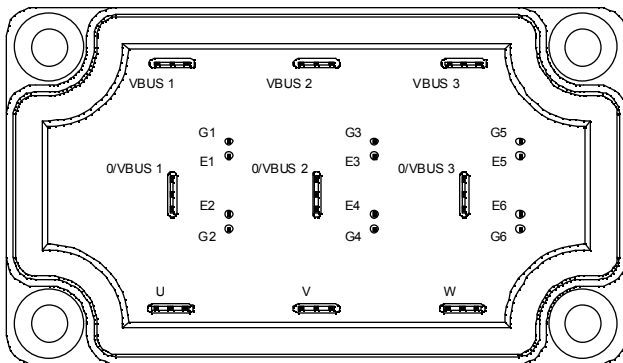
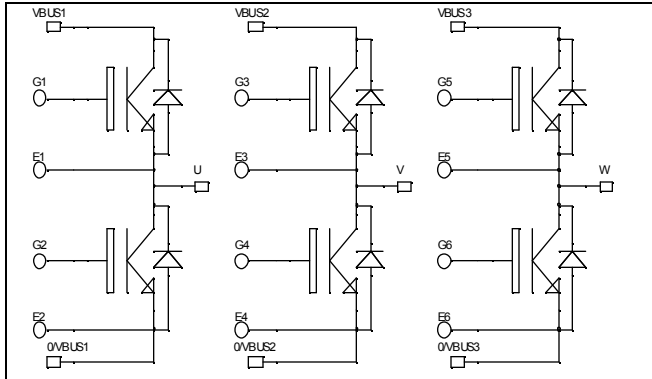


**Triple phase leg
NPT IGBT Power Module**

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



Application

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

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
- 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
- Very low (12mm) profile
- Easy paralleling due to positive TC of VCESat
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge

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	± 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	$V_{GE} = 0V$ $V_{CE} = 600V$			100	μA
					1000	
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15V$ $I_C = 90A$		2.0	2.5	V
				2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1mA$	3		5	V
I_{GES}	Gate - Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			± 150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1MHz$		4300		pF	
C_{oes}	Output Capacitance			470			
C_{res}	Reverse Transfer Capacitance			400			
Q_g	Total gate Charge	$V_{GS} = 15V$ $V_{Bus} = 300V$ $I_C = 90A$		330		nC	
Q_{ge}	Gate - Emitter Charge			290			
Q_{gc}	Gate - Collector Charge			200			
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°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°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			

① E_{on} includes diode reverse recovery

② In accordance with JEDEC standard JESD24-1

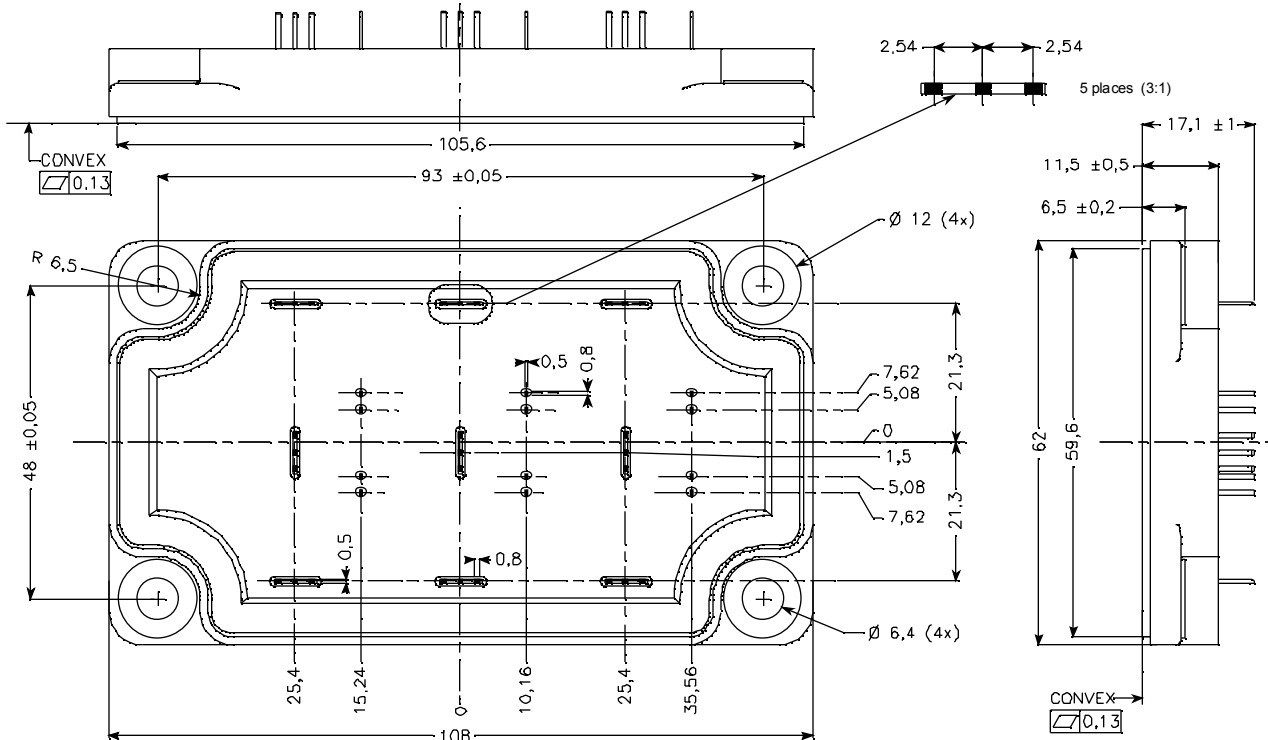
Reverse diode ratings and characteristics

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 =600V	T _j = 25°C			250	µA
			T _j = 125°C			500	
I _{F(AV)}	Maximum Average Forward Current	50% duty cycle	T _c = 70°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°C		1.4		
t _{rr}	Reverse Recovery Time	I _F = 60A V _R = 400V di/dt = 200A/µs	T _j = 25°C		130		ns
			T _j = 125°C		170		
Q _{rr}	Reverse Recovery Charge			T _j = 25°C		220	
			T _j = 125°C		920		

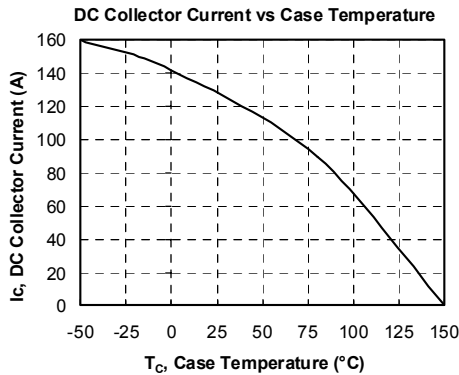
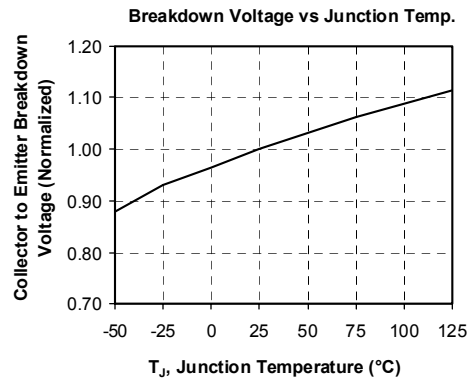
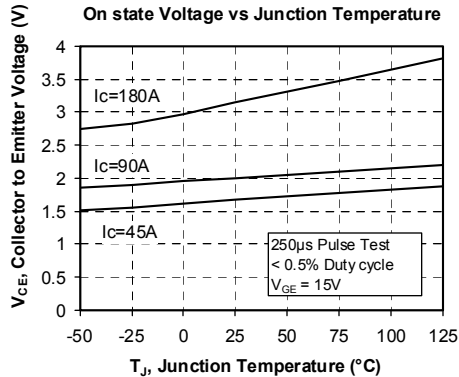
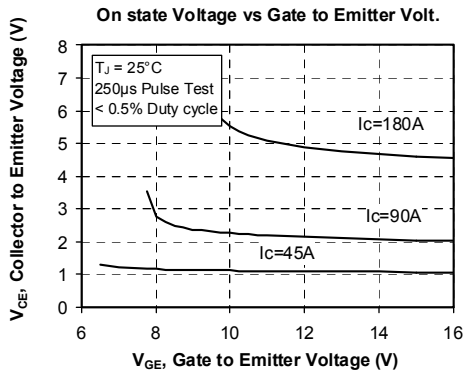
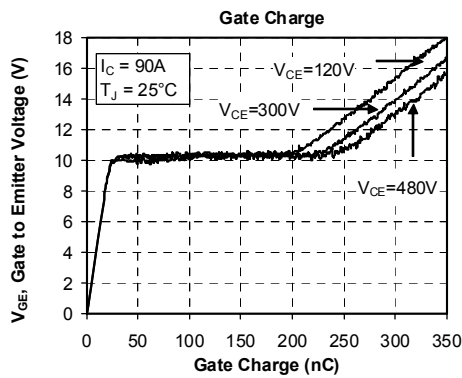
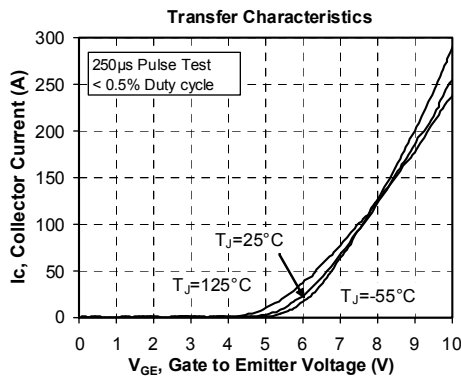
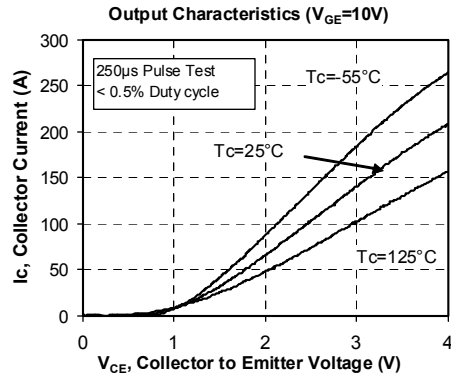
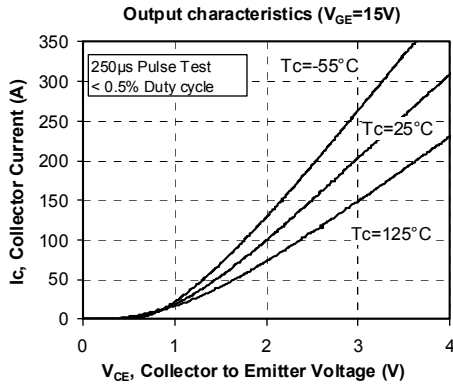
Thermal and package characteristics

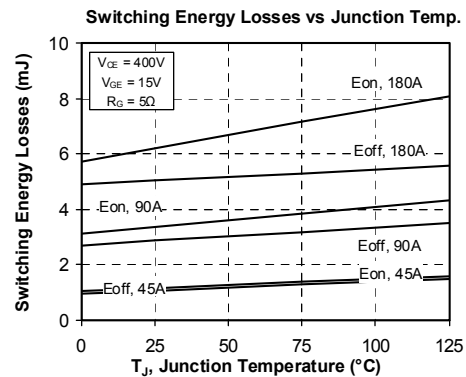
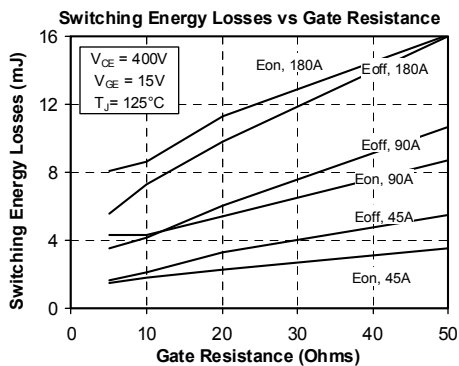
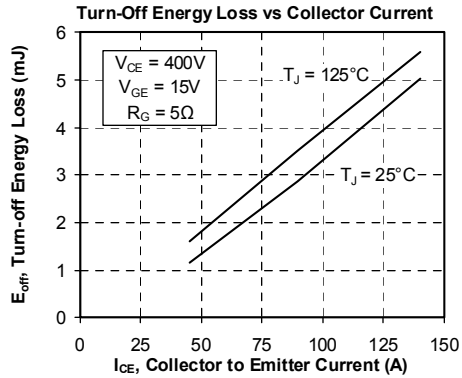
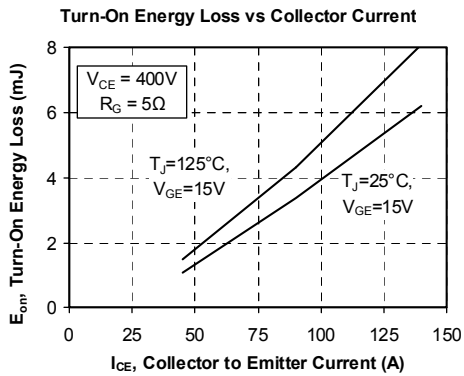
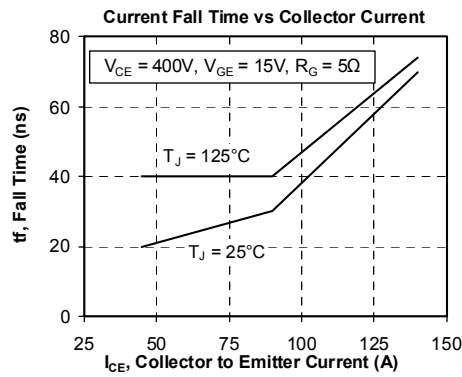
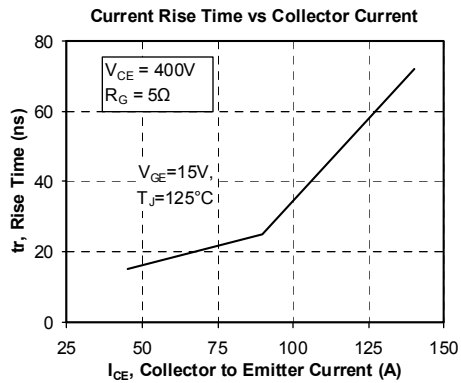
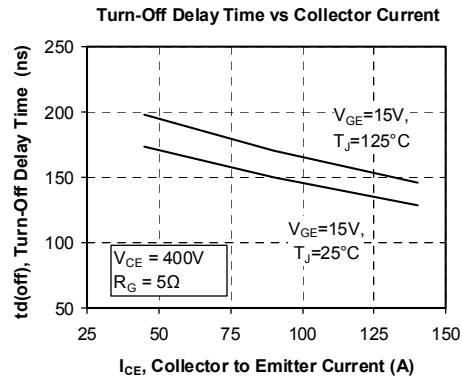
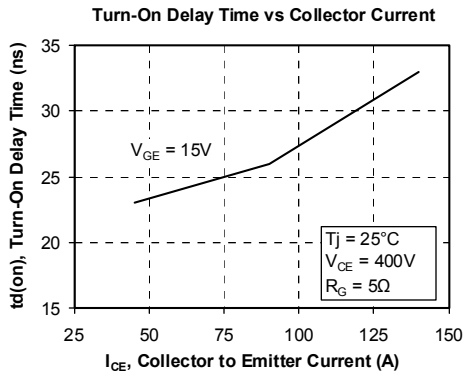
Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case	IGBT				0.3	°C/W
		Diode				0.9	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz			2500			V
T _J	Operating junction temperature range			-40		150	°C
T _{STG}	Storage Temperature Range			-40		125	
T _C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

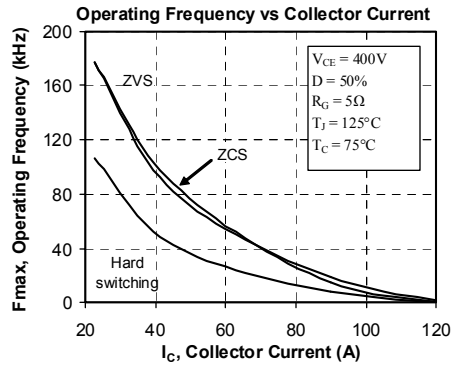
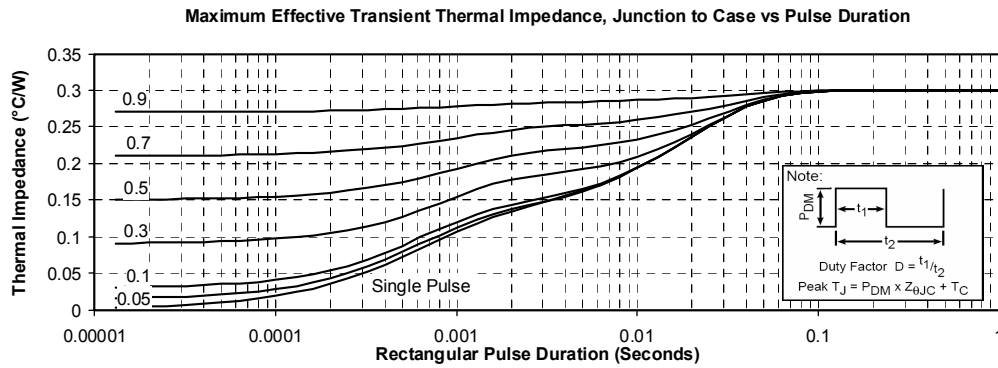
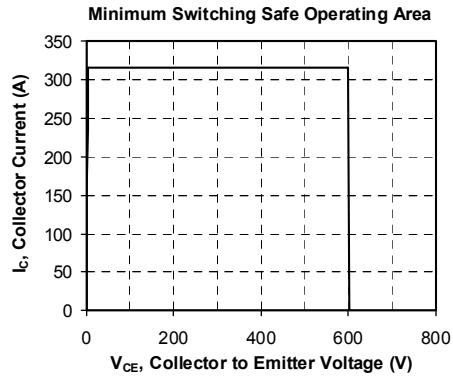
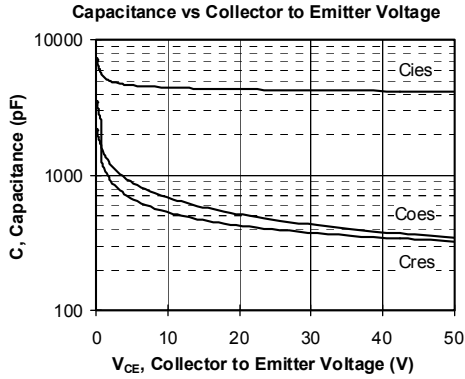
Package outline



Typical Performance Curve







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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.