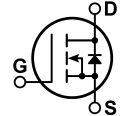


## N-Channel FREDFET


POWER MOS 8<sup>®</sup> 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.



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 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 @ $T_C = 25^\circ C$	31	A
	Continuous Drain Current @ $T_C = 100^\circ C$	19	
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	173	
$V_{GS}$	Gate-Source Voltage	±30	V
$E_{AS}$	Single Pulse Avalanche Energy <sup>2</sup>	1979	mJ
$I_{AR}$	Avalanche Current, Repetitive or Non-Repetitive	24	A

### Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$P_D$	Total Power Dissipation @ $T_C = 25^\circ C$			543	W
$R_{\theta JC}$	Junction to Case Thermal Resistance			0.23	°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**
**APT29F80J**

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	800			V
ΔV <sub>BR(DSS)</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> = 250μA		1.41		V/°C
R <sub>DS(on)</sub>	Drain-Source On Resistance <sup>③</sup>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 24A		0.19	0.21	Ω
V <sub>GS(th)</sub>	Gate-Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 2.5mA	2.5	4	5	V
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Threshold Voltage Temperature Coefficient			-10		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 800V V <sub>GS</sub> = 0V			250	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> = 24A		43		S
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V f = 1MHz		9326		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			159		
C <sub>oss</sub>	Output Capacitance			927		
C <sub>o(cr)</sub> <sup>4</sup>	Effective Output Capacitance, Charge Related	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 533V		438		
C <sub>o(er)</sub> <sup>5</sup>	Effective Output Capacitance, Energy Related			217		
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 10V, I <sub>D</sub> = 24A, V <sub>DS</sub> = 400V		303		nC
Q <sub>gs</sub>	Gate-Source Charge			51		
Q <sub>gd</sub>	Gate-Drain Charge			155		
t <sub>d(on)</sub>	Turn-On Delay Time	Resistive Switching V <sub>DD</sub> = 533V, I <sub>D</sub> = 24A R <sub>G</sub> = 2.2Ω <sup>⑥</sup> , V <sub>GG</sub> = 15V		53		ns
t <sub>r</sub>	Current Rise Time			76		
t <sub>d(off)</sub>	Turn-Off Delay Time			231		
t <sub>f</sub>	Current Fall Time			67		

**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)			31	A
I <sub>SM</sub>	Pulsed Source Current (Body Diode) <sup>①</sup>				173	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>SD</sub> = 24A, T <sub>J</sub> = 25°C, V <sub>GS</sub> = 0V			1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 24A <sup>3</sup> di <sub>SD</sub> /dt = 100A/μs	T <sub>J</sub> = 25°C		370	ns
			T <sub>J</sub> = 125°C		710	
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> = 25°C		1.91	μC
			T <sub>J</sub> = 125°C		5.18	
I <sub>rrm</sub>	Reverse Recovery Current	T <sub>J</sub> = 25°C		12	A	
		T <sub>J</sub> = 125°C		18		
dv/dt	Peak Recovery dv/dt	I <sub>SD</sub> ≤ 24A, di/dt ≤ 1000A/μs, V <sub>DD</sub> = 100V, T <sub>J</sub> = 125°C			25	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 = 6.9mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 24A.

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> = -8.27E-7/V<sub>DS</sub><sup>2</sup> + 1.01E-7/V<sub>DS</sub> + 1.43E-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.

# Typical Performance Curves

APT29F80J

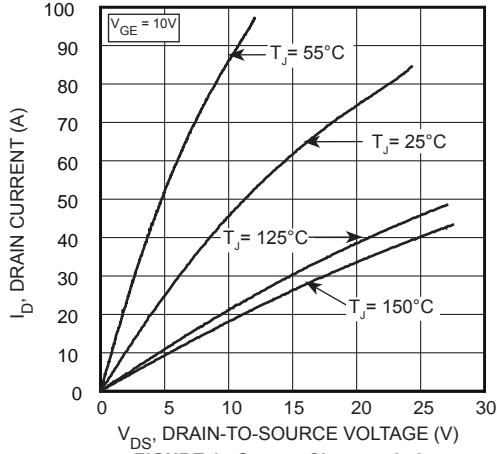


FIGURE 1, Output Characteristics

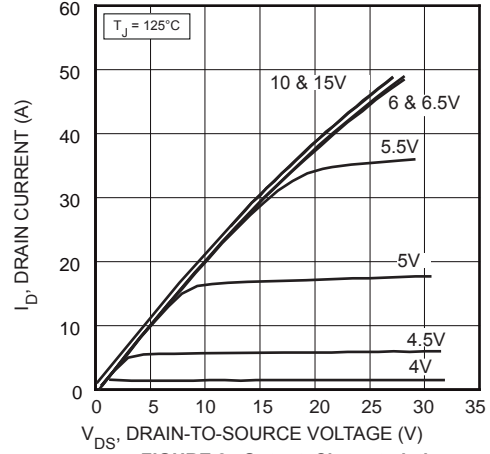


FIGURE 2, Output Characteristics

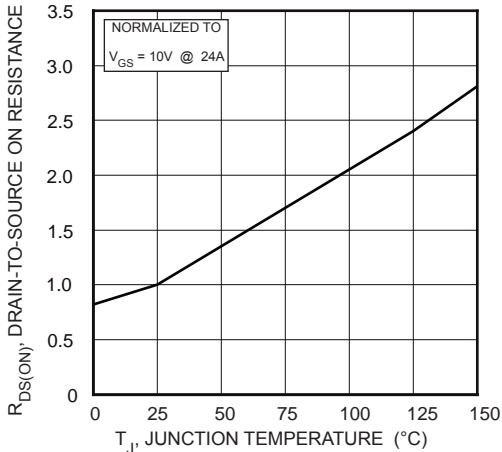


FIGURE 3,  $R_{DS(ON)}$  vs Junction Temperature

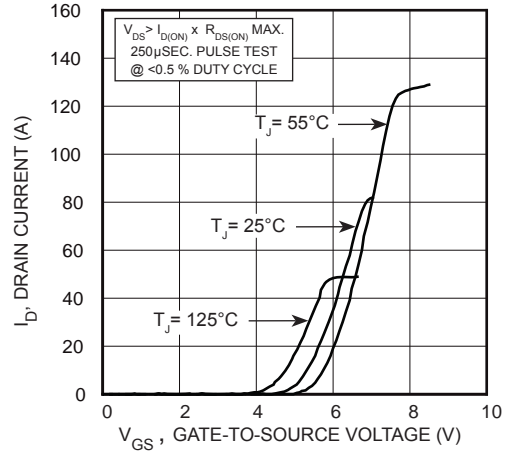


FIGURE 4, Transfer Characteristics

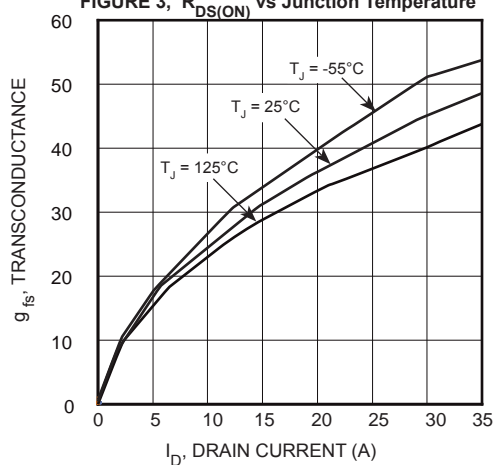


FIGURE 5, Gain vs Drain Current

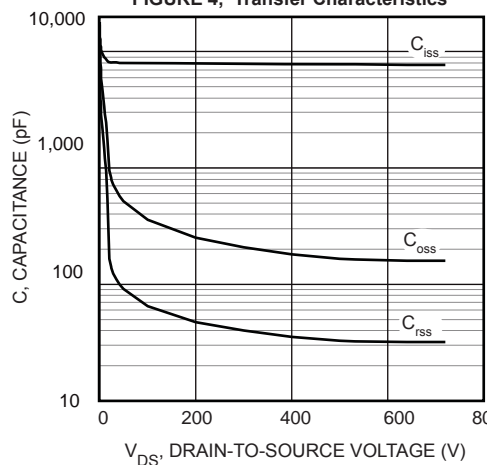


FIGURE 6, CAPACITANCE VS DRAIN-TO-SOURCE VOLTAGE

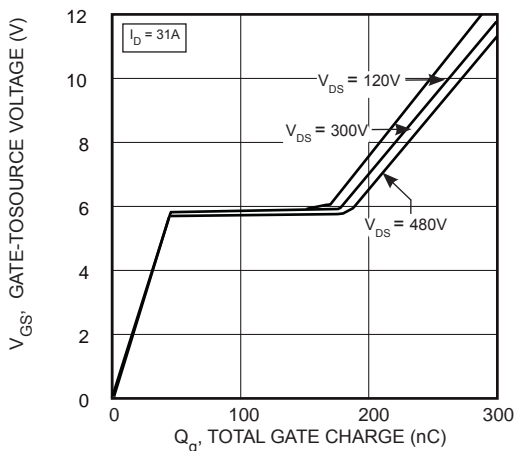


FIGURE 7, Gate Charge vs Gate-to-Source Voltage

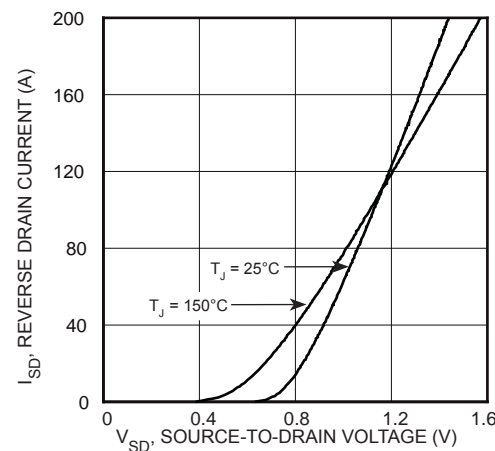
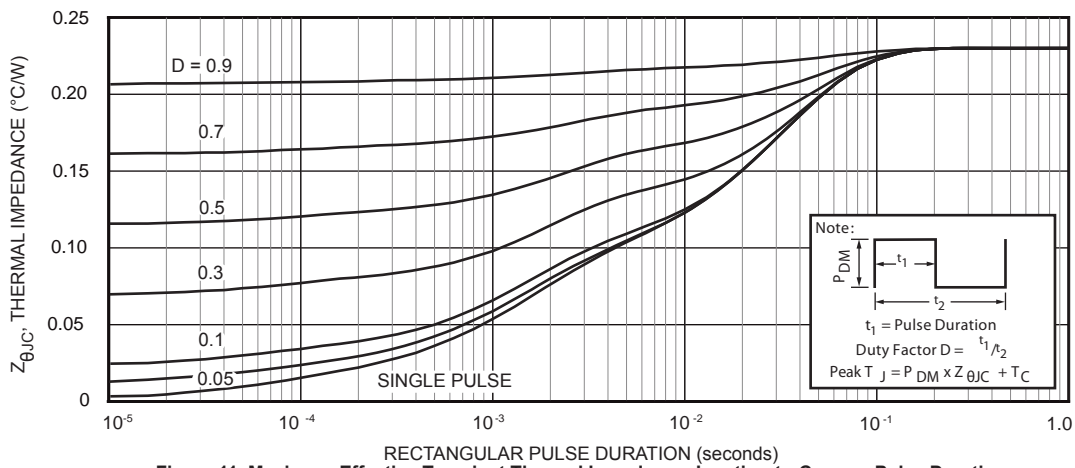
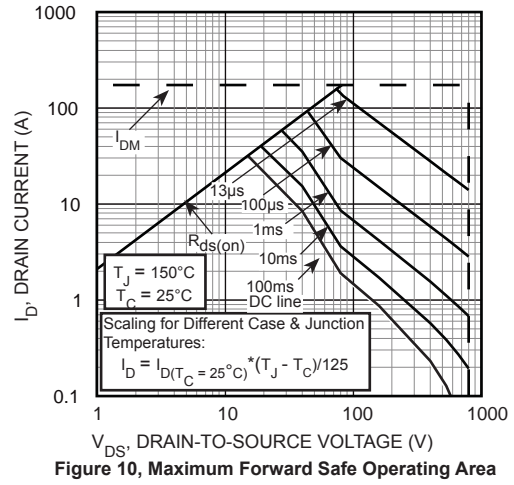
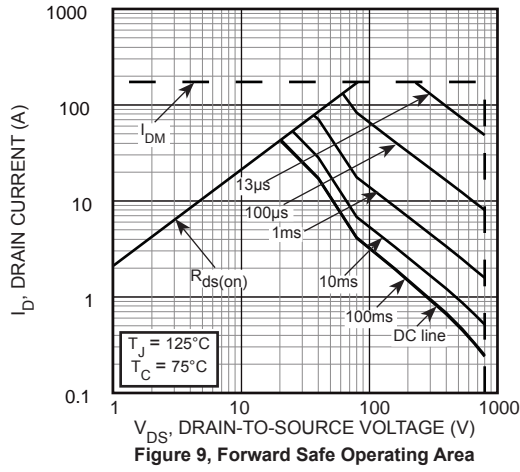
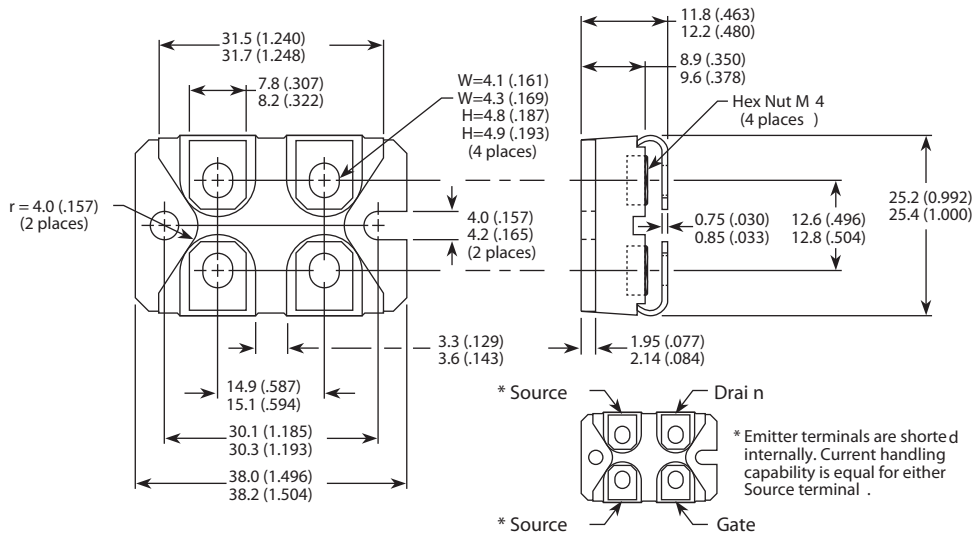


FIGURE 8, Reverse Drain Current vs Source-to-Drain Voltage



**SOT-227 (ISOTOP®) Package Outline**



Dimensions in Millimeters and (Inches)

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[80EH1](#) [MT9HVF6472PZ-667G1](#) [ND104N16K](#) [25.163.0653.1](#) [25.163.2453.0](#) [25.163.4253.0](#) [25.190.2053.0](#) [25.194.3453.0](#) [25.320.4853.1](#)  
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