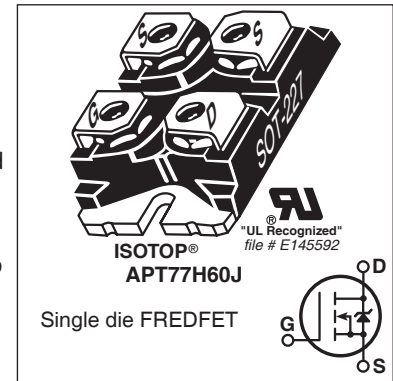



## N-Channel Ultrafast Recovery FREDFET

Power MOS 8™ is a high speed, high voltage N-channel switch-mode power MOSFET. This 'FREDFET' version has a drain-source (body) diode that has been optimized for maximum reliability in ZVS phase shifted bridge and other circuits through much reduced  $t_{rr}$ , soft recovery, and high recovery  $dv/dt$  capability. Low gate charge, high gain, and a greatly reduced ratio of  $C_{rSS}/C_{iSS}$  result in excellent noise immunity and low switching loss. The intrinsic gate resistance and capacitance of the poly-silicon gate structure help control  $di/dt$  during switching, resulting in low EMI and reliable paralleling, even when switching at very high frequency.



### FEATURES

- Fast switching with low EMI
- Very Low  $t_{rr}$  for maximum reliability
- Ultra low  $C_{rSS}$  for improved noise immunity
- Low gate charge
- Avalanche energy rated
- RoHS compliant 

### TYPICAL APPLICATIONS

- ZVS phase shifted and other full bridge
- Half bridge
- UPS
- Welding
- Solar inverters
- Telecom rectifiers

### Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	77	A
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	48	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	445	
$V_{GS}$	Gate-Source Voltage	±30	V
$E_{AS}$	Single Pulse Avalanche Energy <sup>②</sup>	3350	mJ
$I_{AR}$	Avalanche Current, Repetitive or Non-Repetitive	60	A

### Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$			960	W
$R_{\theta JC}$	Junction to Case Thermal Resistance			0.13	°C/W
$R_{\theta CS}$	Case to Sink Thermal Resistance, Flat, Greased Surface		0.15		
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55		150	°C
$V_{Isolation}$	RMS Voltage (50-60Hz Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.)	2500			V
$W_T$	Package Weight		1.03		oz
			29.2		g
Torque	Terminals and Mounting Screws.			10	in-lbf
				1.1	N-m

**Static Characteristics**
**T<sub>J</sub> = 25°C unless otherwise specified**
**APT77H60J**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V <sub>BR(DSS)</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	600			V
ΔV <sub>BR(DSS)/ΔT<sub>J</sub></sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> = 250μA		0.57		V/°C
R <sub>DS(on)</sub>	Drain-Source On Resistance <sup>③</sup>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 60A		0.050	0.065	Ω
V <sub>GS(th)</sub>	Gate-Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 5mA	3	4	5	V
ΔV <sub>GS(th)/ΔT<sub>J</sub></sub>	Threshold Voltage Temperature Coefficient			-10		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 600V V <sub>GS</sub> = 0V			100	μA
		T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C			1000	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = ±30V			±100	nA

**Dynamic Characteristics**
**T<sub>J</sub> = 25°C unless otherwise specified**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> = 50V, I <sub>D</sub> = 60A		115		S
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V f = 1MHz		24000		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			245		
C <sub>oss</sub>	Output Capacitance			2200		
C <sub>o(cr)</sub> <sup>④</sup>	Effective Output Capacitance, Charge Related	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 400V		1170		
C <sub>o(er)</sub> <sup>⑤</sup>	Effective Output Capacitance, Energy Related			605		
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 10V, I <sub>D</sub> = 60A, V <sub>DS</sub> = 300V		600		nC
Q <sub>gs</sub>	Gate-Source Charge			130		
Q <sub>gd</sub>	Gate-Drain Charge			250		
t <sub>d(on)</sub>	Turn-On Delay Time	<b>Resistive Switching</b> V <sub>DD</sub> = 400V, I <sub>D</sub> = 60A R <sub>G</sub> = 2.2Ω <sup>⑥</sup> , V <sub>GG</sub> = 15V		135		ns
t <sub>r</sub>	Current Rise Time			155		
t <sub>d(off)</sub>	Turn-Off Delay Time			410		
t <sub>f</sub>	Current Fall Time			125		

**Source-Drain Diode Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I <sub>S</sub>	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode (body diode)			77	A
I <sub>SM</sub>	Pulsed Source Current (Body Diode) <sup>①</sup>				445	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>SD</sub> = 60A, T <sub>J</sub> = 25°C, V <sub>GS</sub> = 0V			1.0	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 60A <sup>③</sup> di <sub>SD</sub> /dt = 100A/μs V <sub>DD</sub> = 100V	T <sub>J</sub> = 25°C	260	300	ns
			T <sub>J</sub> = 125°C	460	550	
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> = 25°C	2.08		μC
			T <sub>J</sub> = 125°C	5.54		
I <sub>rrm</sub>	Reverse Recovery Current		T <sub>J</sub> = 25°C	11.6		A
		T <sub>J</sub> = 125°C	17.8			
dv/dt	Peak Recovery dv/dt	I <sub>SD</sub> ≤ 60A, di/dt ≤ 1000A/μs, V <sub>DD</sub> = 400V, T <sub>J</sub> = 125°C			30	V/ns

① Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

② Starting at T<sub>J</sub> = 25°C, L = 1.86mH, R<sub>G</sub> = 2.2Ω, I<sub>AS</sub> = 60A.

③ Pulse test: Pulse Width < 380μs, duty cycle < 2%.

④ C<sub>o(cr)</sub> is defined as a fixed capacitance with the same stored charge as C<sub>OSS</sub> with V<sub>DS</sub> = 67% of V<sub>(BR)DSS</sub>.

⑤ C<sub>o(er)</sub> is defined as a fixed capacitance with the same stored energy as C<sub>OSS</sub> with V<sub>DS</sub> = 67% of V<sub>(BR)DSS</sub>. To calculate C<sub>o(er)</sub> for any value of V<sub>DS</sub> less than V<sub>(BR)DSS</sub>, use this equation: C<sub>o(er)</sub> = -2.32E-7/V<sub>DS</sub><sup>2</sup> + 9.75E-8/V<sub>DS</sub> + 3.64E-10.

⑥ R<sub>G</sub> is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

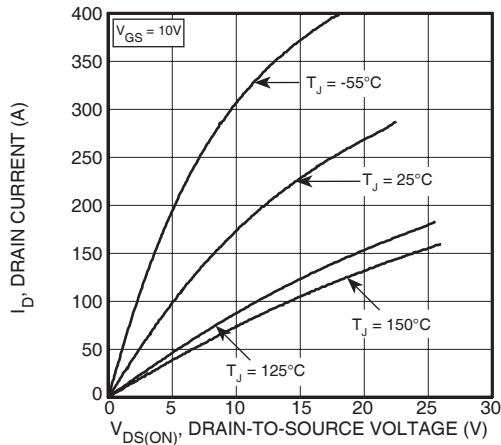


Figure 1, Output Characteristics

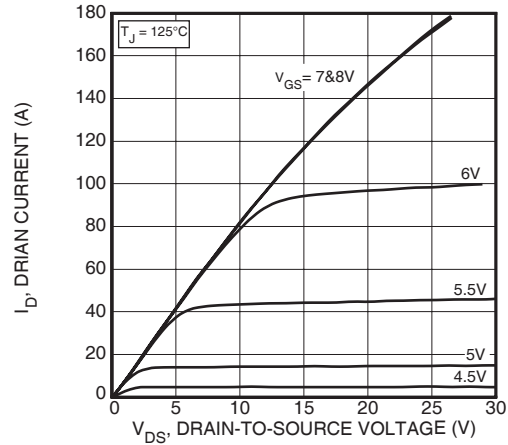


Figure 2, Output Characteristics

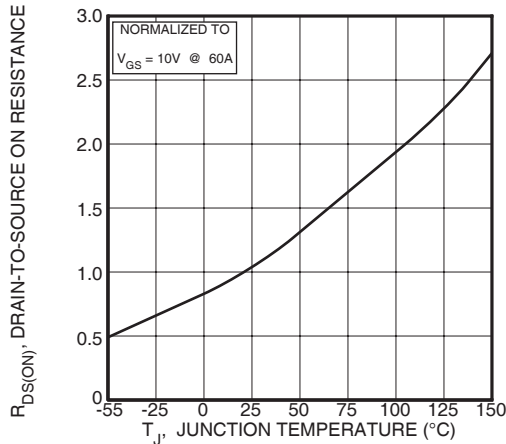


Figure 3,  $R_{DS(ON)}$  vs Junction Temperature

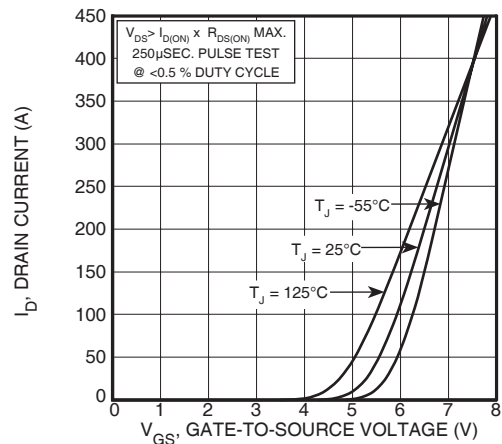


Figure 4, Transfer Characteristics

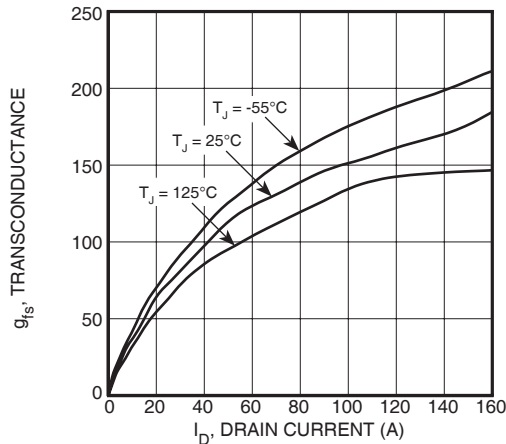


Figure 5, Gain vs Drain Current

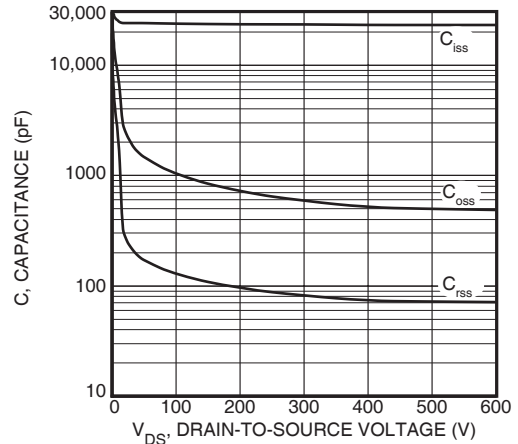


Figure 6, Capacitance vs Drain-to-Source Voltage

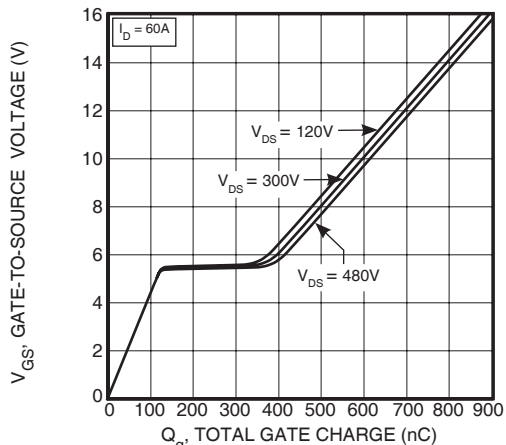


Figure 7, Gate Charge vs Gate-to-Source Voltage

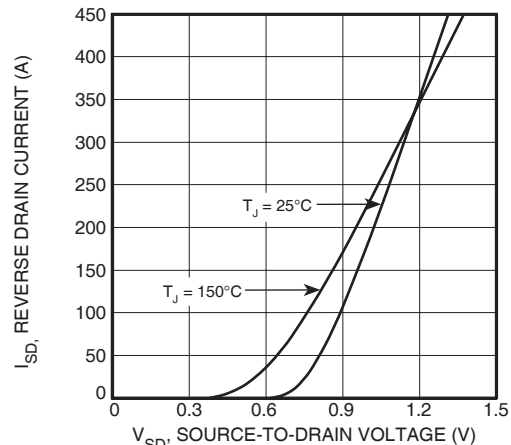
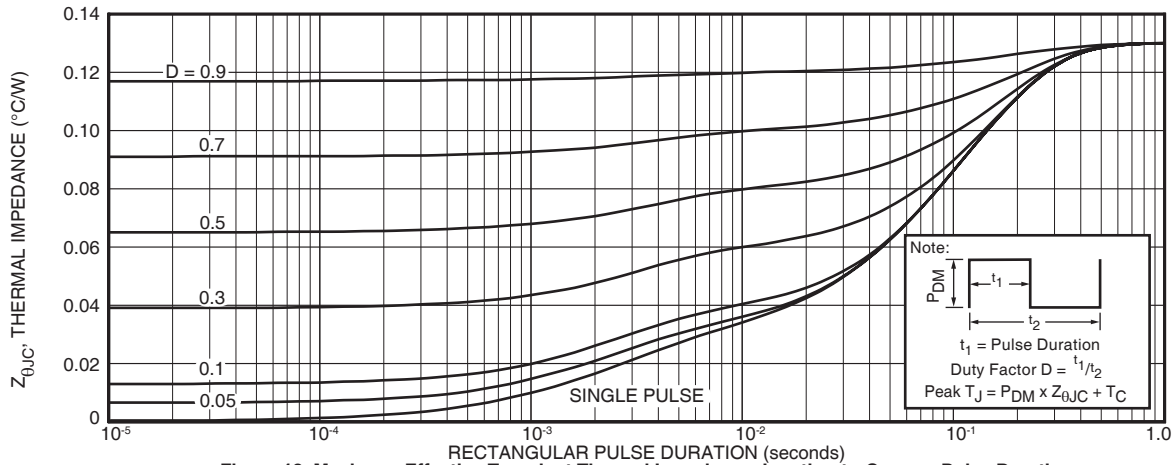
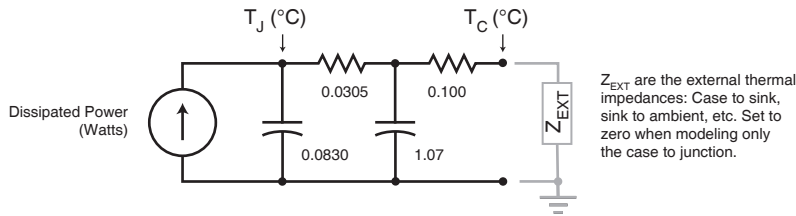
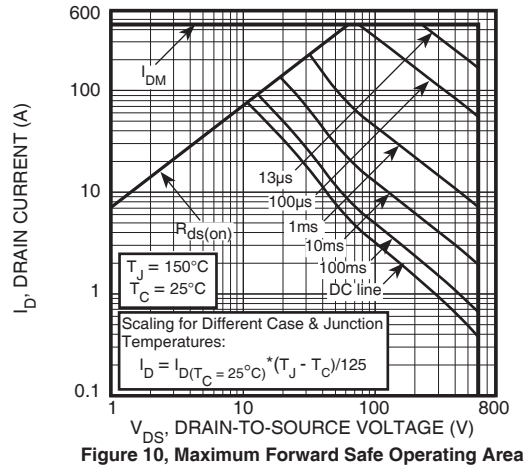
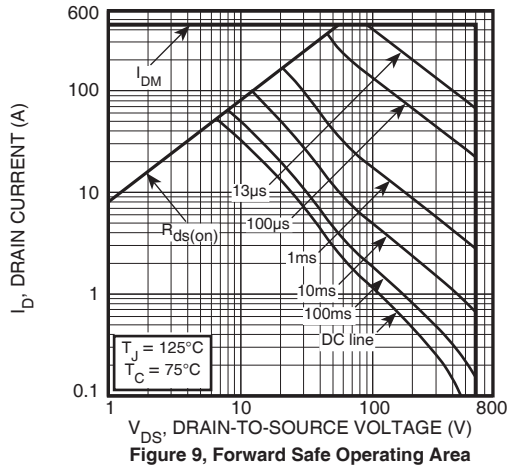
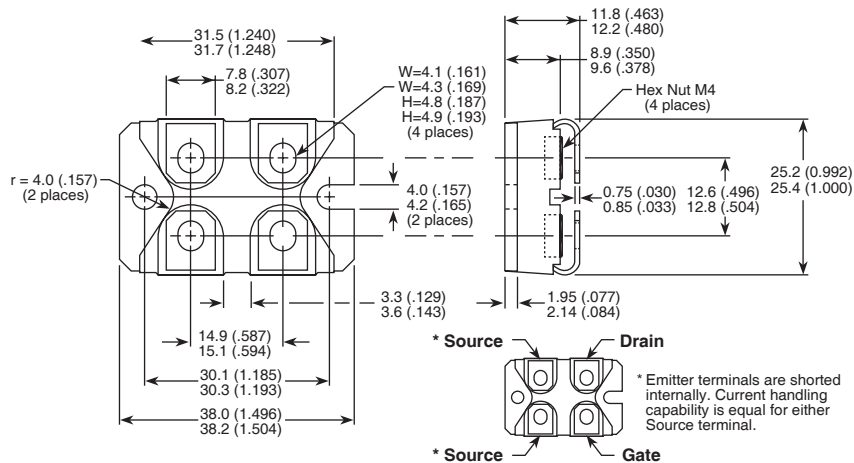


Figure 8, Reverse Drain Current vs Source-to-Drain Voltage



**SOT-227 (ISOTOP®) Package Outline**



Dimensions in Millimeters and (Inches)

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