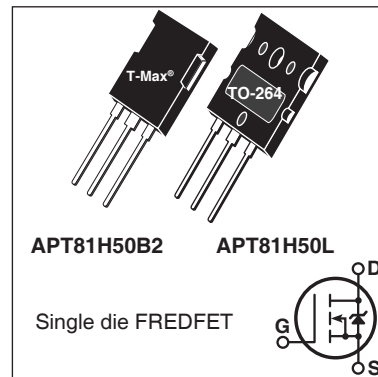


## N-Channel Ultrafast Recovery FREDFET

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 maximum reliability in ZVS phase shifted bridge and other circuits through much 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
- Very Low  $t_{rr}$  for maximum 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
- UPS
- Welding
- Solar inverters
- Telecom rectifiers

### Absolute Maximum Ratings

| Symbol   | Parameter                                            | Ratings  | Unit |
|----------|------------------------------------------------------|----------|------|
| $I_D$    | Continuous Drain Current @ $T_C = 25^\circ\text{C}$  | 81       | A    |
|          | Continuous Drain Current @ $T_C = 100^\circ\text{C}$ | 51       |      |
| $I_{DM}$ | Pulsed Drain Current <sup>①</sup>                    | 270      |      |
| $V_{GS}$ | Gate-Source Voltage                                  | $\pm 30$ | V    |
| $E_{AS}$ | Single Pulse Avalanche Energy <sup>②</sup>           | 1845     | mJ   |
| $I_{AR}$ | Avalanche Current, Repetitive or Non-Repetitive      | 42       | A    |

### Thermal and Mechanical Characteristics

| Symbol          | Characteristic                                         | Min | Typ  | Max  | Unit               |
|-----------------|--------------------------------------------------------|-----|------|------|--------------------|
| $P_D$           | Total Power Dissipation @ $T_C = 25^\circ\text{C}$     |     |      | 1135 | W                  |
| $R_{\theta JC}$ | Junction to Case Thermal Resistance                    |     |      | 0.11 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | 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<sub>J</sub> = 25°C unless otherwise specified**
**APT81H50B2\_L**

| Symbol                          | Parameter                                 | Test Conditions                           | Min | Typ   | Max       | Unit     |
|---------------------------------|-------------------------------------------|-------------------------------------------|-----|-------|-----------|----------|
| $V_{BR(DSS)}$                   | Drain-Source Breakdown Voltage            | $V_{GS} = 0V, I_D = 250\mu A$             | 500 |       |           | V        |
| $\Delta V_{BR(DSS)}/\Delta T_J$ | Breakdown Voltage Temperature Coefficient | Reference to 25°C, $I_D = 250\mu A$       |     | 0.60  |           | V/°C     |
| $R_{DS(on)}$                    | Drain-Source On Resistance <sup>③</sup>   | $V_{GS} = 10V, I_D = 42A$                 |     | 0.059 | 0.070     | $\Omega$ |
| $V_{GS(th)}$                    | Gate-Source Threshold Voltage             | $V_{GS} = V_{DS}, I_D = 2.5mA$            | 3   | 4     | 5         | V        |
| $\Delta V_{GS(th)}/\Delta T_J$  | Threshold Voltage Temperature Coefficient |                                           |     | -10   |           | mV/°C    |
| $I_{DSS}$                       | Zero Gate Voltage Drain Current           | $V_{DS} = 500V$<br>$V_{GS} = 0V$          |     |       | 250       | $\mu A$  |
|                                 |                                           | $T_J = 25^\circ C$<br>$T_J = 125^\circ C$ |     |       | 1000      |          |
| $I_{GSS}$                       | Gate-Source Leakage Current               | $V_{GS} = \pm 30V$                        |     |       | $\pm 100$ | nA       |

**Dynamic Characteristics**
**T<sub>J</sub> = 25°C unless otherwise specified**

| Symbol          | Parameter                                    | Test Conditions                                                                                 | Min | Typ   | Max | Unit |
|-----------------|----------------------------------------------|-------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| $g_{fs}$        | Forward Transconductance                     | $V_{DS} = 50V, I_D = 42A$                                                                       |     | 65    |     | S    |
| $C_{iss}$       | Input Capacitance                            | $V_{GS} = 0V, V_{DS} = 25V$<br>$f = 1MHz$                                                       |     | 13500 |     | pF   |
| $C_{rss}$       | Reverse Transfer Capacitance                 |                                                                                                 |     | 185   |     |      |
| $C_{oss}$       | Output Capacitance                           |                                                                                                 |     | 1455  |     |      |
| $C_{o(cr)}^{④}$ | Effective Output Capacitance, Charge Related | $V_{GS} = 0V, V_{DS} = 0V \text{ to } 333V$                                                     |     | 845   |     |      |
| $C_{o(er)}^{⑤}$ | Effective Output Capacitance, Energy Related |                                                                                                 |     | 425   |     |      |
| $Q_g$           | Total Gate Charge                            | $V_{GS} = 0 \text{ to } 10V, I_D = 42A,$<br>$V_{DS} = 250V$                                     |     | 340   |     | nC   |
| $Q_{gs}$        | Gate-Source Charge                           |                                                                                                 |     | 75    |     |      |
| $Q_{gd}$        | Gate-Drain Charge                            |                                                                                                 |     | 155   |     |      |
| $t_{d(on)}$     | Turn-On Delay Time                           | <b>Resistive Switching</b><br>$V_{DD} = 333V, I_D = 42A$<br>$R_G = 2.2\Omega^{⑥}, V_{GG} = 15V$ |     | 60    |     | ns   |
| $t_r$           | Current Rise Time                            |                                                                                                 |     | 70    |     |      |
| $t_{d(off)}$    | Turn-Off Delay Time                          |                                                                                                 |     | 155   |     |      |
| $t_f$           | Current Fall Time                            |                                                                                                 |     | 50    |     |      |

**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)       |                     |      | 81  | A       |
| $I_{SM}$  | Pulsed Source Current (Body Diode) <sup>①</sup> |                                                                                  |                     |      | 270 |         |
| $V_{SD}$  | Diode Forward Voltage                           | $I_{SD} = 42A, T_J = 25^\circ C, V_{GS} = 0V$                                    |                     |      | 1.0 | V       |
| $t_{rr}$  | Reverse Recovery Time                           | $I_{SD} = 42A^{③}$<br>$di_{SD}/dt = 100A/\mu s$<br>$V_{DD} = 100V$               | $T_J = 25^\circ C$  |      | 260 | ns      |
|           |                                                 |                                                                                  | $T_J = 125^\circ C$ |      | 480 |         |
| $Q_{rr}$  | Reverse Recovery Charge                         |                                                                                  | $T_J = 25^\circ C$  | 1.50 |     | $\mu C$ |
|           |                                                 |                                                                                  | $T_J = 125^\circ C$ | 3.93 |     |         |
| $I_{rrm}$ | Reverse Recovery Current                        |                                                                                  | $T_J = 25^\circ C$  | 9.6  |     | A       |
|           |                                                 |                                                                                  | $T_J = 125^\circ C$ | 14.2 |     |         |
| dv/dt     | Peak Recovery dv/dt                             | $I_{SD} \leq 42A, di/dt \leq 1000A/\mu s, V_{DD} = 333V,$<br>$T_J = 125^\circ C$ |                     |      | 30  | V/ns    |

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

② Starting at  $T_J = 25^\circ C, L = 2.08mH, R_G = 2.2\Omega, I_{AS} = 42A$ .

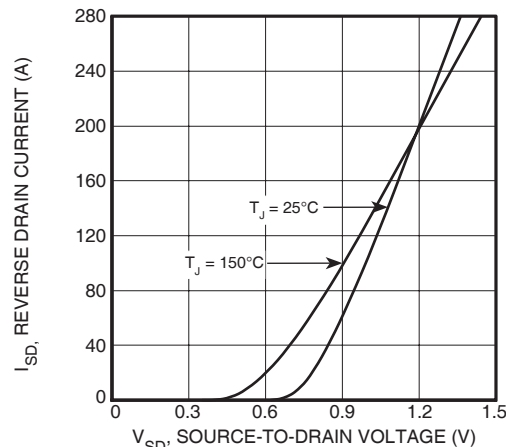
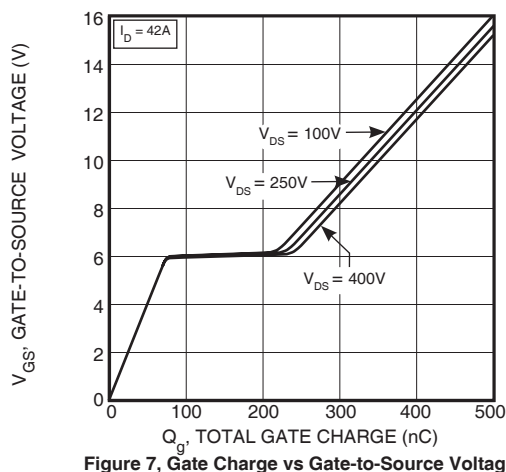
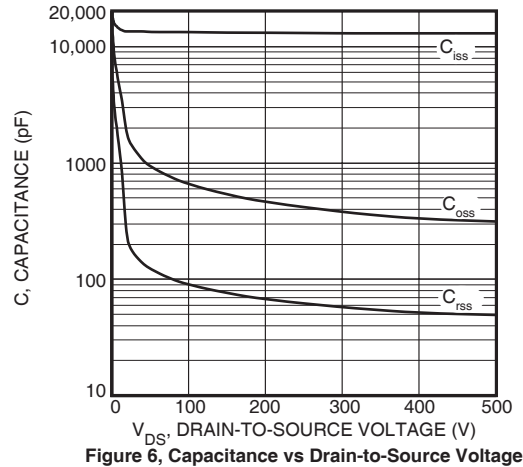
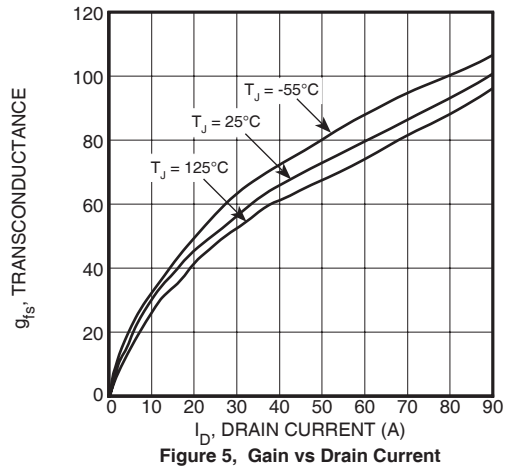
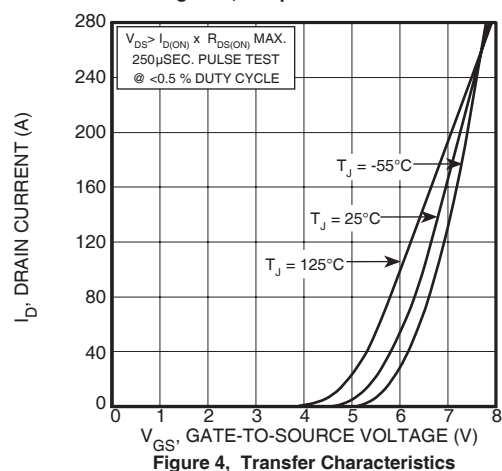
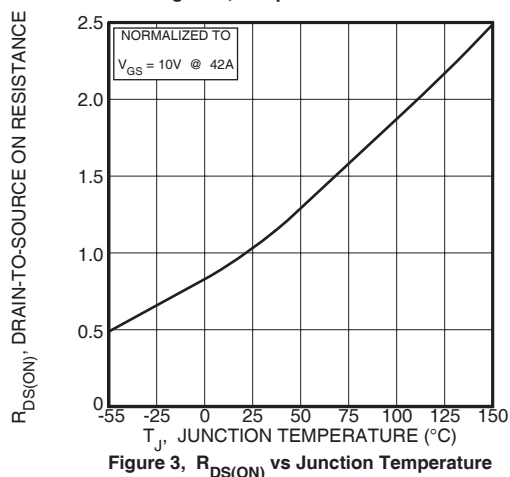
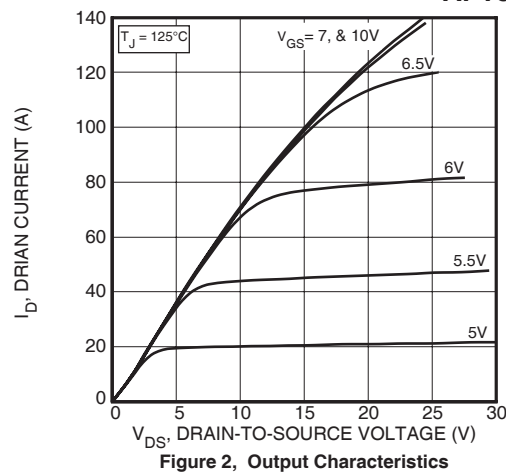
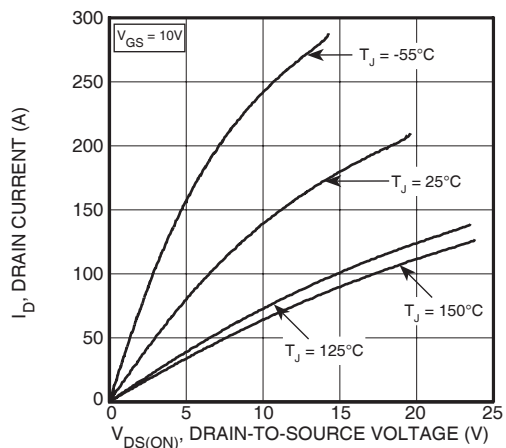
③ Pulse test: Pulse Width < 380 $\mu s$ , duty cycle < 2%.

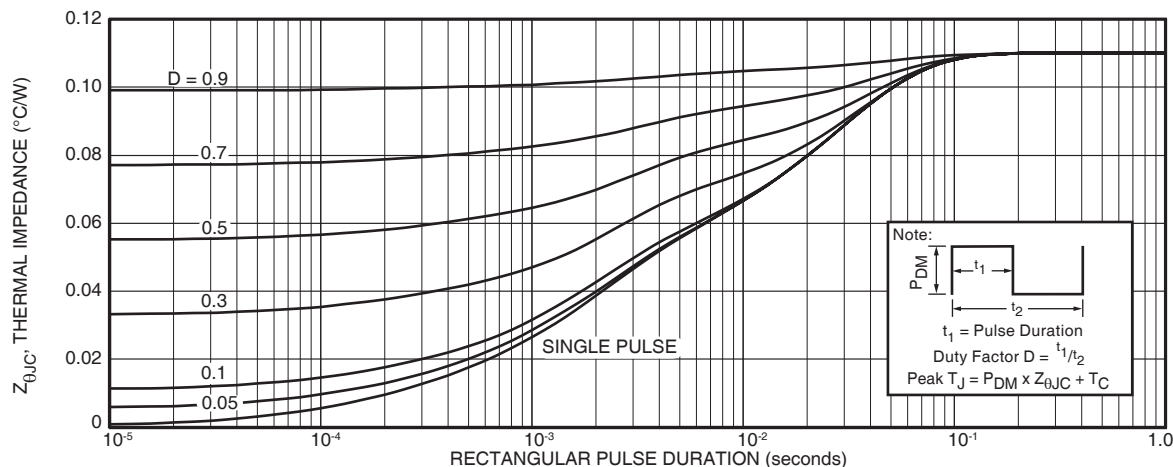
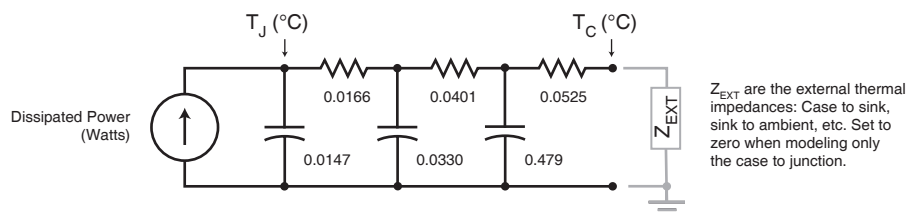
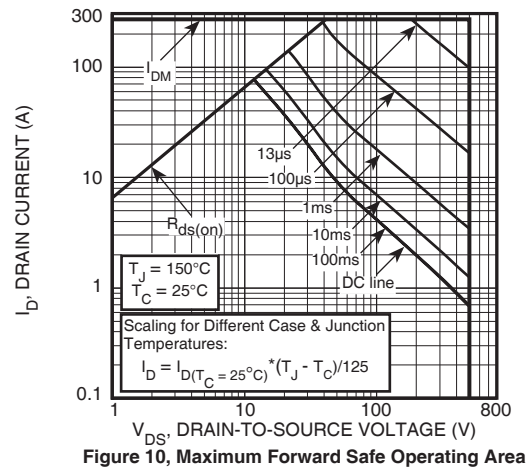
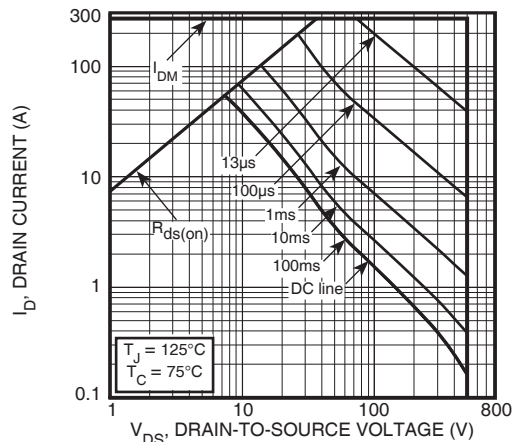
④  $C_{o(cr)}$  is defined as a fixed capacitance with the same stored charge as  $C_{OSS}$  with  $V_{DS} = 67\%$  of  $V_{(BR)DSS}$ .

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:  $C_{o(er)} = -3.14E-7/V_{DS}^2 + 7.31E-8/V_{DS} + 2.09E-10$ .

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

### TO-264 (L) Package Outline

