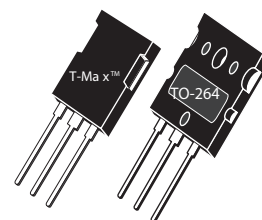


N-Channel FREDFET

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.



APT22F120B2 **APT22F120L**

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 @ $T_C = 25^\circ\text{C}$	23	A
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	15	
I_{DM}	Pulsed Drain Current ^①	90	
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy ^②	1875	mJ
I_{AR}	Avalanche Current, Repetitive or Non-Repetitive	12	A

Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$			1040	W
$R_{\theta JC}$	Junction to Case Thermal Resistance			0.12	$^\circ\text{C/W}$
$R_{\theta CS}$	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

 $T_J = 25^\circ\text{C}$ unless otherwise specified

APT22F120B2_L

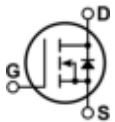
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	1200			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}, I_D = 250\mu A$		1.41		V/ $^\circ\text{C}$
$R_{DS(on)}$	Drain-Source On Resistance ^③	$V_{GS} = 10V, I_D = 12A$		0.53	0.70	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/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200V$ $V_{GS} = 0V$			250 1000	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 30V$			± 100	nA

Dynamic Characteristics

 $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
g_{fs}	Forward Transconductance	$V_{DS} = 50V, I_D = 12A$		27		S
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1MHz$		8370		pF
C_{rss}	Reverse Transfer Capacitance			100		
C_{oss}	Output Capacitance			615		
$C_{o(cr)}^{④}$	Effective Output Capacitance, Charge Related	$V_{GS} = 0V, V_{DS} = 0V \text{ to } 800V$		240		
$C_{o(er)}^{⑤}$	Effective Output Capacitance, Energy Related			125		
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10V, I_D = 12A,$ $V_{DS} = 600V$		260		nC
Q_{gs}	Gate-Source Charge			42		
Q_{gd}	Gate-Drain Charge			120		
$t_{d(on)}$	Turn-On Delay Time	Resistive Switching $V_{DD} = 800V, I_D = 12A$ $R_G = 2.2\Omega^{⑥}, V_{GG} = 15V$		45		ns
t_r	Current Rise Time			27		
$t_{d(off)}$	Turn-Off Delay Time			145		
t_f	Current Fall Time			42		

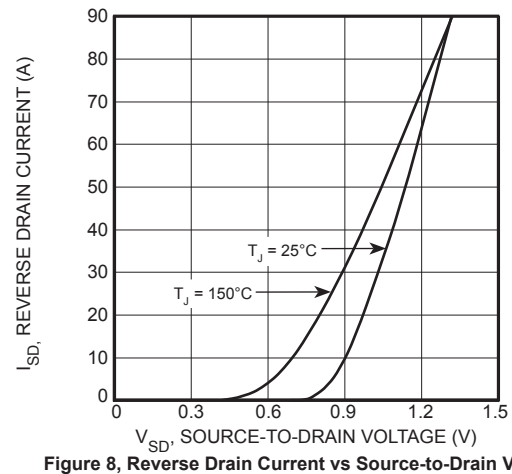
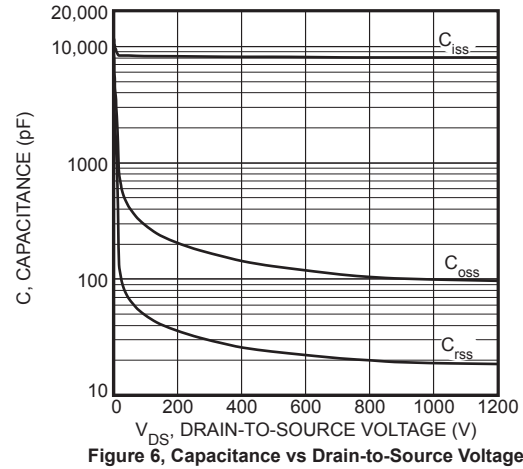
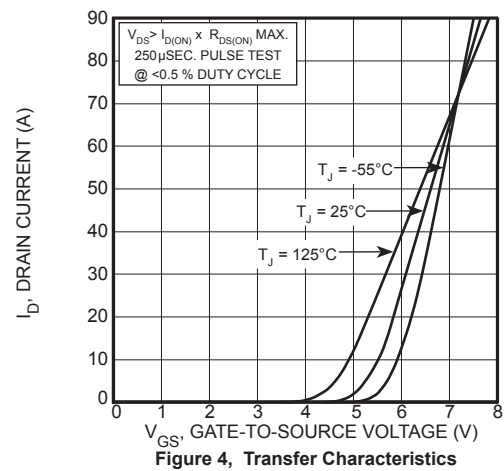
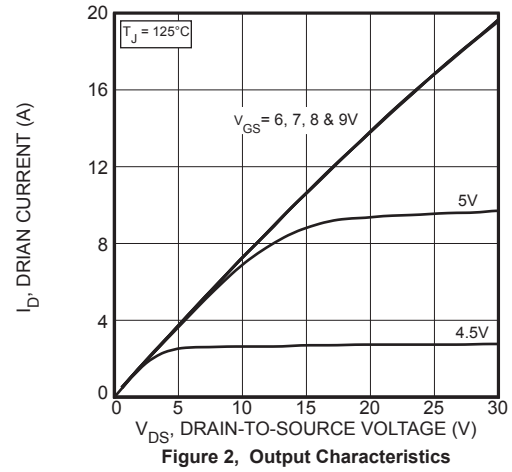
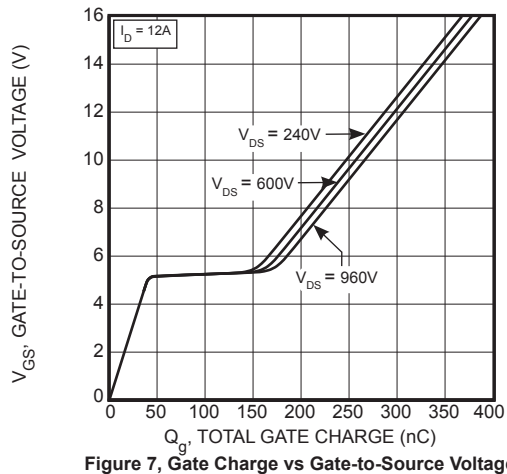
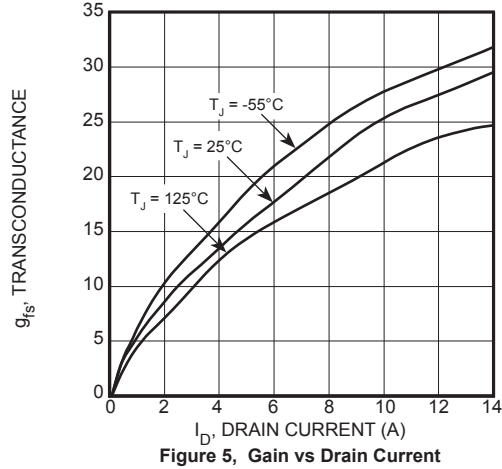
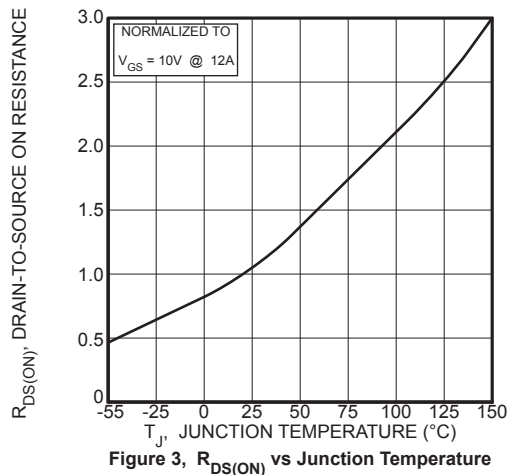
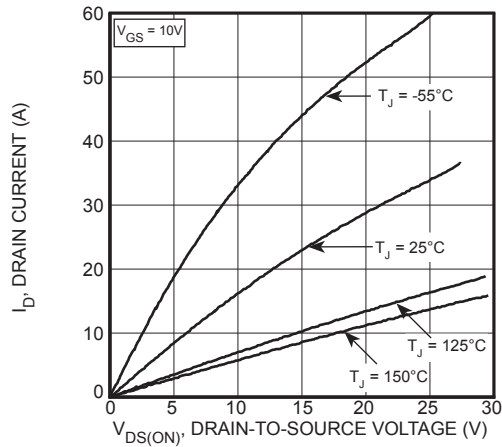
Source-Drain Diode Characteristics

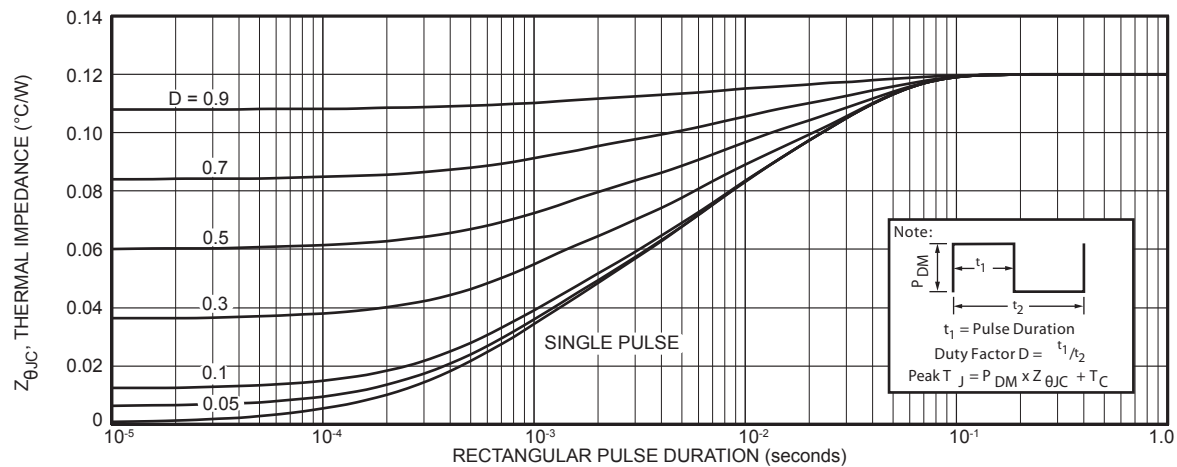
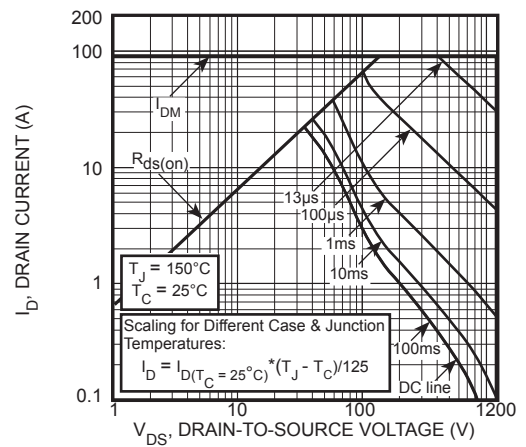
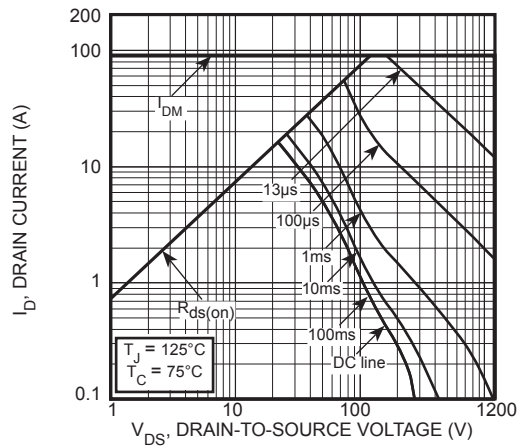
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode (body diode) 			23	A
I_{SM}	Pulsed Source Current (Body Diode) ^①				90	
V_{SD}	Diode Forward Voltage	$I_{SD} = 12A, T_J = 25^\circ\text{C}, V_{GS} = 0V$			1.2	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 12A^{③}$ $di_{SD}/dt = 100A/\mu s$	$T_J = 25^\circ\text{C}$	375	425	ns
			$T_J = 125^\circ\text{C}$	720	850	
Q_{rr}	Reverse Recovery Charge		$T_J = 25^\circ\text{C}$	2.2		μC
			$T_J = 125^\circ\text{C}$	5.8		
I_{rrm}	Reverse Recovery Current		$T_J = 25^\circ\text{C}$	12.3		A
			$T_J = 125^\circ\text{C}$	16.5		
dv/dt	Peak Recovery dv/dt	$I_{SD} \leq 12A, di/dt \leq 1000A/\mu s, V_{DD} = 800V,$ $T_J = 125^\circ\text{C}$			25	V/ns

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

② Starting at $T_J = 25^\circ\text{C}$, $L = 26.04mH$, $R_G = 25\Omega$, $I_{AS} = 12A$.③ Pulse test: Pulse Width < 380 μs , 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: $C_{o(er)} = -3.80E-7/V_{DS}^2 + 4.62E-8/V_{DS} + 6.57E-11$.⑥ R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

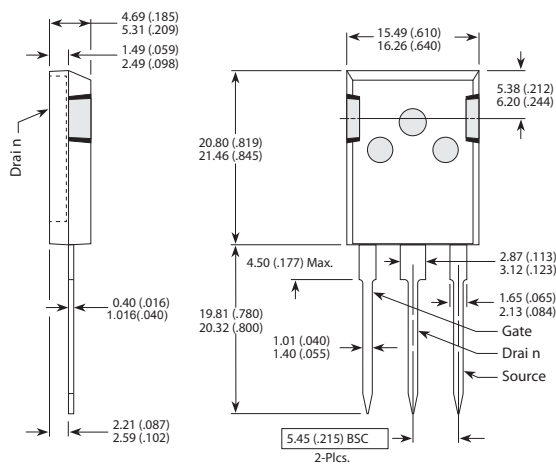
Microsemi reserves the right to change, without notice, the specifications and information contained herein.





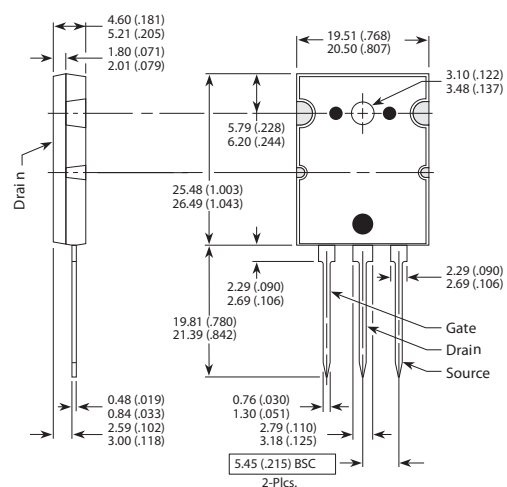
T-MAX® (B2) Package Outline

e3 100% Sn Plated



These dimensions are equal to the TO-247 without the mounting hole.
Dimensions in Millimeters and (Inches)

TO-264 (L) Package Outline



Dimensions in Millimeters and (Inches)