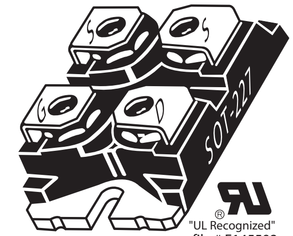
APT80F60J

600V, 84A, 0.055Ω Max, t_{rr} ≤ 370ns

N-Channel 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 high reliability in ZVS phase shifted bridge and other circuits through 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.

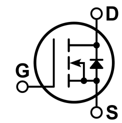


ISOTOP®

"UL Recognized" file # E145592

APT80F60J

Single die FREDFET



FEATURES

- **Fast switching with low EMI**
- **Low t_{rr} for high 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**
- **PFC and other boost converter**
- **Buck converter**
- **Single and two switch forward**
- **Flyback**

Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
I_D	Continuous Drain Current @ T_C = 25°C	84	A
	Continuous Drain Current @ T_C = 100°C	52	
I_{DM}	Pulsed Drain Current ①	447	
V_{GS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy ②	3352	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°C			961	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 (50-60hHz 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

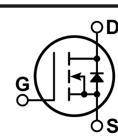
Static Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA		600			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D = 250μA			0.60		V/°C
$R_{DS(on)}$	Drain-Source On Resistance③	V_{GS} = 10V, I_D = 60A			0.042	0.055	Ω
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 2.5mA		2.5	4	5	V
$\Delta V_{GS(th)}/\Delta T_J$	Threshold Voltage Temperature Coefficient				-10		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600V	T_J = 25°C			250	μA
		V_{GS} = 0V	T_J = 125°C			1000	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = ±30V				±100	nA

Dynamic Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
g_{fs}	Forward Transconductance	V_{DS} = 50V, I_D = 60A		117		S
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 25V f = 1MHz		23994		pF
C_{rss}	Reverse Transfer Capacitance			245		
C_{oss}	Output Capacitance			2201		
$C_{o(cr)}$ ④	Effective Output Capacitance, Charge Related	V_{GS} = 0V, V_{DS} = 0V to 400V		1170		
$C_{o(er)}$ ⑤	Effective Output Capacitance, Energy Related			606		
Q_g	Total Gate Charge	V_{GS} = 0 to 10V, I_D = 60A, V_{DS} = 300V		598		nC
Q_{gs}	Gate-Source Charge			128		
Q_{gd}	Gate-Drain Charge			251		
$t_{d(on)}$	Turn-On Delay Time	**Resistive Switching** V_{DD} = 400V, I_D = 60A R_G = 2.2Ω⑥, V_{GG} = 15V		134		ns
t_r	Current Rise Time			156		
$t_{d(off)}$	Turn-Off Delay Time			408		
t_f	Current Fall Time			123		

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
I_S	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode (body diode) 				84	A
I_{SM}	Pulsed Source Current (Body Diode)①					447	
V_{SD}	Diode Forward Voltage	I_{SD} = 60A, T_J = 25°C, V_{GS} = 0V				1.2	V
t_{rr}	Reverse Recovery Time	I_{SD} = 60A③ V_{DD} = 100V di_{SD}/dt = 100A/μs	T_J = 25°C			370	ns
			T_J = 125°C			690	
Q_{rr}	Reverse Recovery Charge		T_J = 25°C		2.6		μC
			T_J = 125°C		7.0		
I_{rrm}	Reverse Recovery Current		T_J = 25°C		14.5		A
			T_J = 125°C		20		
dv/dt	Peak Recovery dv/dt	I_{SD} ≤ 60A, di/dt ≤1000A/μs, V_{DD} = 400V, T_J = 125°C				25	V/ns

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

2 Starting at T_J = 25°C, L = 2.08mH, R_G = 25Ω, I_{AS} = 60A.

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

4 $C_{o(cr)}$ is defined as a fixed capacitance with the same stored charge as C_{OSS} with V_{DS} = 67% of $V_{(BR)DSS}$.

5 $C_{o(er)}$ is defined as a fixed capacitance with the same stored energy as C_{OSS} with V_{DS} = 67% of $V_{(BR)DSS}$. To calculate $C_{o(er)}$ for any value of V_{DS} less than $V_{(BR)DSS,}$ use this equation: $C_{o(er)}$ = -3.14E-7/V_{DS}^2 + 7.31E-8/V_{DS} + 2.09E-10.

6 R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

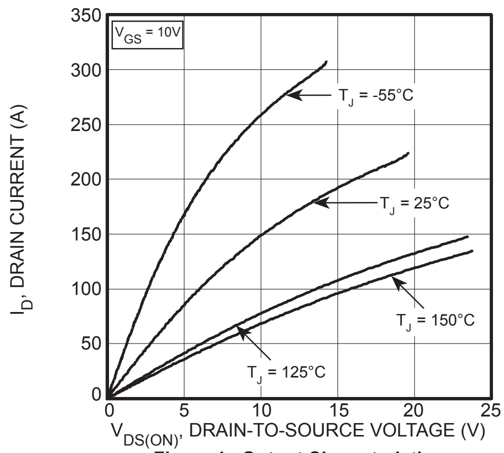


Figure 1, Output Characteristics

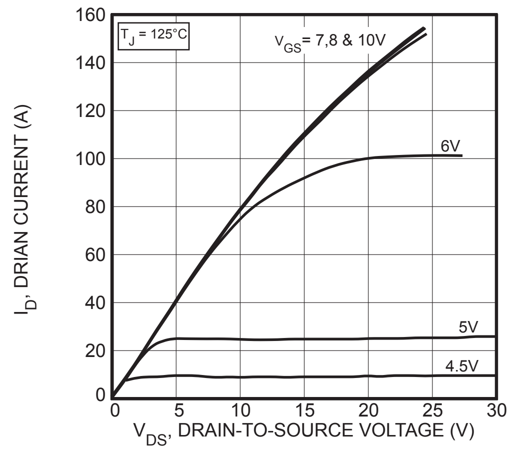


Figure 2, Output Characteristics

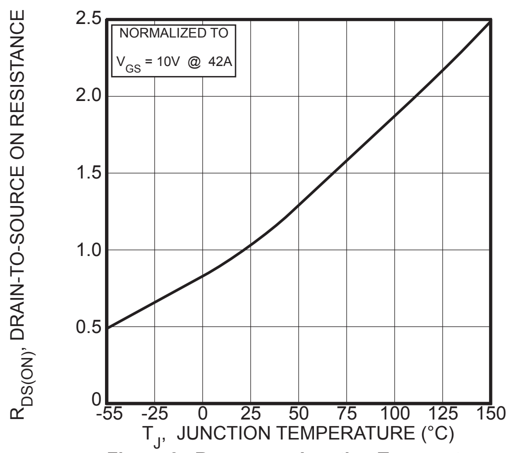


Figure 3, $R_{DS(ON)}$ vs Junction Temperature

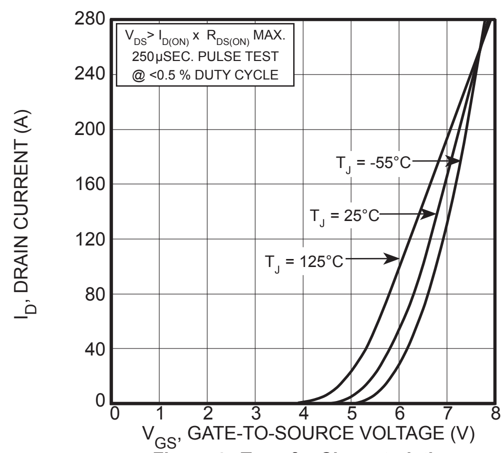


Figure 4, Transfer Characteristics

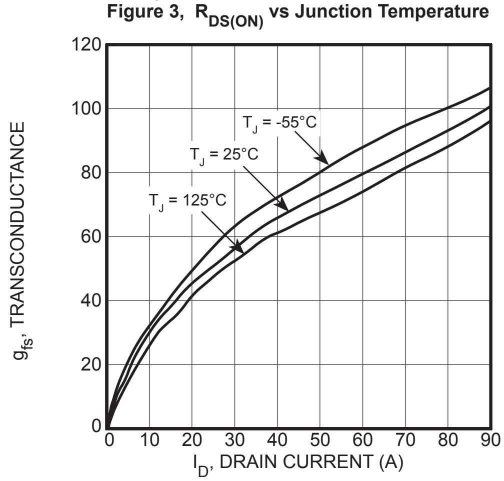


Figure 5, Gain vs Drain Current

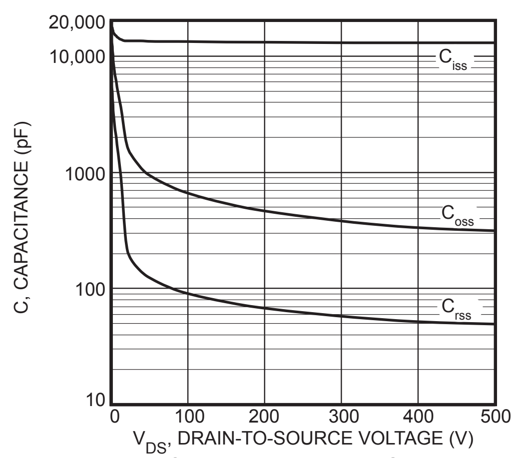


Figure 6, Capacitance vs Drain-to-Source Voltage

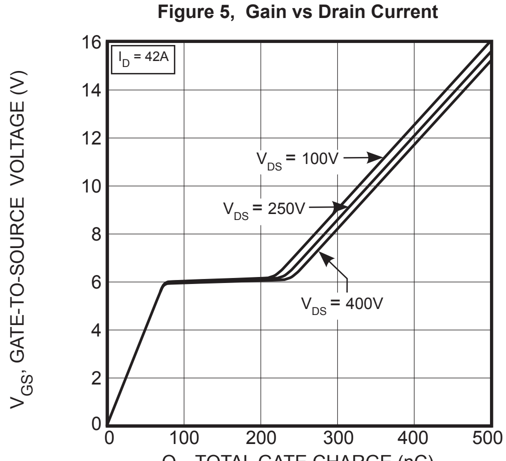


Figure 7, Gate Charge vs Gate-to-Source Voltage

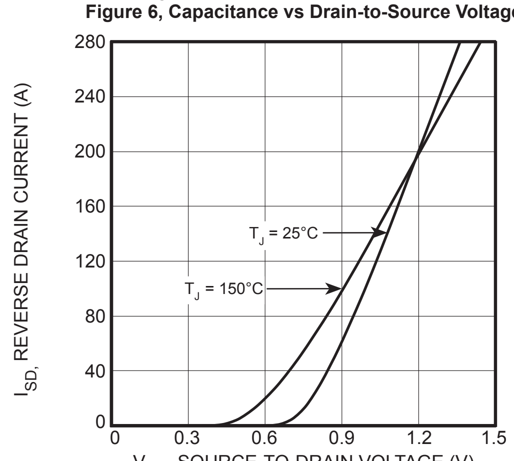


Figure 8, Reverse Drain Current vs Source-to-Drain Voltage

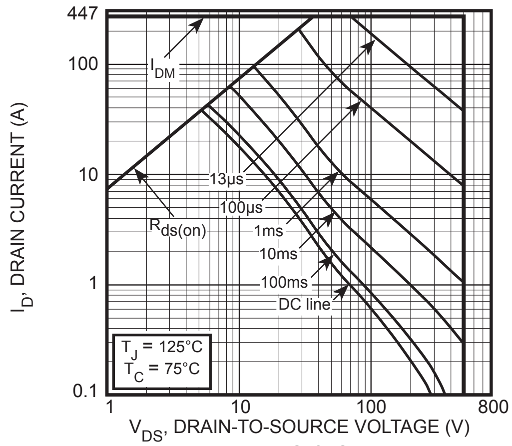


Figure 9, Forward Safe Operating Area

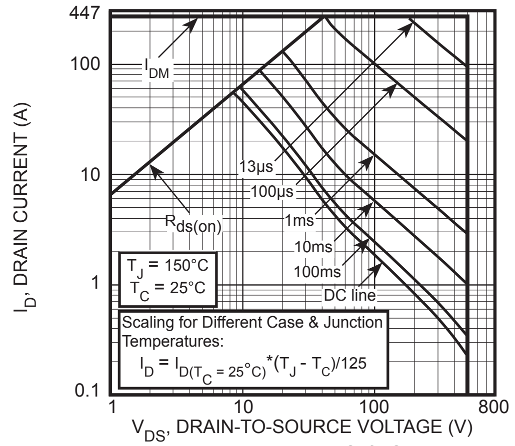


Figure 10, Maximum Forward Safe Operating Area

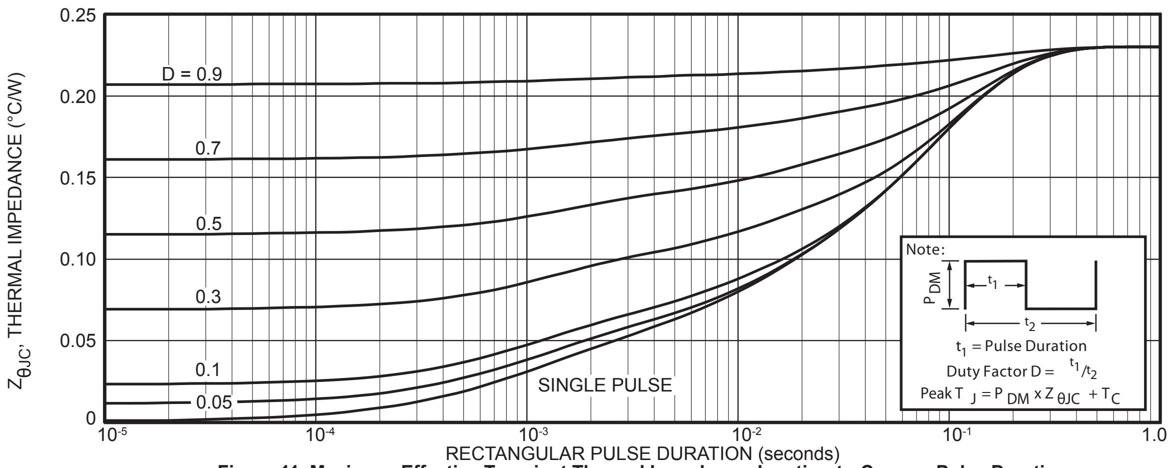
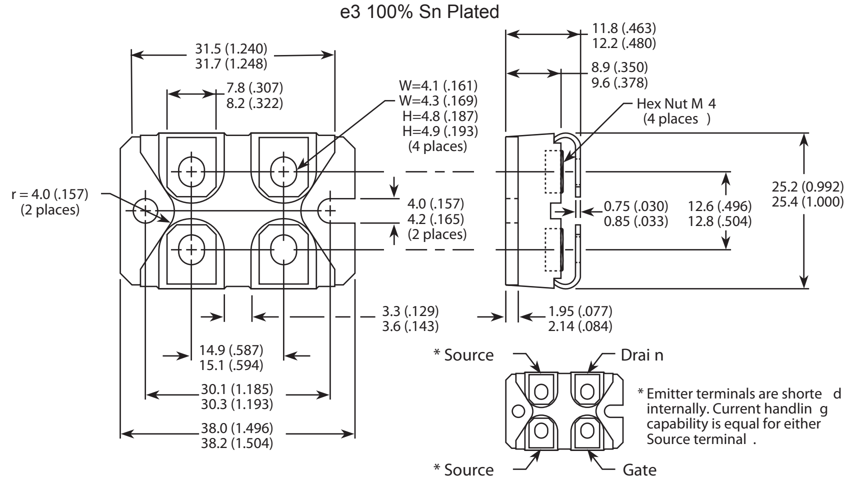


Figure 11. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

SOT-227 (ISOTOP®) Package Outline

e3 100% Sn Plated



Dimensions in Millimeters and (Inches)

050-8175 Rev C 4-2011

Стандарт
Электрон
Связь

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