

International  
**IR** Rectifier

PD - 96116

**IRF8714PbF****Applications**

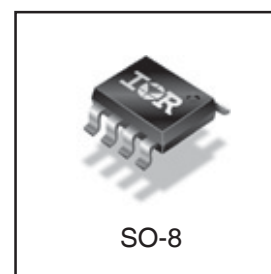
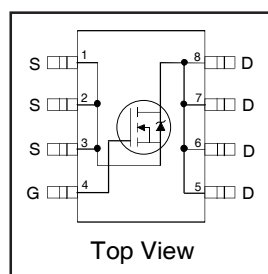
- Control MOSFET of Sync-Buck Converters used for Notebook Processor Power
- Control MOSFET for Isolated DC-DC Converters in Networking Systems

HEXFET® Power MOSFET

| $V_{DS}$   | $R_{DS(on)}$ max                              | Qg           |
|------------|-----------------------------------------------|--------------|
| <b>30V</b> | <b><math>8.7m\Omega @ V_{GS} = 10V</math></b> | <b>8.1nC</b> |

**Benefits**

- Very Low Gate Charge
- Very Low  $R_{DS(on)}$  at 4.5V  $V_{GS}$
- Ultra-Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current
- 20V  $V_{GS}$  Max. Gate Rating
- 100% tested for Rg
- Lead-Free

**Description**

The IRF8714PbF incorporates the latest HEXFET Power MOSFET Silicon Technology into the industry standard SO-8 package. The IRF8714PbF has been optimized for parameters that are critical in synchronous buck operation including  $R_{ds(on)}$  and gate charge to reduce both conduction and switching losses. The reduced total losses make this product ideal for high efficiency DC-DC converters that power the latest generation of processors for Notebook and Netcom applications.

**Absolute Maximum Ratings**

|                          | Parameter                                | Max.         | Units         |
|--------------------------|------------------------------------------|--------------|---------------|
| $V_{DS}$                 | Drain-to-Source Voltage                  | 30           | V             |
| $V_{GS}$                 | Gate-to-Source Voltage                   | $\pm 20$     |               |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 14           | A             |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 11           |               |
| $I_{DM}$                 | Pulsed Drain Current ①                   | 110          |               |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation                        | 2.5          | W             |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation                        | 1.6          |               |
|                          | Linear Derating Factor                   | 0.02         | W/ $^\circ C$ |
| $T_J$                    | Operating Junction and                   | -55 to + 150 | $^\circ C$    |
| $T_{STG}$                | Storage Temperature Range                |              |               |

**Thermal Resistance**

|                 | Parameter                | Typ. | Max. | Units        |
|-----------------|--------------------------|------|------|--------------|
| $R_{\theta JL}$ | Junction-to-Drain Lead ⑤ | —    | 20   | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction-to-Ambient ④⑤   | —    | 50   |              |

Notes ① through ⑤ are on page 9

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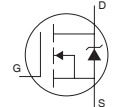
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

|                              | Parameter                                  | Min. | Typ.  | Max. | Units                | Conditions                                                                       |
|------------------------------|--------------------------------------------|------|-------|------|----------------------|----------------------------------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage          | 30   | —     | —    | V                    | $V_{GS} = 0V, I_D = 250\mu A$                                                    |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient        | —    | 0.021 | —    | V/ $^\circ\text{C}$  | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$                                |
| $R_{DS(on)}$                 | Static Drain-to-Source On-Resistance       | —    | 7.1   | 8.7  | $m\Omega$            | $V_{GS} = 10V, I_D = 14A$ ③                                                      |
|                              |                                            | —    | 10.9  | 13   |                      | $V_{GS} = 4.5V, I_D = 11A$ ③                                                     |
| $V_{GS(th)}$                 | Gate Threshold Voltage                     | 1.35 | 1.80  | 2.35 | V                    | $V_{DS} = V_{GS}, I_D = 25\mu A$                                                 |
| $\Delta V_{GS(th)}$          | Gate Threshold Voltage Coefficient         | —    | -6.0  | —    | mV/ $^\circ\text{C}$ | $V_{DS} = V_{GS}, I_D = 25\mu A$                                                 |
| $I_{DSS}$                    | Drain-to-Source Leakage Current            | —    | —     | 1.0  | $\mu A$              | $V_{DS} = 24V, V_{GS} = 0V$                                                      |
|                              |                                            | —    | —     | 150  |                      | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$                             |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage             | —    | —     | 100  | nA                   | $V_{GS} = 20V$                                                                   |
|                              | Gate-to-Source Reverse Leakage             | —    | —     | -100 |                      | $V_{GS} = -20V$                                                                  |
| $g_{fs}$                     | Forward Transconductance                   | 71   | —     | —    | S                    | $V_{DS} = 15V, I_D = 11A$                                                        |
| $Q_g$                        | Total Gate Charge                          | —    | 8.1   | 12   | nC                   | $V_{DS} = 15V$<br>$V_{GS} = 4.5V$<br>$I_D = 11A$<br>See Figs. 15 & 16            |
| $Q_{gs1}$                    | Pre-V <sub>th</sub> Gate-to-Source Charge  | —    | 1.9   | —    |                      |                                                                                  |
| $Q_{gs2}$                    | Post-V <sub>th</sub> Gate-to-Source Charge | —    | 1.0   | —    |                      |                                                                                  |
| $Q_{gd}$                     | Gate-to-Drain Charge                       | —    | 3.0   | —    |                      |                                                                                  |
| $Q_{godr}$                   | Gate Charge Overdrive                      | —    | 2.2   | —    |                      |                                                                                  |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ )       | —    | 4.0   | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                                      |
| $Q_{oss}$                    | Output Charge                              | —    | 4.8   | —    |                      |                                                                                  |
| $R_g$                        | Gate Resistance                            | —    | 1.6   | 2.6  | $\Omega$             |                                                                                  |
| $t_{d(on)}$                  | Turn-On Delay Time                         | —    | 10    | —    | ns                   | $V_{DD} = 15V, V_{GS} = 4.5V$<br>$I_D = 11A$<br>$R_G = 1.8\Omega$<br>See Fig. 18 |
| $t_r$                        | Rise Time                                  | —    | 9.9   | —    |                      |                                                                                  |
| $t_{d(off)}$                 | Turn-Off Delay Time                        | —    | 11    | —    |                      |                                                                                  |
| $t_f$                        | Fall Time                                  | —    | 5.0   | —    |                      |                                                                                  |
| $C_{iss}$                    | Input Capacitance                          | —    | 1020  | —    | pF                   | $V_{GS} = 0V$<br>$V_{DS} = 15V$<br>$f = 1.0\text{MHz}$                           |
| $C_{oss}$                    | Output Capacitance                         | —    | 220   | —    |                      |                                                                                  |
| $C_{rss}$                    | Reverse Transfer Capacitance               | —    | 110   | —    |                      |                                                                                  |

## Avalanche Characteristics

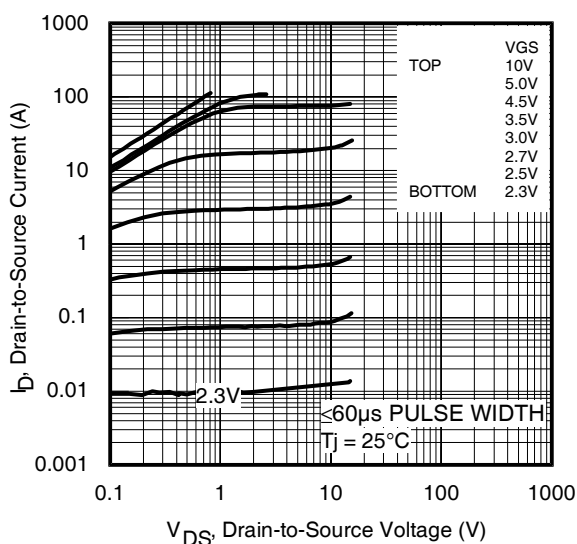
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 65   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 11   | A     |

## Diode Characteristics

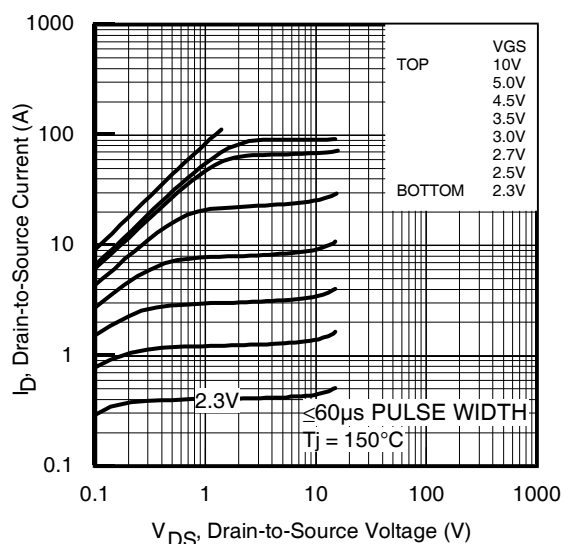
|          | Parameter                                 | Min.                                                                 | Typ. | Max. | Units | Conditions                                                                                                                                                       |
|----------|-------------------------------------------|----------------------------------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                                                    | —    | 3.1  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                                                    | —    | 110  |       |                                                                                                                                                                  |
| $V_{SD}$ | Diode Forward Voltage                     | —                                                                    | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 11A, V_{GS} = 0V$ ③                                                                                                               |
| $t_{rr}$ | Reverse Recovery Time                     | —                                                                    | 14   | 21   | ns    | $T_J = 25^\circ\text{C}, I_F = 11A, V_{DD} = 15V$                                                                                                                |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                                                    | 15   | 23   | nC    | $di/dt = 300A/\mu s$ ③                                                                                                                                           |
| $t_{on}$ | Forward Turn-On Time                      | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) |      |      |       |                                                                                                                                                                  |

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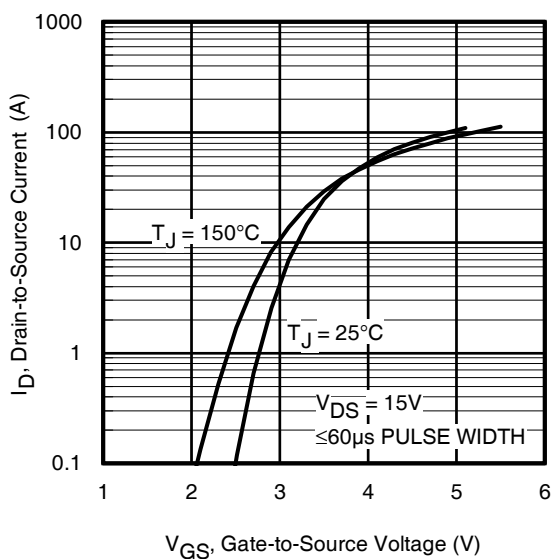
# IRF8714PbF



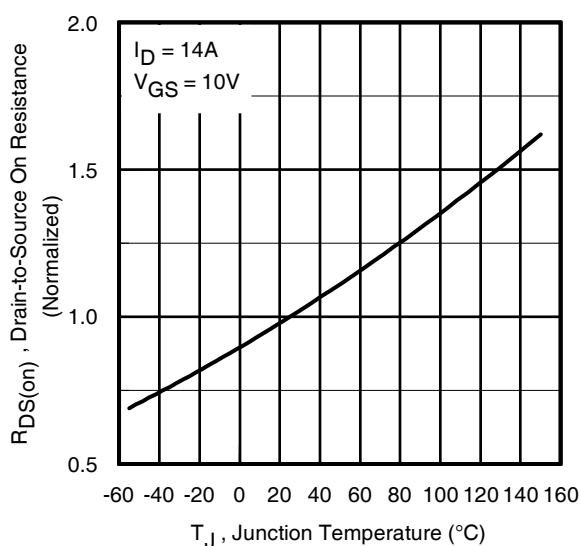
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



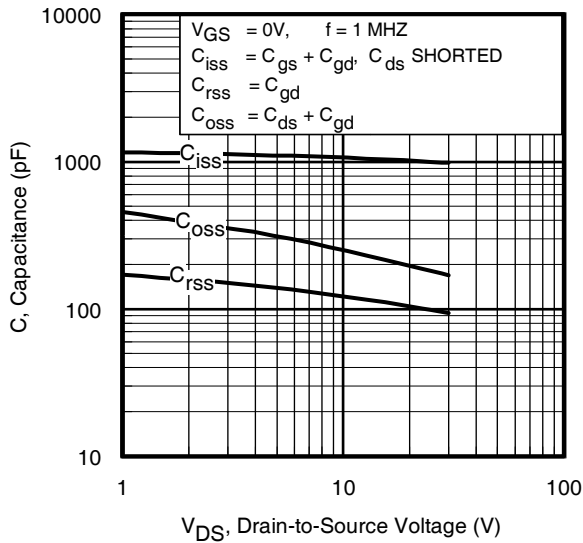
**Fig 3.** Typical Transfer Characteristics



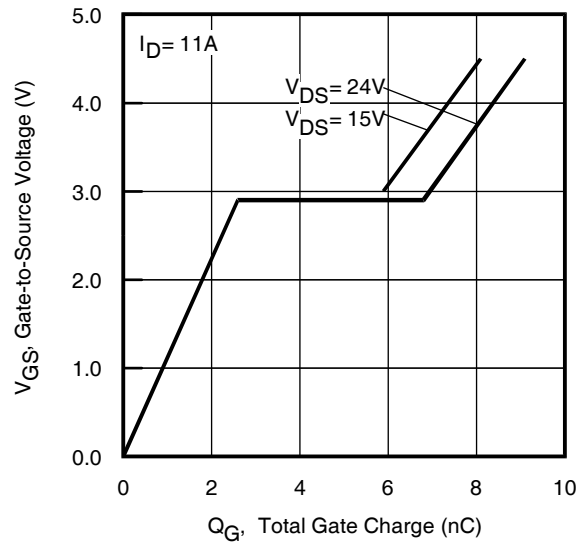
**Fig 4.** Normalized On-Resistance  
vs. Temperature

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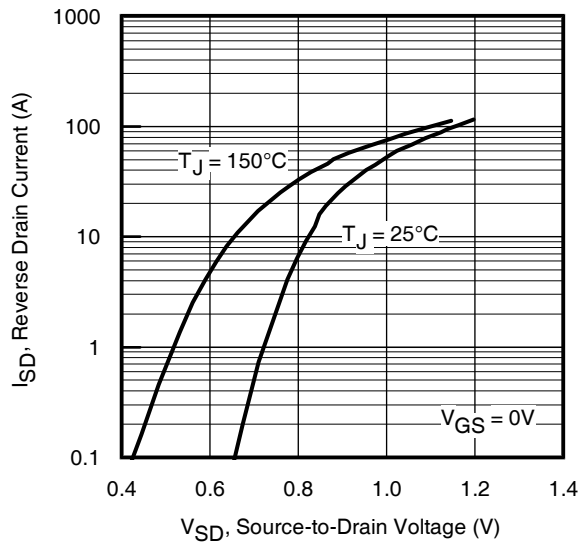
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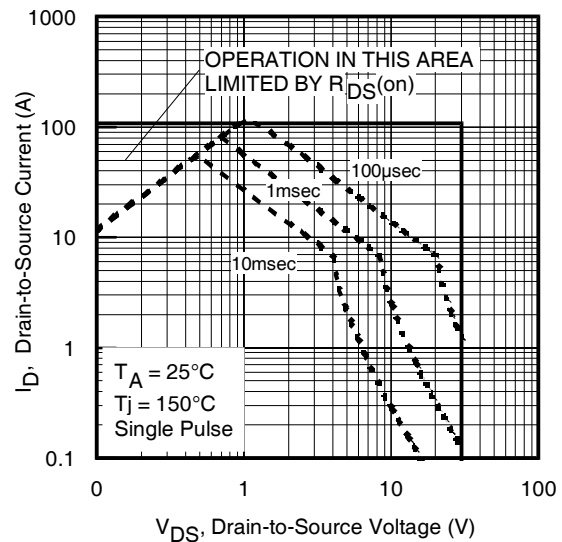
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



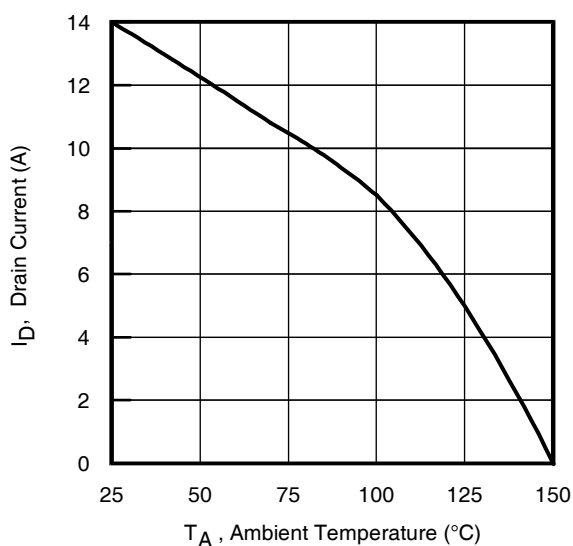
**Fig 7.** Typical Source-Drain Diode Forward Voltage



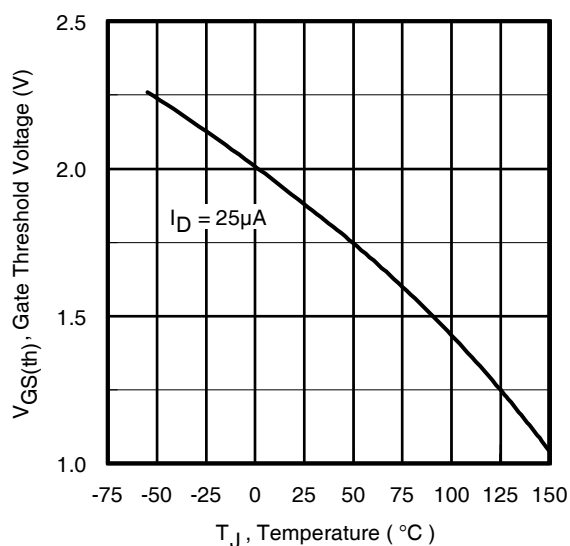
**Fig 8.** Maximum Safe Operating Area

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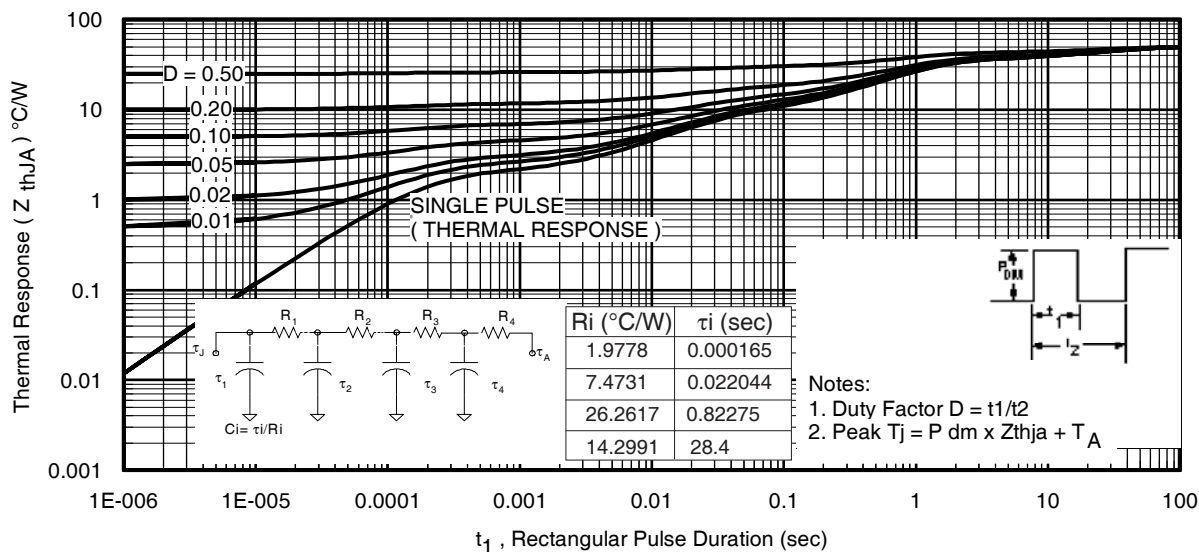
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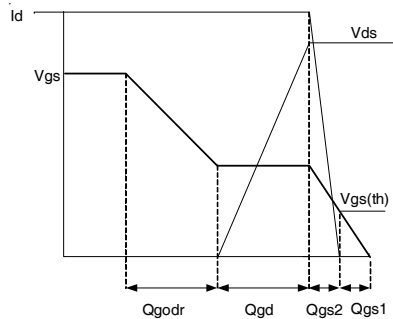
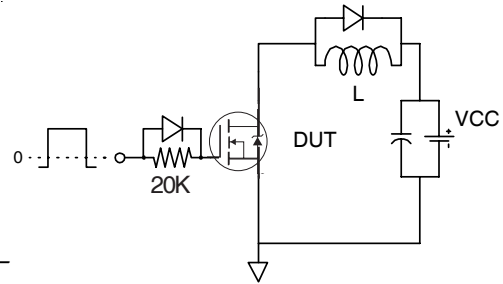
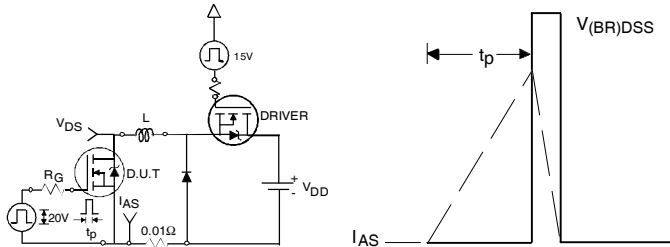
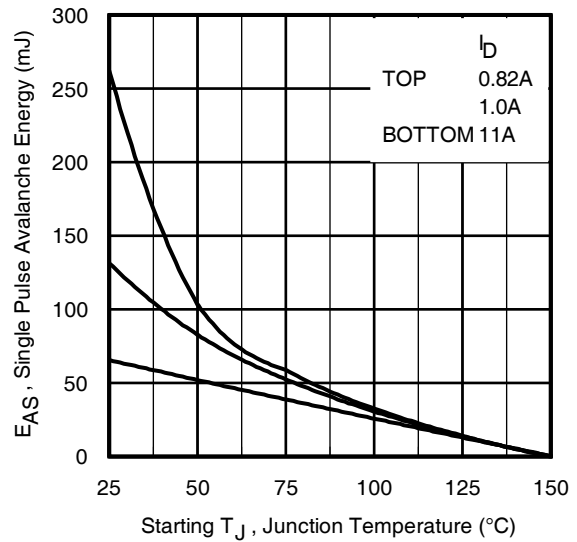
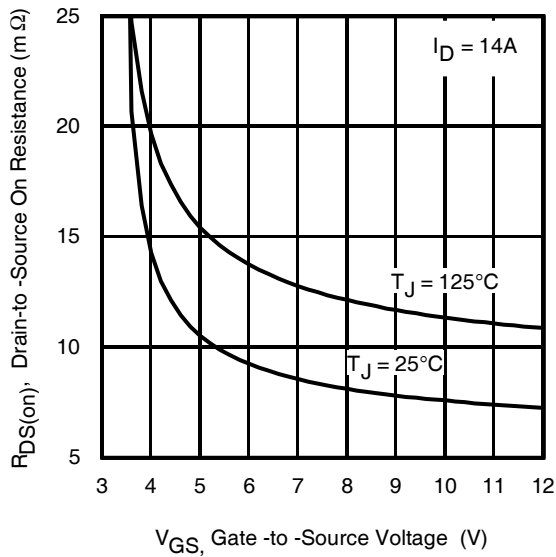
**Fig 9.** Maximum Drain Current vs. Ambient Temperature

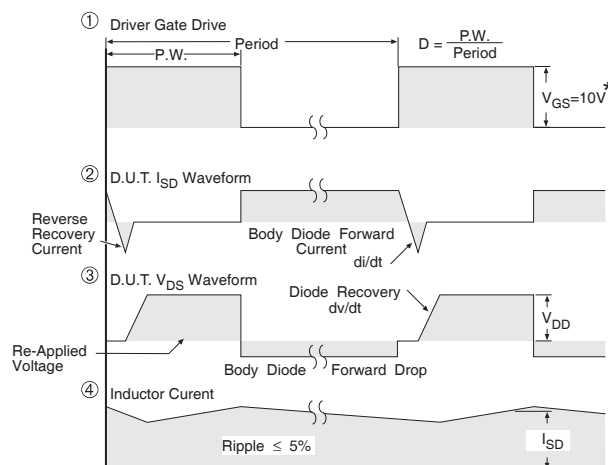
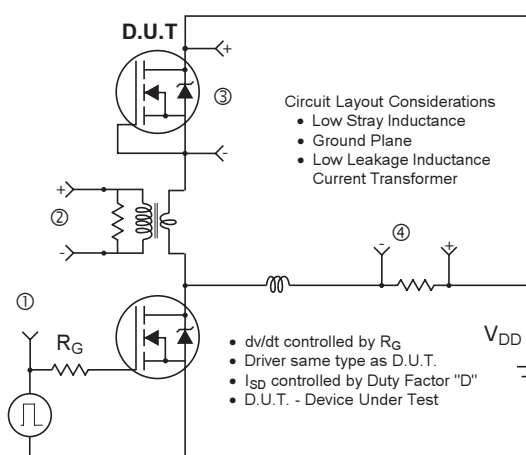


**Fig 10.** Threshold Voltage vs. Temperature



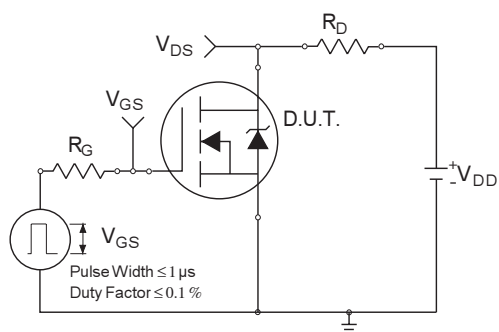
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



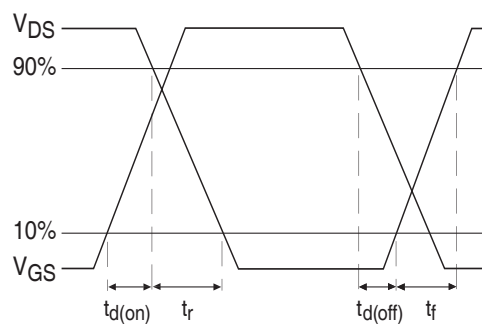


\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 17. Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs**



**Fig 18a. Switching Time Test Circuit**



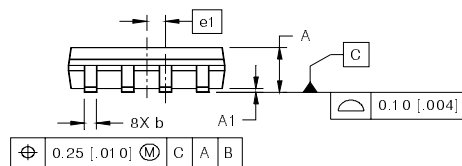
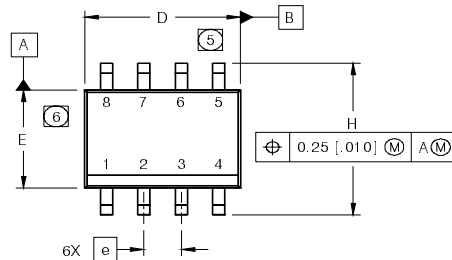
**Fig 18b. Switching Time Waveforms**

# IRF8714PbF

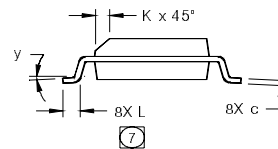
## SO-8 Package Outline

Dimensions are shown in millimeters (inches)

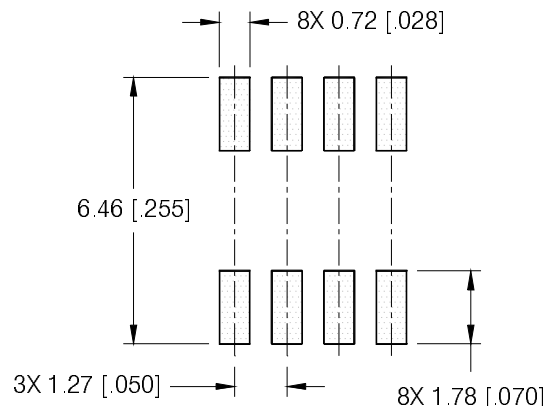
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| DIM | INCHES     |       | MILLIMETERS |      |
|-----|------------|-------|-------------|------|
|     | MIN        | MAX   | MIN         | MAX  |
| A   | .0532      | .0688 | 1.35        | 1.75 |
| A1  | .0040      | .0098 | 0.10        | 0.25 |
| b   | .013       | .020  | 0.33        | 0.51 |
| c   | .0075      | .0098 | 0.19        | 0.25 |
| D   | .189       | .1968 | 4.80        | 5.00 |
| E   | .1497      | .1574 | 3.80        | 4.00 |
| e   | .050 BASIC |       | 1.27 BASIC  |      |
| e1  | .025 BASIC |       | 0.635 BASIC |      |
| H   | .2284      | .2440 | 5.80        | 6.20 |
| K   | .0099      | .0196 | 0.25        | 0.50 |
| L   | .016       | .050  | 0.40        | 1.27 |
| y   | 0°         | 8°    | 0°          | 8°   |



### FOOTPRINT

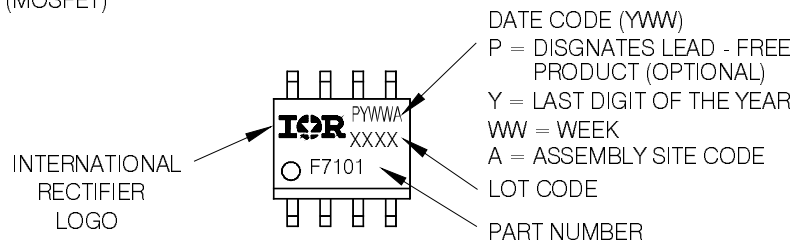


#### NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [0.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

## SO-8 Part Marking Information

EXAMPLE: THIS IS AN IRF7101 (MOSFET)



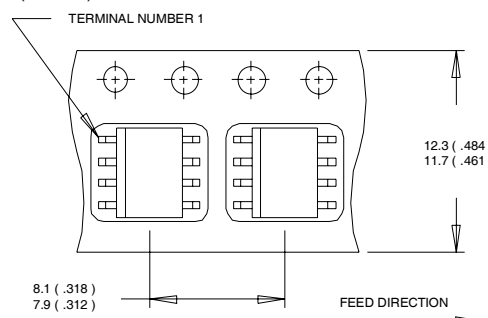
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>

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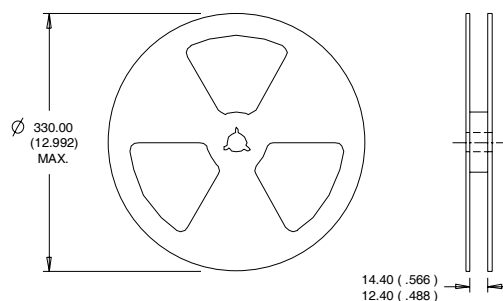
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## SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)



- NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
  2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
  3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



- NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
  2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1.1\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 11\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④ When mounted on 1 inch square copper board.
- ⑤  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .

**Note:** For the most current drawing please refer to IR website at <http://www.irf.com/package>

Data and specifications subject to change without notice.  
This product has been designed and qualified for the Consumer market.  
Qualification Standards can be found on IR's Web site.

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