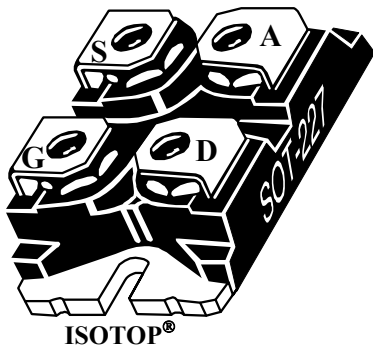
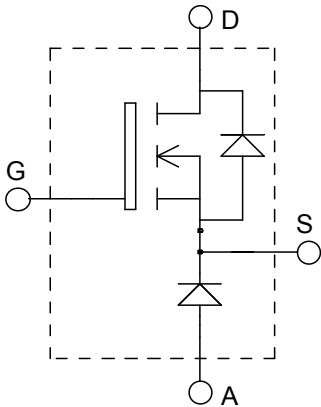


**ISOTOP[®] Buck chopper
MOSFET Power Module**

$V_{DSS} = 500V$
 $R_{DSon} = 75m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 51A \text{ @ } T_c = 25^\circ C$


Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- Power MOS 7[®] MOSFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- ISOTOP[®] Package (SOT-227)
- Very low stray inductance
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Very rugged
- Low profile
- RoHS Compliant

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	500	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	51
		$T_c = 80^\circ C$	39
I_{DM}	Pulsed Drain current	204	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	75	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	290
I_{AR}	Avalanche current (repetitive and non repetitive)	51	A
E_{AR}	Repetitive Avalanche Energy	50	mJ
E_{AS}	Single Pulse Avalanche Energy	2500	
IF_{AV}	Maximum Average Forward Current	Duty cycle=0.5	A
IF_{RMS}	RMS Forward Current (Square wave, 50% duty)	$T_c = 80^\circ C$	
			39

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 _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0V, V _{DS} = 500V T _j = 25°C			100	μA
		V _{GS} = 0V, V _{DS} = 400V T _j = 125°C			500	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 25.5A			75	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 1mA	3		5	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0V			±100	nA

Dynamic Characteristics

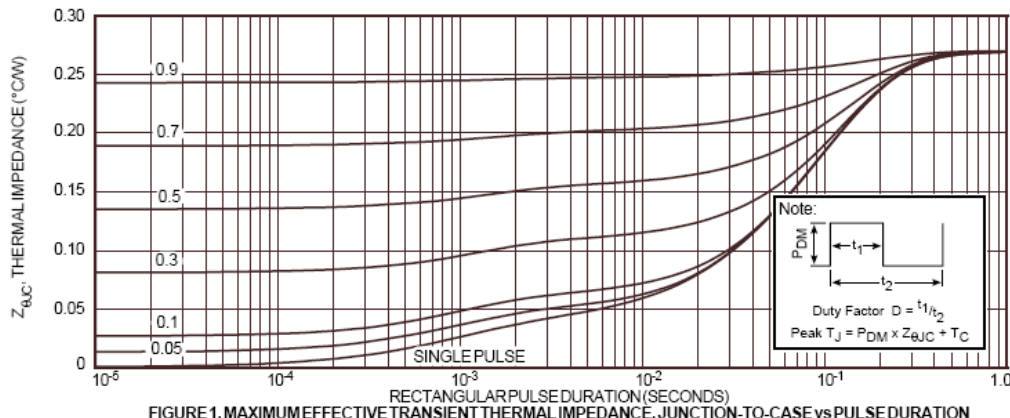
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1MHz		5590		pF
C _{oss}	Output Capacitance			1180		
C _{rss}	Reverse Transfer Capacitance			85		
Q _g	Total gate Charge	V _{GS} = 10V V _{Bus} = 250V I _D = 51A		123		nC
Q _{gs}	Gate – Source Charge			33		
Q _{gd}	Gate – Drain Charge			65		
T _{d(on)}	Turn-on Delay Time	Resistive Switching V _{GS} = 15V V _{Bus} = 250V I _D = 51A R _G = 0.6Ω		10		ns
T _r	Rise Time			20		
T _{d(off)}	Turn-off Delay Time			21		
T _f	Fall Time			5		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C V _{GS} = 15V, V _{Bus} = 330V I _D = 51A, R _G = 5Ω		755		μJ
E _{off}	Turn-off Switching Energy			726		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C V _{GS} = 15V, V _{Bus} = 330V I _D = 51A, R _G = 5Ω		1241		μJ
E _{off}	Turn-off Switching Energy			846		

Chopper diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
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			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 di/dt = 100A/μs	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		
			T _j = 125°C	130		
Q _{rr}	Reverse Recovery Charge		T _j = 25°C	700		nC
			T _j = 125°C	700		
t _{rr}	Reverse Recovery Time	I _F = 30A		70		ns
Q _{rr}	Reverse Recovery Charge	V _R = 400V	T _j = 125°C	1300		nC
I _{RRM}	Maximum Reverse Recovery Current	di/dt = 1000A/μs		30		A

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance	MOSFET		0.27	°C/W
		Diode		1.21	
R _{thJA}	Junction to Ambient (IGBT & Diode)			20	°C/W
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 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	°C
Torque	Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine)			1.5	N.m
Wt	Package Weight		29.2		g

Typical MOSFET Performance Curve


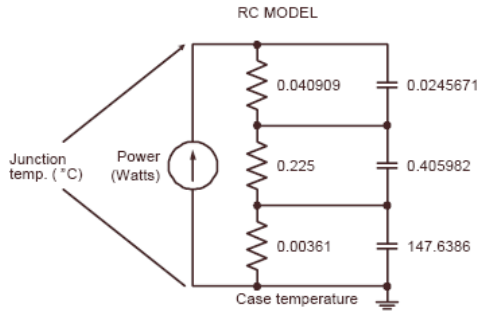


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

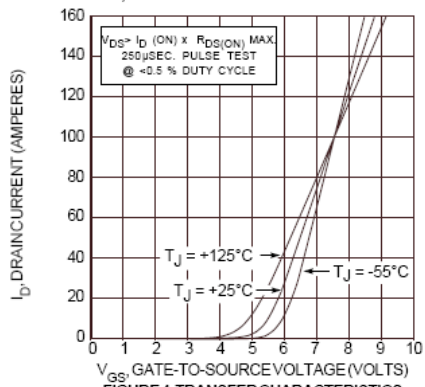


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

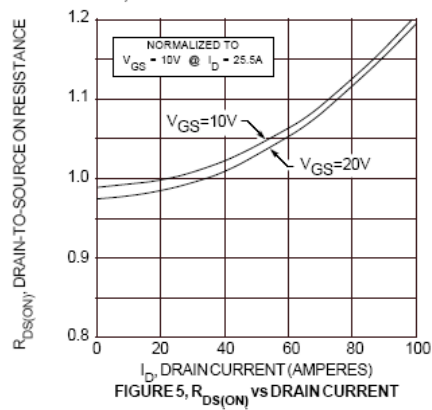


FIGURE 4, TRANSFER CHARACTERISTICS

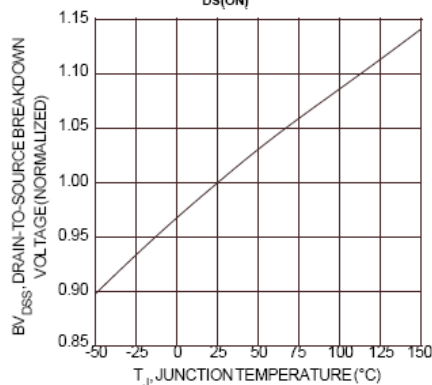


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

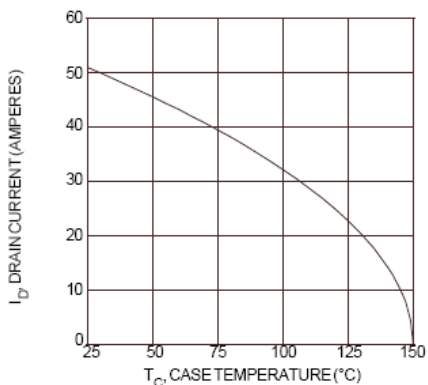


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

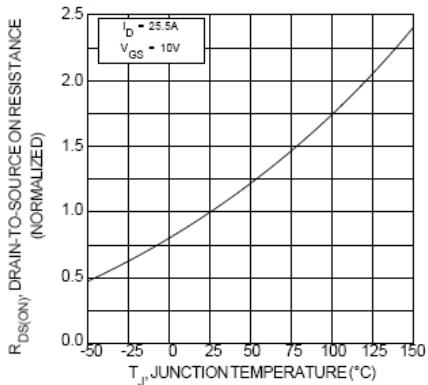


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

FIGURE 8, $R_{DS(ON)}$ vs. TEMPERATURE

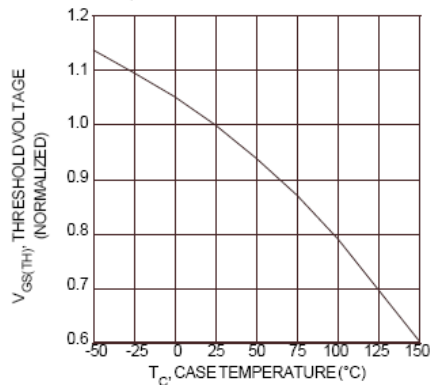


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

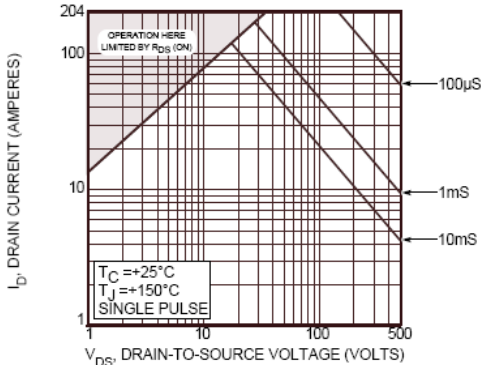


FIGURE 10, MAXIMUM SAFE OPERATING AREA

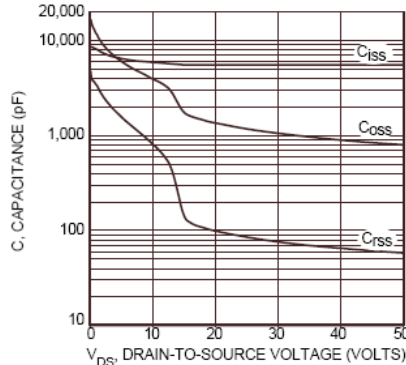


FIGURE 11, CAPACITANCE vs. DRAIN-TO-SOURCE VOLTAGE

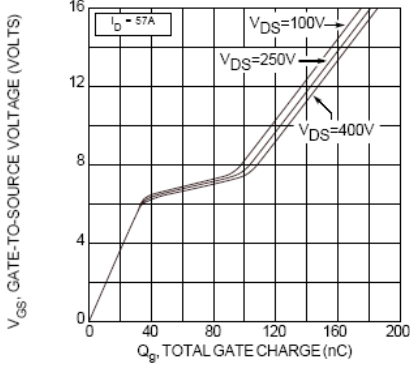


FIGURE 12, GATE CHARGE vs. GATE-TO-SOURCE VOLTAGE

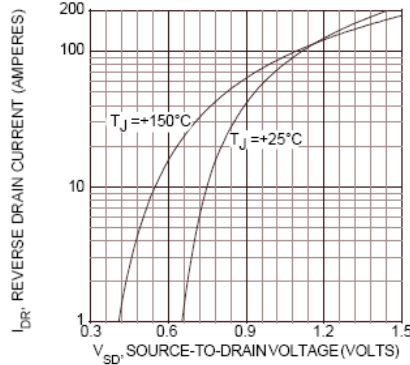


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

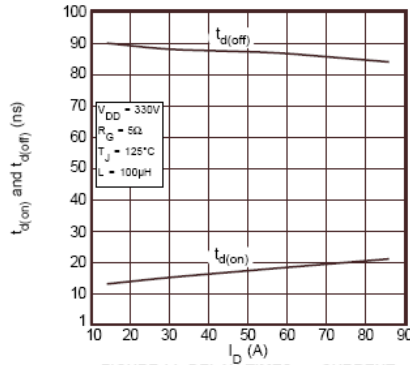


FIGURE 14, DELAY TIMES vs. CURRENT

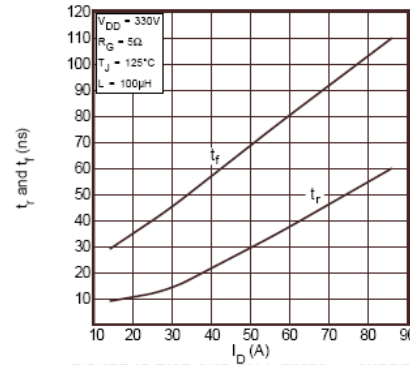


FIGURE 15, RISE AND FALL TIMES vs. CURRENT

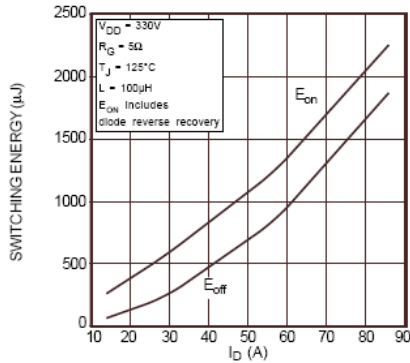


FIGURE 16, SWITCHING ENERGY vs. CURRENT

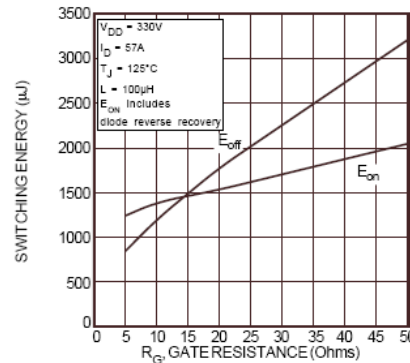


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

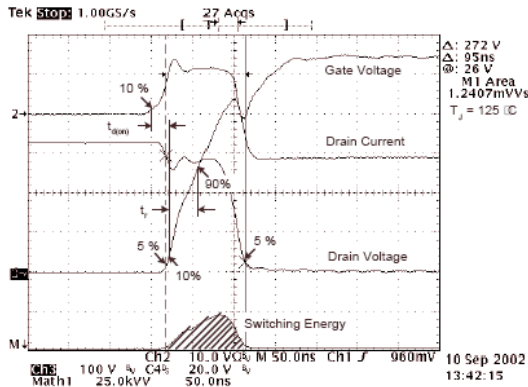


Figure 18, Turn-on Switching Waveforms and Definitions

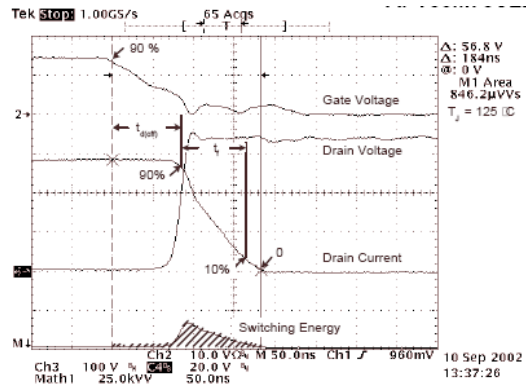


Figure 19, Turn-off Switching Waveforms and Definitions

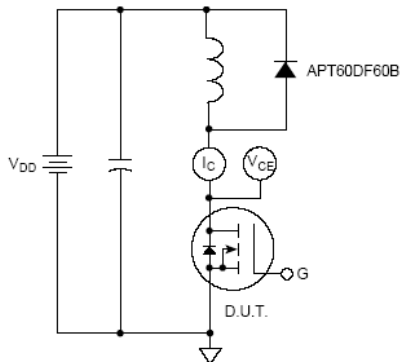


Figure 20, Inductive Switching Test Circuit

Typical Diode Performance Curve

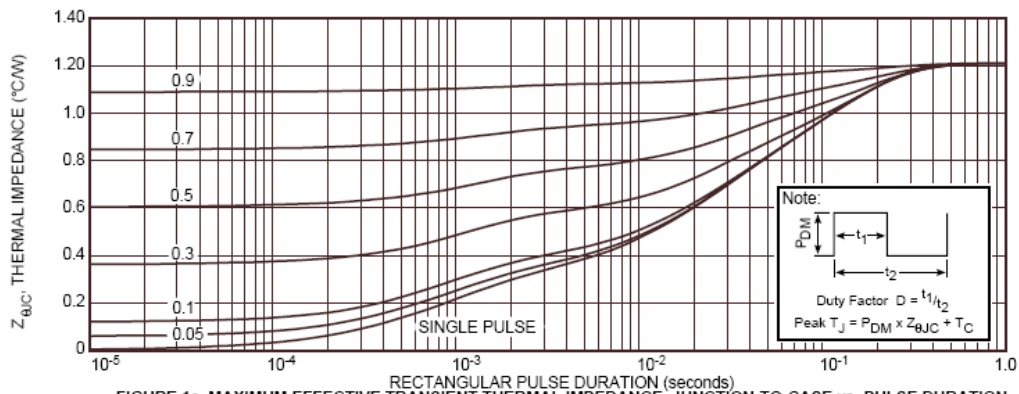


FIGURE 1a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

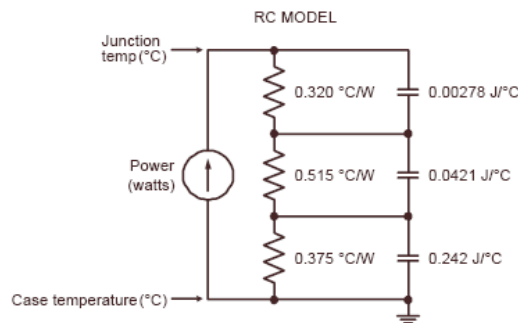


FIGURE 1b, TRANSIENT THERMAL IMPEDANCE MODEL

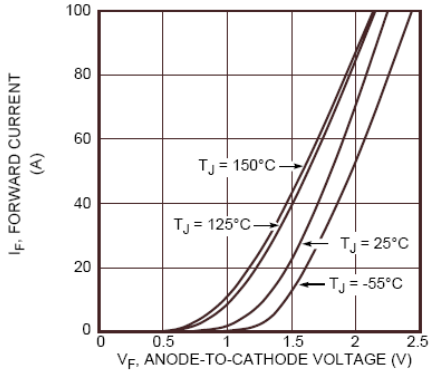


Figure 2. Forward Current vs. Forward Voltage

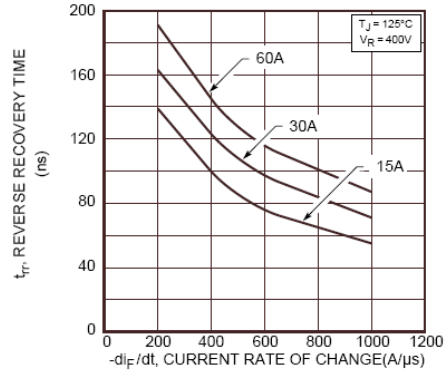


Figure 3. Reverse Recovery Time vs. Current Rate of Change

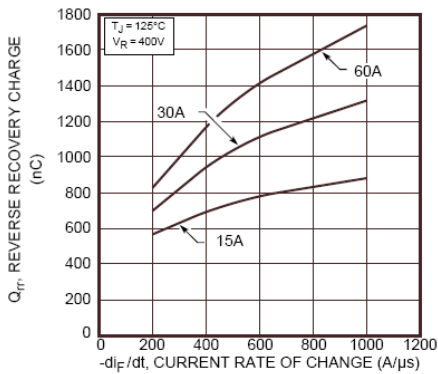


Figure 4. Reverse Recovery Charge vs. Current Rate of Change

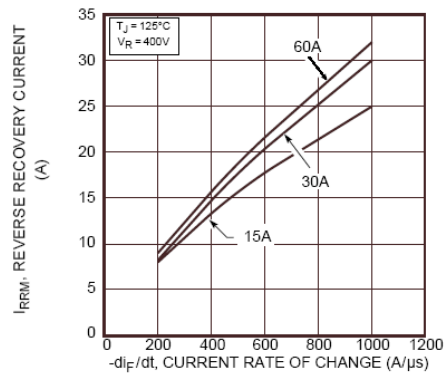


Figure 5. Reverse Recovery Current vs. Current Rate of Change

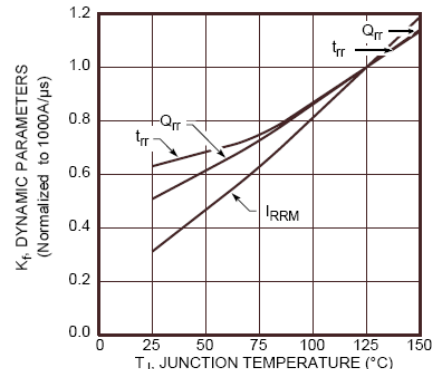


Figure 6. Dynamic Parameters vs. Junction Temperature

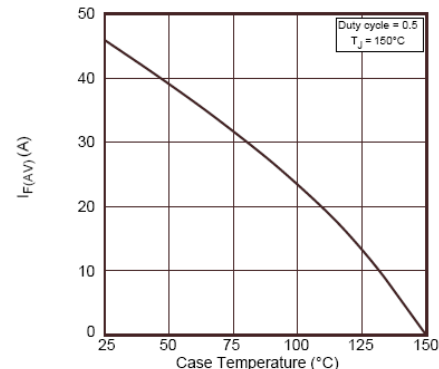


Figure 7. Maximum Average Forward Current vs. Case Temperature

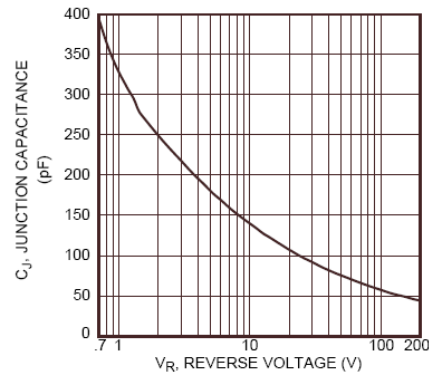


Figure 8. Junction Capacitance vs. Reverse Voltage

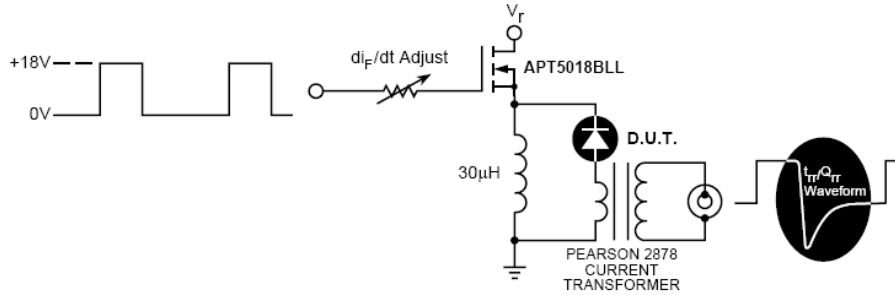


Figure 9. Diode Test Circuit

- 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} .

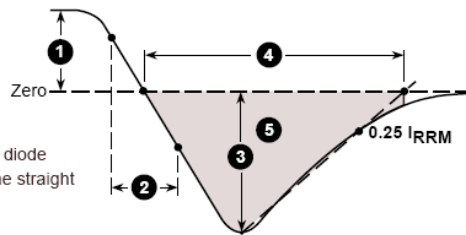
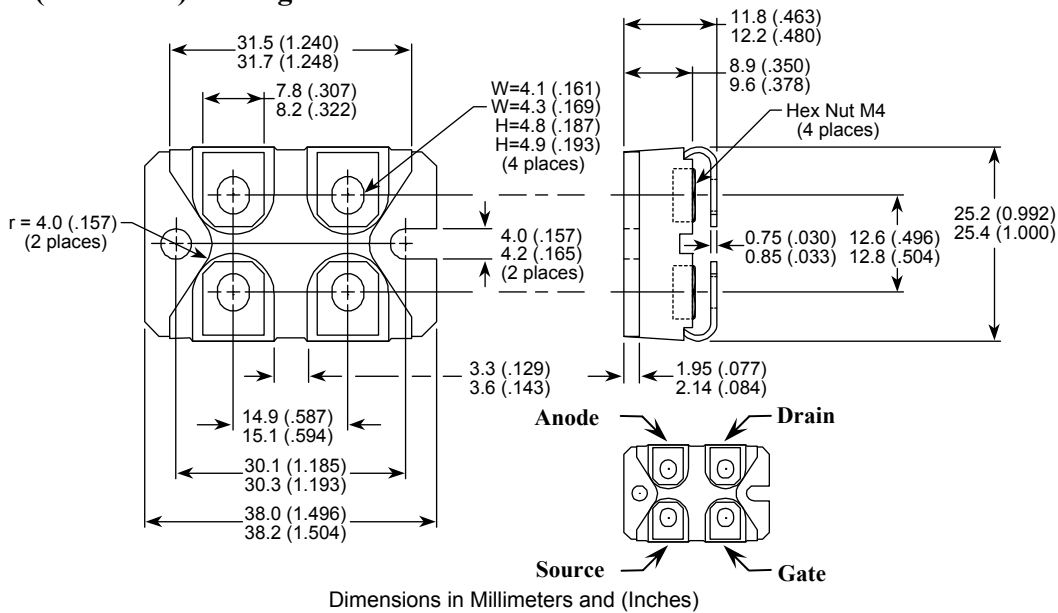


Figure 10. Diode Reverse Recovery Waveform and Definitions

SOT-227 (ISOTOP[®]) Package Outline



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