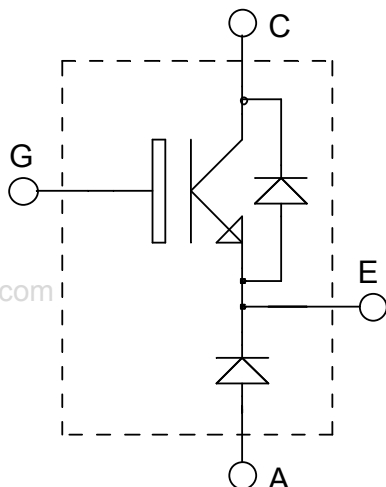


ISOTOP® Buck chopper Trench IGBT

**$V_{CES} = 1200V$
 $I_C = 35A @ T_c = 80^\circ C$**



Application

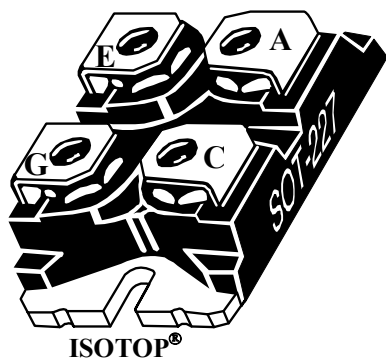
- AC and DC motor control
- Switched Mode Power Supplies

Features

- Trench + Field Stop IGBT® Technology
 - Low voltage drop
 - Low tail current
 - Switching frequency up to 20 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

- Low conduction losses
- 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			1200	V
I_{C1}	Continuous Collector Current	$T_C = 25^\circ C$		55	A
I_{C2}				35	
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$		80	
V_{GE}	Gate - Emitter Voltage			± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$		260	W
I_{FAV}	Maximum Average Forward Current	Duty cycle=0.5	$T_C = 80^\circ C$	27	A
I_{FRMS}	RMS Forward Current (Square wave, 50% duty)			34	



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 = 5mA		1200			V
I _{CES}	Zero Gate Voltage Collector Current	V _{GE} = 0V, V _{CE} = 1200V				5	mA
V _{CE(on)}	Collector Emitter on Voltage	V _{GE} = 15V I _C = 35A	T _j = 25°C	1.4	1.7	2.1	V
			T _j = 125°C		2.0		
V _{GE(th)}	Gate Threshold Voltage	V _{GE} = V _{CE} , I _C = 3mA		5.0		6.5	V
I _{GES}	Gate – Emitter Leakage Current	V _{GE} = ±20V, V _{CE} = 0V				500	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$		2530		pF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		132		
C_{res}	Reverse Transfer Capacitance	$f = 1MHz$		115		
$T_{d(on)}$	Turn-on Delay Time	Resistive Switching (25°C)		85		ns
T_r	Rise Time	$V_{GE} = 15V$ $V_{Bus} = 600V$		30		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 35A$		420		
T_f	Fall Time	$R_G = 27\Omega$		62		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		90		ns
T_r	Rise Time	$V_{GE} = 15V$ $V_{Bus} = 600V$		45		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 35A$		520		
T_f	Fall Time	$R_G = 27\Omega$		90		
E_{on}	Turn-on Switching Energy			5.8		mJ
E_{off}	Turn-off Switching Energy			4.6		

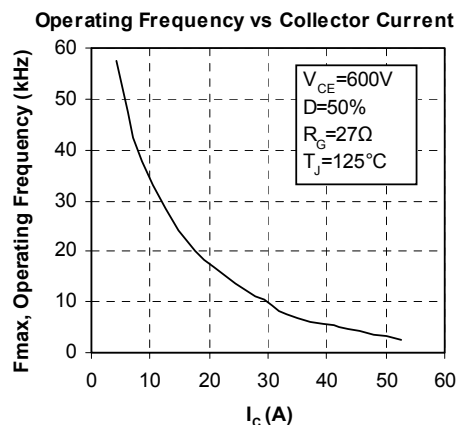
Diode ratings and characteristics

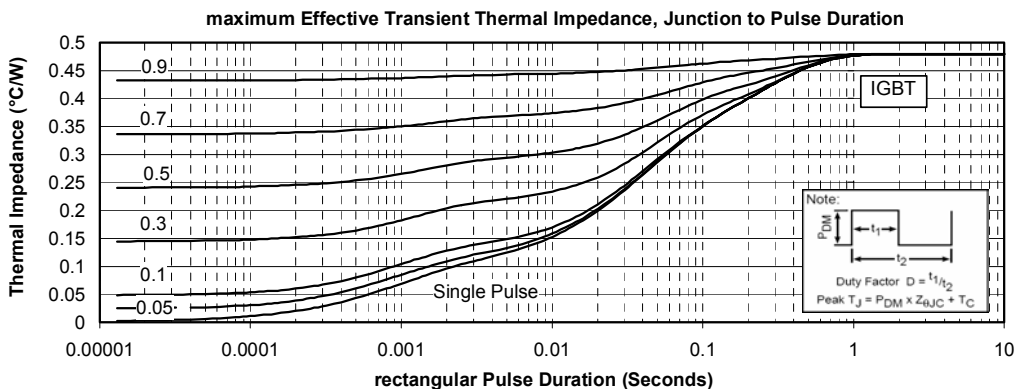
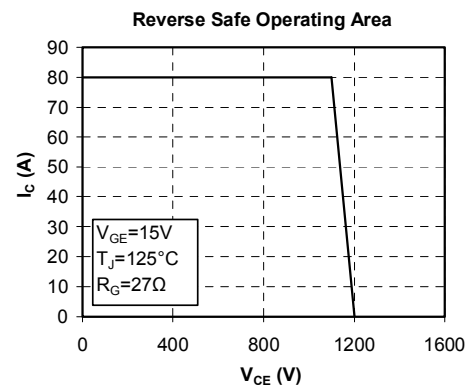
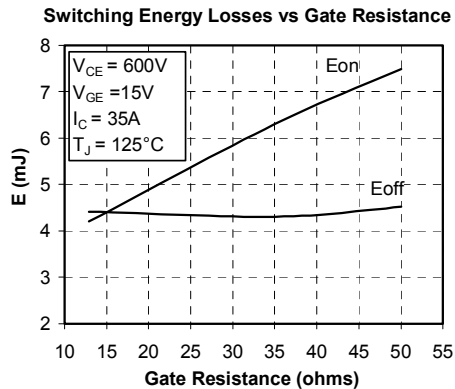
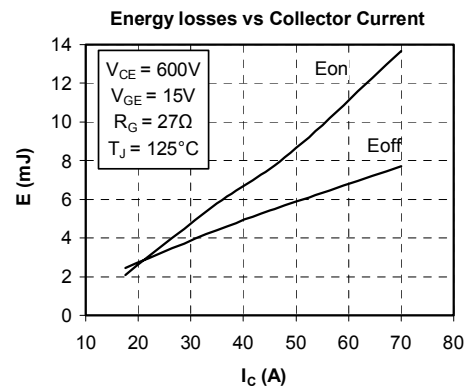
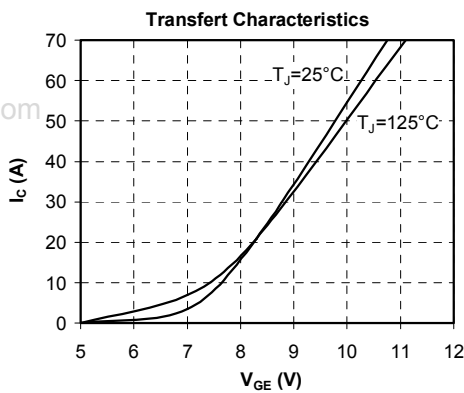
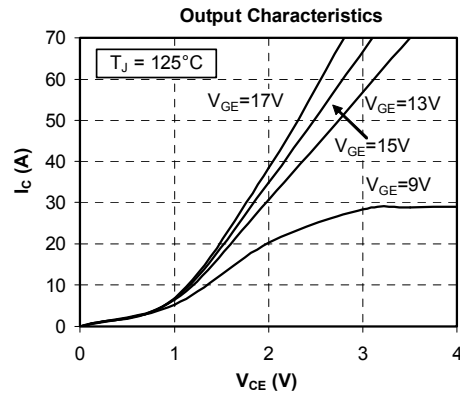
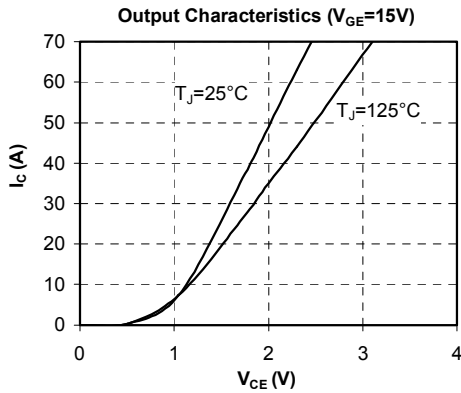
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit	
V _F	Diode Forward Voltage	I _F = 30A			2.0	2.5	V	
		I _F = 60A			2.3			
		I _F = 30A	T _j = 125°C		1.8			
I _{RM}	Maximum Reverse Leakage Current	V _R = 1200V	T _j = 25°C			250	μA	
		V _R = 1200V	T _j = 125°C			500		
C _T	Junction Capacitance	V _R = 200V			32		pF	
t _{rr}	Reverse Recovery Time	I _F =1A, V _R =30V di/dt =100A/μs	T _j = 25°C		31		ns	
	Reverse Recovery Time	I _F = 30A V _R = 800V di/dt =200A/μs	T _j = 25°C		370			
			T _j = 125°C		500			
I _{RRM}	Maximum Reverse Recovery Current		T _j = 25°C		5	A		
			T _j = 125°C		12			
Q _{rr}	Reverse Recovery Charge				T _j = 25°C		660	nC
					T _j = 125°C		3450	
t _{rr}	Reverse Recovery Time	I _F = 30A V _R = 800V di/dt =1000A/μs	T _j = 125°C		220		ns	
Q _{rr}	Reverse Recovery Charge				4650		nC	
I _{RRM}	Maximum Reverse Recovery Current					37		A

Thermal and package characteristics

Symbol	Characteristic		Min	Typ	Max	Unit
R_{thJC}	Junction to Case	IGBT			0.48	$^\circ C/W$
		Diode			1.1	
R_{thJA}	Junction to Ambient (IGBT & Diode)				20	$^\circ C/W$
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	$^\circ C$
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





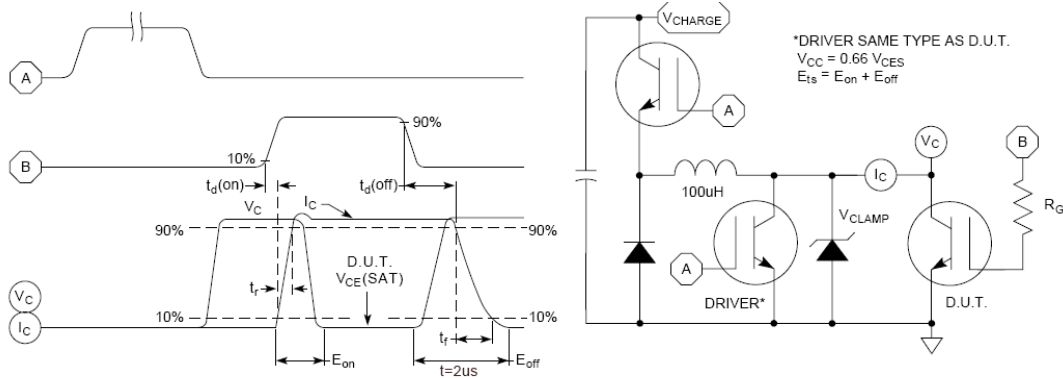


Figure 15, Switching Loss Test Circuit and Waveforms

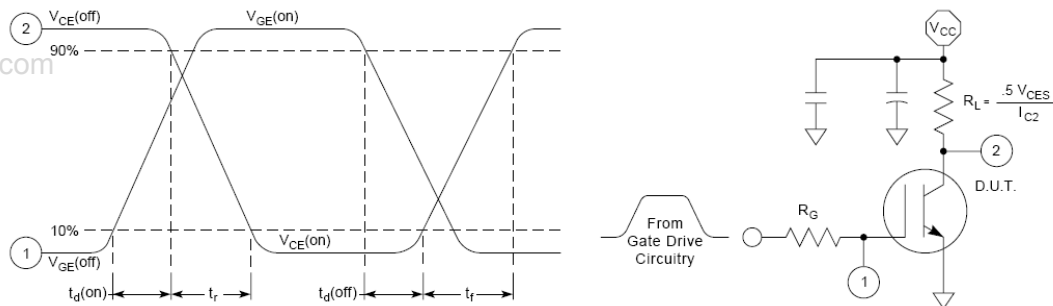


Figure 16, Resistive Switching Time Test Circuit and Waveforms

Typical Diode Performance Curve

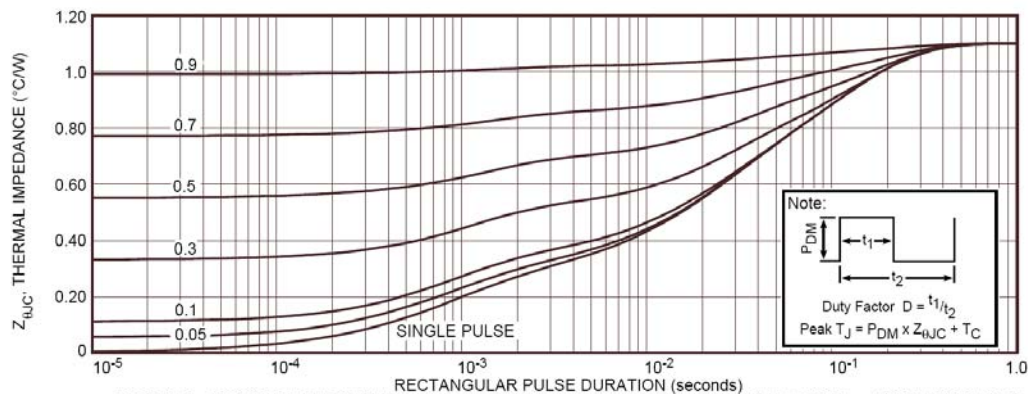


FIGURE 1a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

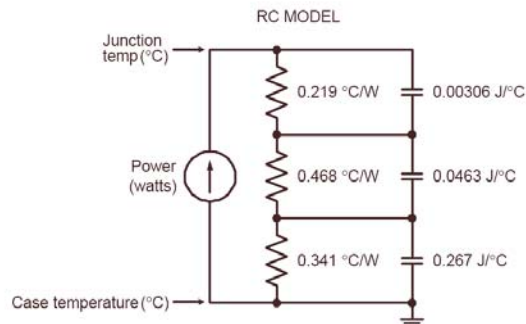


FIGURE 1b, TRANSIENT THERMAL IMPEDANCE MODEL

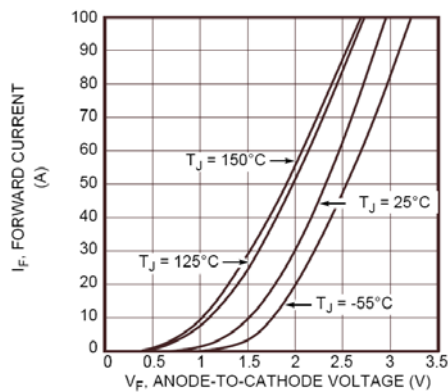


Figure 2. Forward Current vs. Forward Voltage

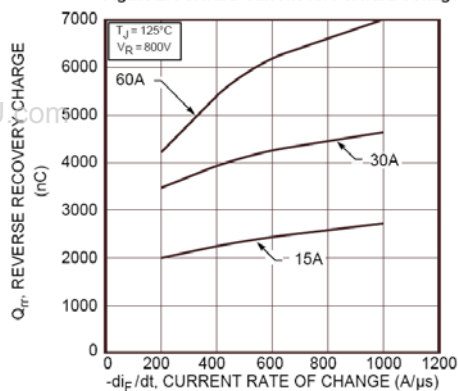


Figure 4. Reverse Recovery Charge vs. Current Rate of Change

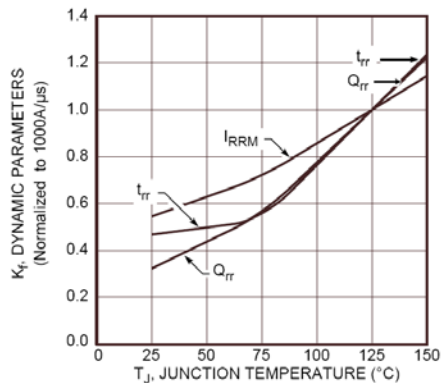


Figure 6. Dynamic Parameters vs. Junction Temperature

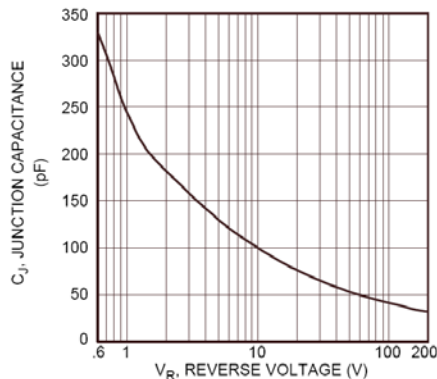


Figure 8. Junction Capacitance vs. Reverse Voltage

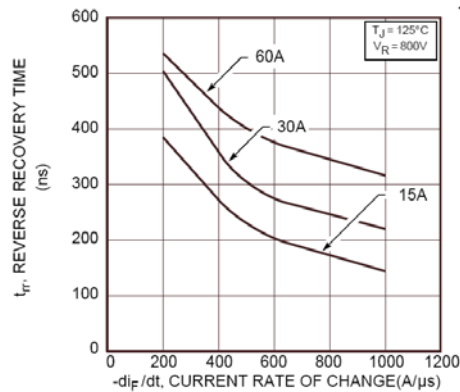


Figure 3. Reverse Recovery Time vs. Current Rate of Change

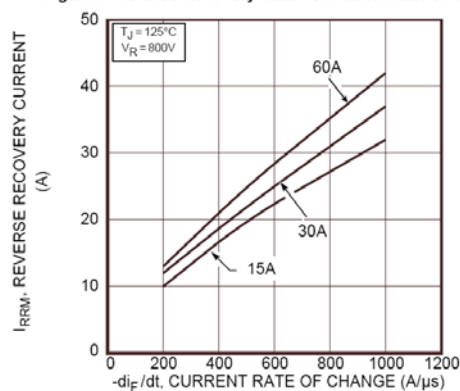


Figure 5. Reverse Recovery Current vs. Current Rate of Change

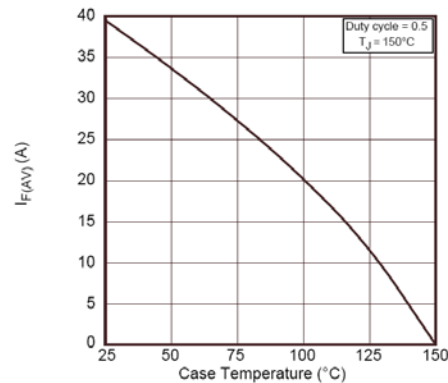


Figure 7. Maximum Average Forward Current vs. Case Temperature

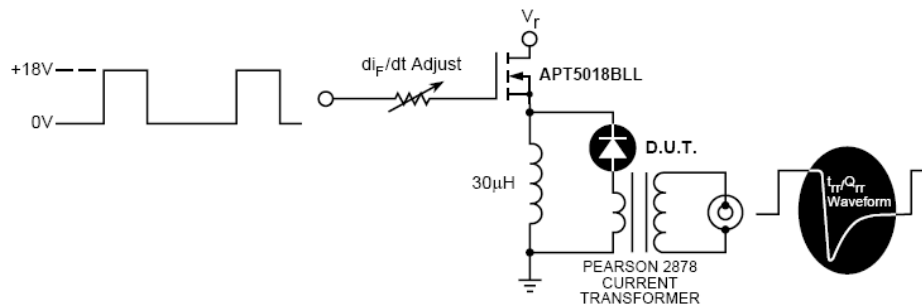


Figure 9. Diode Test Circuit

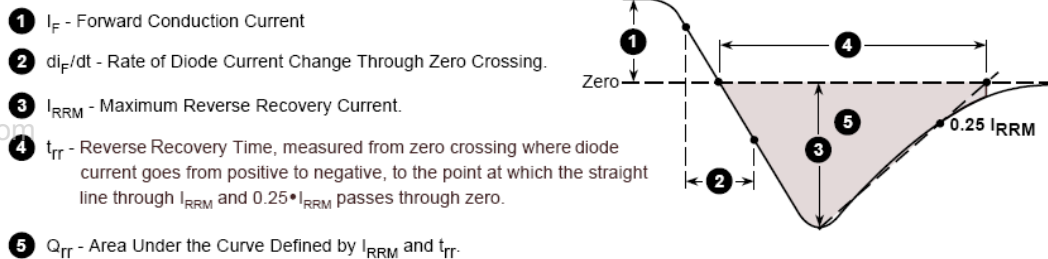
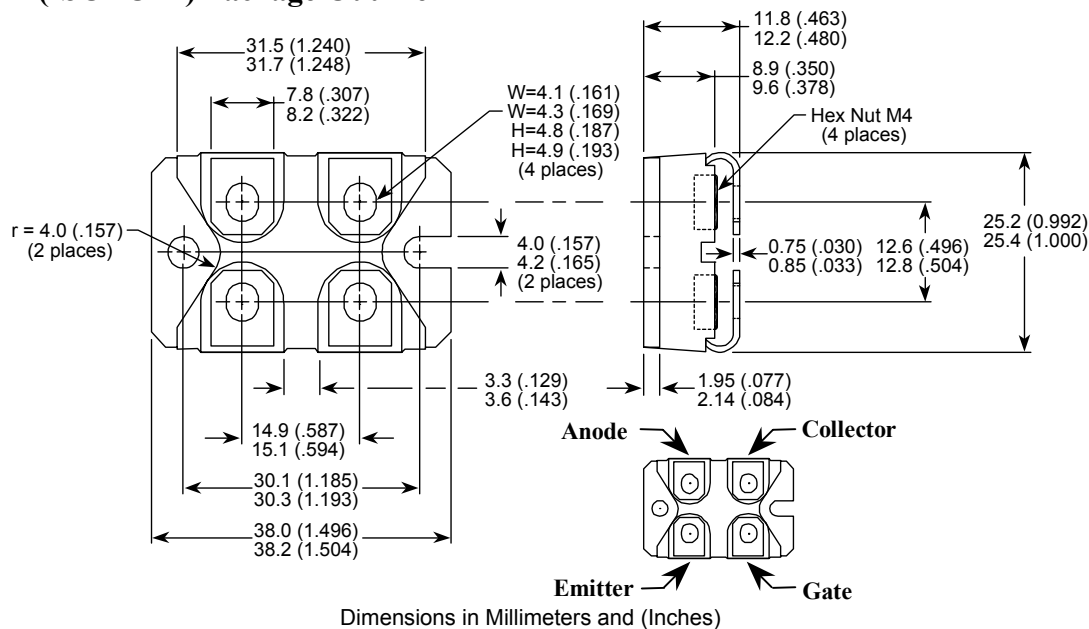


Figure 10. Diode Reverse Recovery Waveform and Definitions

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.