

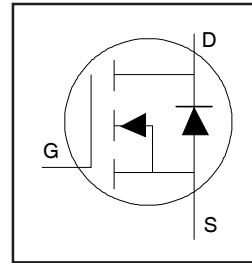
HEXFET® Power MOSFET

Applications

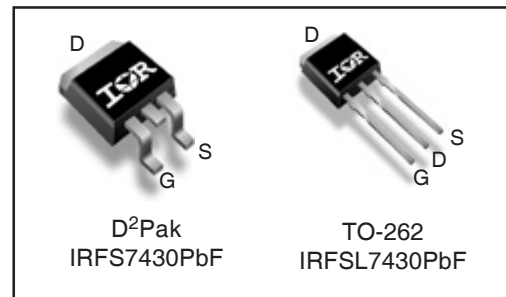
- Brushed motor drive applications
- BLDC motor drive applications
- Battery powered circuits
- Half-bridge and full-bridge topologies
- Synchronous rectifier applications
- Resonant mode power supplies
- OR-ing and redundant power switches
- DC/DC and AC/DC converters
- DC/AC inverters

Benefits

- Improved gate, avalanche and dynamic dV/dt ruggedness
- Fully characterized capacitance and avalanche SOA
- Enhanced body diode dV/dt and dI/dt capability
- Lead-free



| | | |
|-------------------------|------|---------------|
| V_{DS} | | 40V |
| $R_{DS(on)}$ | typ. | 0.97mΩ |
| | max. | 1.2mΩ |
| I_D (Silicon Limited) | | 426A ① |
| I_D (Package Limited) | | 195A |



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

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|--------------|--------------------|----------|-----------------------|
| | | Form | Quantity | |
| IRFSL7430PbF | TO-262 | Tube | 50 | IRFSL7430PbF |
| IRFS7430PbF | D2-Pak | Tube | 50 | IRFS7430PbF |
| | | Tape and Reel Left | 800 | IRFS7430TRLPbF |

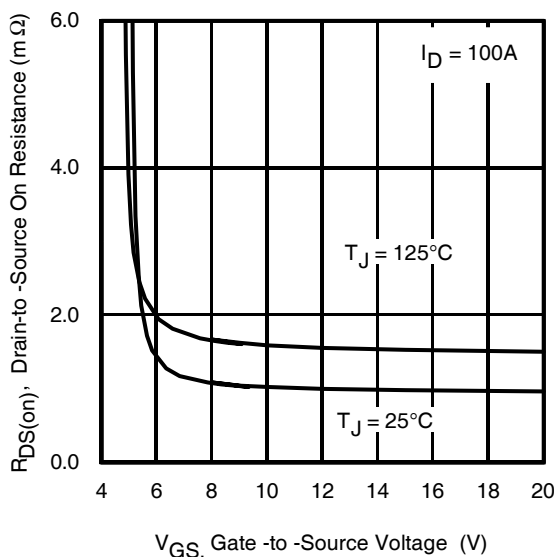


Fig 1. Typical On-Resistance vs. Gate Voltage

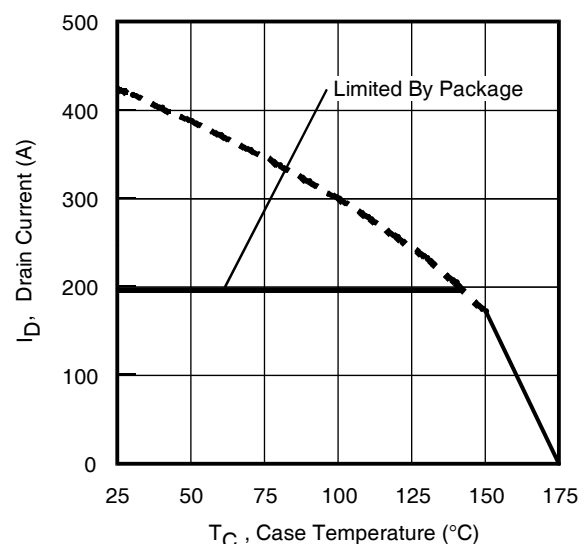


Fig 2. Maximum Drain Current vs. Case Temperature

Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|---------------------------------|---|--------------|-------|
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited) | 426① | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited) | 301① | |
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Wire Bond Limited) | 195 | |
| I_{DM} | Pulsed Drain Current ② | 1524 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Maximum Power Dissipation | 375 | W |
| | Linear Derating Factor | 2.5 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| T_J | Operating Junction and | -55 to + 175 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds (1.6mm from case) | 300 | |

Avalanche Characteristics

| | | | |
|------------------------------|---------------------------------|---------------------------|----|
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ③ | 760 | mJ |
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ④ | 1452 | |
| I_{AR} | Avalanche Current ② | See Fig. 15, 16, 22a, 22b | A |
| E_{AR} | Repetitive Avalanche Energy ② | | mJ |

Thermal Resistance

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|---|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ⑤ | — | 0.40 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB Mount, steady-state) ⑥ | — | 40 | |

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

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------------------|--------------------------------------|------|-------|------|-------|--|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 40 | — | — | V | $V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.014 | — | V/°C | Reference to 25°C , $I_D = 1.0\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 0.97 | 1.2 | mΩ | $V_{GS} = 10\text{V}$, $I_D = 100\text{A}$ ⑦ |
| | | — | 1.2 | — | | $V_{GS} = 6.0\text{V}$, $I_D = 50\text{A}$ ⑧ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.2 | — | 3.9 | V | $V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1.0 | μA | $V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$ |
| | | — | — | 150 | | $V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$, $T_J = 125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 20\text{V}$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS} = -20\text{V}$ |
| R_G | Internal Gate Resistance | — | 2.1 | — | Ω | |


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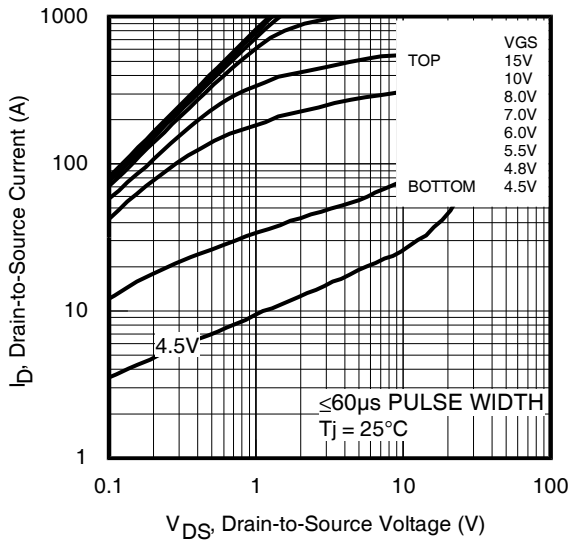
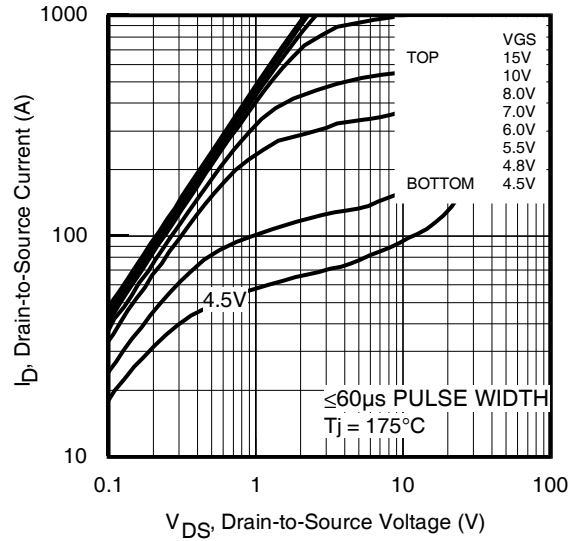
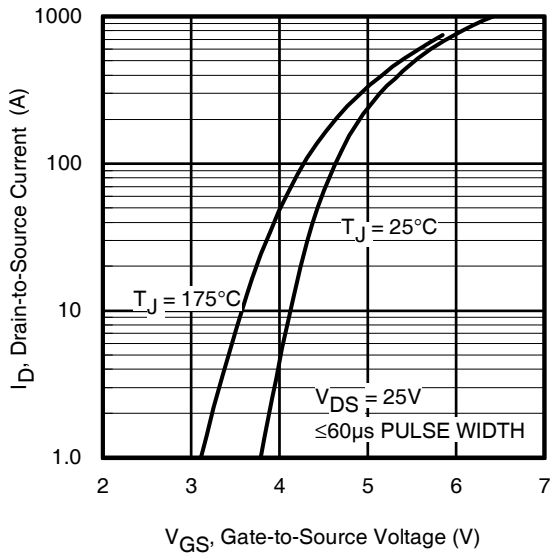
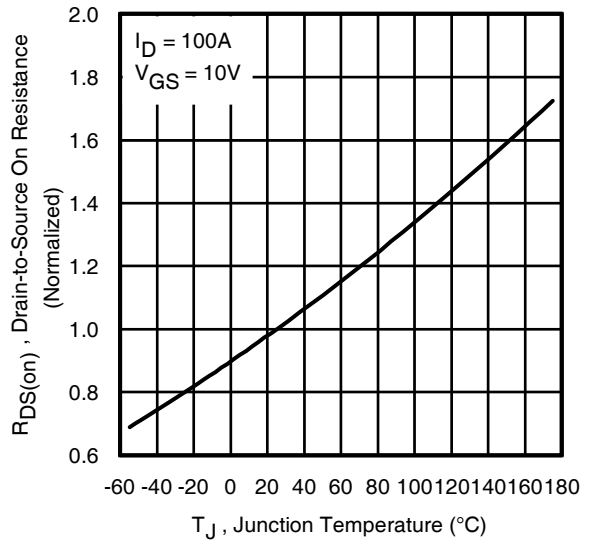
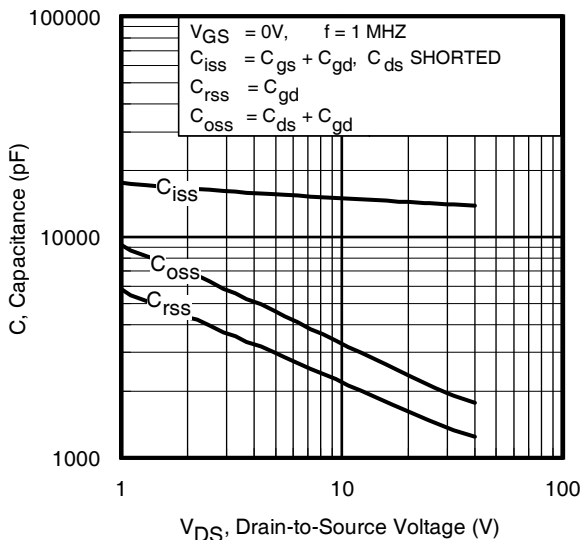
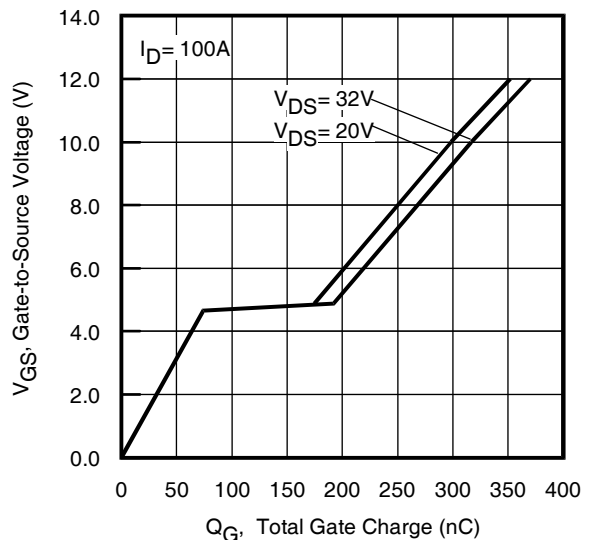
- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 195A. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 0.15\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 100\text{A}$, $V_{GS} = 10\text{V}$.
- ④ $I_{SD} \leq 100\text{A}$, $di/dt \leq 990\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ⑤ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑧ R_θ is measured at T_J approximately 90°C .
- ⑨ Limited by T_{Jmax} starting $T_J = 25^\circ\text{C}$, $L = 1\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 54\text{A}$, $V_{GS} = 10\text{V}$.
- ⑩ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994. <http://www.irf.com/technical-info/appnotes/an-994.pdf>

Dynamic @ T_J = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------------------------|---|------|-------|------|-------|---|
| g _{fs} | Forward Transconductance | 150 | — | — | S | V _{DS} = 10V, I _D = 100A |
| Q _g | Total Gate Charge | — | 300 | 460 | nC | I _D = 100A V _{DS} = 20V V _{GS} = 10V ⑤ |
| Q _{gs} | Gate-to-Source Charge | — | 77 | — | | |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | 98 | — | | |
| Q _{sync} | Total Gate Charge Sync. (Q _g - Q _{gd}) | — | 202 | — | | I _D = 100A, V _{DS} = 0V, V _{GS} = 10V |
| t _{d(on)} | Turn-On Delay Time | — | 32 | — | ns | V _{DD} = 20V I _D = 30A R _G = 2.7Ω V _{GS} = 10V ⑤ |
| t _r | Rise Time | — | 105 | — | | |
| t _{d(off)} | Turn-Off Delay Time | — | 160 | — | | |
| t _f | Fall Time | — | 100 | — | | |
| C _{iss} | Input Capacitance | — | 14240 | — | pF | V _{GS} = 0V V _{DS} = 25V f = 1.0 MHz |
| C _{oss} | Output Capacitance | — | 2130 | — | | |
| C _{rss} | Reverse Transfer Capacitance | — | 1460 | — | | |
| C _{oss} eff. (ER) | Effective Output Capacitance (Energy Related) | — | 2605 | — | | |
| C _{oss} eff. (TR) | Effective Output Capacitance (Time Related) | — | 2920 | — | | |

Diode Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|------------------|---|------|------|-------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 426 ① | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ② | — | — | 1524 | A | |
| V _{SD} | Diode Forward Voltage | — | 0.86 | 1.2 | V | T _J = 25°C, I _S = 100A, V _{GS} = 0V ③ |
| dv/dt | Peak Diode Recovery ④ | — | 2.7 | — | V/ns | T _J = 175°C, I _S = 100A, V _{DS} = 40V |
| t _{rr} | Reverse Recovery Time | — | 52 | — | ns | T _J = 25°C V _R = 34V, T _J = 125°C I _F = 100A |
| Q _{rr} | Reverse Recovery Charge | — | 97 | — | | |
| I _{RRM} | Reverse Recovery Current | — | 2.3 | — | A | T _J = 25°C |


Fig 3. Typical Output Characteristics

Fig 4. Typical Output Characteristics

Fig 5. Typical Transfer Characteristics

Fig 6. Normalized On-Resistance vs. Temperature

Fig 7. Typical Capacitance vs. Drain-to-Source Voltage

Fig 8. Typical Gate Charge vs. Gate-to-Source Voltage

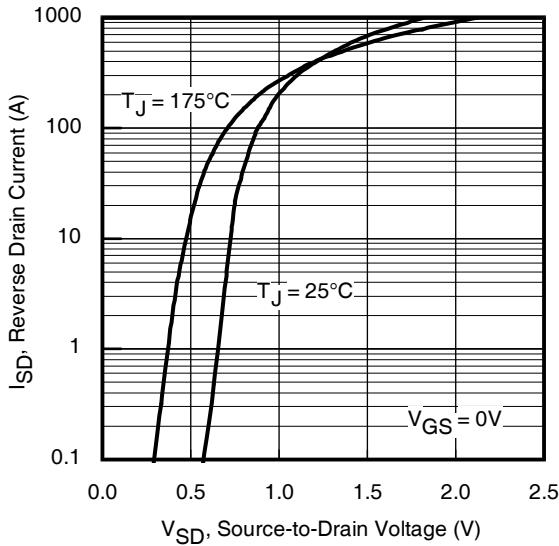


Fig 9. Typical Source-Drain Diode Forward Voltage

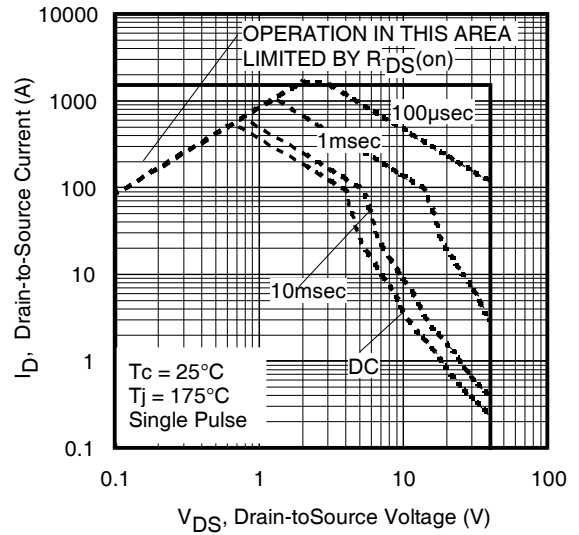


Fig 10. Maximum Safe Operating Area

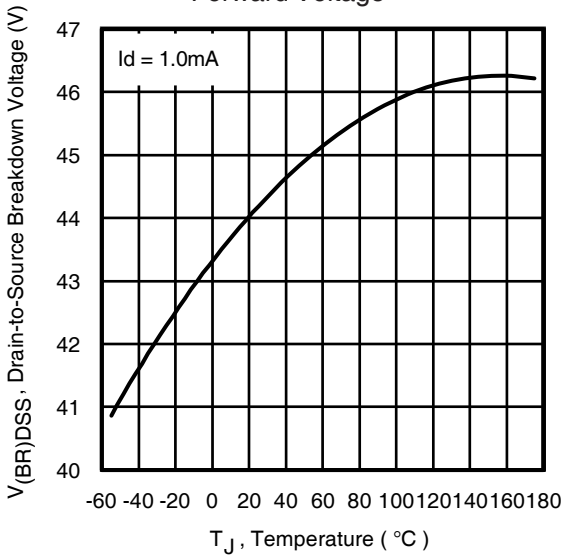


Fig 11. Drain-to-Source Breakdown Voltage

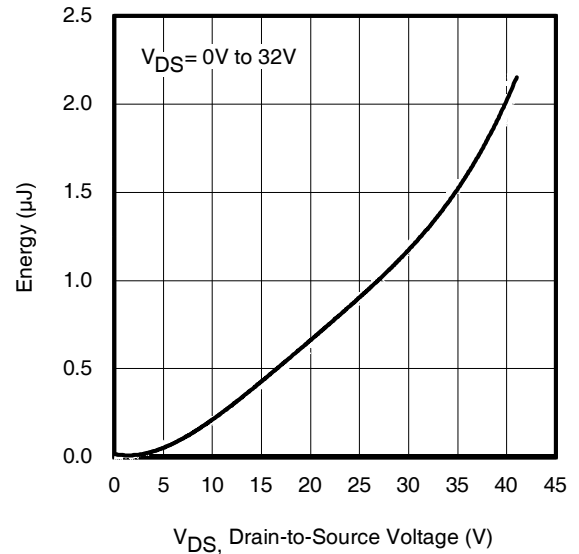


Fig 12. Typical C_{OSS} Stored Energy

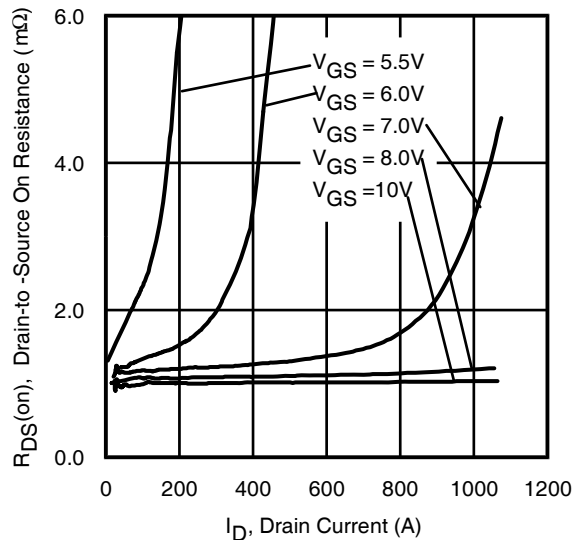
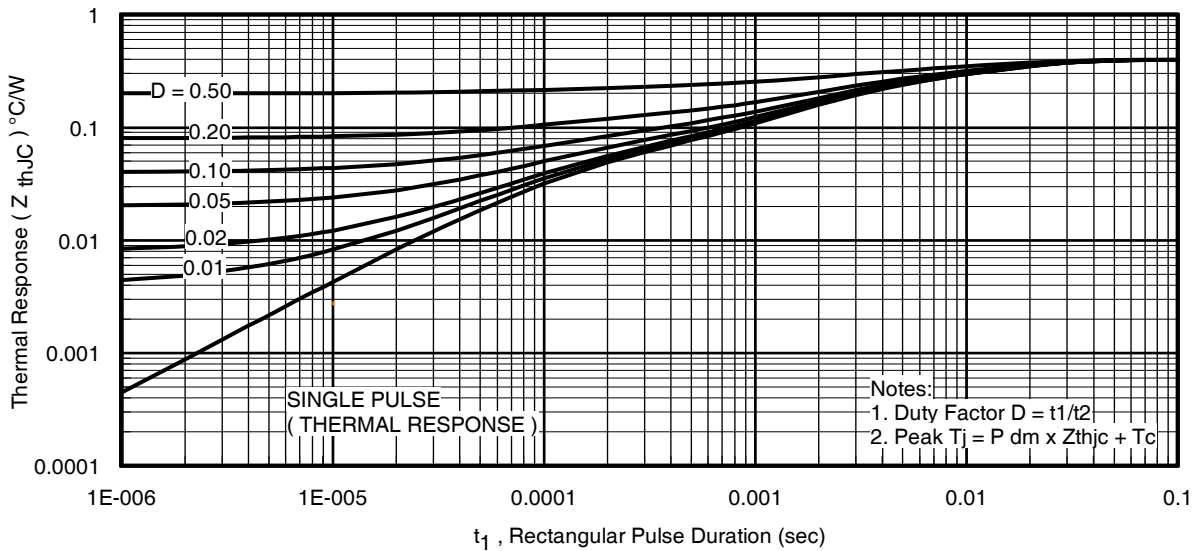
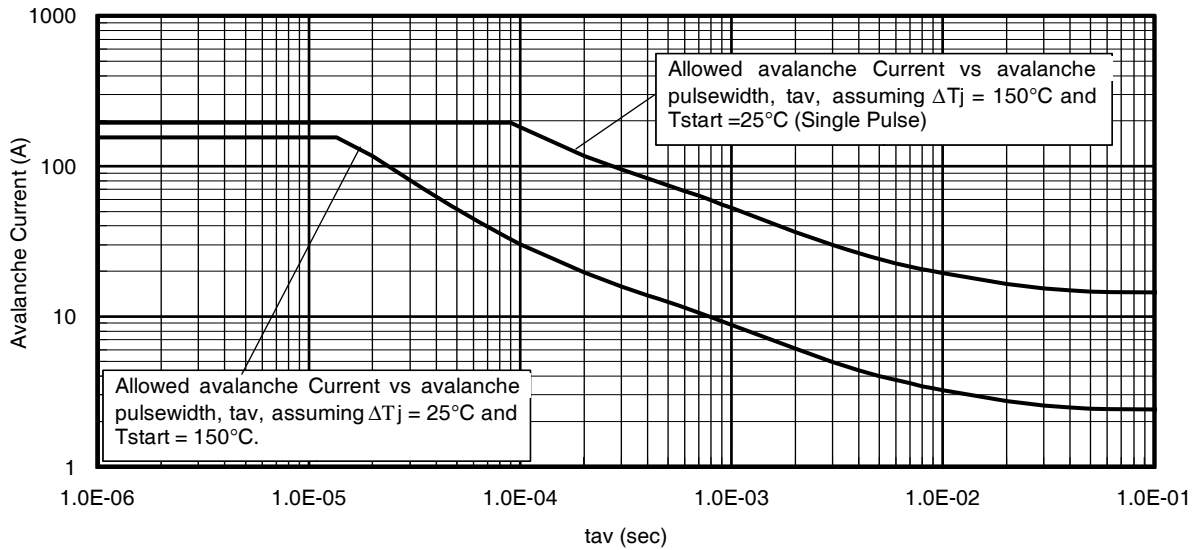
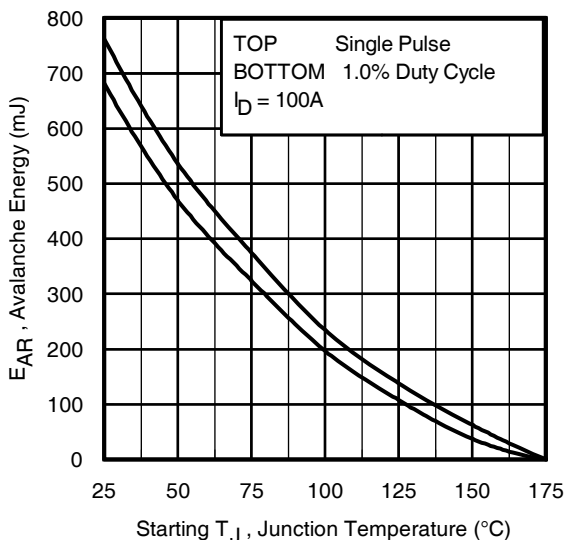


Fig 13. Typical On-Resistance vs. Drain Current

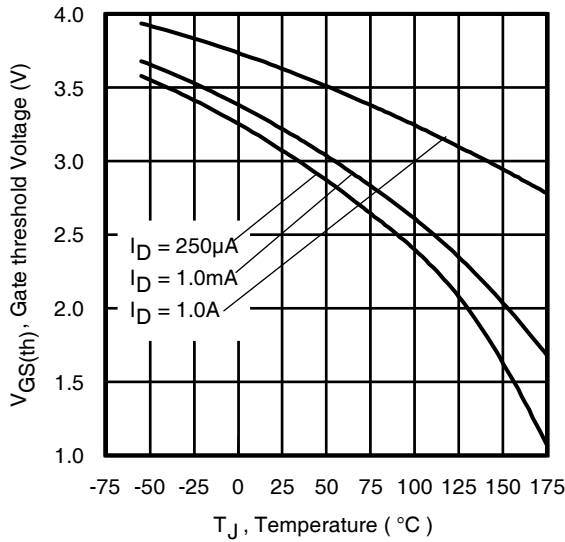
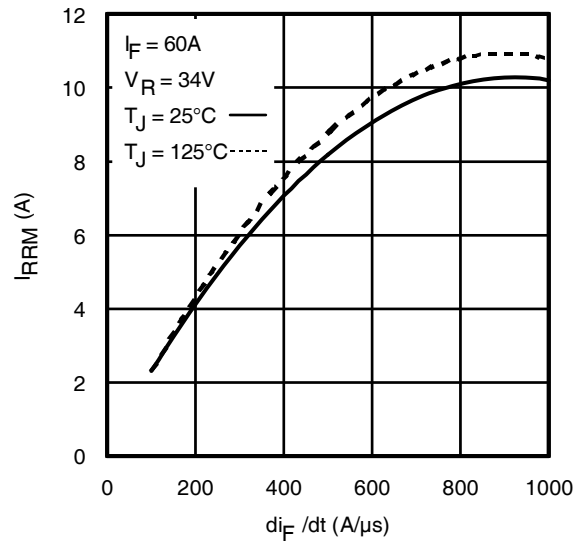
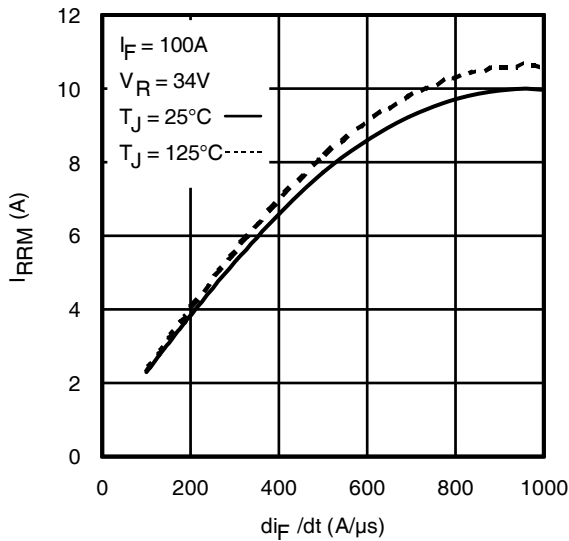
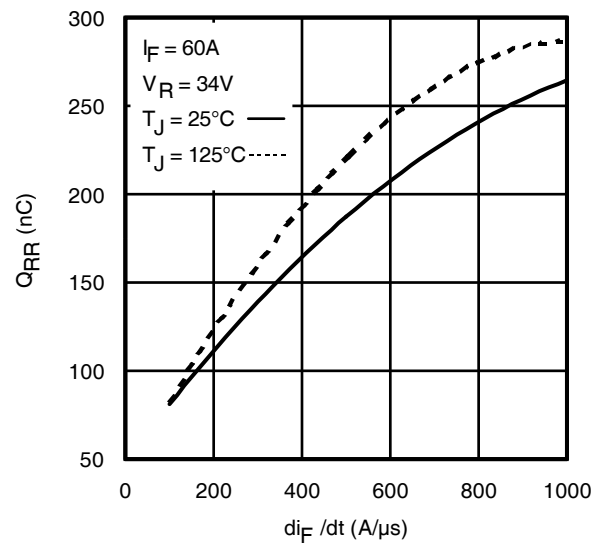
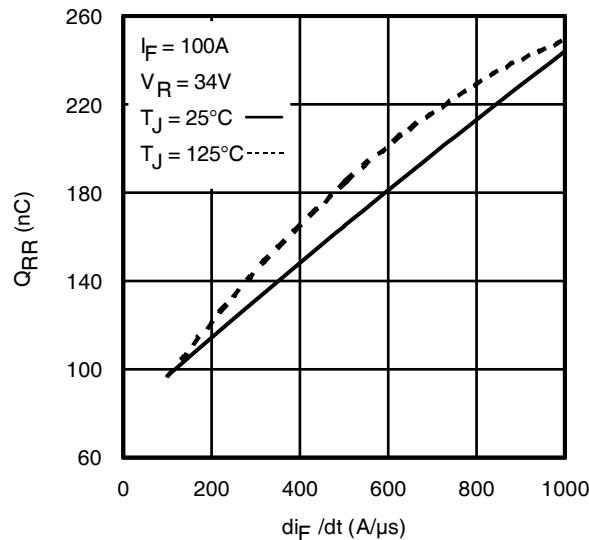

Fig 14. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Fig 15. Avalanche Current vs. Pulsewidth

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)**

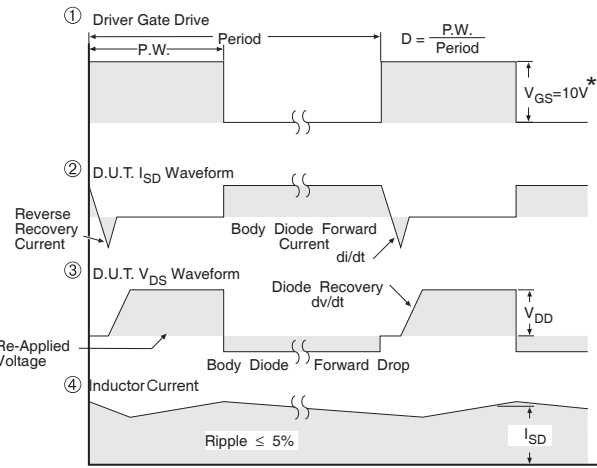
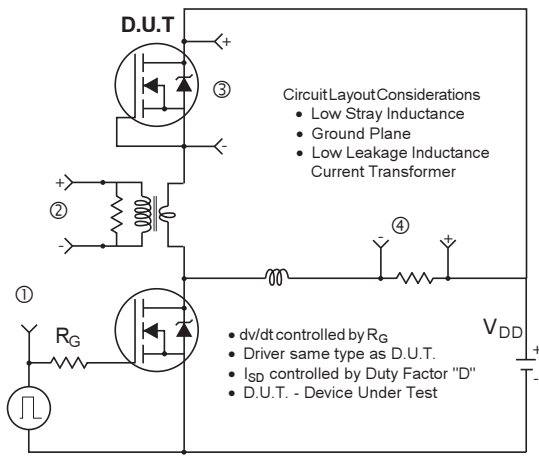
1. Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax} . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as T_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 16a, 16b.
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 = $t_{av} \cdot f$
 $Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 14)

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

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

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


Fig 17. Threshold Voltage vs. Temperature

Fig. 18 - Typical Recovery Current vs. di_f/dt

Fig. 19 - Typical Recovery Current vs. di_f/dt

Fig. 20 - Typical Stored Charge vs. di_f/dt

Fig. 21 - Typical Stored Charge vs. di_f/dt



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

Fig 22. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

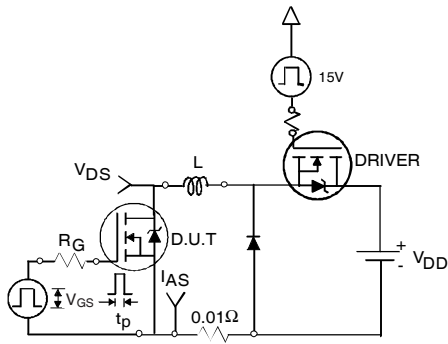


Fig 22a. Unclamped Inductive Test Circuit

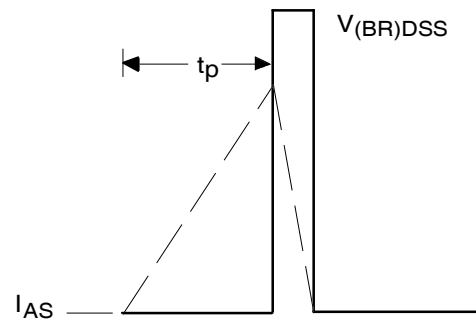


Fig 22b. Unclamped Inductive Waveforms

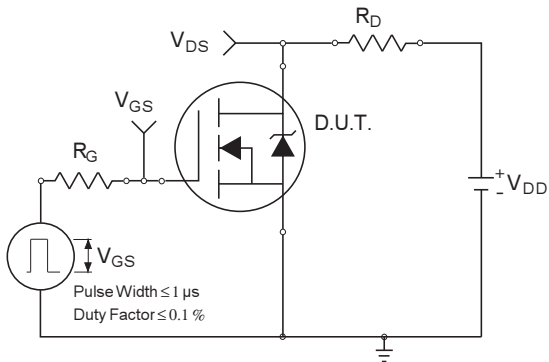


Fig 23a. Switching Time Test Circuit

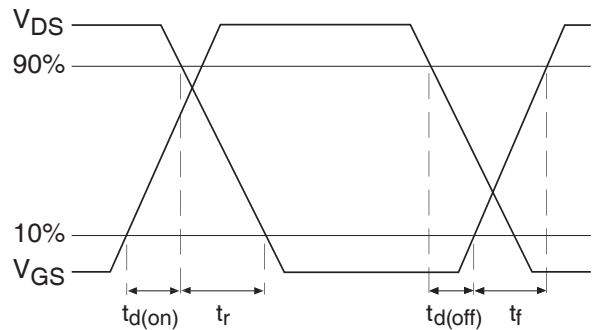


Fig 23b. Switching Time Waveforms

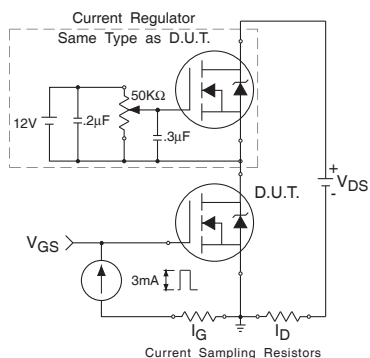


Fig 24a. Gate Charge Test Circuit

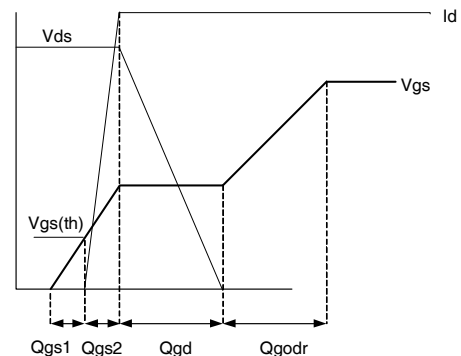
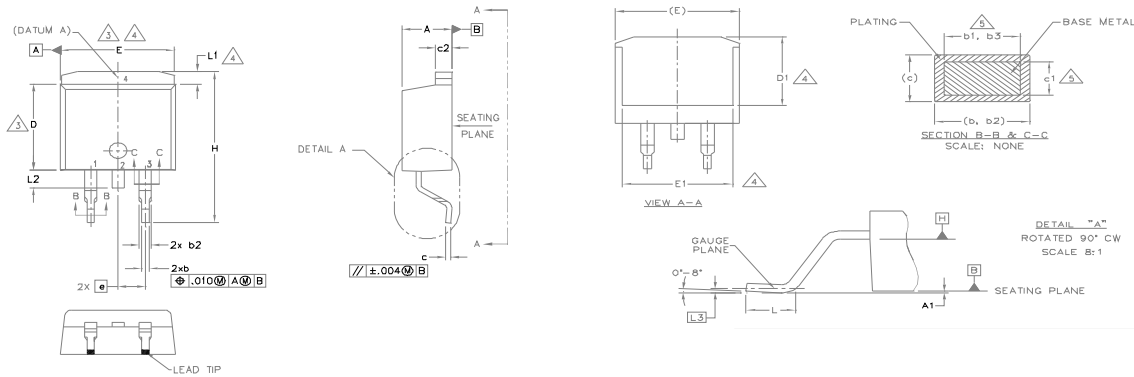


Fig 24b. Gate Charge Waveform

D²Pak (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 | - | 1.68 | - | .066 | 4 |
| L2 | - | 1.78 | - | .070 | |
| L3 | 0.25 BSC | | .010 BSC | | |

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, b3 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.

LEAD ASSIGNMENTS

DIODES

- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
- 2, 4.- CATHODE
- 3.- ANODE

HEXFET

- 1.- GATE
- 2, 4.- DRAIN
- 3.- SOURCE

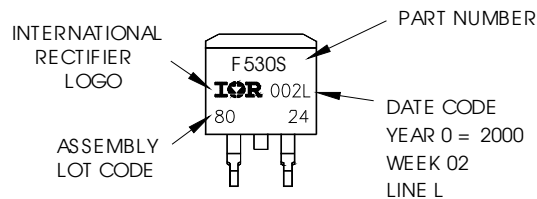
IGBTs, CoPACK

- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

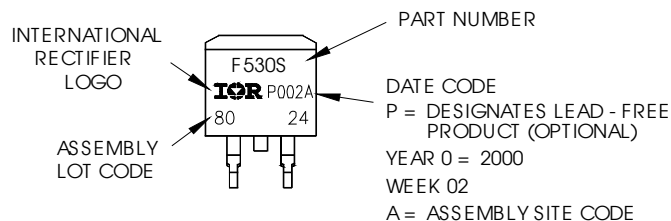
D²Pak (TO-263AB) Part Marking Information

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"



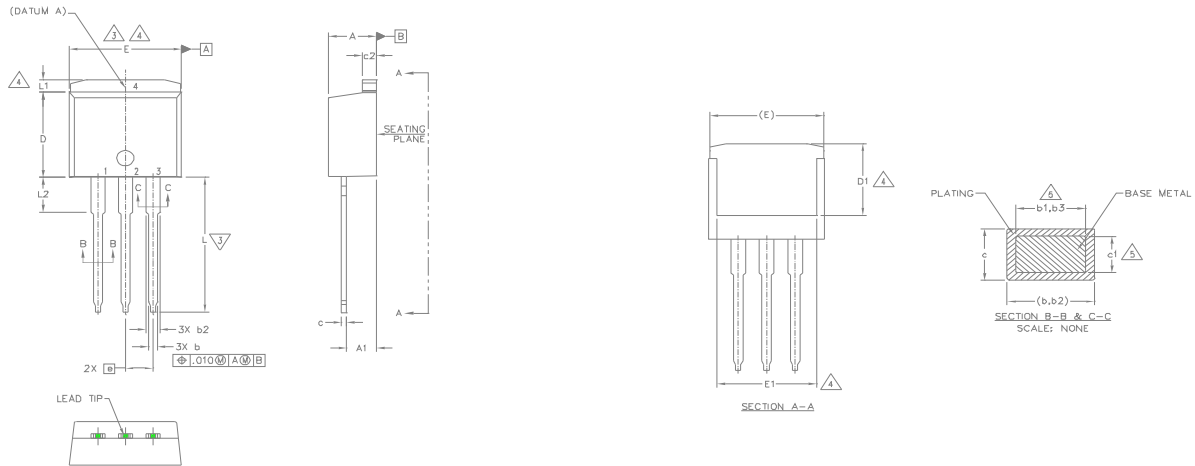
OR



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

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 | 5 |
| A1 | 2.03 | 3.02 | .080 | .119 | |
| b | 0.51 | 0.99 | .020 | .039 | |
| b1 | 0.51 | 0.89 | .020 | .035 | |
| b2 | 1.14 | 1.78 | .045 | .070 | |
| b3 | 1.14 | 1.73 | .045 | .068 | 5 |
| c | 0.38 | 0.74 | .015 | .029 | 5 |
| c1 | 0.38 | 0.58 | .015 | .023 | |
| 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 | | 4 |
| L | 13.46 | 14.10 | .530 | .555 | |
| L1 | - | 1.65 | - | .065 | |
| L2 | 3.56 | 3.71 | .140 | .146 | |

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.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION: INCH.
7. OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

LEAD ASSIGNMENTS

IGBTs, CoPACK

- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

HEXFET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

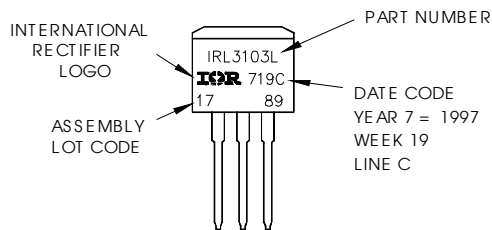
DIODES

- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
- 2.- CATHODE
- 3.- ANODE

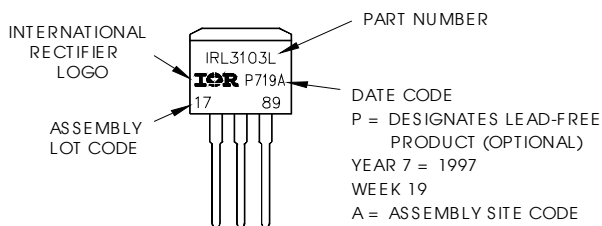
TO-262 Part Marking Information

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

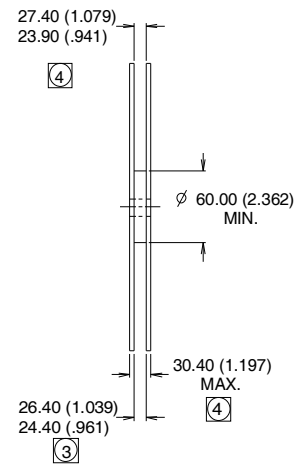
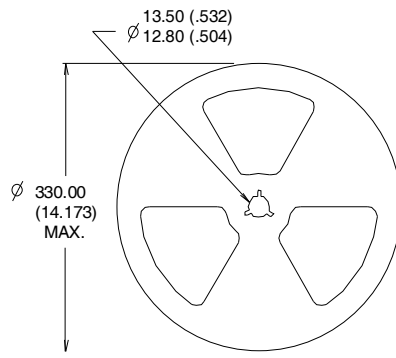
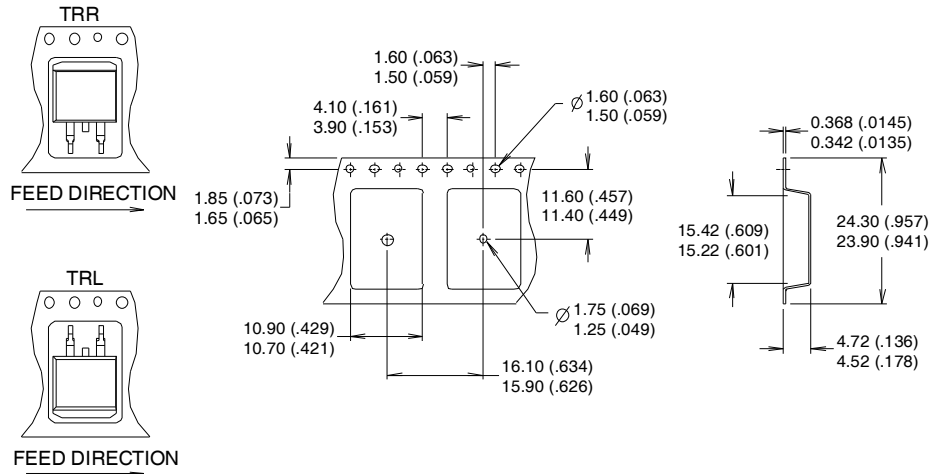
Note: "P" in assembly line position indicates "Lead - Free"



OR



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

D²Pak (TO-263AB) Tape & Reel Information Dimensions are shown in millimeters (inches)


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

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

Qualification information†

| | | |
|----------------------------|--|---|
| Qualification level | Industrial (per JEDEC JESD47F ^{††} guidelines) | |
| Moisture Sensitivity Level | D2Pak | MSL1 (per JEDEC J-STD-020D ^{††}) |
| | TO-262 | Not applicable |
| RoHS compliant | Yes | |

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability/>

†† Applicable version of JEDEC standard at the time of product release.

Revision History

| Date | Comment |
|-----------|---|
| 11/6/2014 | <ul style="list-style-type: none"> • Updated $E_{AS(L=1mH)} = 1452mJ$ on page 2 • Updated note 9 "Limited by T_{Jmax}, starting $T_J = 25^{\circ}C$, $L = 1mH$, $R_G = 50\Omega$, $I_{AS} = 54A$, $V_{GS} = 10V$". on page 2 • Updated package outline on page 9 & 10 |

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