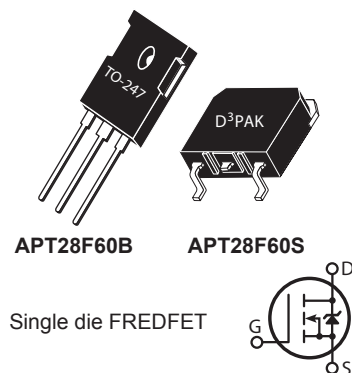


N-Channel FREDFET

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 = 250μA	600			V
ΔV _{BR(DSS)} /ΔT _J	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I _D = 250μA		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
ΔV _{GS(th)} /ΔT _J	Threshold Voltage Temperature Coefficient			-10		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 600V V _{GS} = 0V			250 1000	μA
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 = 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 to 400V		270		
C _{o(er)} ^⑤	Effective Output Capacitance, Energy Related			140		
Q _g	Total Gate Charge	V _{GS} = 0 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 = 4.7Ω ^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°C, V _{GS} = 0V			1.0	V
t _{rr}	Reverse Recovery Time	I _{SD} = 14A ^③ di _{SD} /dt = 100A/μs V _{DD} = 100V	T _J = 25°C		230	ns
			T _J = 125°C		430	
Q _{rr}	Reverse Recovery Charge		T _J = 25°C	0.83		μC
			T _J = 125°C	2.07		
I _{rrm}	Reverse Recovery Current		T _J = 25°C	8.0		A
			T _J = 125°C	11.2		
dv/dt	Peak Recovery dv/dt	I _{SD} ≤ 14A, di/dt ≤ 1000A/μs, V _{DD} = 400V, T _J = 125°C			20	V/ns

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

② Starting at T_J = 25°C, L = 7.96mH, R_G = 25Ω, I_{AS} = 14A.

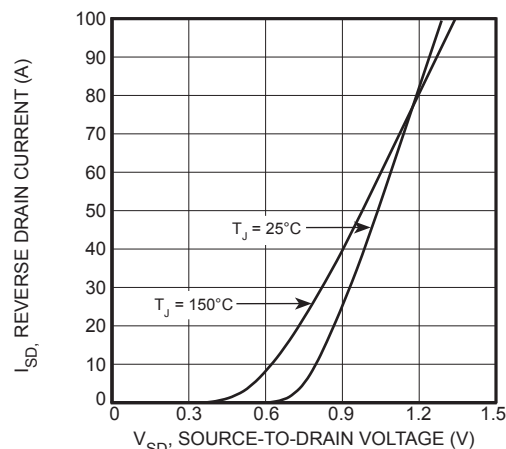
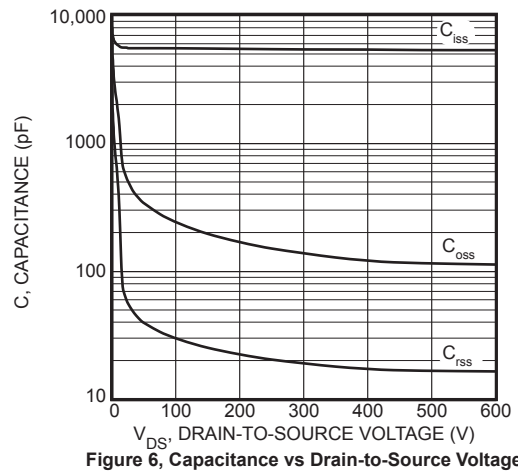
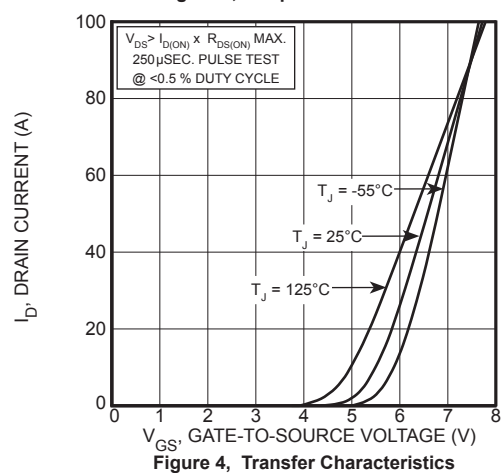
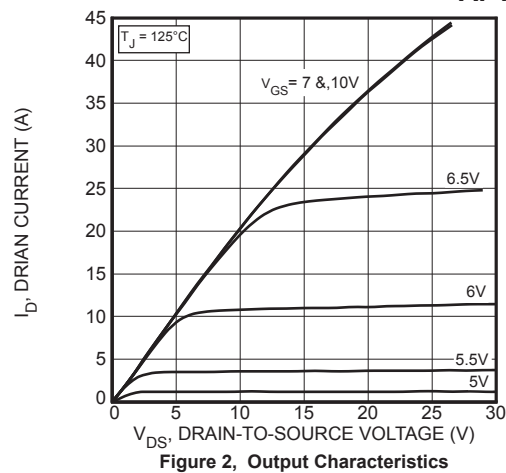
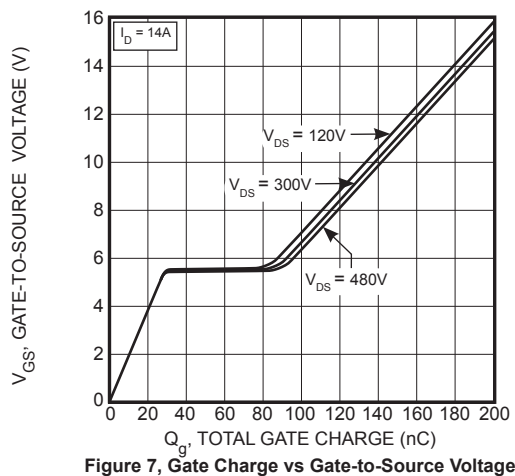
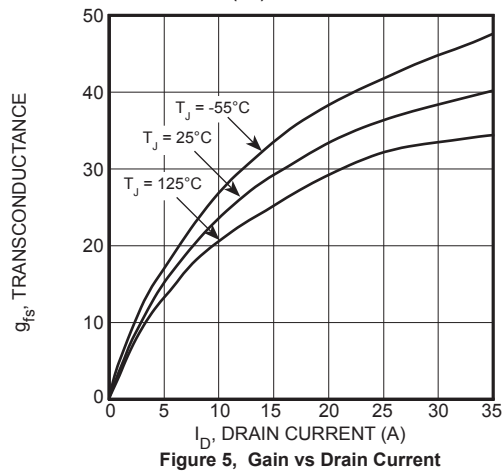
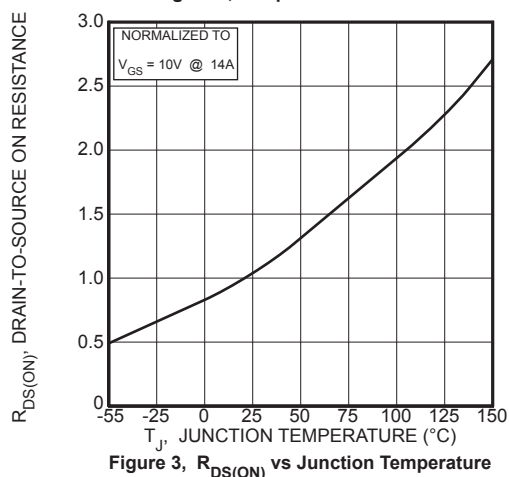
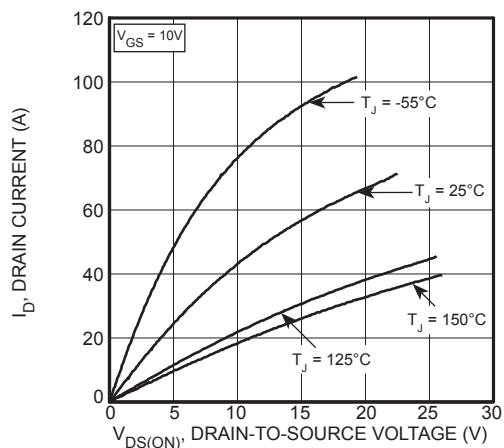
③ Pulse test: Pulse Width < 380μs, duty cycle < 2%.

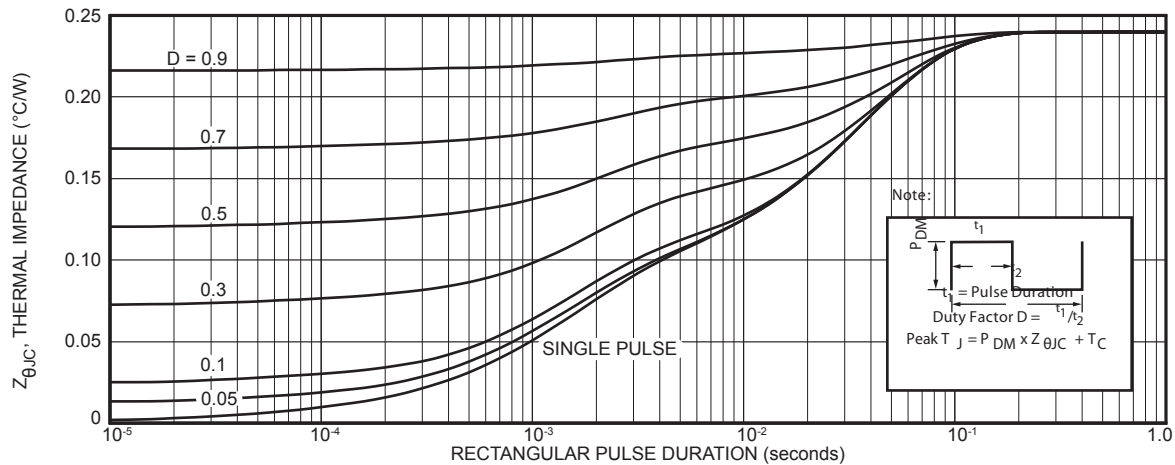
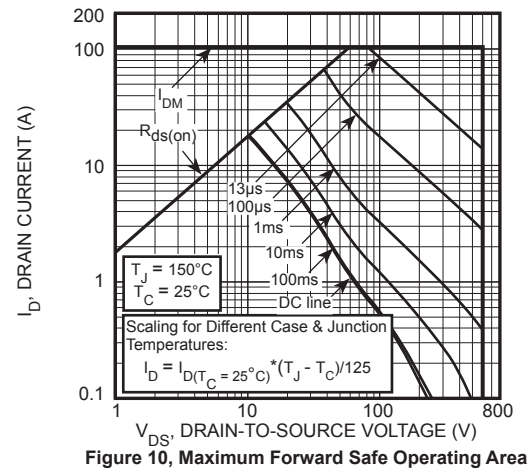
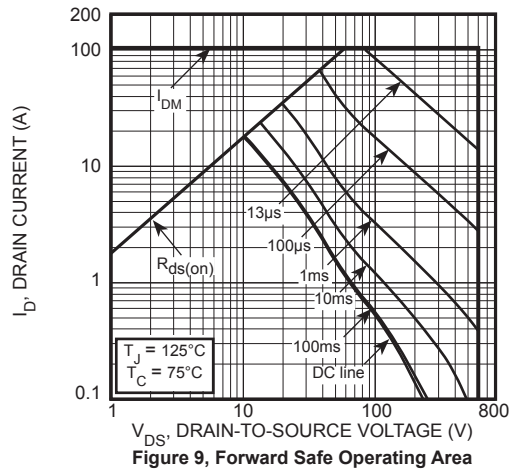
④ C_{o(cr)} is defined as a fixed capacitance with the same stored charge as C_{OSS} with V_{DS} = 67% of V_{(BR)DSS}.

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)

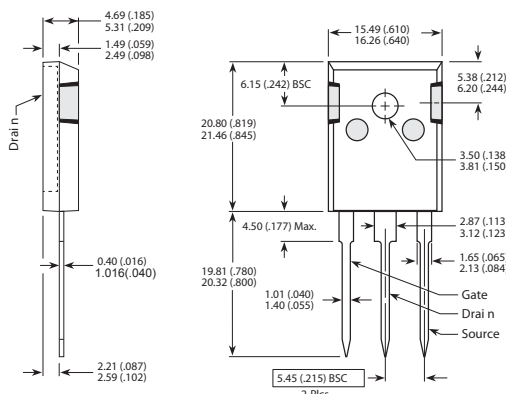
Microsemi reserves the right to change, without notice, the specifications and information contained herein.





TO-247 (B) Package Outline

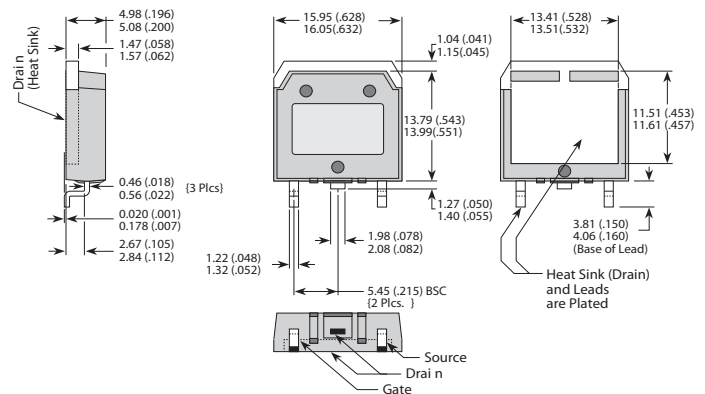
(e1) SAC: Tin, Silver, Copper



Dimensions in Millimeters (Inches)

D³PAK Package Outline

(e3) 100% Sn Plated



Dimensions in Millimeters (Inches)