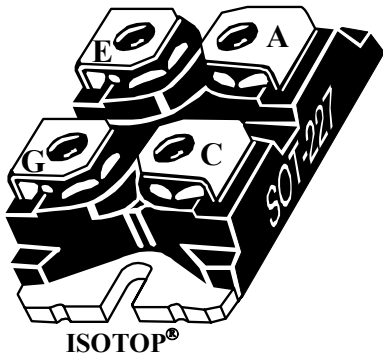
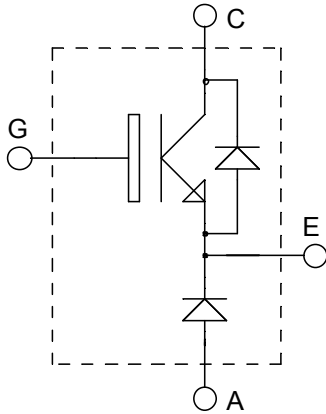


**ISOTOP® Buck chopper
NPT IGBT**

**$V_{CES} = 600V$
 $I_C = 100A @ T_c = 80^\circ C$**



Application

- AC and DC motor control
- Switched Mode 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
- ISOTOP® Package (SOT-227)
- Very low stray inductance
- 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
- Easy paralleling due to positive TC of VCEsat

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	600	V
I_{C1}	Continuous Collector Current	$T_C = 25^\circ C$	120
I_{C2}		$T_C = 80^\circ C$	100
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$	320
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	416
I_{FAV}	Maximum Average Forward Current	$T_C = 80^\circ C$	A
I_{FRMS}	RMS Forward Current (Square wave, 50% duty)		

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

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
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	$V_{GE} = 15V$ $I_C = 100A$		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	$V_{GE} = \pm 20V, V_{CE} = 0V$			± 150	nA

Dynamic Characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
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	$I_C = 100A$		200		
$T_{d(on)}$	Turn-on Delay Time	Resistive Switching (25°C)		26		ns
T_r	Rise Time	$V_{GE} = 15V$		25		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		150		
T_f	Fall Time	$I_C = 100A$		30		
E_{on}	Turn-on Switching Energy	$R_G = 5\Omega$		3.35		
E_{off}	Turn off Switching Energy			2.85		mJ
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		26		ns
T_r	Rise Time	$V_{GE} = 15V$		25		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		170		
T_f	Fall Time	$I_C = 100A$		40		
E_{on}	Turn-on Switching Energy	$R_G = 5\Omega$		4.3		
E_{off}	Turn-off Switching Energy			3.5		mJ

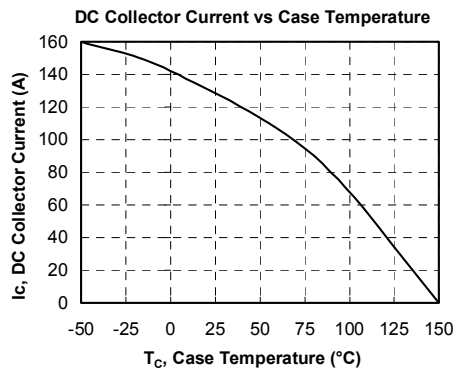
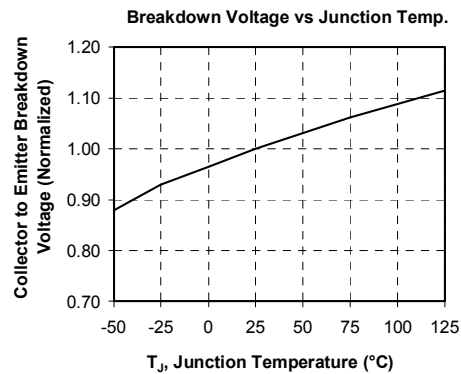
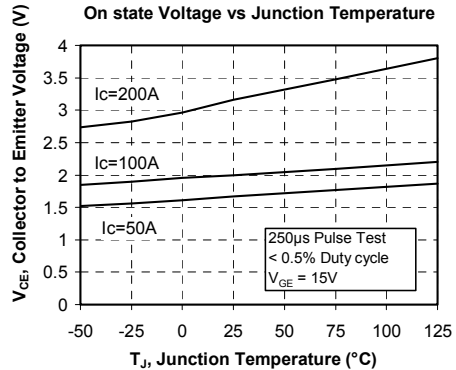
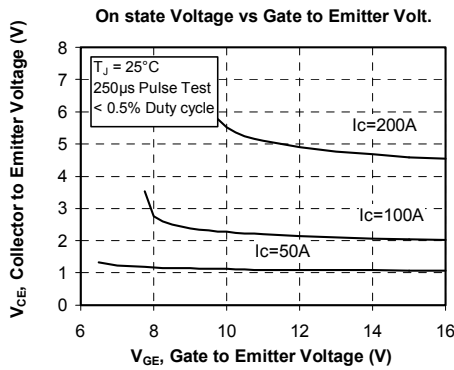
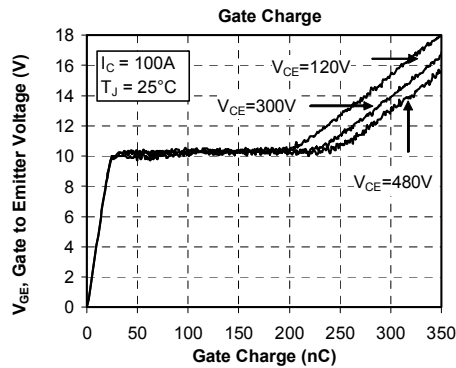
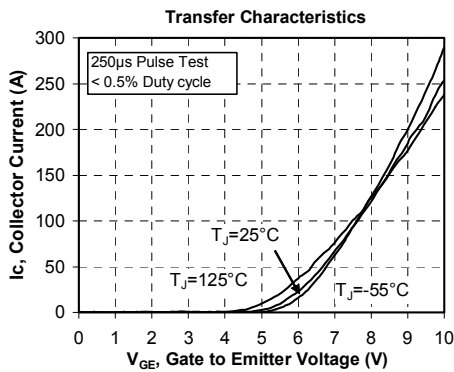
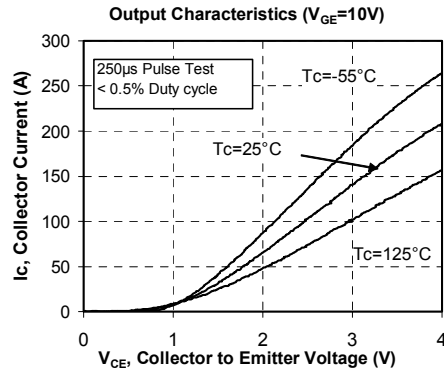
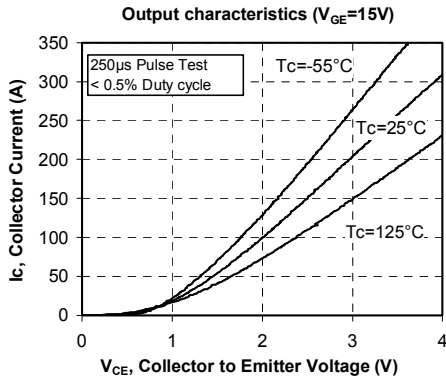
Diode ratings and characteristics

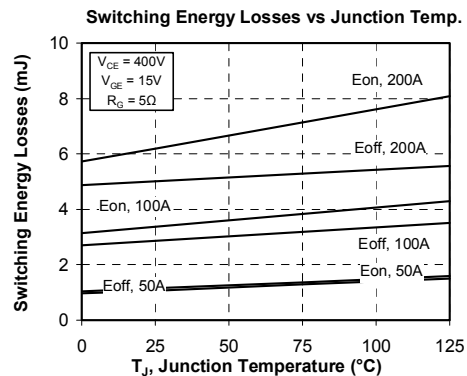
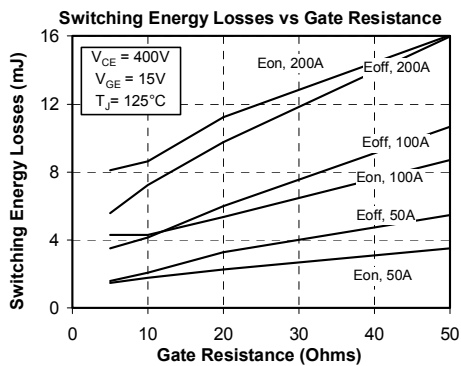
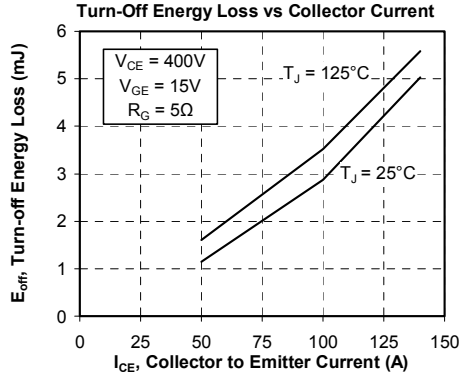
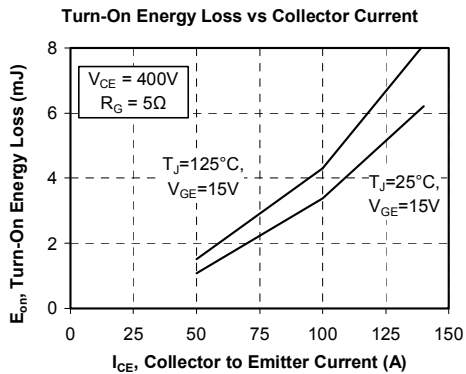
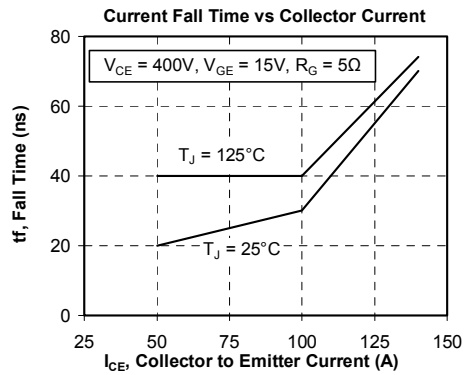
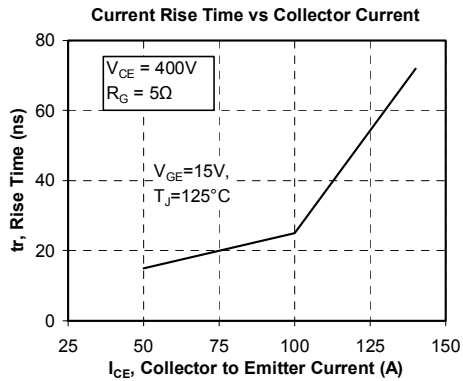
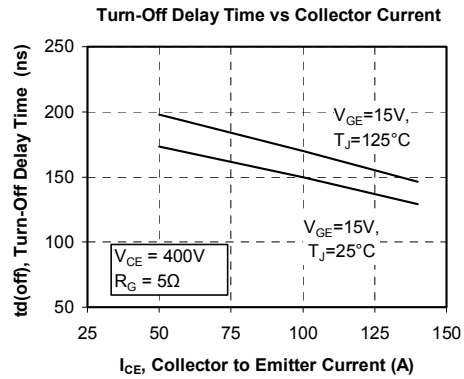
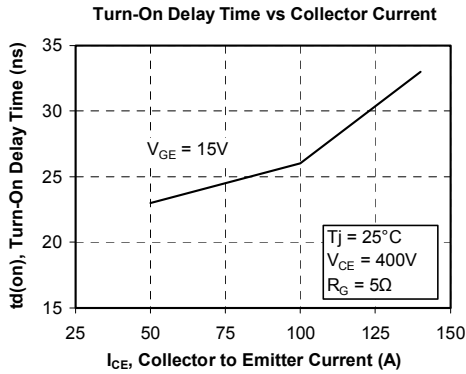
<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V _F	Diode Forward Voltage	I _F = 30A			1.6	1.8	V
		I _F = 60A			1.9		
		I _F = 30A	T _j = 125°C		1.4		
I _{RM}	Maximum Reverse Leakage Current	V _R = 600V	T _j = 25°C			250	μA
		V _R = 600V	T _j = 125°C			500	
C _T	Junction Capacitance	V _R = 200V			44		pF
t _{rr}	Reverse Recovery Time	I _F = 1A, V _R = 30V	T _j = 25°C		23		ns
	Reverse Recovery Time		T _j = 25°C		85		
			T _j = 125°C		160		
I _{RRM}	Maximum Reverse Recovery Current	I _F = 30A V _R = 400V di/dt = 200A/μs	T _j = 25°C		4		A
			T _j = 125°C		8		
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		130		nC
			T _j = 125°C		700		
t _{rr}	Reverse Recovery Time	I _F = 30A	T _j = 125°C		70		ns
Q _{rr}	Reverse Recovery Charge	V _R = 400V			1300		nC
I _{RRM}	Maximum Reverse Recovery Current	di/dt = 1000A/μs			30		A

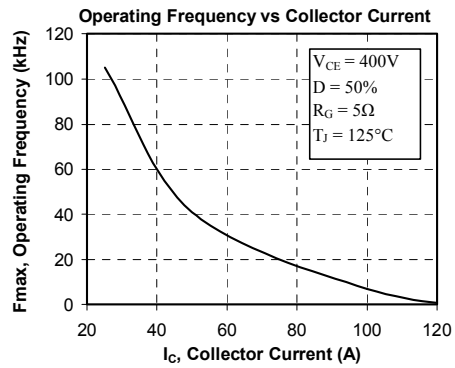
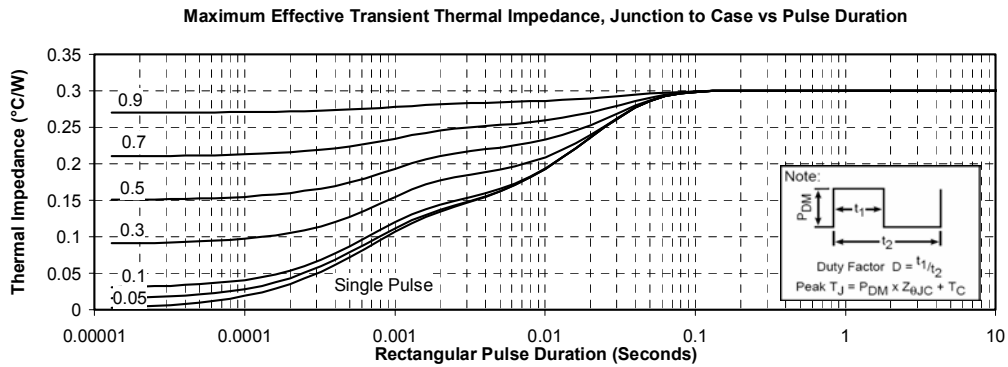
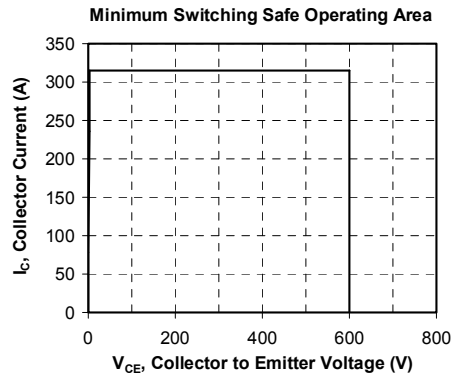
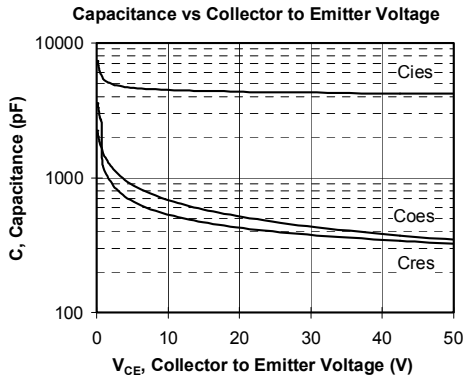
Thermal and package characteristics

<i>Symbol</i>	<i>Characteristic</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R _{thJC}	Junction to Case	IGBT			0.3	°C/W
		Diode			1.21	
R _{thJA}	Junction to Ambient (IGBT & Diode)				20	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz		2500			V
T _J , T _{STG}	Storage Temperature Range		-55		150	°C
T _L	Max Lead Temp for Soldering: 0.063" from case for 10 sec				300	
Torque	Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine)				1.5	N.m
Wt	Package Weight			29.2		g

Typical IGBT Performance Curve







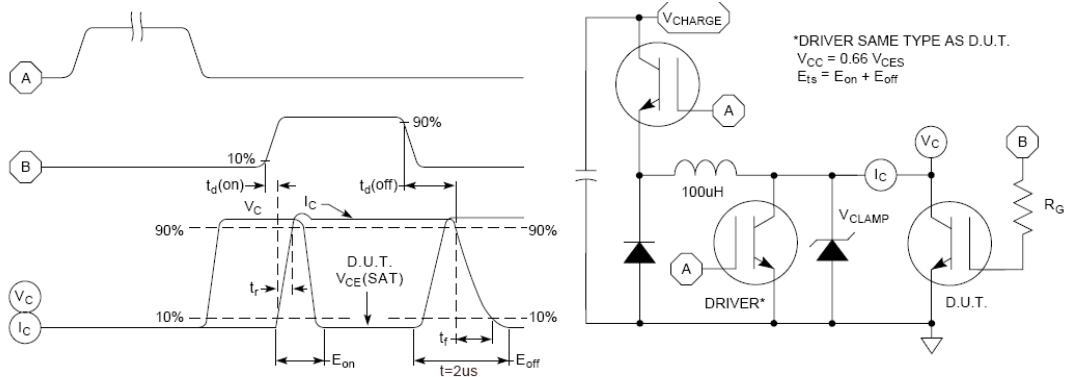


Figure 15, Switching Loss Test Circuit and Waveforms

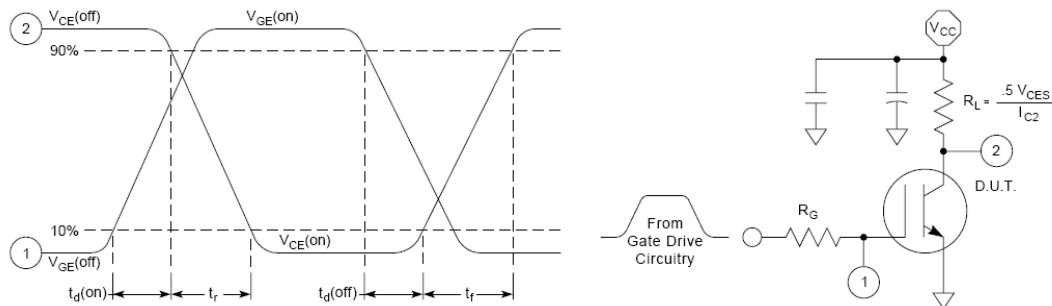


Figure 16, Resistive Switching Time Test Circuit and Waveforms

Typical Diode Performance Curve

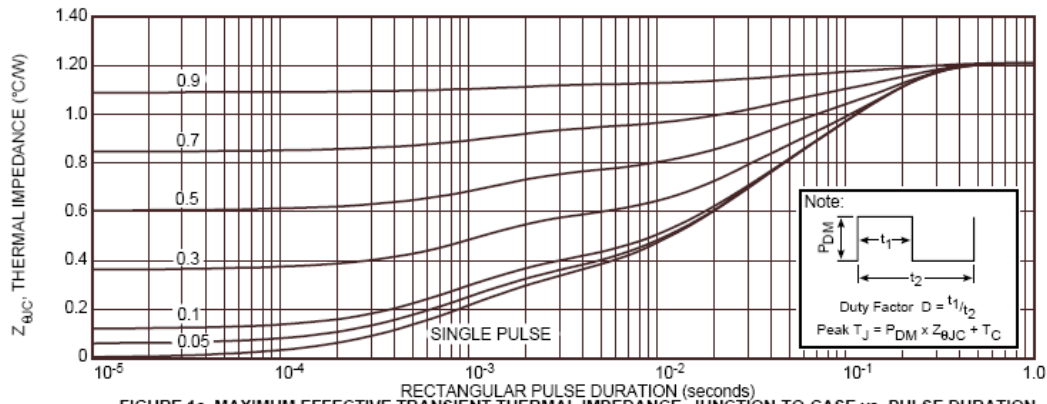


FIGURE 1a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

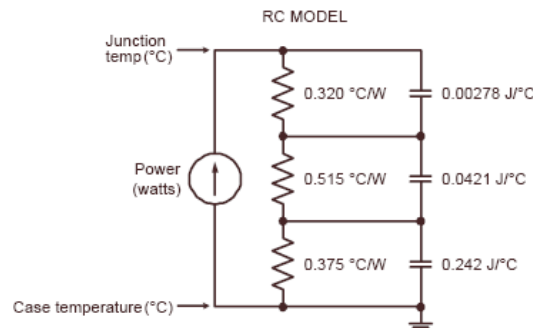


FIGURE 1b, TRANSIENT THERMAL IMPEDANCE MODEL

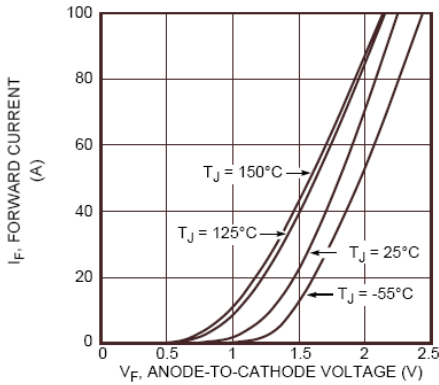


Figure 2. Forward Current vs. Forward Voltage

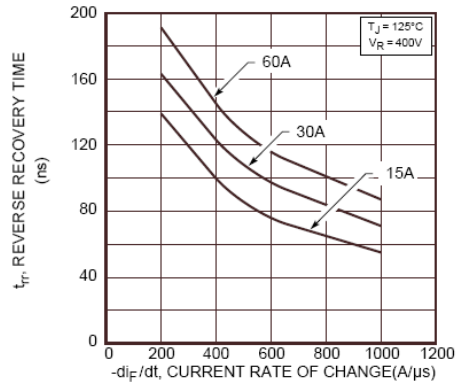


Figure 3. Reverse Recovery Time vs. Current Rate of Change

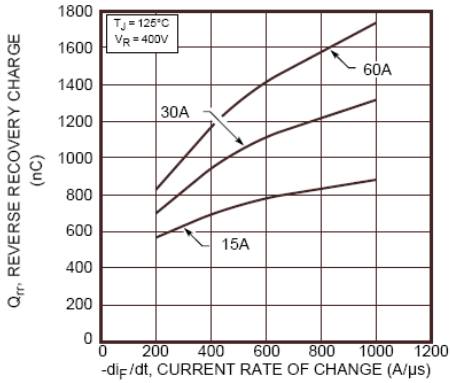


Figure 4. Reverse Recovery Charge vs. Current Rate of Change

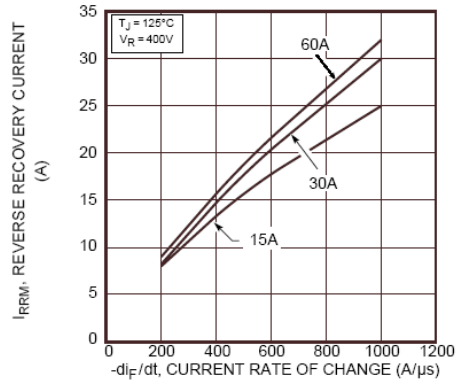


Figure 5. Reverse Recovery Current vs. Current Rate of Change

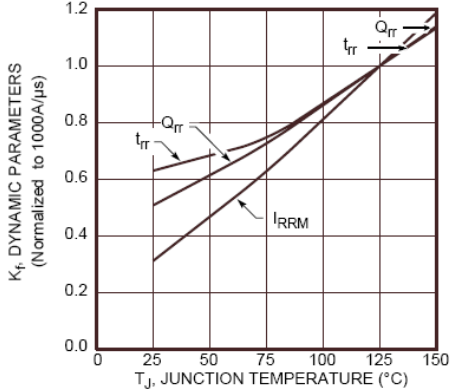


Figure 6. Dynamic Parameters vs. Junction Temperature

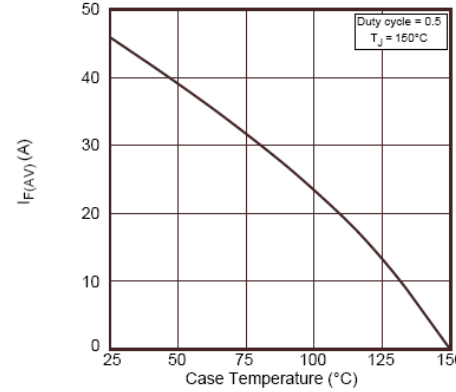


Figure 7. Maximum Average Forward Current vs. Case Temperature

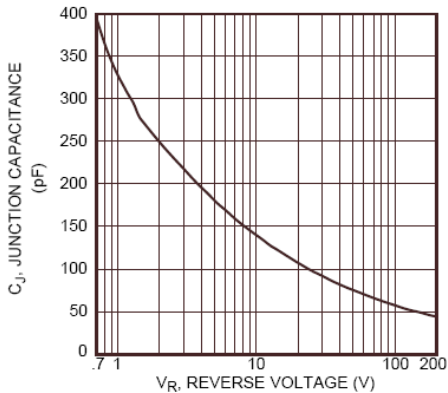


Figure 8. Junction Capacitance vs. Reverse Voltage

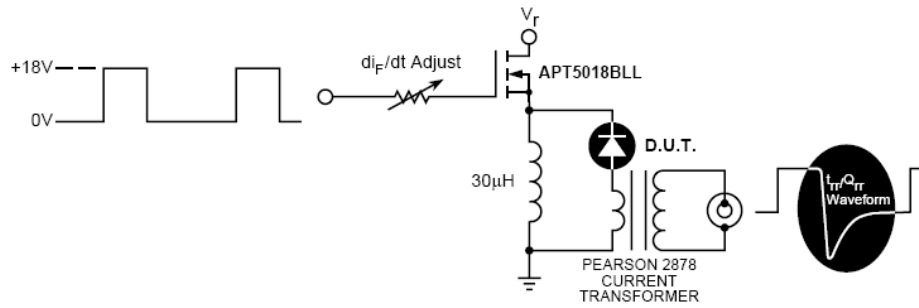


Figure 9. Diode Test Circuit

- ❶ I_F - Forward Conduction Current
- ❷ di_F/dt - Rate of Diode Current Change Through Zero Crossing.
- ❸ I_{RRM} - Maximum Reverse Recovery Current.
- ❹ t_{rr} - Reverse Recovery Time, measured from zero crossing where diode current goes from positive to negative, to the point at which the straight line through I_{RRM} and $0.25 \cdot I_{RRM}$ passes through zero.
- ❺ Q_{rr} - Area Under the Curve Defined by I_{RRM} and t_{rr} .

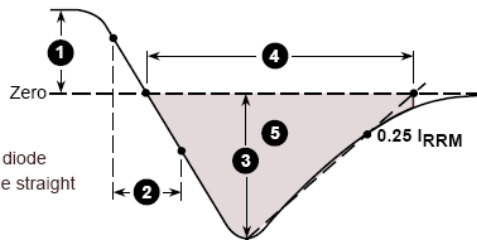
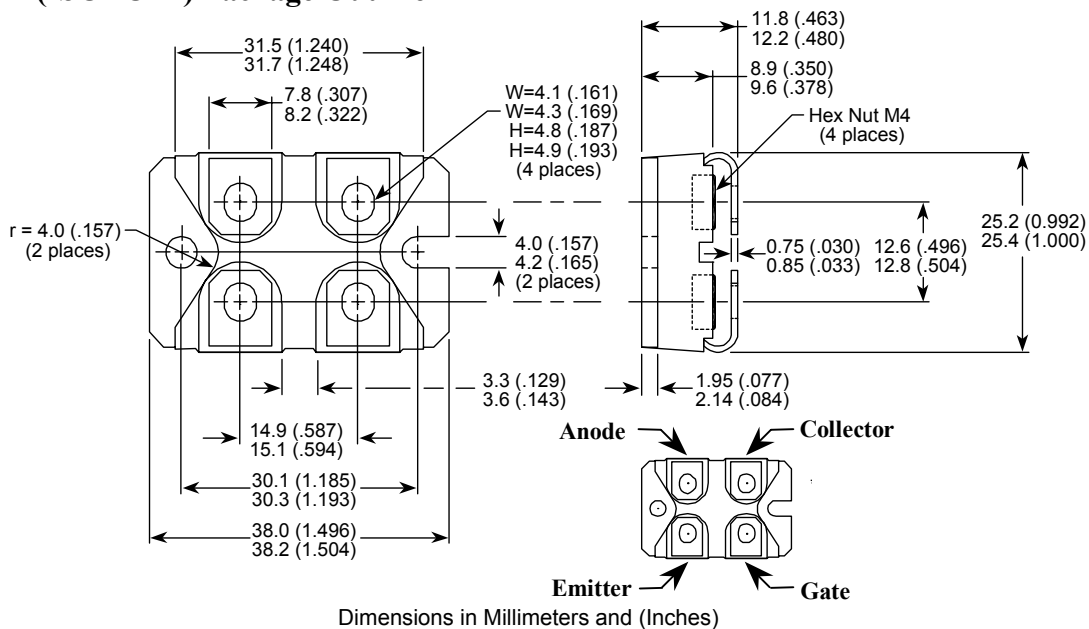


Figure 10. Diode Reverse Recovery Waveform and Definitions

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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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.