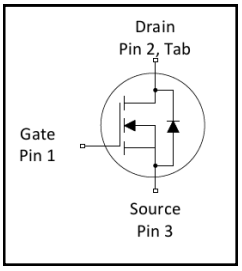
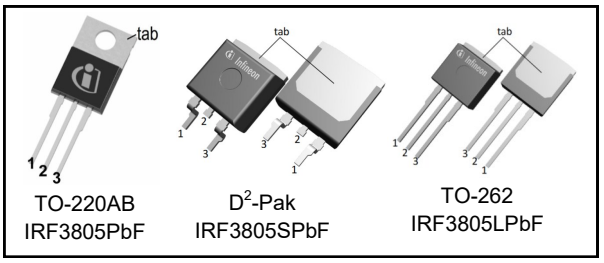
| | |
|---|---|
| $V_{(BR)DSS}$ | 55V |
| $R_{DS(on)}$ | 3.3mΩ |
| $I_D$ | 75A |




**Features**

- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

| G | D | S |
|---|---|---|
| Gate | Drain | Source |

**Description**

This HEXFET Power MOSFETs utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in a wide variety of applications.

| Base part number | Package Type | Standard Pack | | Orderable Part Number |
|---|---|---|---|---|
| | | Form | Quantity | |
| IRF3805PbF | TO-220 | Tube | 50 | IRF3805PbF |
| IRF3805SPbF | $D^2$-Pak | Tape and Reel | 800 | IRF3805SPbF |
| IRF3805LPbF | TO-262 | Tube | 50 | IRF3805LPbF |

**Absolute Maximum Rating**

| Symbol | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V (Silicon Limited) | 210 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V (Silicon Limited) | 150 | |
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V (Package Limited) | 75 | |
| $I_{DM}$ | Pulsed Drain Current ① | 890 | |
| $P_D$ @$T_C$ = 25°C | Power Dissipation | 300 | W |
| | Linear Derating Factor | 2.0 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy (Thermally Limited)② | 650 | mJ |
| $E_{AS}$ (tested) | Single Pulse Avalanche Energy Tested Value ⑥ | 940 | |
| $I_{AR}$ | Avalanche Current ① | See Fig. 12a,12b,15,16 | A |
| $E_{AR}$ | Repetitive Avalanche Energy ⑤ | | mJ |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 175 | °C |
| | Soldering Temperature, for 10 seconds (1.6mm from case) | 300 | |
| | Mounting torque, 6-32 or M3 screw ⑦ | 10 lbf•in (1.1N•m) | |

**Thermal Resistance**

| Symbol | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case ⑨ | —— | 0.5⑩ | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface ⑦ | 0.50 | —— | |
| $R_{\theta JA}$ | Junction-to-Ambient ⑦⑨ | —— | 62 | |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB Mount, steady state) ⑧⑨ | —— | 40 | |

**Static @ $T_J$ = 25°C (unless otherwise specified)**

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 55 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.051 | — | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 2.6 | 3.3 | mΩ | $V_{GS}$ = 10V, $I_D$ = 75A ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| gfs | Forward Trans conductance | 75 | — | — | S | $V_{DS}$ = 25V, $I_D$ = 75A |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 20 | µA | $V_{DS}$ = 55V, $V_{GS}$ = 0V |
| | | — | — | 250 | | $V_{DS}$ = 55V,$V_{GS}$ = 0V,$T_J$ =125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | — | — | 200 | nA | $V_{GS}$ = 20V |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | $V_{GS}$ = -20V |

**Dynamic Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)**

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge | — | 190 | 290 | nC | $I_D$ = 75A |
| $Q_{gs}$ | Gate-to-Source Charge | — | 52 | — | | $V_{DS}$ = 44V |
| $Q_{gd}$ | Gate-to-Drain Charge | — | 72 | — | | $V_{GS}$ = 10V③ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 150 | — | ns | $V_{DD}$ = 28V |
| $t_r$ | Rise Time | — | 20 | — | | $I_D$ = 75A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 93 | — | | $R_G$= 2.6Ω |
| $t_f$ | Fall Time | — | 87 | — | | $V_{GS}$ = 10V③ |
| $L_D$ | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| $L_S$ | Internal Source Inductance | — | 7.5 | — | | |
| $C_{iss}$ | Input Capacitance | — | 7960 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 1260 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 630 | — | | $f$ = 1.0MHz |
| $C_{oss}$ | Output Capacitance | — | 4400 | — | | $V_{GS}$ = 0V,$V_{DS}$ = 1.0V, $f$ = 1.0MHz |
| $C_{oss}$ | Output Capacitance | — | 980 | — | | $V_{GS}$ = 0V,$V_{DS}$ = 44V, $f$ = 1.0MHz |
| $C_{oss\ eff.}$ | Effective Output Capacitance | — | 1550 | — | | $V_{GS}$ = 0V,$V_{DS}$ = 0V to 44V④ |

**Diode Characteristics**

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 75 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 890 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.3 | V | $T_J$ = 25°C,$I_S$ = 75A,$V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | — | 36 | 54 | ns | $T_J$ = 25°C ,$I_F$ = 75A, $V_{DD}$ = 28V |
| $Q_{rr}$ | Reverse Recovery Charge | — | 47 | 71 | nC | di/dt = 100A/µs ③ |

**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).

② Limited by $T_{Jmax}$ starting $T_J$ = 25°C, L = 0.23mH, $R_G$ = 25Ω, $I_{AS}$ = 75A, $V_{GS}$ =10V. Part not recommended for use above this value.

③ Pulse width ≤ 1.0ms; duty cycle ≤ 2%.

④ $C_{oss}$ eff. is a fixed capacitance that gives the same charging time as $C_{oss}$ while $V_{DS}$ is rising from 0 to 80% $V_{DSS}$ .

⑤ Limited by $T_{Jmax}$ , see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.

⑥ This value determined from sample failure population. 100% tested to this value in production.

⑦ This is only applied to TO-220AB package.

⑧ This is applied to $D^2$ Pak, when mounted on 1" square PCB ( FR-4 or G-10 Material ). For recommended footprint and soldering techniques refer to application note# AN-994.

⑨ $R_\theta$ is measured at $T_J$ of approximately 90°C.

⑩ TO-220 device will have an Rth of 0.45°C/W.

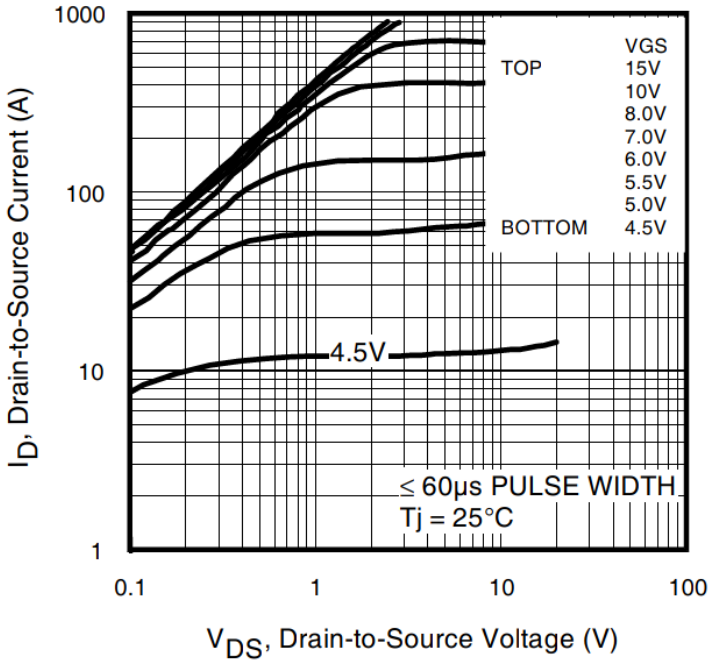



**Fig. 1** Typical Output Characteristics

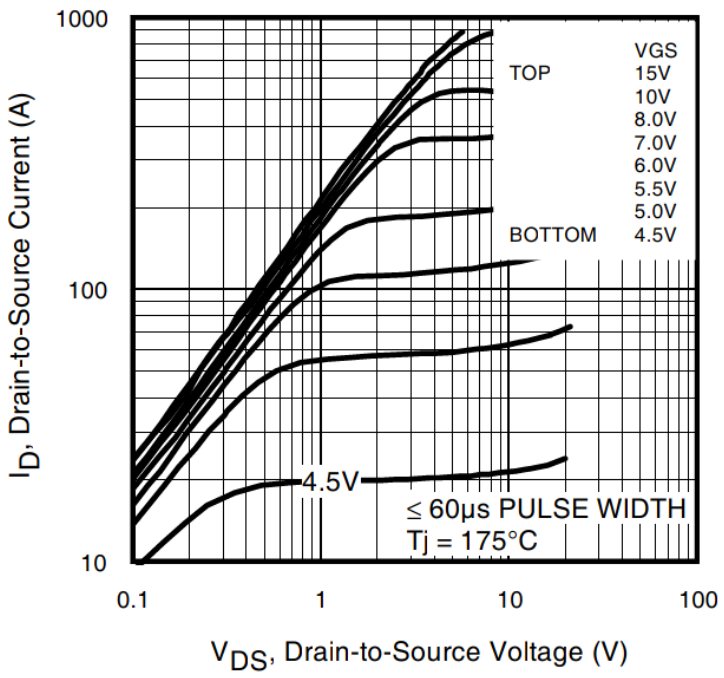



**Fig. 2** Typical Output Characteristics

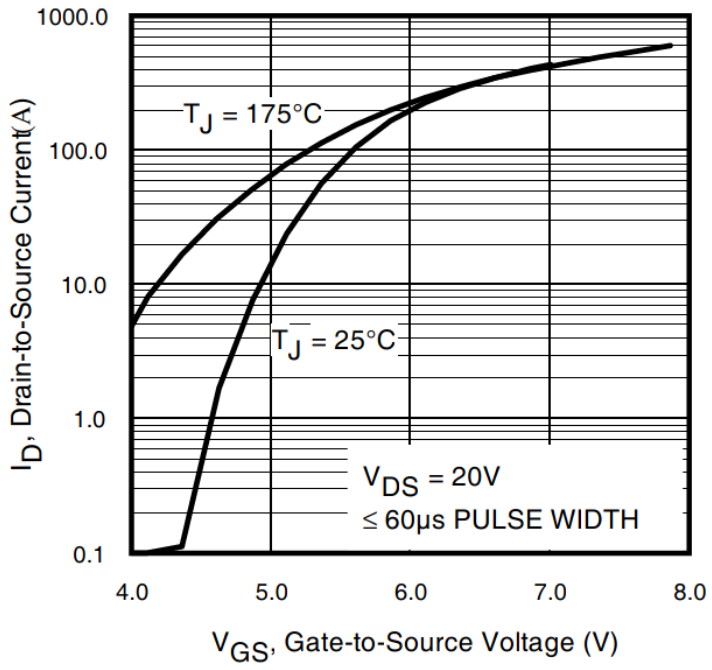



**Fig. 3** Typical Transfer Characteristics

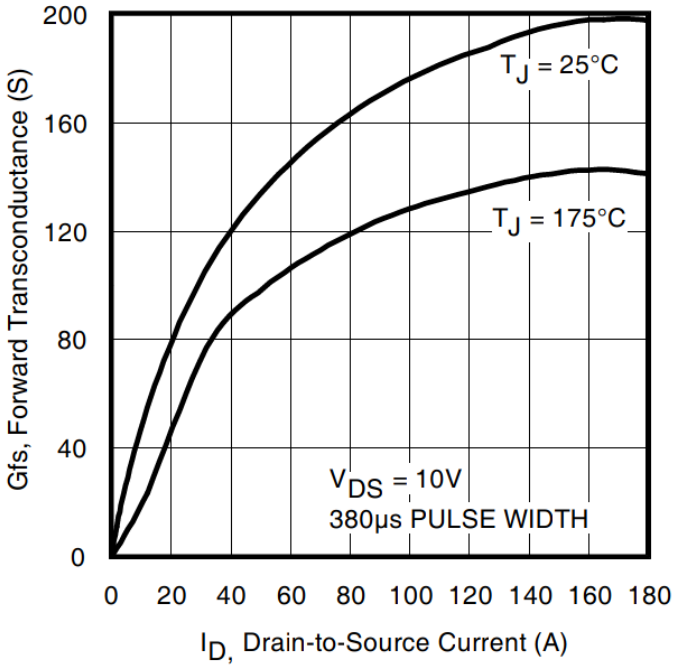



**Fig. 4** Typical Forward Transconductance vs. Drain Current

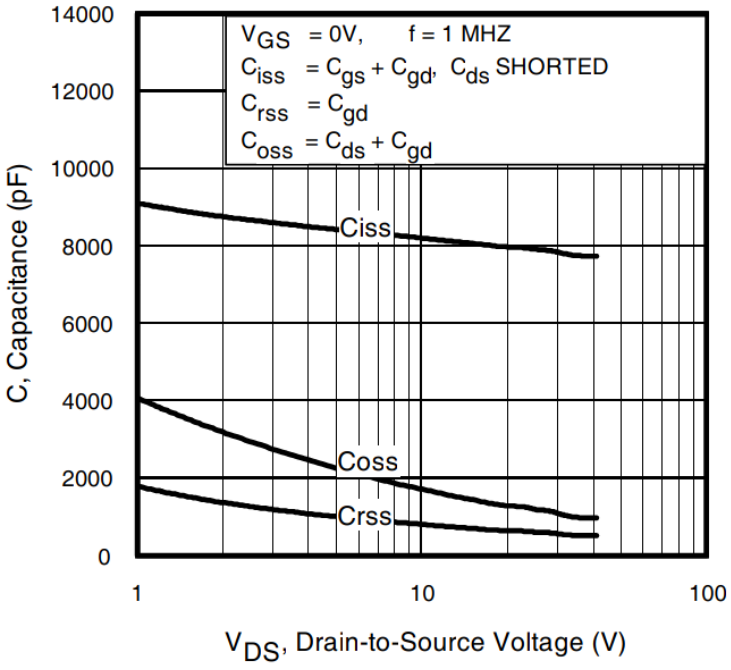



**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage

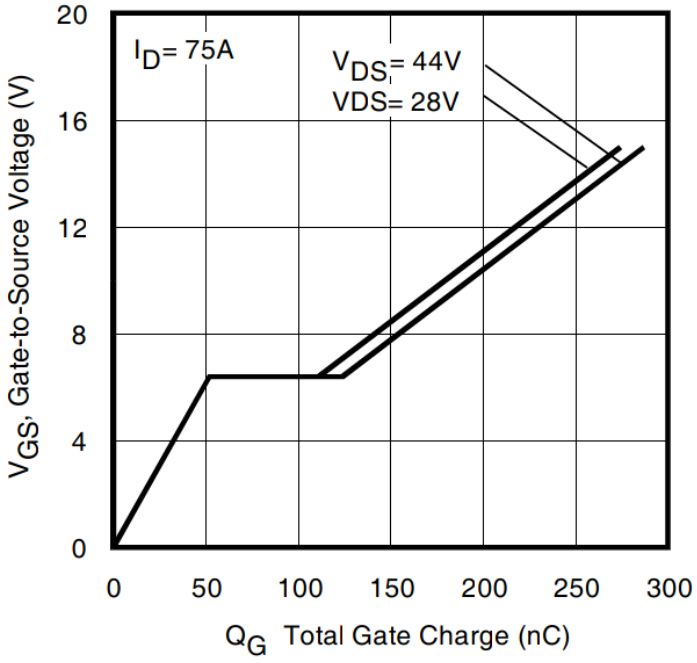



**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage

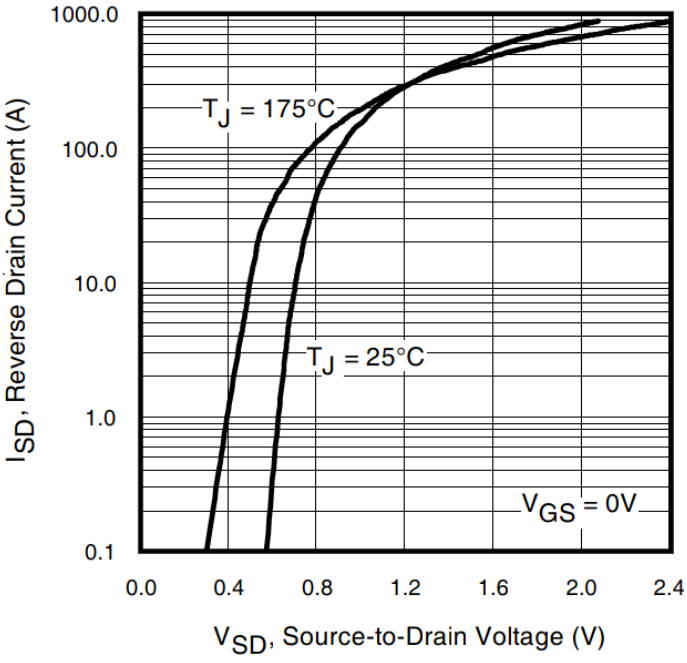



**Fig. 7** Typical Source-to-Drain Diode Forward Voltage

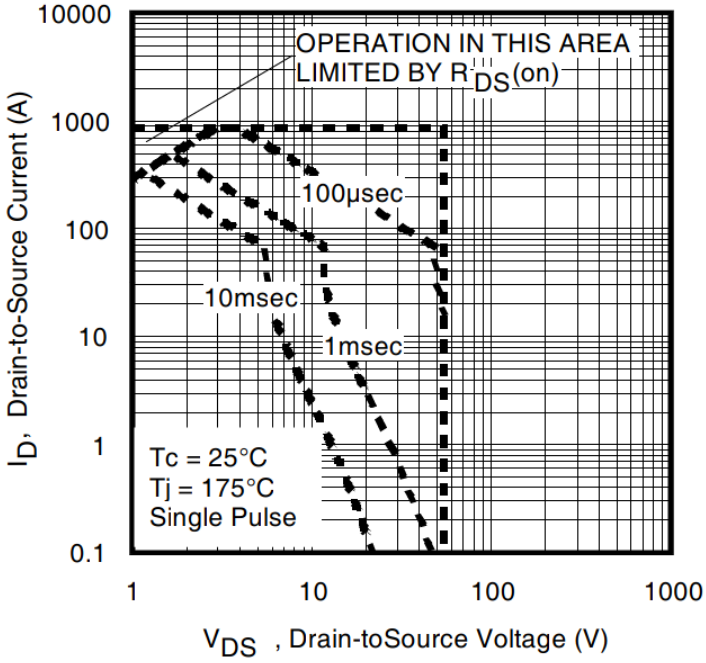



**Fig 8.** Maximum Safe Operating Area

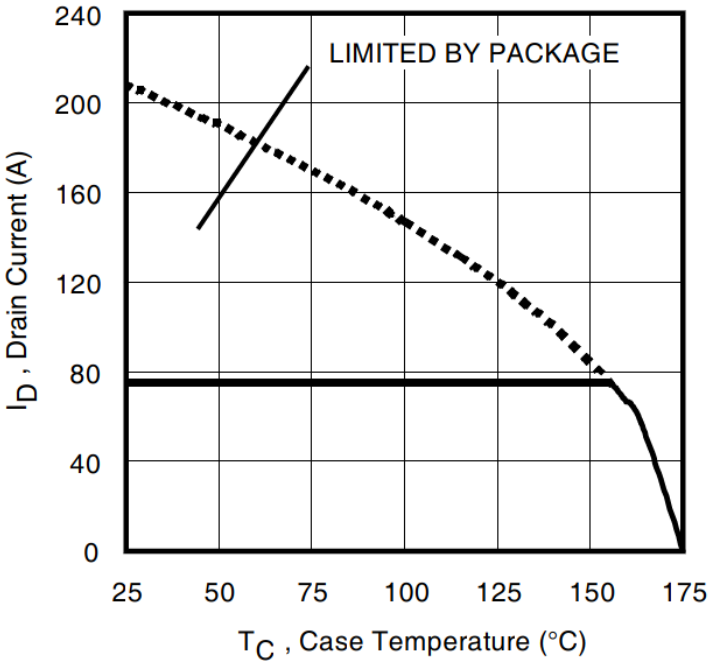



**Fig 9.** Maximum Drain Current vs. Case Temperature

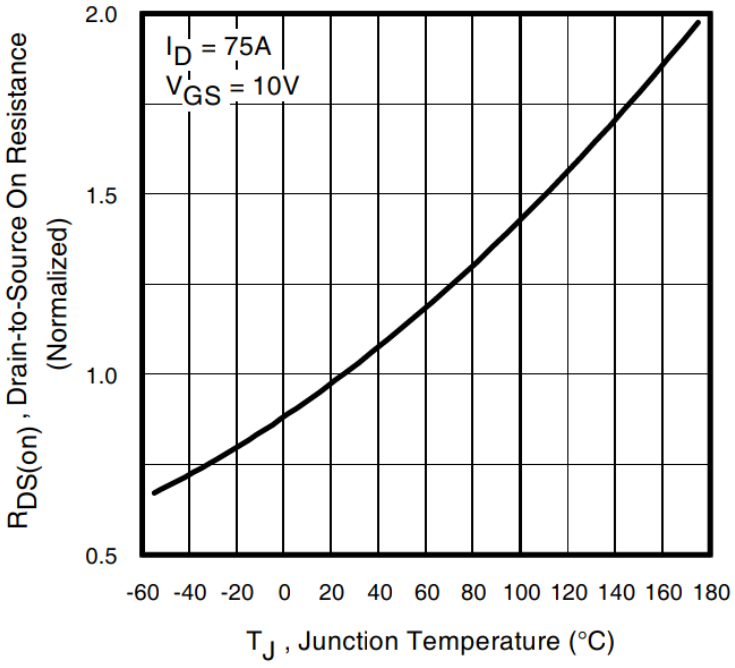



**Fig 10.** Normalized On-Resistance vs. Temperature

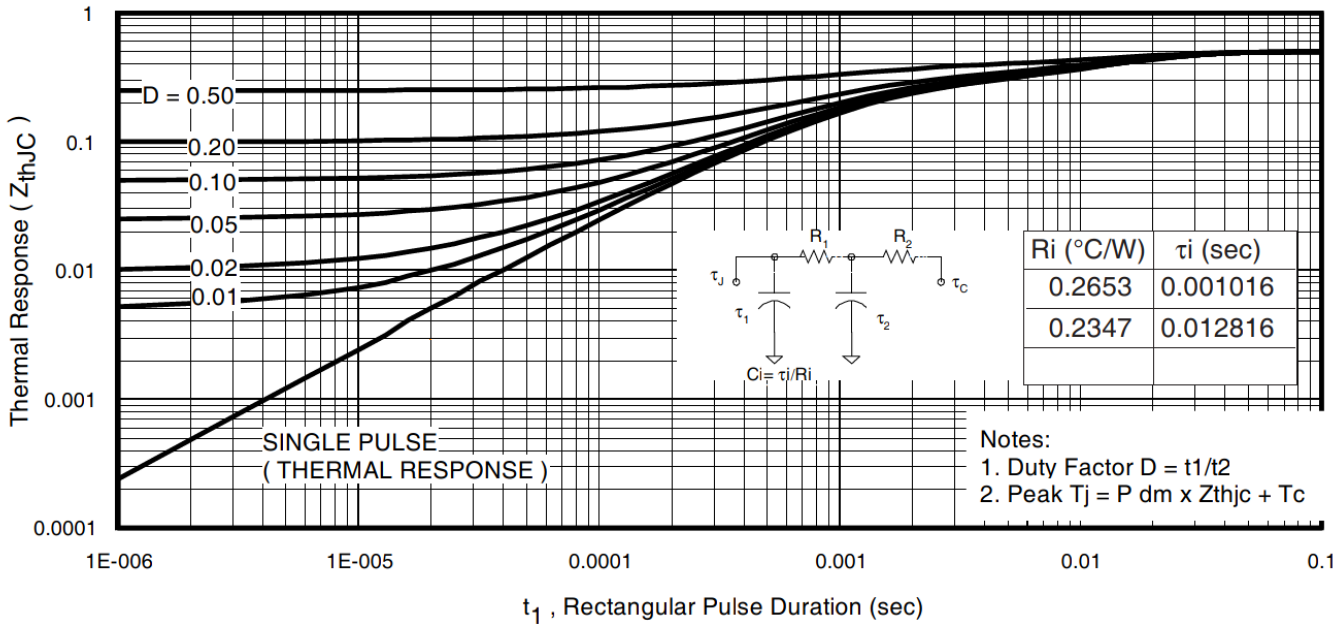



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

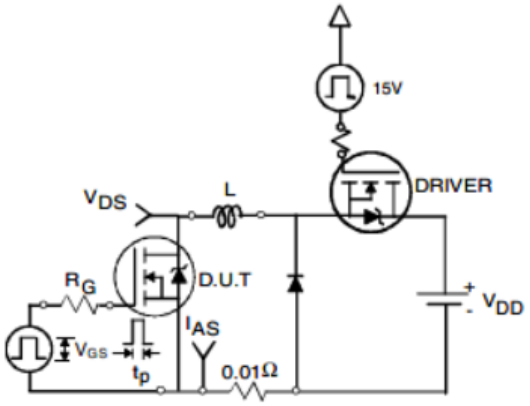



**Fig. 12a.** Unclamped Inductive Test Circuit

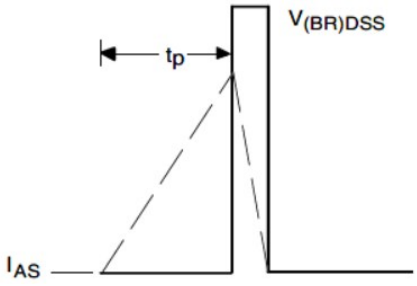



**Fig. 12b.** Unclamped Inductive Waveforms

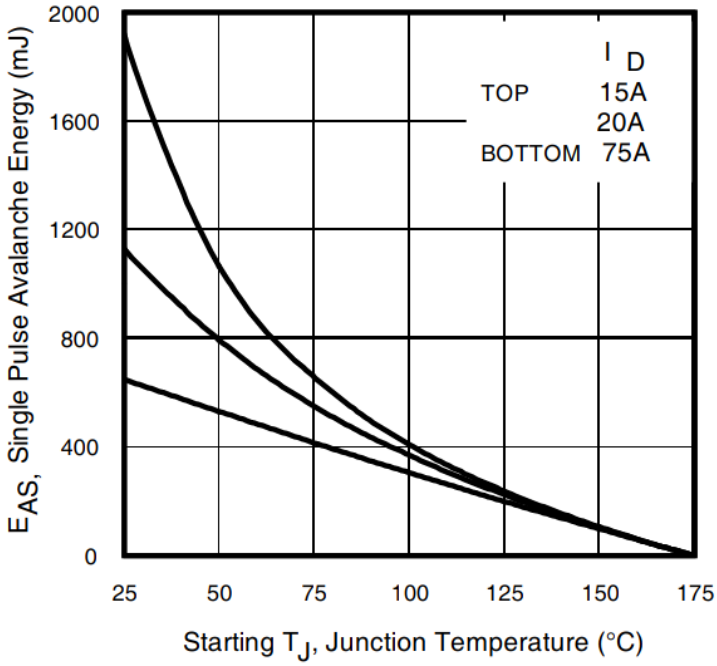



**Fig 12c.** Maximum Avalanche Energy vs. Drain Current

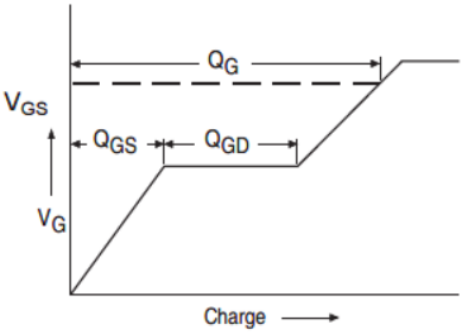



**Fig 13a.** Basic Gate Charge Waveform

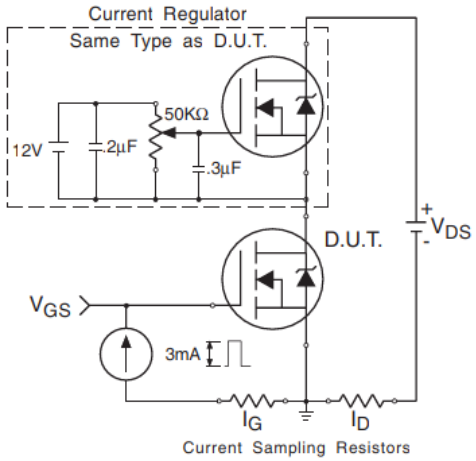



**Fig 13b.** Gate Charge Test Circuit

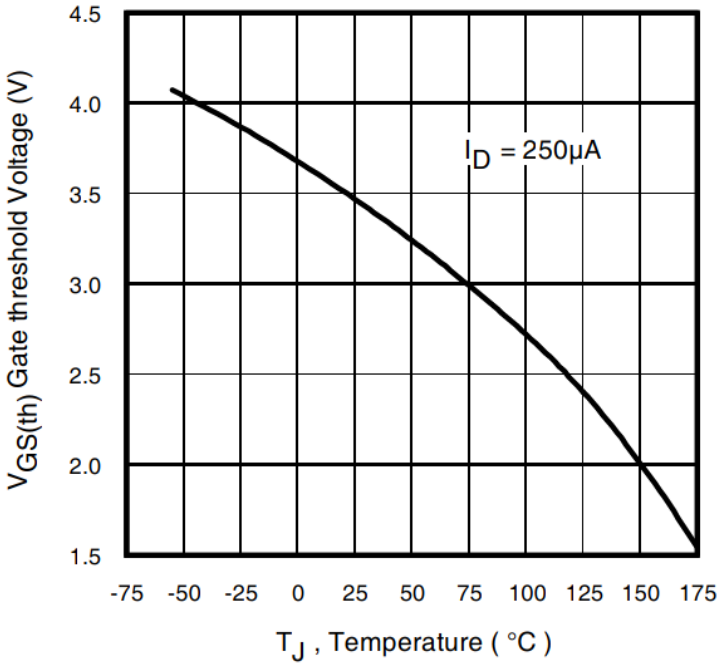



**Fig. 14** Threshold Voltage vs. Temperature

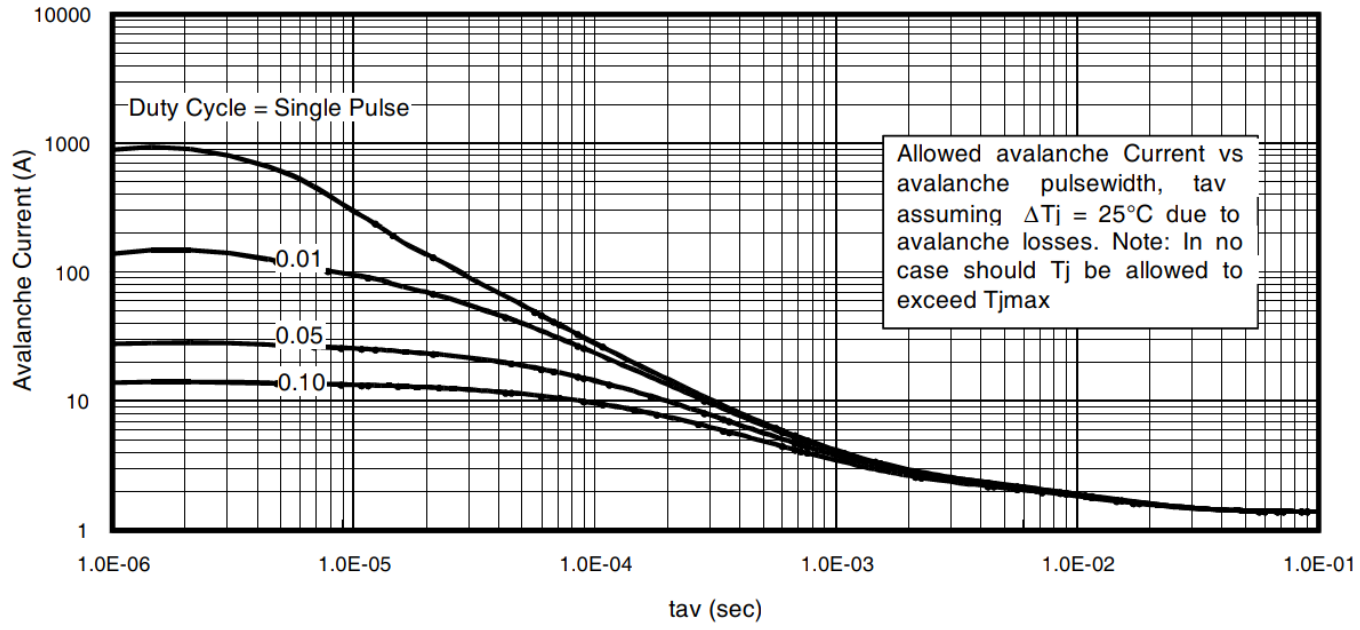



**Fig 15.** Typical Avalanche Current vs. Pulse Width

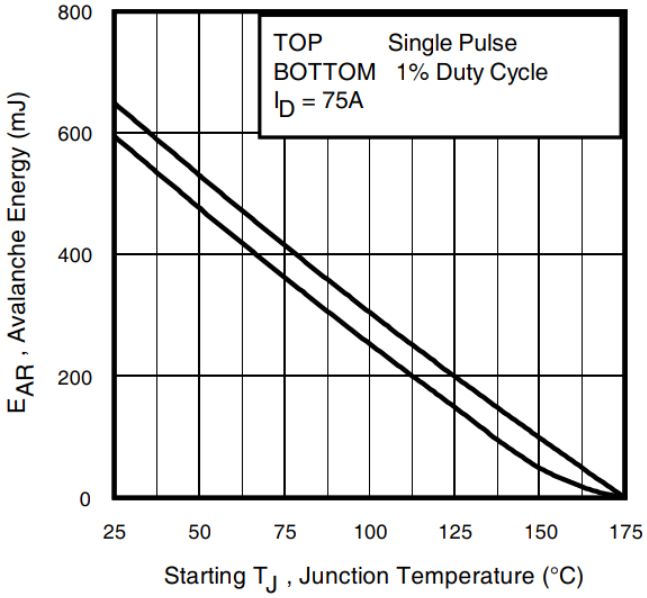



**Fig 16.** Maximum Avalanche Energy vs. Temperature

**Notes on Repetitive Avalanche Curves , Figures 15, 16:**
**(For further info, see AN-1005 at www.irf.com)**

1.Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of $T_{jmax}$. This is validated for every part type.

2. Safe operation in Avalanche is allowed as long as$T_{jmax}$ is not exceeded.

3. Equation below based on circuit and waveforms shown in Figures 23a, 23b.

4. $P_{D\ (ave)}$ = Average power dissipation per single avalanche pulse.

5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).

6. $I_{av}$ = Allowable avalanche current.

7. ΔT = Allowable rise in junction temperature, not to exceed $T_{jmax}$ (assumed as 25°C in Figure 15, 16).

$t_{av}$ = Average time in avalanche.

D = Duty cycle in avalanche = tav ·f

$Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 14)

$$\mathbf{PD\ (ave) = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}}$$

$$\mathbf{I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]}$$

$$\mathbf{E_{AS\ (AR)} = P_{D\ (ave)} \cdot t_{av}}$$

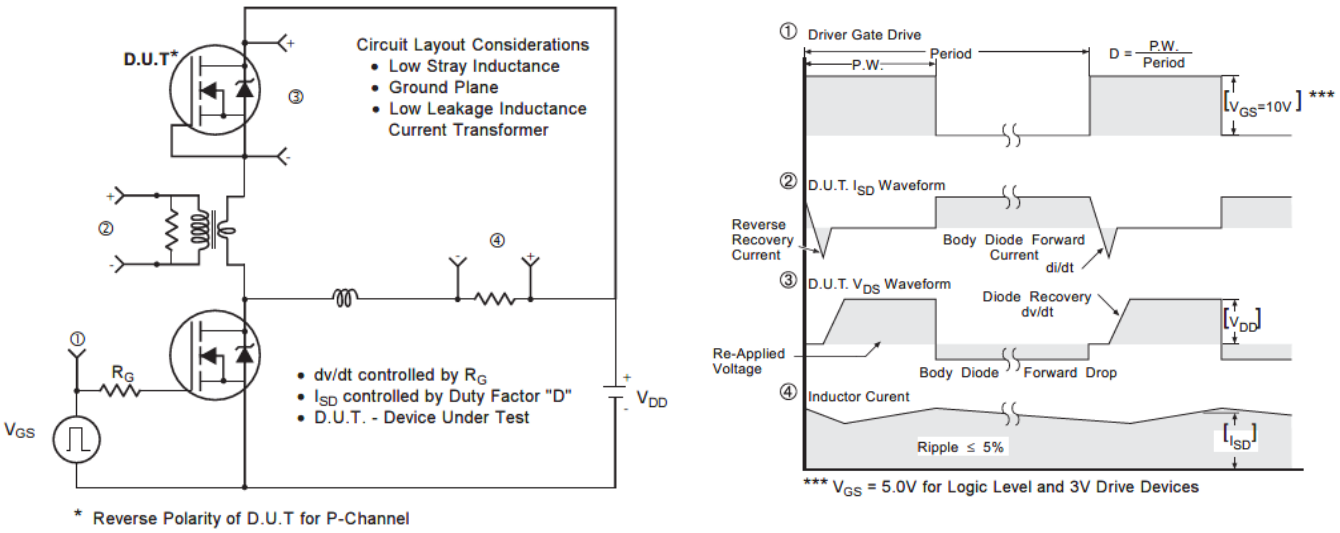



**Fig 17.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

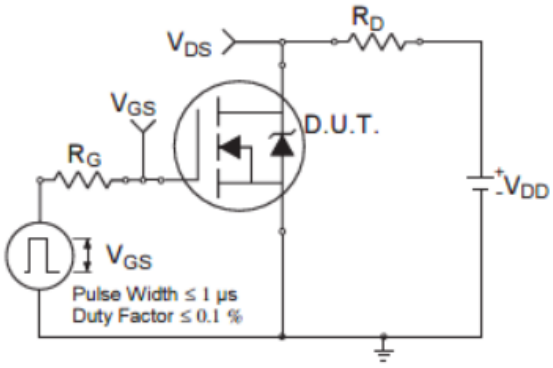



**Fig 18a.** Switching Time Test Circuit

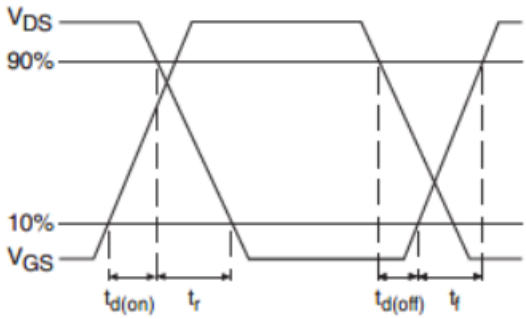
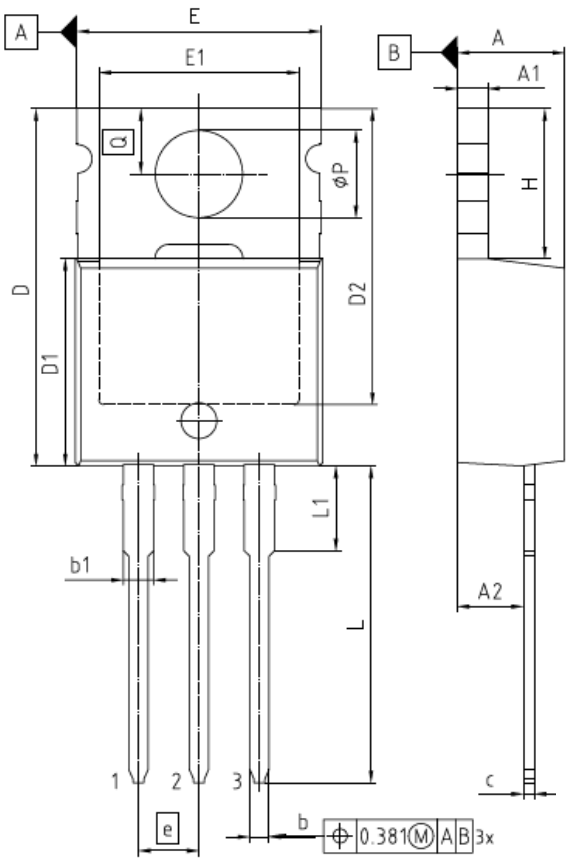



**Fig 18b.** Switching Time Waveforms

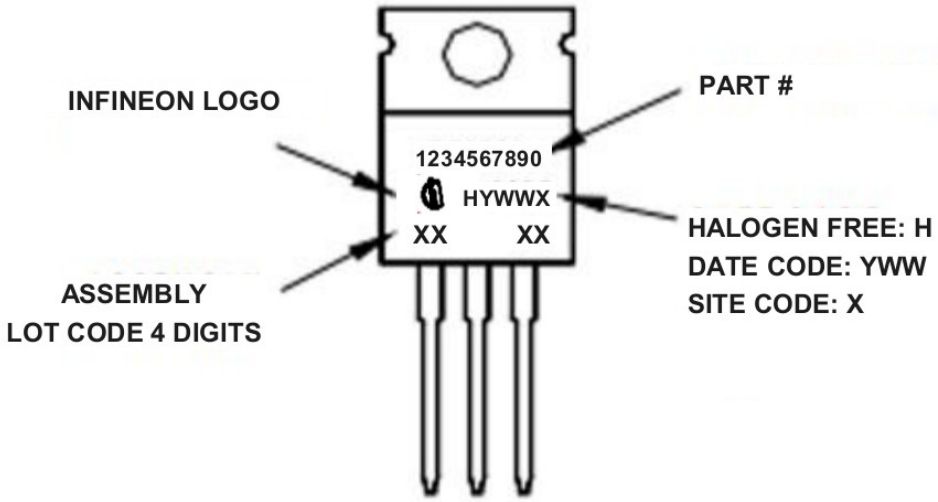
**TO-220 Package Outline** (Dimensions are shown in millimeters (inches))




NOTES:
DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS
GATE BURRS ARE LESS THAN 0.5 mm

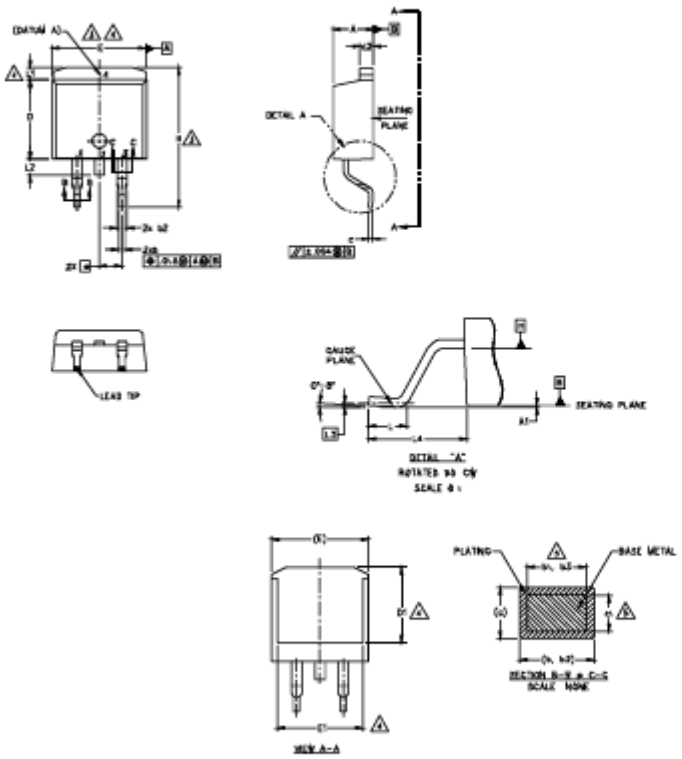
| PACKAGE - GROUP NUMBER: | PG-TO220-3-U05 | |
|---|---|---|
| DIMENSIONS | MILLIMETERS | |
| | MIN. | MAX. |
| A | 3.56 | 4.83 |
| A1 | 1.14 | 1.40 |
| A2 | 2.03 | 2.92 |
| b | 0.38 | 1.01 |
| b1 | 1.14 | 1.78 |
| c | 0.36 | 0.61 |
| D | 14.22 | 16.51 |
| D1 | 8.38 | 9.20 |
| D2 | 11.68 | 12.88 |
| E | 9.65 | 10.67 |
| E1 | 6.86 | 8.89 |
| e | 2.54 | |
| N | 3 | |
| H | 5.84 | 6.86 |
| L | 12.70 | 14.73 |
| L1 | 3.56 | 4.06 |
| øP | 3.54 | 4.08 |
| Q | 2.54 | 3.42 |

**TO-220 Part Marking Information**




TO-220 packages are not recommended for Surface Mount Application.

## D² Pak (TO-263AB) Package Outline (Dimensions are shown in millimeters (inches))



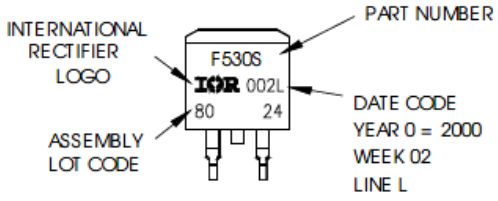
| SYMBOL | DIMENSIONS | | | | NOTES |
|---|---|---|---|---|---|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN | MAX. | |
| A | 4.06 | 4.83 | .160 | .190 | |
| A1 | 0.00 | 0.254 | .000 | 010 | |
| b | 0.51 | 0.99 | .020 | .039 | |
| b1 | 0.51 | 0 89 | .020 | .035 | 5 |
| b2 | 1.14 | 1.78 | .045 | .070 | |
| b3 | 1 14 | 1.73 | .045 | .068 | 5 |
| c | 0.38 | 0.74 | .015 | .029 | |
| c1 | 0.38 | 0.58 | .015 | .023 | 5 |
| c2 | 1.14 | 1.65 | .045 | .065 | |
| D | 8.38 | 9.65 | .330 | .380 | 3 |
| D1 | 6.86 | – | .270 | | 4 |
| E | 9.65 | 10 67 | .380 | .420 | 3,4 |
| E1 | 6.22 | – | .245 | | 4 |
| e | 2.54 BSC | | .100 BSC | | |
| H | 14 61 | 15 88 | .575 | .625 | |
| L | 1.78 | 2.79 | .070 | .110 | |
| L1 | – | 1 65 | – | 066 | 4 |
| L2 | – | 1.78 | – | .070 | |
| L3 | 0.25 BSC | | 010 BSC | | |
| L4 | 4.78 | 5.28 | .188 | .208 | |

NOTES
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY
6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H
7. CONTROLLING DIMENSION: INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

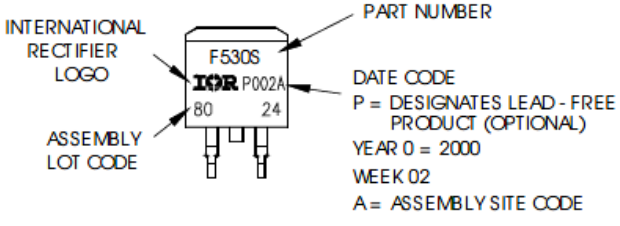
## D² Pak (TO-263AB) Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

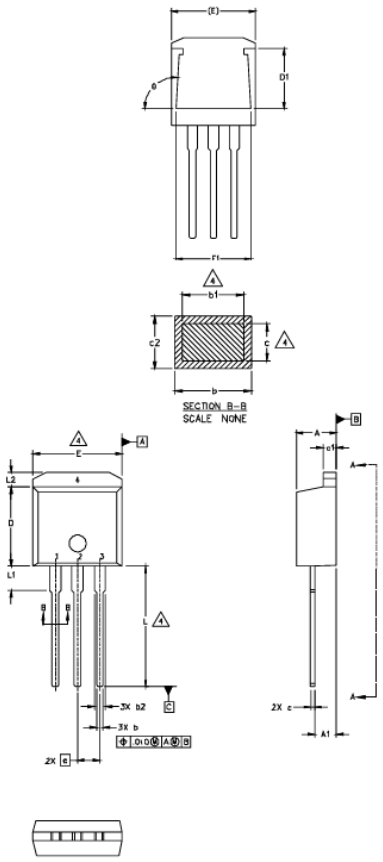
Note. "P" in assembly line position
indicates "Lead – Free"




OR



**TO-262 Package Outline** (Dimensions are shown in millimeters (inches))




| SYMBOL | DIMENSIONS | | | | NOTES |
|---|---|---|---|---|---|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.06 | 4.83 | .160 | .190 | |
| A1 | 2.03 | 2.92 | .080 | .115 | |
| b | 0.51 | 0.99 | .020 | .039 | |
| b1 | 0.51 | 0.89 | .020 | .035 | 4 |
| b2 | 1.14 | 1.40 | .045 | .055 | |
| c | 0.38 | 0.63 | .015 | .025 | 4 |
| c1 | 1.14 | 1.40 | .045 | .055 | |
| c2 | 0.43 | .063 | .017 | .029 | |
| D | 8.51 | 9.65 | .335 | .380 | 3 |
| D1 | 5.33 | | .210 | | |
| E | 9.65 | 10.67 | .380 | .420 | 3 |
| E1 | 6.22 | | .245 | | |
| e | 2.54 BSC | | 100 BSC | | |
| L | 13.46 | 14.09 | .530 | .555 | |
| L1 | 3.56 | 3.71 | .140 | .146 | |
| L2 | | 1.65 | | .065 | |

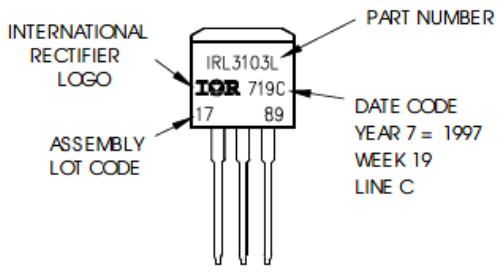
LEAD ASSIGNMENTS

| HEXFET | IGBT |
|---|---|
| 1.– GATE | 1 – GATE |
| 2.– DRAIN | 2 – COLLECTOR |
| 3.– SOURCE | 3 – EMITTER |
| 4.– DRAIN | |

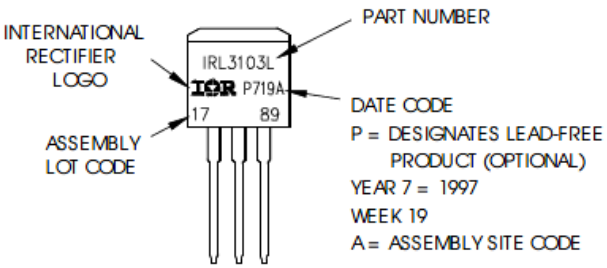
**TO-262 Part Marking Information**

EXAMPLE: THIS IS AN IRL3103L
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

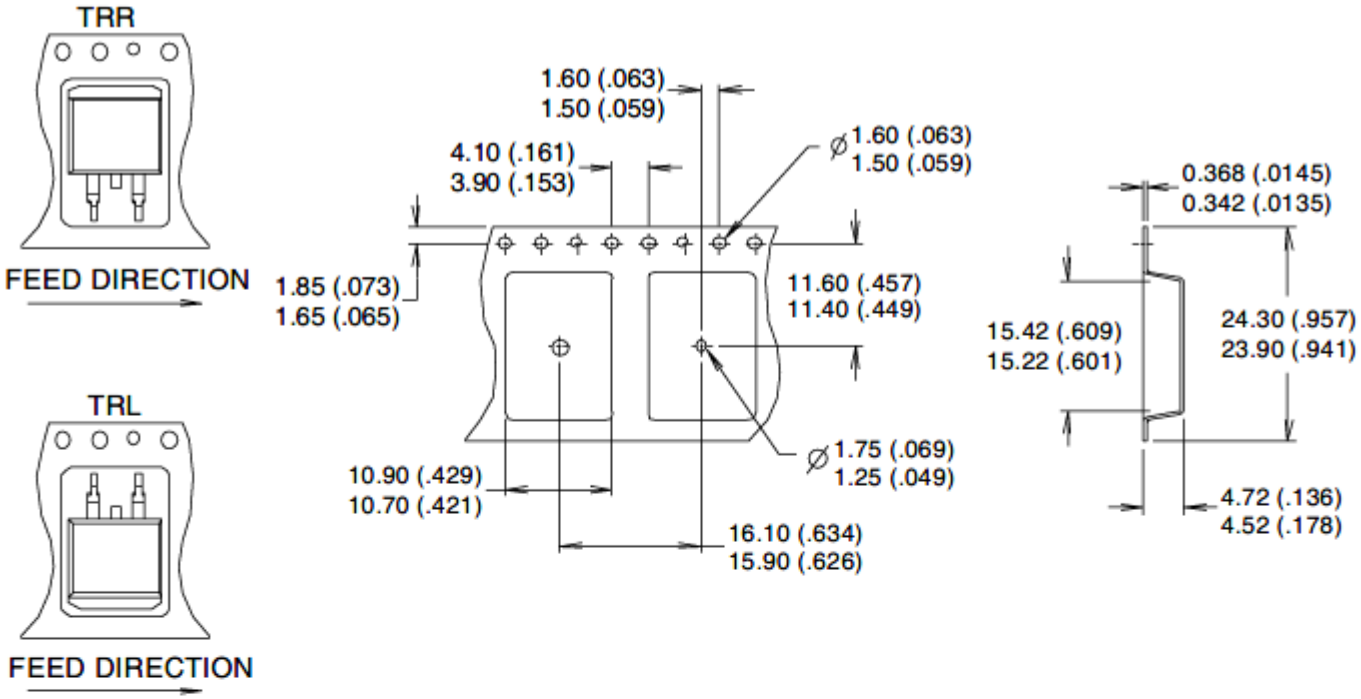
Note: "P" in assembly line position indicates "Lead – Free"

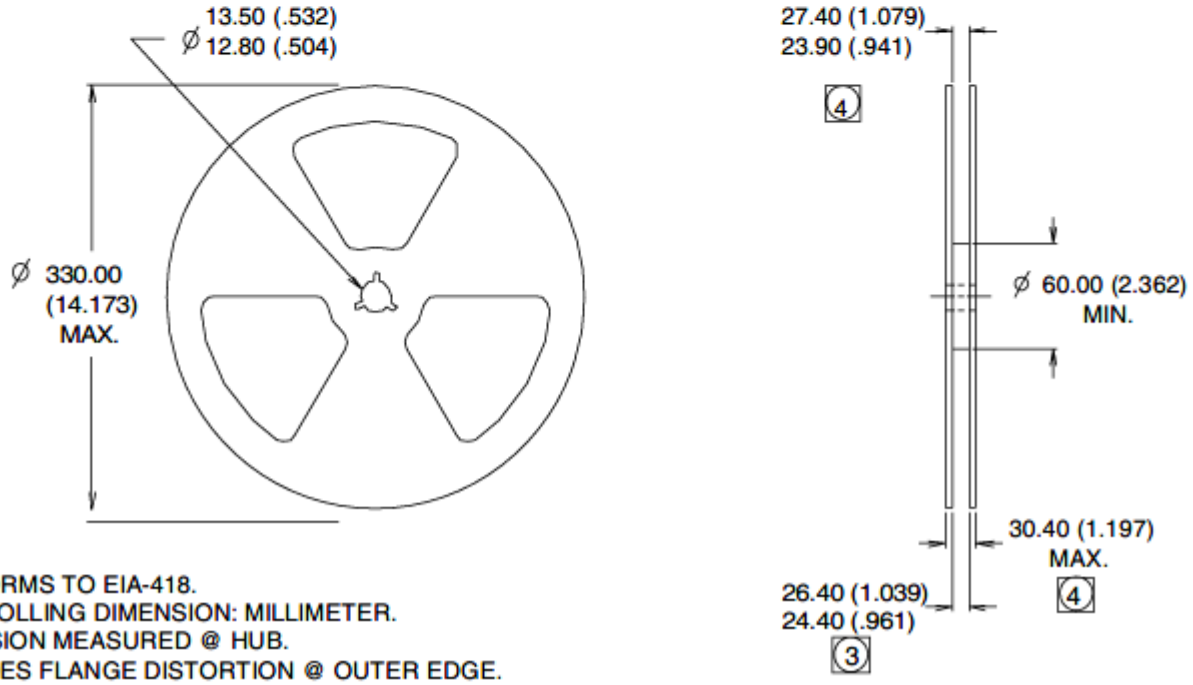



OR



**D² Pak (TO-263AB) Tape & Reel Information** (Dimensions are shown in millimeters (inches))




NOTES :
1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION MEASURED @ HUB.
4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

## Revision History

| Date | Rev. | Comments |
|---|---|---|
| 2026-09-01 | 2.1 | • Update datasheet to Infineon format<br>• Updated Package Outline and Part marking –page 9<br>• Added disclaimer on last page. |

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