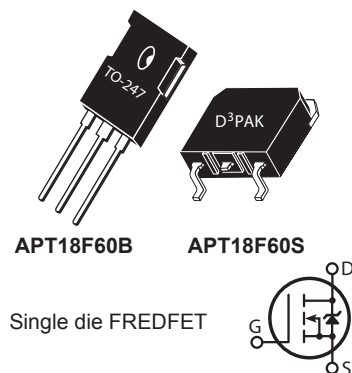


## N-Channel FREDFET

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 @ $T_C = 25^\circ\text{C}$  | 19       | A    |
|          | Continuous Drain Current @ $T_C = 100^\circ\text{C}$ | 12       |      |
| $I_{DM}$ | Pulsed Drain Current <sup>①</sup>                    | 65       |      |
| $V_{GS}$ | Gate-Source Voltage                                  | $\pm 30$ | V    |
| $E_{AS}$ | Single Pulse Avalanche Energy <sup>②</sup>           | 495      | mJ   |
| $I_{AR}$ | Avalanche Current, Repetitive or Non-Repetitive      | 9        | A    |

### Thermal and Mechanical Characteristics

| Symbol          | Characteristic                                         | Min | Typ  | Max  | Unit               |
|-----------------|--------------------------------------------------------|-----|------|------|--------------------|
| $P_D$           | Total Power Dissipation @ $T_C = 25^\circ\text{C}$     |     |      | 335  | W                  |
| $R_{\theta JC}$ | Junction to Case Thermal Resistance                    |     |      | 0.37 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | Case to Sink Thermal Resistance, Flat, Greased Surface |     | 0.15 |      |                    |
| $T_J, T_{STG}$  | Operating and Storage Junction Temperature Range       | -55 |      | 150  | $^\circ\text{C}$   |
| $T_L$           | Soldering Temperature for 10 Seconds (1.6mm from case) |     |      | 300  |                    |
| $W_T$           | Package Weight                                         |     | 0.22 |      | oz                 |
|                 |                                                        |     | 6.2  |      | g                  |
| Torque          | Mounting Torque ( TO-247 Package), 6-32 or M3 screw    |     |      | 10   | in·lbf             |
|                 |                                                        |     |      | 1.1  | N·m                |

**Static Characteristics**
**T<sub>J</sub> = 25°C unless otherwise specified**
**APT18F60B\_S**

| 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             | 600 |      |             | V     |
| ΔV <sub>BR(DSS)</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temperature Coefficient | Reference to 25°C, I <sub>D</sub> = 250μA                |     | 0.57 |             | V/°C  |
| R <sub>DS(on)</sub>                    | Drain-Source On Resistance <sup>③</sup>   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A               |     | .31  | 0.37        | Ω     |
| V <sub>GS(th)</sub>                    | Gate-Source Threshold Voltage             | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 1mA | 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> = 600V<br>V <sub>GS</sub> = 0V           |     |      | 250<br>1000 | μA    |
| 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> = 9A                                                                                              |     | 17   |     | S    |
| C <sub>iss</sub>                | Input Capacitance                            | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V<br>f = 1MHz                                                                                 |     | 3550 |     | pF   |
| C <sub>rss</sub>                | Reverse Transfer Capacitance                 |                                                                                                                                         |     | 36   |     |      |
| C <sub>oss</sub>                | Output Capacitance                           |                                                                                                                                         |     | 325  |     |      |
| C <sub>o(cr)</sub> <sup>④</sup> | Effective Output Capacitance, Charge Related | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 400V                                                                                      |     | 175  |     |      |
| C <sub>o(er)</sub> <sup>⑤</sup> | Effective Output Capacitance, Energy Related |                                                                                                                                         |     | 90   |     |      |
| Q <sub>g</sub>                  | Total Gate Charge                            | V <sub>GS</sub> = 0 to 10V, I <sub>D</sub> = 9A,<br>V <sub>DS</sub> = 300V                                                              |     | 90   |     | nC   |
| Q <sub>gs</sub>                 | Gate-Source Charge                           |                                                                                                                                         |     | 19   |     |      |
| Q <sub>gd</sub>                 | Gate-Drain Charge                            |                                                                                                                                         |     | 37   |     |      |
| t <sub>d(on)</sub>              | Turn-On Delay Time                           | <b>Resistive Switching</b><br>V <sub>DD</sub> = 400V, I <sub>D</sub> = 9A<br>R <sub>G</sub> = 4.7Ω <sup>⑥</sup> , V <sub>GG</sub> = 15V |     | 20   |     | ns   |
| t <sub>r</sub>                  | Current Rise Time                            |                                                                                                                                         |     | 23   |     |      |
| t <sub>d(off)</sub>             | Turn-Off Delay Time                          |                                                                                                                                         |     | 60   |     |      |
| t <sub>f</sub>                  | Current Fall Time                            |                                                                                                                                         |     | 18   |     |      |

**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)                    |                        |      | 19  | A    |
| I <sub>SM</sub>  | Pulsed Source Current (Body Diode) <sup>①</sup> |                                                                                               |                        |      | 65  |      |
| V <sub>SD</sub>  | Diode Forward Voltage                           | I <sub>SD</sub> = 9A, T <sub>J</sub> = 25°C, V <sub>GS</sub> = 0V                             |                        |      | 1.0 | V    |
| t <sub>rr</sub>  | Reverse Recovery Time                           | I <sub>SD</sub> = 9A <sup>③</sup><br>di <sub>SD</sub> /dt = 100A/μs<br>V <sub>DD</sub> = 100V | T <sub>J</sub> = 25°C  | 175  | 200 | ns   |
|                  |                                                 |                                                                                               | T <sub>J</sub> = 125°C | 315  | 380 |      |
| Q <sub>rr</sub>  | Reverse Recovery Charge                         |                                                                                               | T <sub>J</sub> = 25°C  | 0.65 |     | μC   |
|                  |                                                 |                                                                                               | T <sub>J</sub> = 125°C | 1.56 |     |      |
| I <sub>rrm</sub> | Reverse Recovery Current                        |                                                                                               | T <sub>J</sub> = 25°C  | 6.7  |     | A    |
|                  |                                                 |                                                                                               | T <sub>J</sub> = 125°C | 9.2  |     |      |
| dv/dt            | Peak Recovery dv/dt                             | I <sub>SD</sub> ≤ 9A, di/dt ≤ 1000A/μs, V <sub>DD</sub> = 400V,<br>T <sub>J</sub> = 125°C     |                        |      | 20  | 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 = 12.2mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 9A.

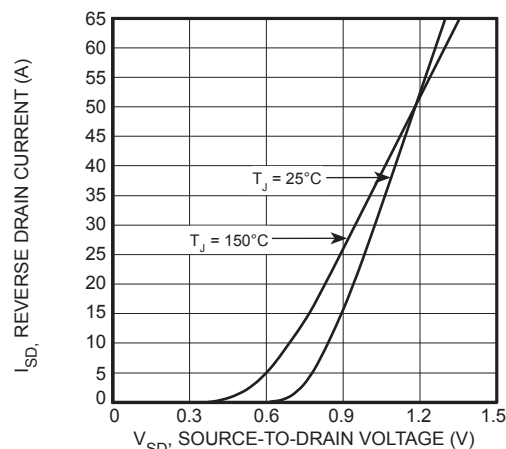
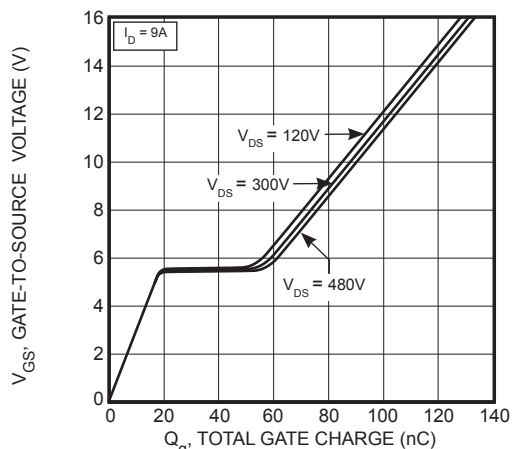
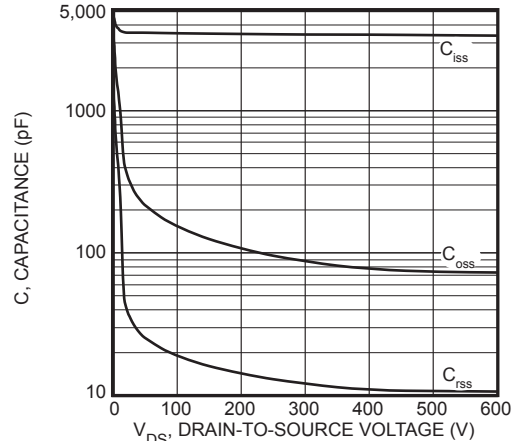
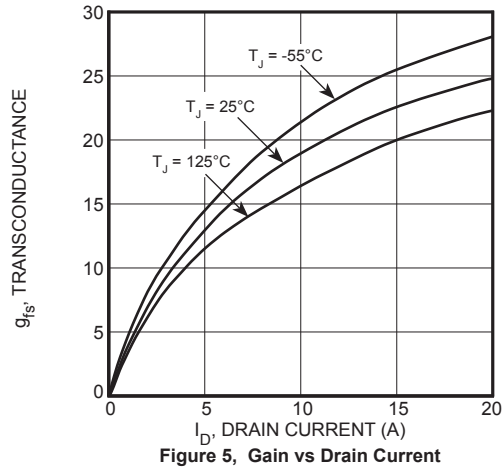
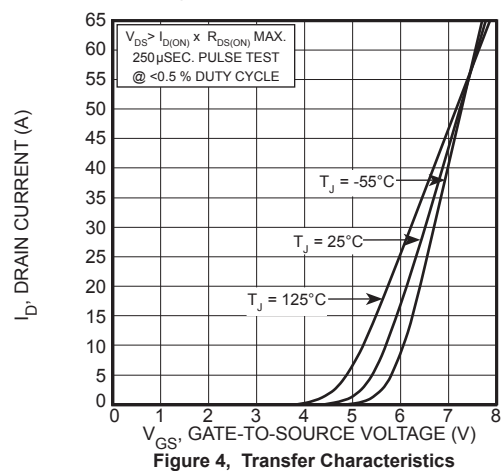
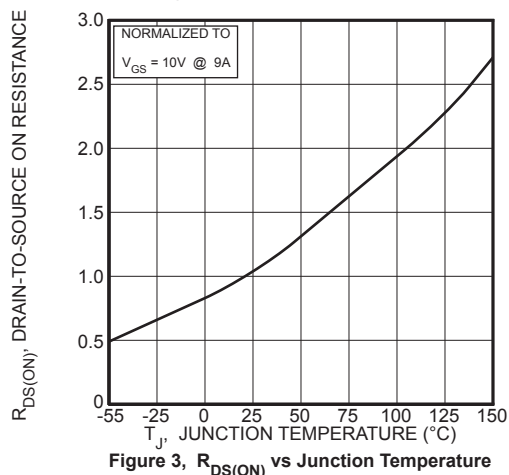
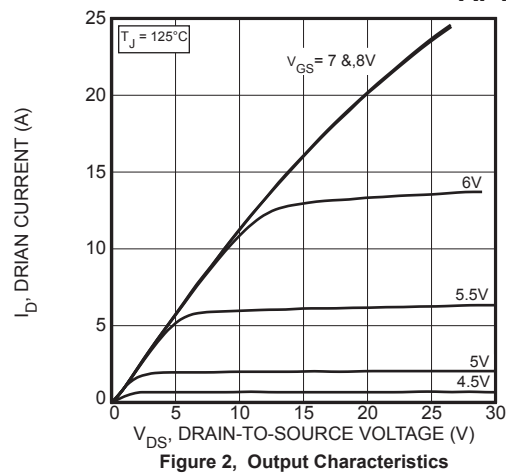
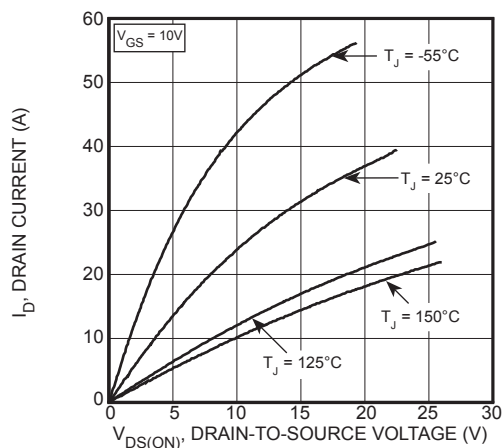
③ Pulse test: Pulse Width < 380μs, duty cycle < 2%.

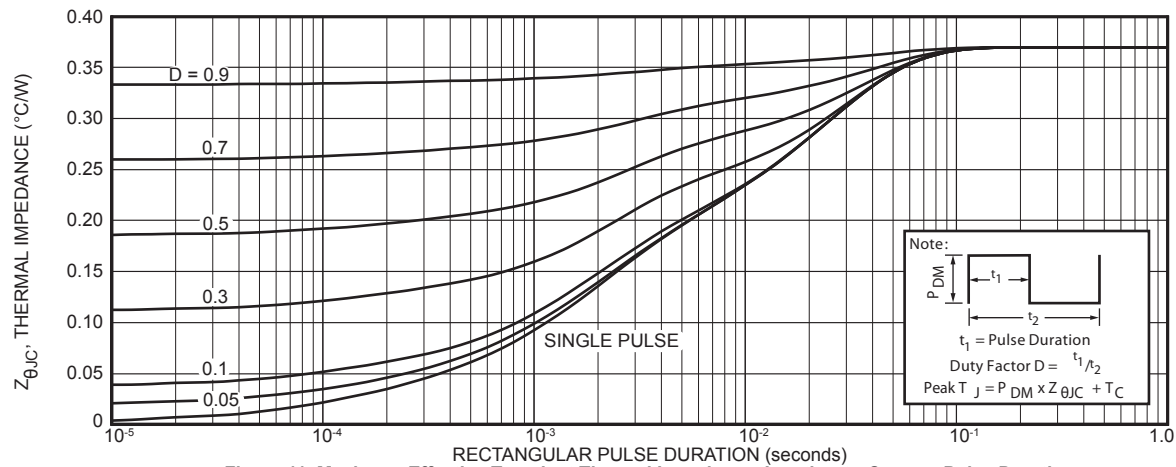
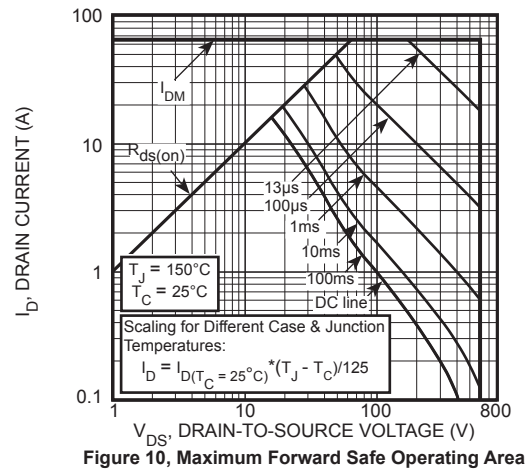
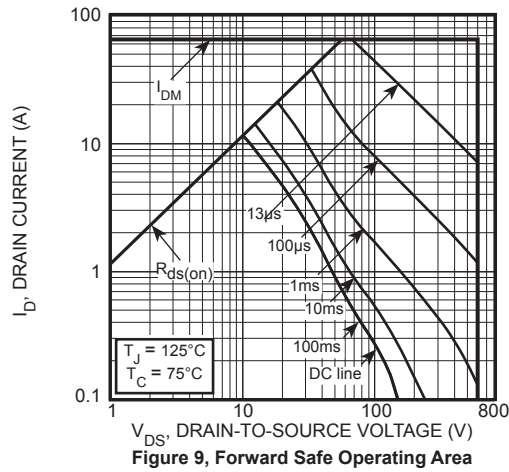
④ C<sub>o(cr)</sub> is defined as a fixed capacitance with the same stored charge as C<sub>OSS</sub> with V<sub>DS</sub> = 67% of V<sub>(BR)DSS</sub>.

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> = -3.43E-8/V<sub>DS</sub><sup>2</sup> + 1.44E-8/V<sub>DS</sub> + 5.38E-11.

⑥ R<sub>G</sub> is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

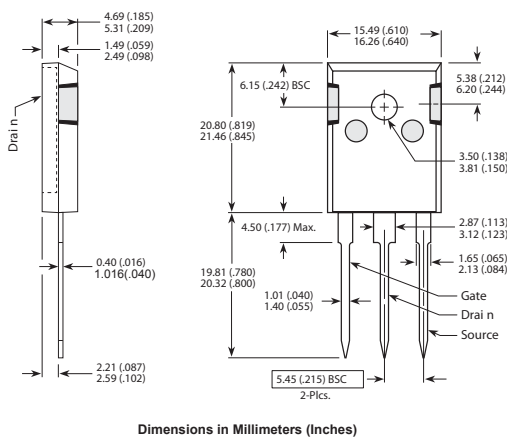
Microsemi reserves the right to change, without notice, the specifications and information contained herein.





### TO-247 (B) Package Outline

① SAC: Tin, Silver, Copper



### D<sup>3</sup>PAK Package Outline

③ 100% Sn Plated

