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$I_F$	DC Forward Current			150		A
$V_F$	Diode Forward Voltage	$I_F = 150\text{A}$ $V_{GE} = 0\text{V}$	$T_j = 25^\circ\text{C}$	1.25	1.6	V
			$T_j = 125^\circ\text{C}$		1.2	
$E_r$	Reverse Recovery Energy	$I_F = 150\text{A}$ $V_R = 300\text{V}$ $di/dt = 5600\text{A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$	4		mJ
$t_{rr}$	Reverse Recovery Time		$T_j = 25^\circ\text{C}$	150		ns
			$T_j = 125^\circ\text{C}$	250		
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	11		$\mu\text{C}$
		$T_j = 125^\circ\text{C}$	17			

**Temperature sensor NTC**

*Symbol Characteristic*

		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R <sub>25</sub>	Resistance @ 25°C		5		kΩ
B <sub>25/50</sub>	T <sub>25</sub> = 298.16 K		3375		K

$$R_T = \frac{R_{25}}{\exp \left[ B_{25/50} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

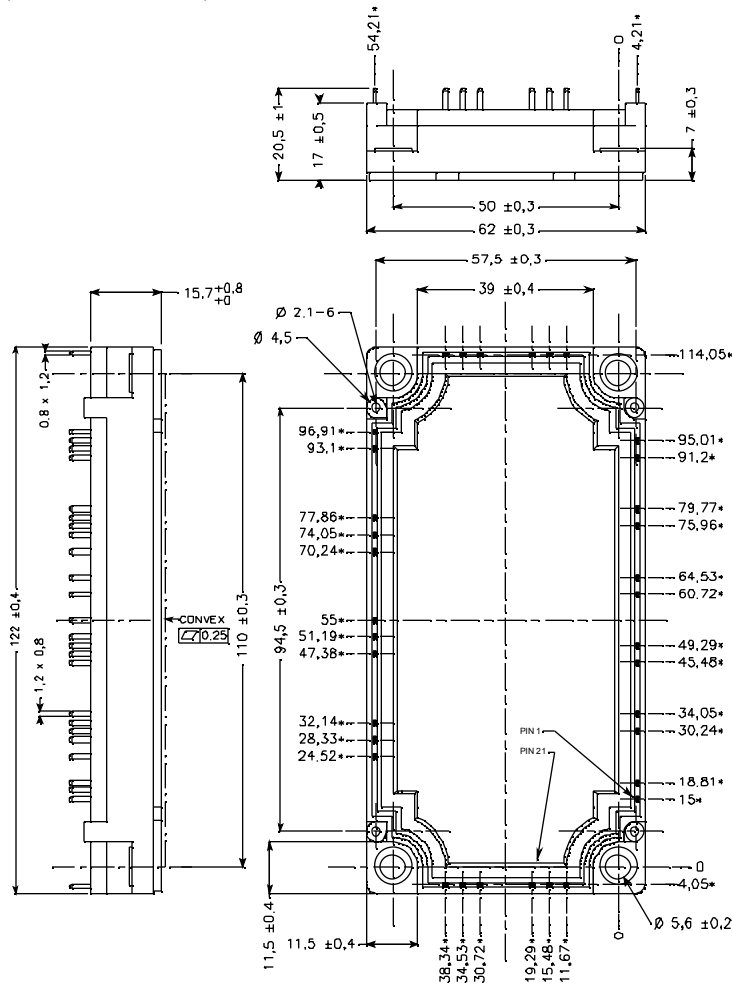
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

**Thermal and package characteristics**

*Symbol Characteristic*

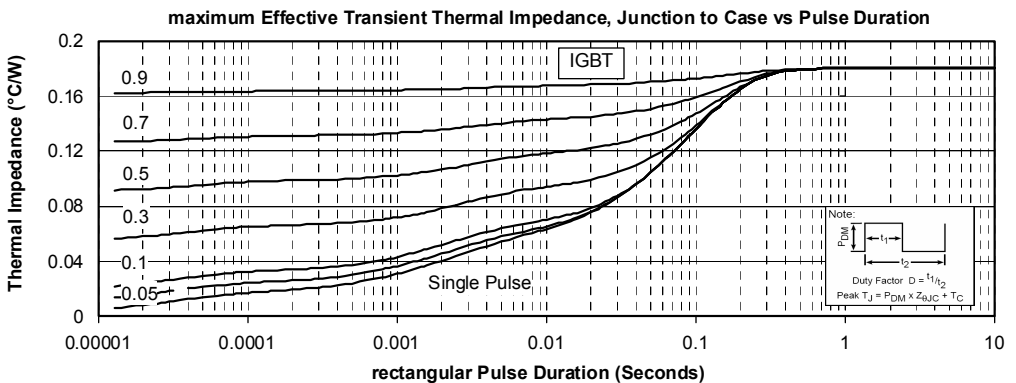
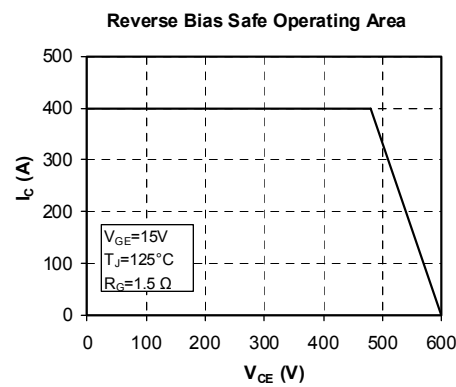
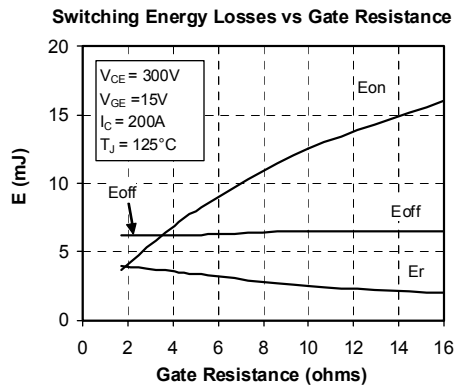
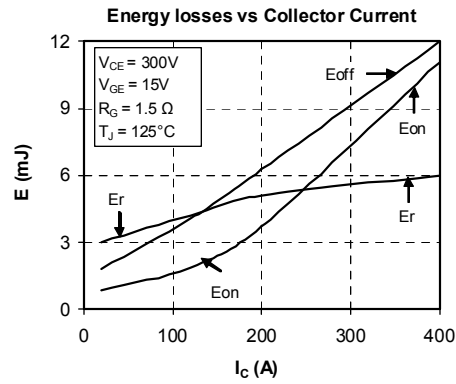
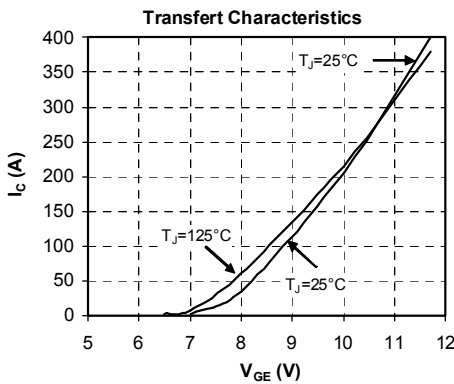
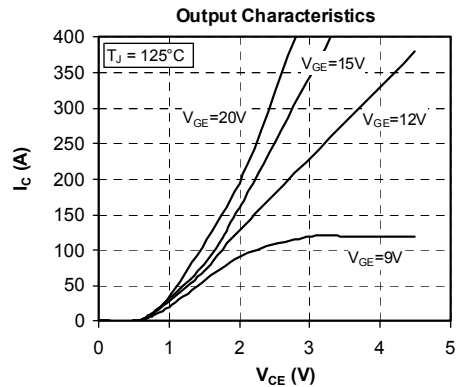
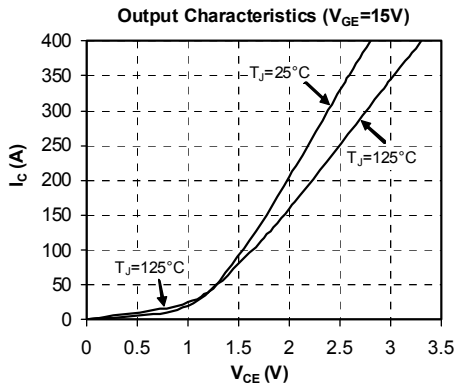
		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.18	°C/W	
		Diode		0.44		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		125		
Torque	Mounting torque	To heatsink	M5	3	4.5	N.m
Wt	Package Weight				300	g

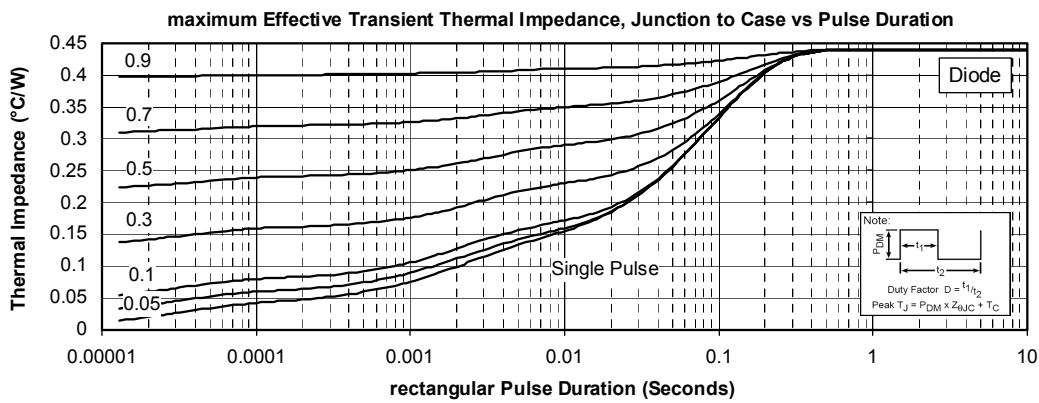
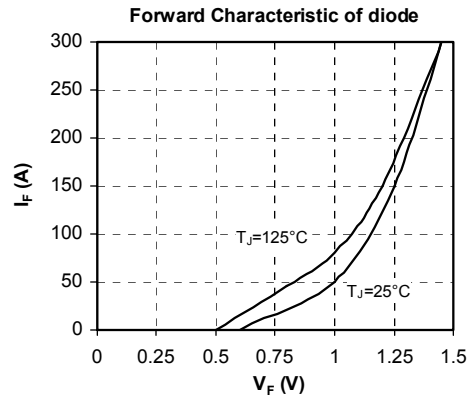
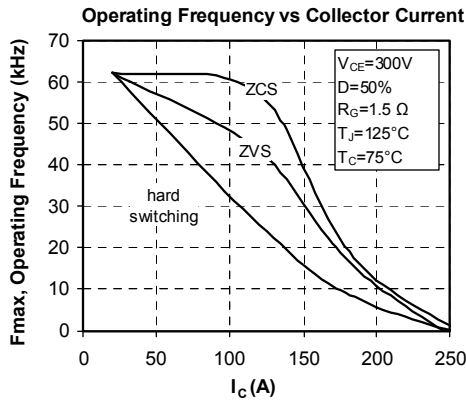
**E3 Package outline (dimensions in mm)**



ALL DIMENSIONS MARKED \*\*\* ARE TOLERANCED AS:  $\pm 0.4$

**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.