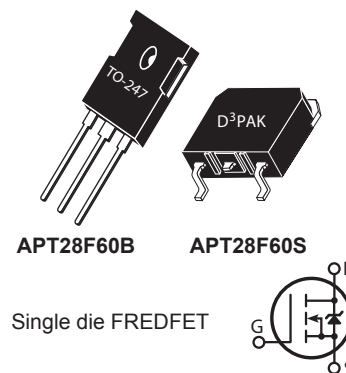


N-Channel FREDFET

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.



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 @ $T_C = 25^\circ\text{C}$	30	A
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	19	
I_{DM}	Pulsed Drain Current ^①	105	
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy ^②	780	mJ
I_{AR}	Avalanche Current, Repetitive or Non-Repetitive	14	A

Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$			520	W
$R_{\theta JC}$	Junction to Case Thermal Resistance			0.24	$^\circ\text{C/W}$
$R_{\theta CS}$	Case to Sink Thermal Resistance, Flat, Greased Surface		0.11		
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55		150	$^\circ\text{C}$
T_L	Soldering Temperature for 10 Seconds (1.6mm from case)			300	
W_T	Package Weight		0.22		oz
			6.2		g
Torque	Mounting Torque (TO-264 Package), 4-40 or M3 screw			10	in·lbf
				1.1	N·m

Static Characteristics
T_J = 25°C unless otherwise specified
APT28F60B_S

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	600			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, $I_D = 250\mu A$		0.57		V/°C
$R_{DS(on)}$	Drain-Source On Resistance ^③	$V_{GS} = 10V, I_D = 14A$		0.17	0.22	Ω
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 1mA$	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	$V_{DS} = 600V$ $V_{GS} = 0V$			250	μA
		$T_J = 25^\circ C$ $T_J = 125^\circ C$			1000	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 30V$			±100	nA

Dynamic Characteristics
T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
g_{fs}	Forward Transconductance	$V_{DS} = 50V, I_D = 14A$		27		S
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1MHz$		5575		pF
C_{rss}	Reverse Transfer Capacitance			55		
C_{oss}	Output Capacitance			510		
$C_{o(cr)}^{④}$	Effective Output Capacitance, Charge Related	$V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V$		270		
$C_{o(er)}^{⑤}$	Effective Output Capacitance, Energy Related			140		
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10V, I_D = 14A,$ $V_{DS} = 300V$		140		nC
Q_{gs}	Gate-Source Charge			30		
Q_{gd}	Gate-Drain Charge			60		
$t_{d(on)}$	Turn-On Delay Time	Resistive Switching $V_{DD} = 400V, I_D = 14A$ $R_G = 4.7\Omega^{⑥}, V_{GG} = 15V$		31		ns
t_r	Current Rise Time			36		
$t_{d(off)}$	Turn-Off Delay Time			95		
t_f	Current Fall Time			29		

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)			30	A
I_{SM}	Pulsed Source Current (Body Diode) ^①				105	
V_{SD}	Diode Forward Voltage	$I_{SD} = 14A, T_J = 25^\circ C, V_{GS} = 0V$			1.0	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 14A^{③}$ $di_{SD}/dt = 100A/\mu s$ $V_{DD} = 100V$	$T_J = 25^\circ C$		230	ns
			$T_J = 125^\circ C$		430	
Q_{rr}	Reverse Recovery Charge		$T_J = 25^\circ C$	0.83		μC
			$T_J = 125^\circ C$	2.07		
I_{rrm}	Reverse Recovery Current		$T_J = 25^\circ C$	8.0		A
			$T_J = 125^\circ C$	11.2		
dv/dt	Peak Recovery dv/dt	$I_{SD} \leq 14A, di/dt \leq 1000A/\mu s, V_{DD} = 400V,$ $T_J = 125^\circ C$			20	V/ns

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

② Starting at $T_J = 25^\circ C, L = 7.96mH, R_G = 25\Omega, I_{AS} = 14A$.

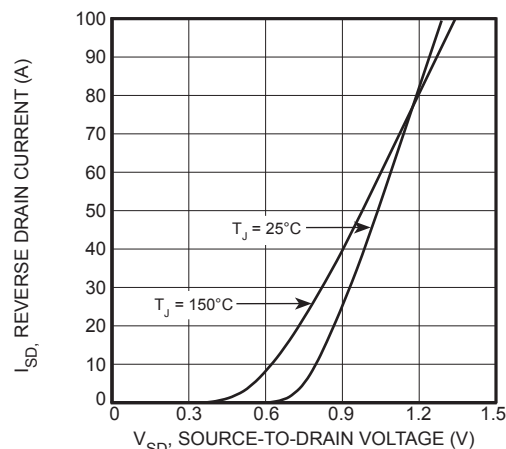
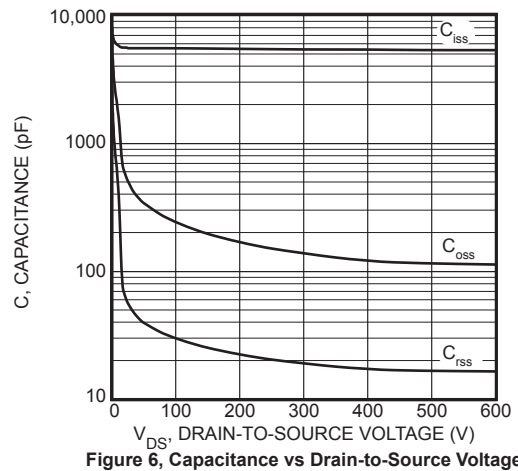
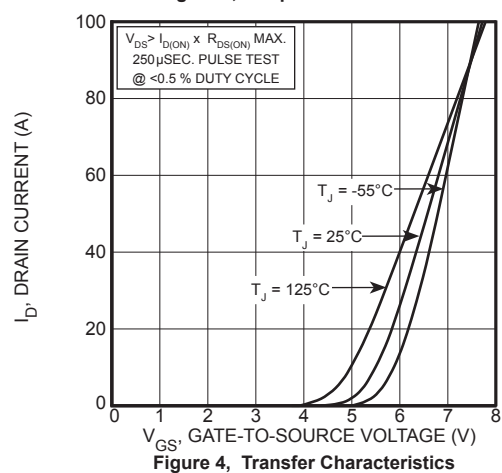
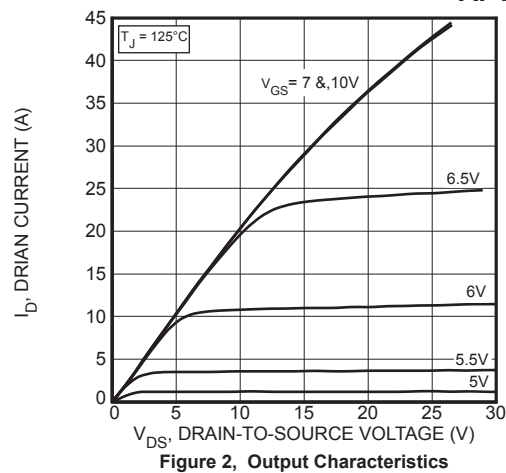
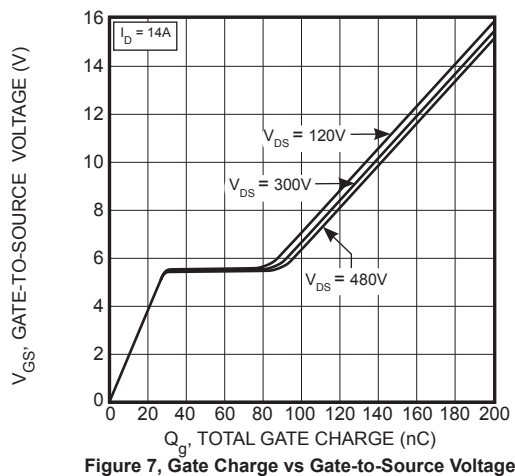
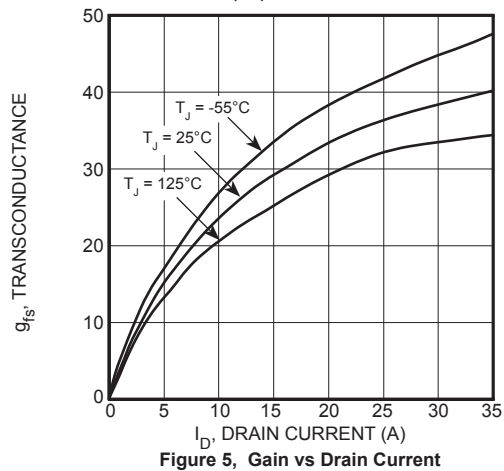
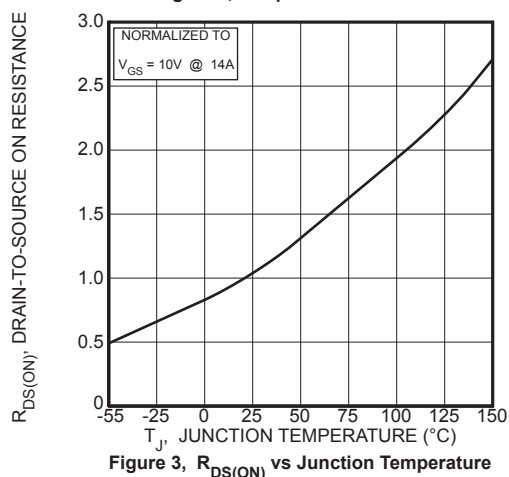
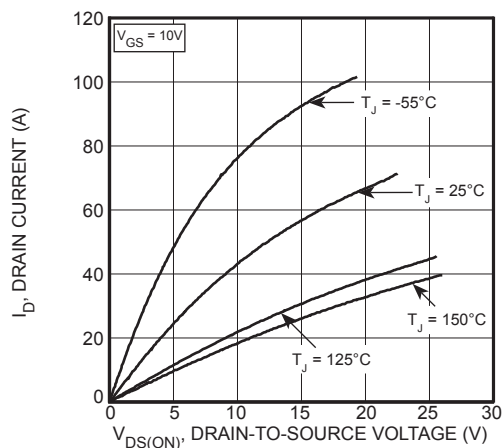
③ Pulse test: Pulse Width < 380μs, duty cycle < 2%.

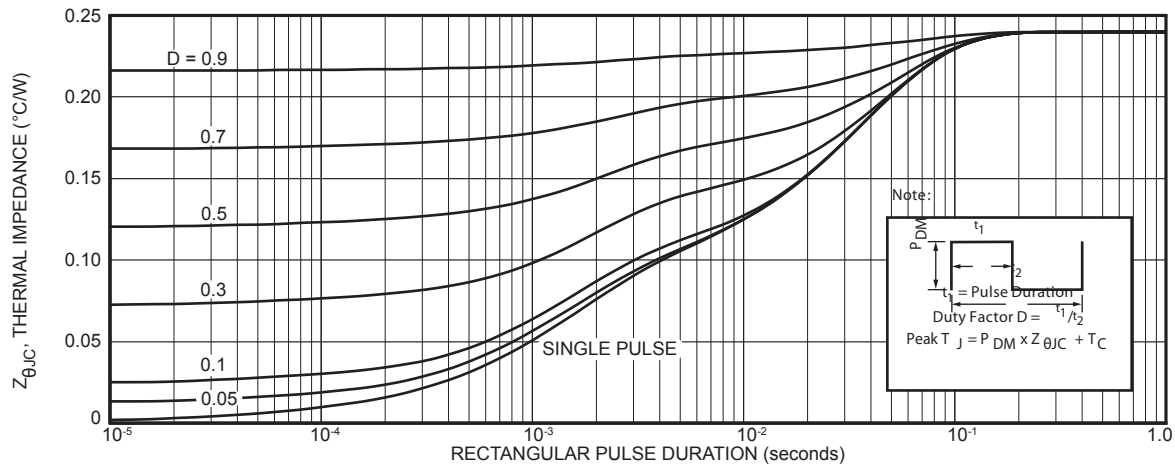
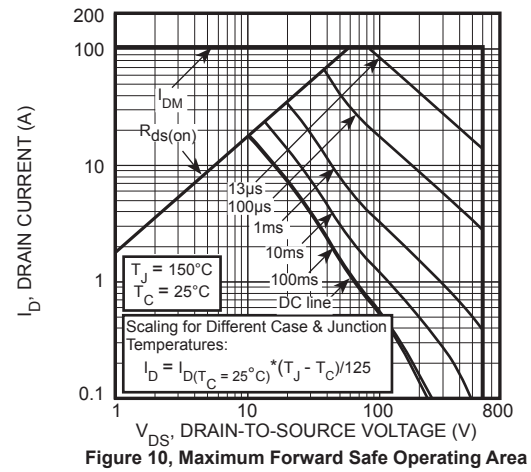
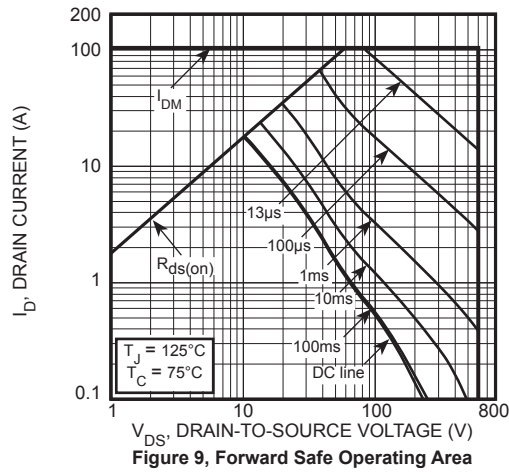
④ $C_{o(cr)}$ is defined as a fixed capacitance with the same stored charge as C_{OSS} with $V_{DS} = 67\%$ of $V_{(BR)DSS}$.

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: $C_{o(er)} = -1.33E-7/V_{DS}^2 + 3.06E-8/V_{DS} + 8.83E-11$.

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

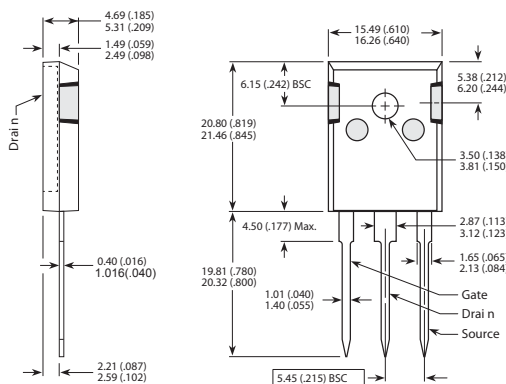
Microsemi reserves the right to change, without notice, the specifications and information contained herein.





TO-247 (B) Package Outline

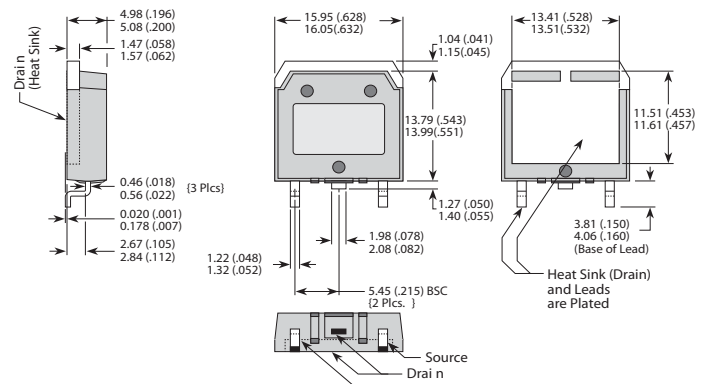
(e1) SAC: Tin, Silver, Copper



Dimensions in Millimeters (Inches)

D³PAK Package Outline

(e3) 100% Sn Plated



Dimensions in Millimeters (Inches)