

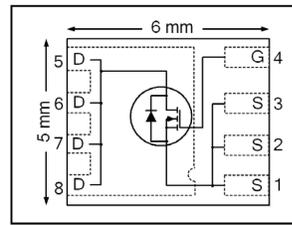
Application

- 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, RoHS compliant

HEXFET® Power MOSFET



| | |
|--------------------------------|--------------|
| V_{DSS} | 75V |
| R_{DS(on)} typ. | 6.6mΩ |
| | 8.0mΩ |
| I_D | 68A |



| Base part number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|----------------|---------------|----------|-----------------------|
| | | Form | Quantity | |
| IRFH7787PbF | PQFN 5mm x 6mm | Tape and Reel | 4000 | IRFH7787TRPbF |

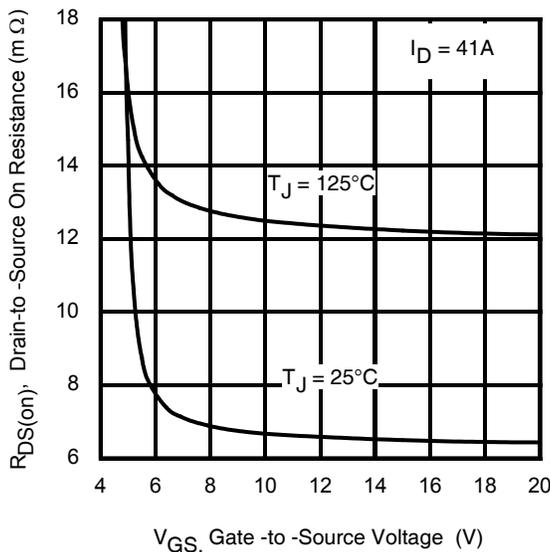


Fig 1. Typical On-Resistance vs. Gate Voltage

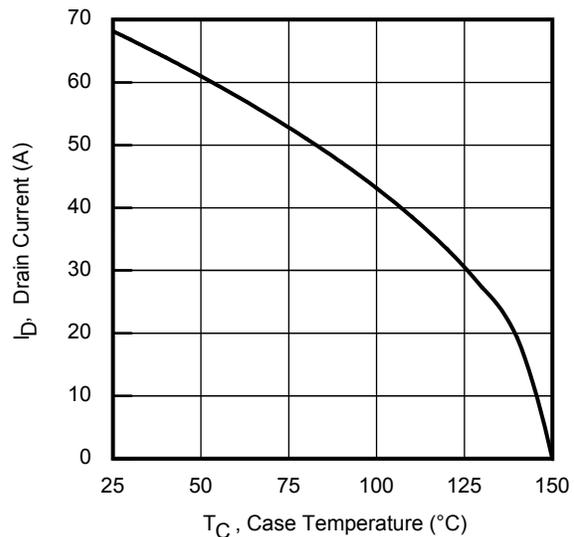


Fig 2. Maximum Drain Current vs. Case Temperature

Absolute Maximum Rating

| Symbol | Parameter | Max. | Units |
|---------------------------------|---|--------------|-------|
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 68 | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 43 | |
| I_{DM} | Pulsed Drain Current ① | 270 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Maximum Power Dissipation | 83 | W |
| | Linear Derating Factor | 0.67 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 150 | °C |

Avalanche Characteristics

| | | | |
|------------------------------|---------------------------------|--------------------------|----|
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ② | 100 | mJ |
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ⑧ | 146 | |
| I_{AR} | Avalanche Current ① | See Fig 15, 16, 23a, 23b | A |
| E_{AR} | Repetitive Avalanche Energy ① | | mJ |

Thermal Resistance

| Symbol | Parameter | Typ. | Max. | Units |
|--------------------------|---------------------|------|------|-------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ⑦ | — | 1.5 | °C/W |
| $R_{\theta JC}$ (Top) | Junction-to-Case ⑦ | — | 21 | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 34 | |
| $R_{\theta JA}$ (<10s) | Junction-to-Ambient | — | 22 | |

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 | 75 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 60 | — | mV/°C | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 6.6 | 8.0 | mΩ | $V_{GS} = 10\text{V}, I_D = 41\text{A}$ |
| | | — | 7.5 | — | | $V_{GS} = 6.0\text{V}, I_D = 21\text{A}$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.1 | — | 3.7 | V | $V_{DS} = V_{GS}, I_D = 100\mu\text{A}$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1.0 | μA | $V_{DS} = 75\text{V}, V_{GS} = 0\text{V}$ |
| | | — | — | 150 | | $V_{DS} = 75\text{V}, V_{GS} = 0\text{V}, T_J = 125^\circ\text{C}$ |
| 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 | Gate Resistance | — | 2.3 | — | Ω | |

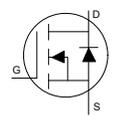
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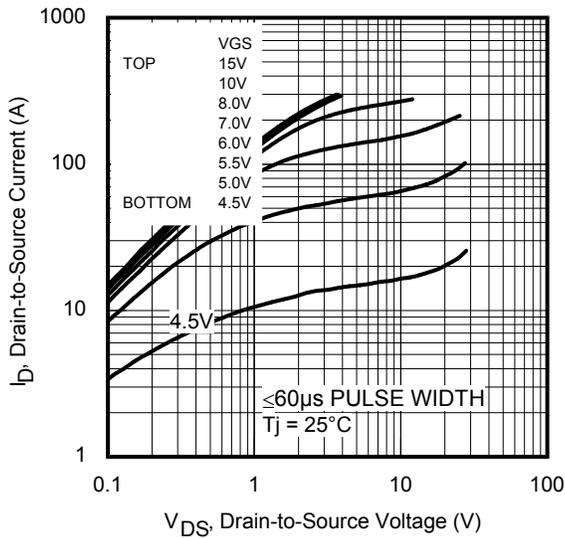
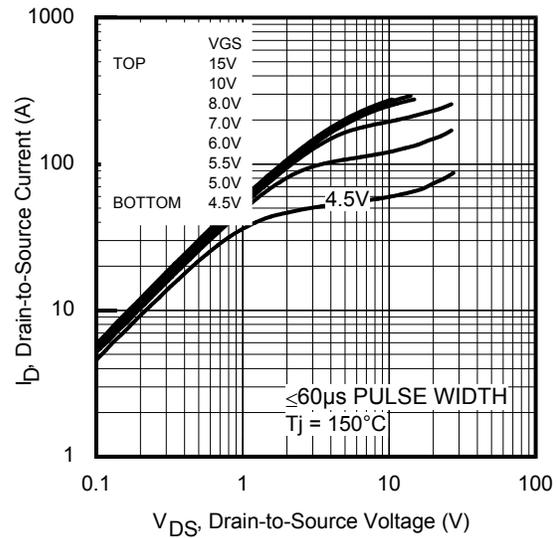
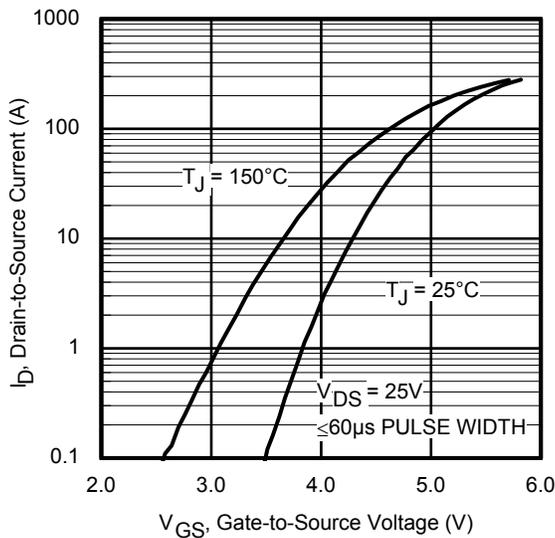
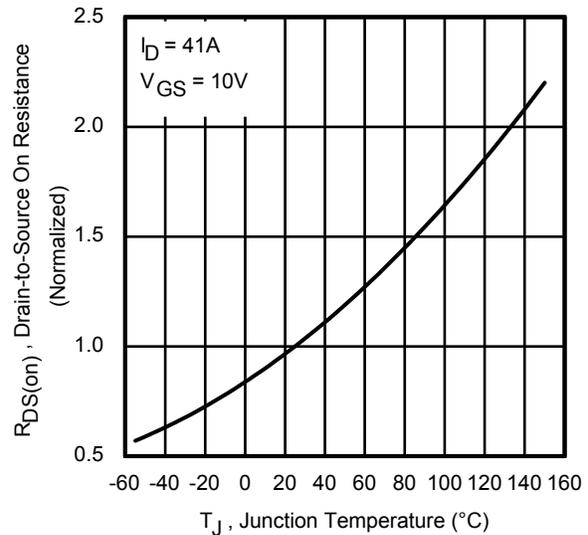
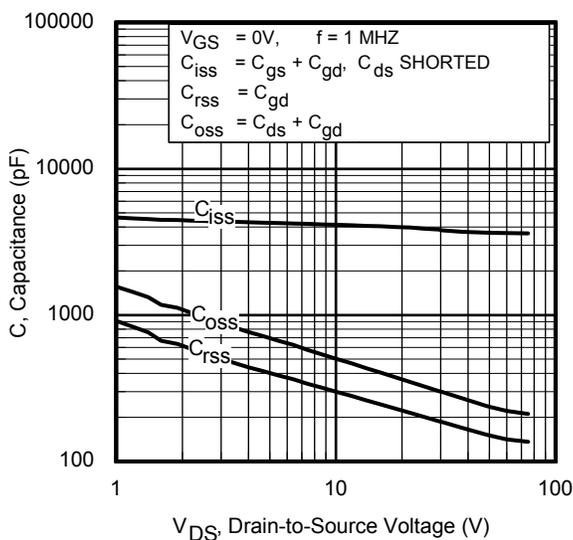
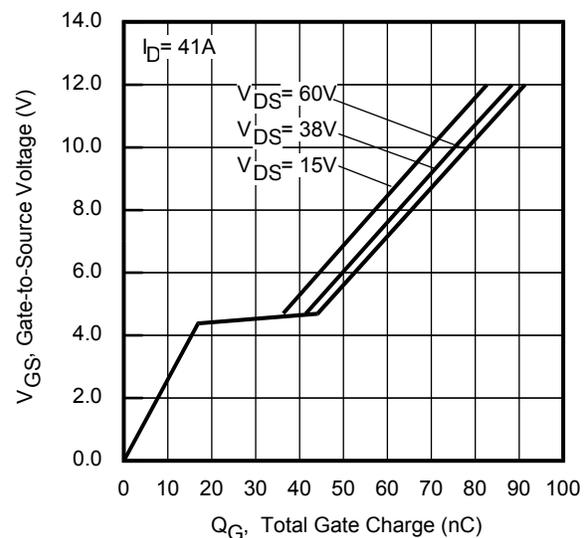
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 120\mu\text{H}$, $R_G = 50\Omega$, $I_{AS} = 41\text{A}$, $V_{GS} = 10\text{V}$.
- ③ $I_{SD} \leq 41\text{A}$, $di/dt \leq 1140\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ④ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑤ 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} .
- ⑥ 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} .
- ⑦ R_θ is measured at T_J approximately 90°C .
- ⑧ Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 1\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 17\text{A}$, $V_{GS} = 10\text{V}$.

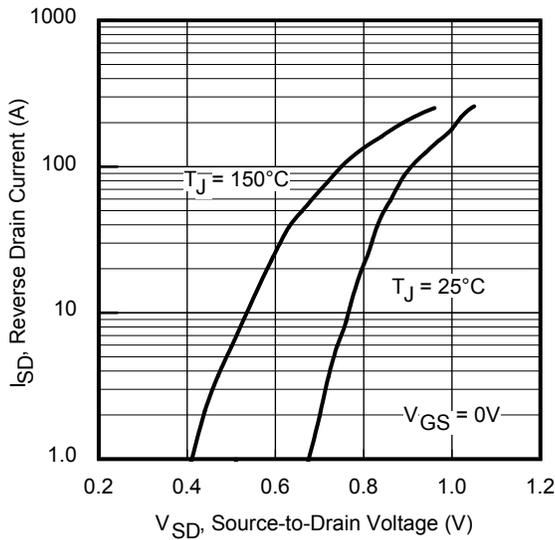
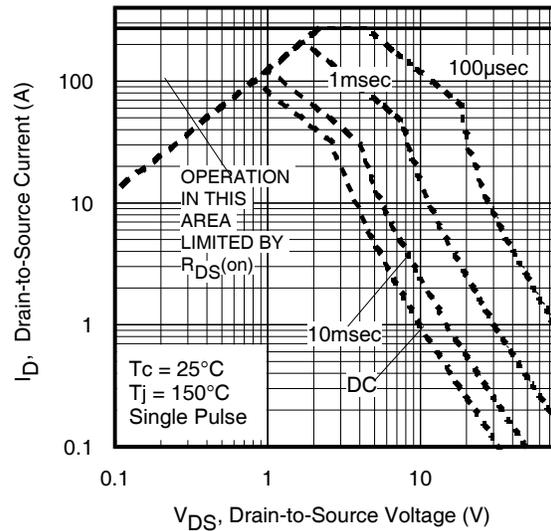
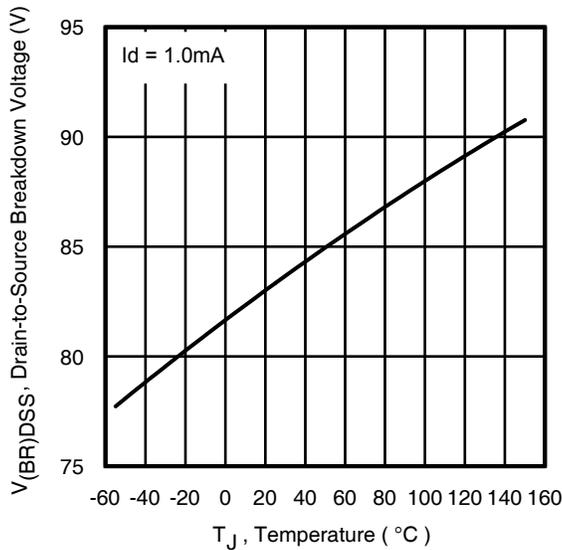
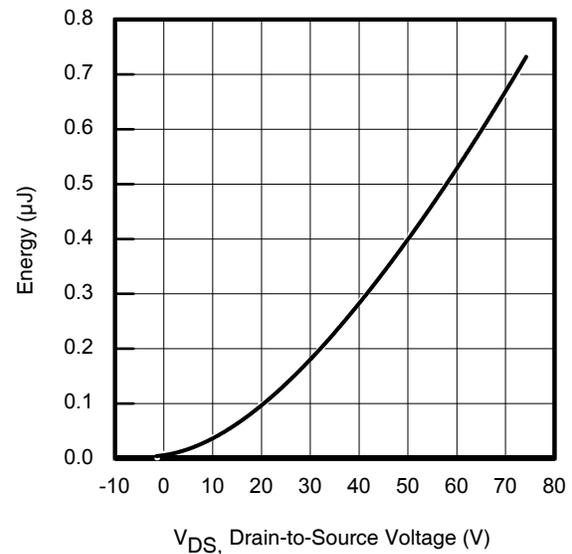
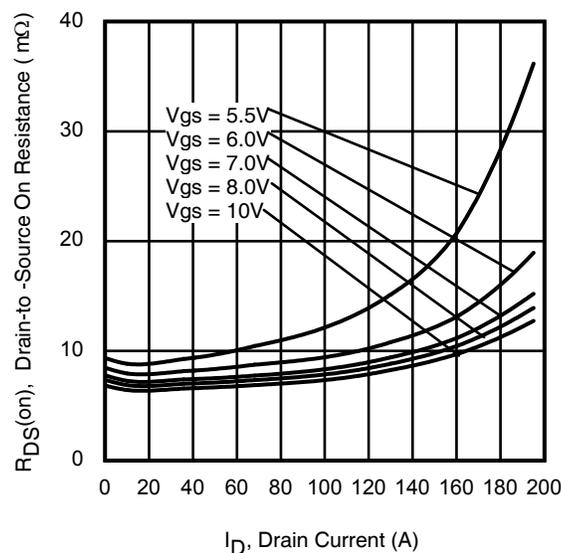
Dynamic Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

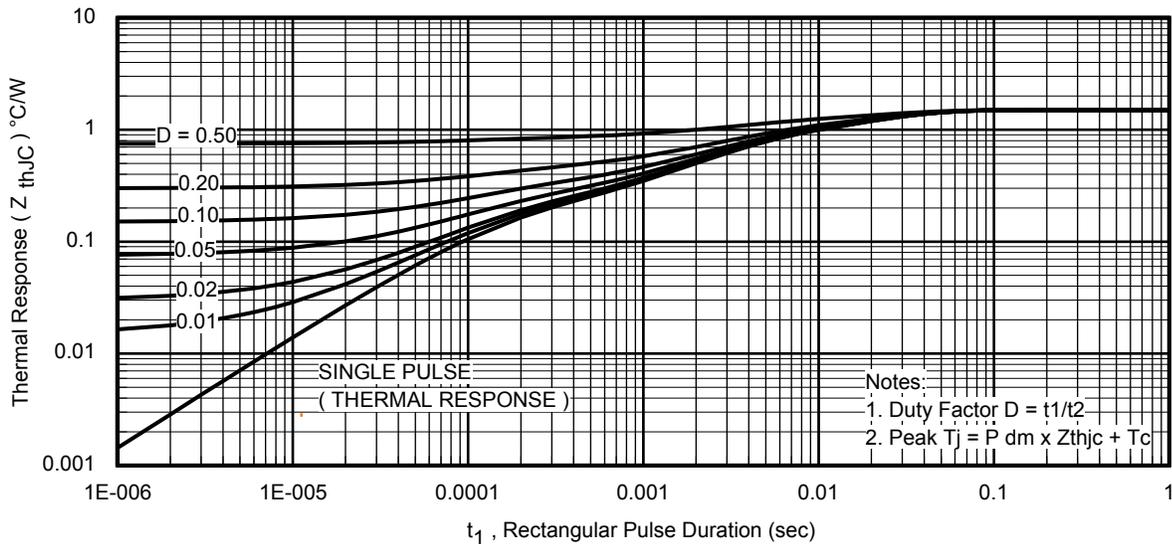
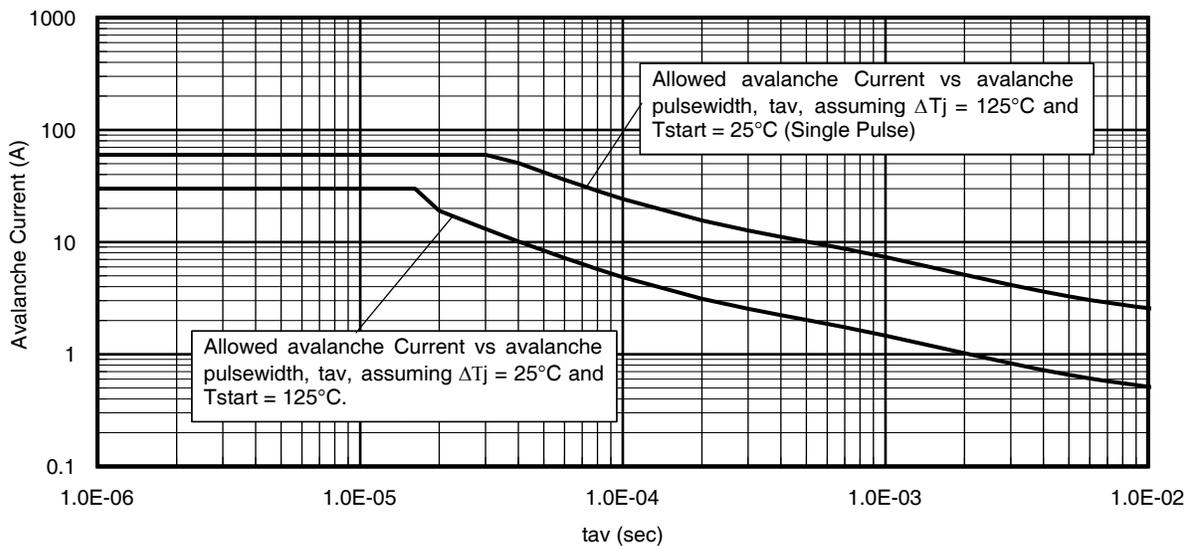
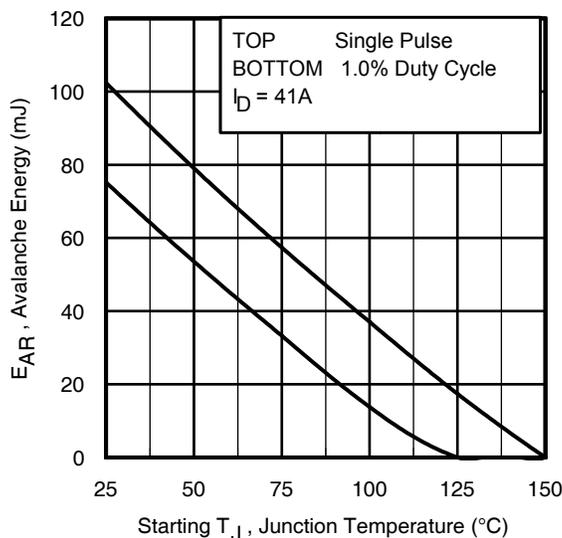
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------------|---|------|------|------|-------|--|
| gfs | Forward Transconductance | 110 | — | — | S | $V_{DS} = 10\text{V}, I_D = 41\text{A}$ |
| Q_g | Total Gate Charge | — | 75 | 110 | nC | $I_D = 41\text{A}$ $V_{DS} = 38\text{V}$ $V_{GS} = 10\text{V}$ |
| Q_{gs} | Gate-to-Source Charge | — | 18 | — | | |
| Q_{gd} | Gate-to-Drain Charge | — | 23 | — | | |
| Q_{sync} | Total Gate Charge Sync. ($Q_g - Q_{gd}$) | — | 52 | — | | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 7.3 | — | ns | $V_{DD} = 38\text{V}$ $I_D = 41\text{A}$ $R_G = 2.7\Omega$ $V_{GS} = 10\text{V}$ ④ |
| t_r | Rise Time | — | 16 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 53 | — | | |
| t_f | Fall Time | — | 12 | — | | |
| C_{iss} | Input Capacitance | — | 4030 | — | pF | $V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1.0\text{MHz}$, See Fig.7 $V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 60\text{V}$ ⑥ $V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 60\text{V}$ ⑤ |
| C_{oss} | Output Capacitance | — | 330 | — | | |
| C_{riss} | Reverse Transfer Capacitance | — | 200 | — | | |
| $C_{oss\text{ eff.}(ER)}$ | Effective Output Capacitance (Energy Related) | — | 290 | — | | |
| $C_{oss\text{ eff.}(TR)}$ | Output Capacitance (Time Related) | — | 380 | — | | |

Diode Characteristics

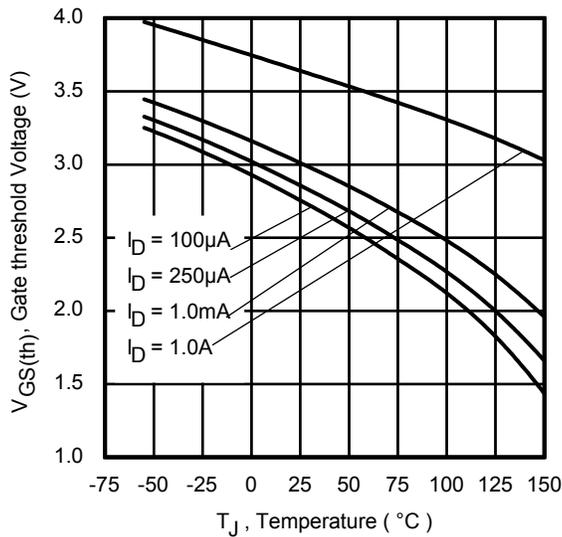
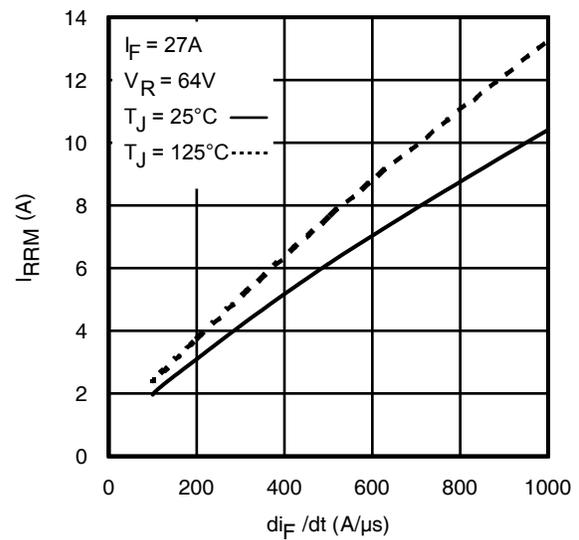
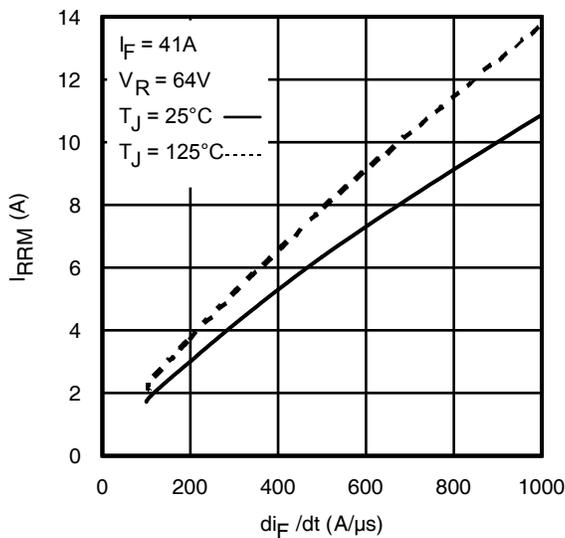
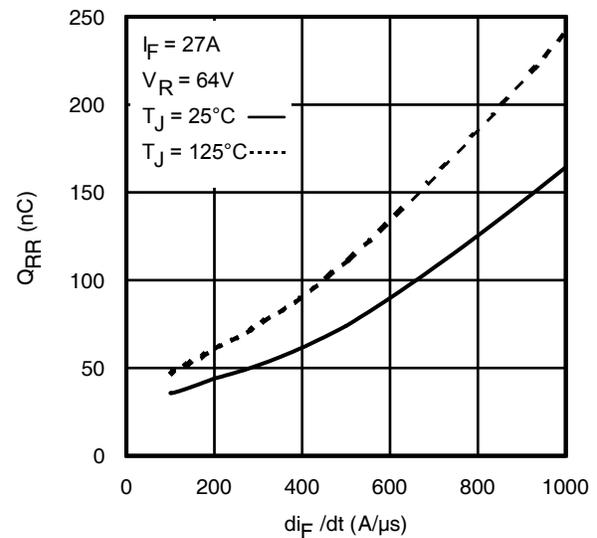
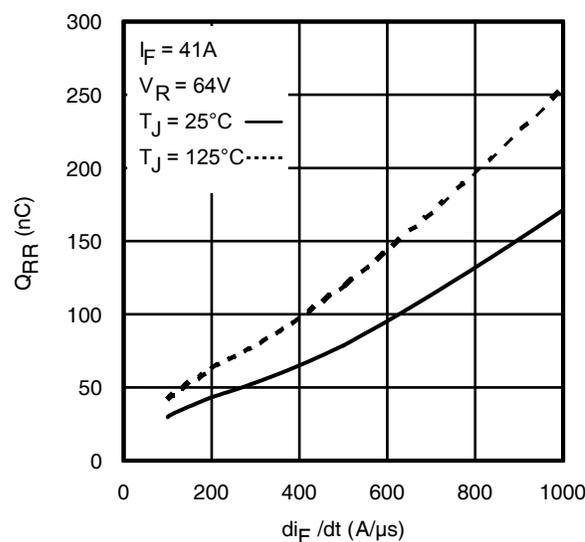
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------|--|------|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 68 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 270 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.2 | V | $T_J = 25^\circ\text{C}, I_S = 41\text{A}, V_{GS} = 0\text{V}$ ④ |
| dv/dt | Peak Diode Recovery dv/dt | — | 11 | — | V/ns | $T_J = 150^\circ\text{C}, I_S = 41\text{A}, V_{DS} = 75\text{V}$ ③ |
| t_{rr} | Reverse Recovery Time | — | 29 | — | ns | $V_{DD} = 64\text{V}$ $I_F = 41\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ ④ |
| | | — | 34 | — | | |
| Q_{rr} | Reverse Recovery Charge | — | 30 | — | nC | $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ |
| | | — | 42 | — | | |
| I_{RRM} | Reverse Recovery Current | — | 1.7 | — | A | $T_J = 25^\circ\text{C}$ |

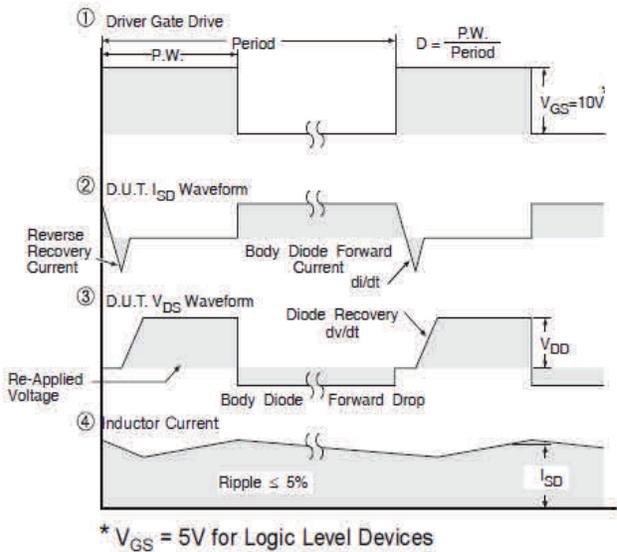
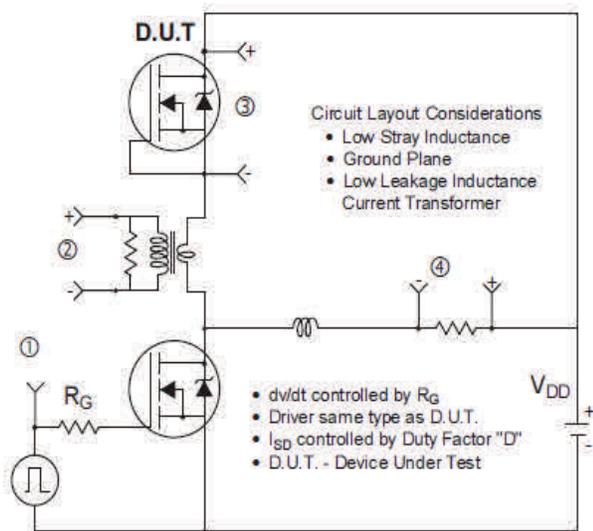
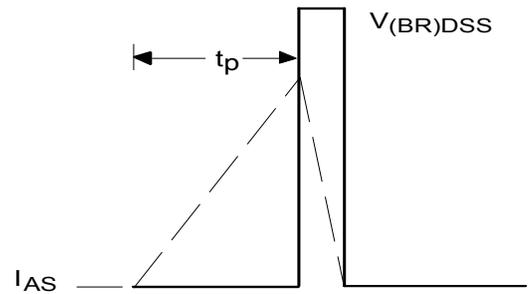
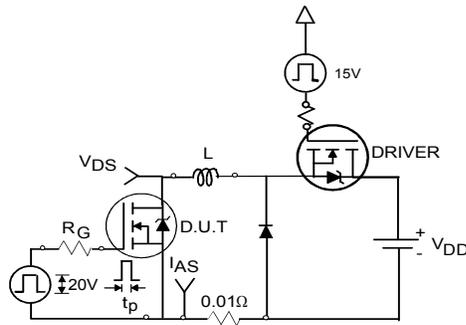
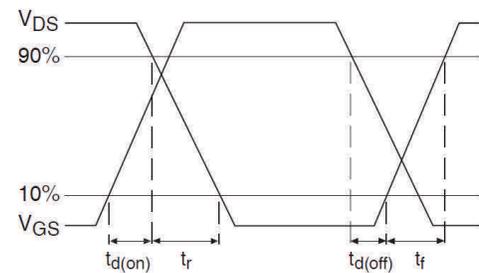
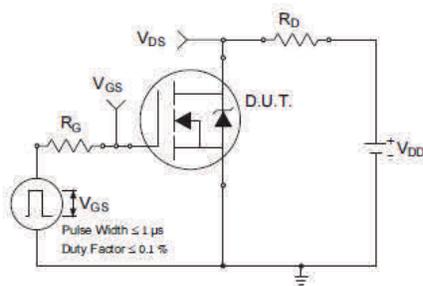
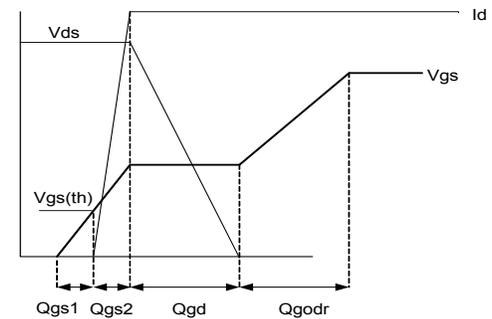
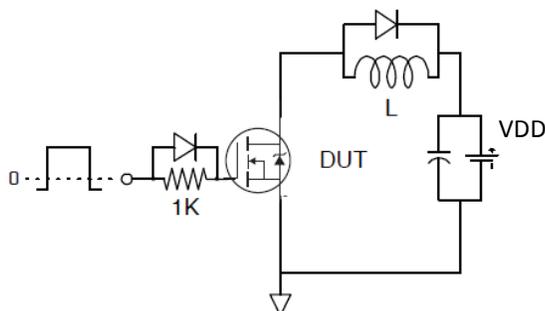

Fig 3. Typical Output Characteristics

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

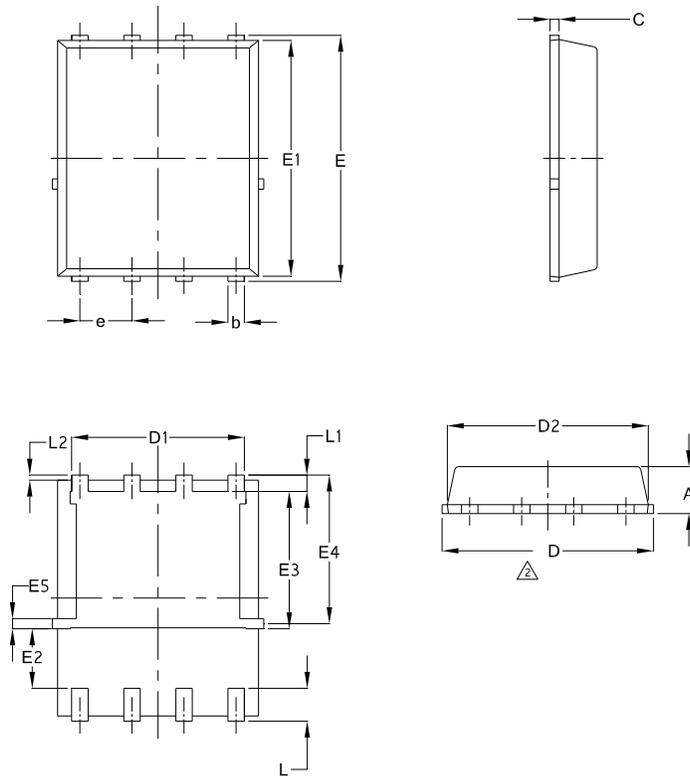

Fig 9. Typical Source-Drain Diode Forward Voltage

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. 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 14, 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 13)
 $P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$
 $I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$
 $E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$


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

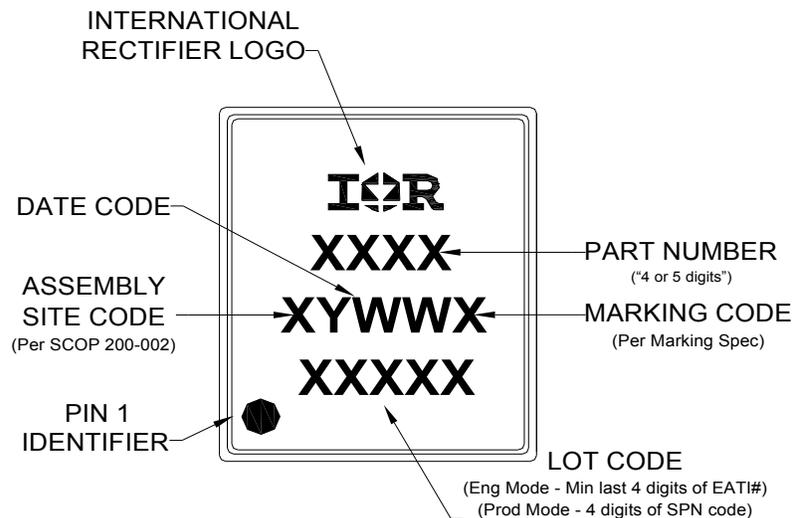

Fig 22. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

Fig 23a. Unclamped Inductive Test Circuit
Fig 23b. Unclamped Inductive Waveforms

Fig 24a. Switching Time Test Circuit
Fig 24b. Switching Time Waveforms

Fig 25a. Gate Charge Test Circuit
Fig 25b. Gate Charge Waveform

PQFN 5x6 Outline "E" Package Details


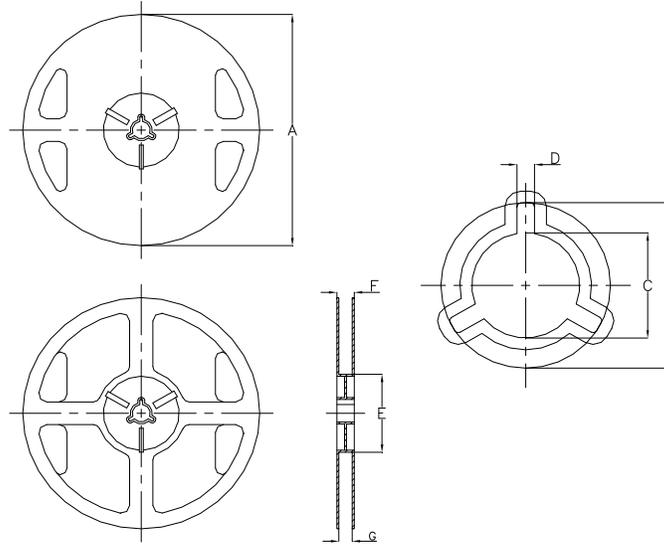
| SYMBOL | COMMON | | | |
|--------|--------|-------|--------|--------|
| | MM | | INCH | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.90 | 1.17 | 0.0354 | 0.0461 |
| b | 0.31 | 0.51 | 0.0130 | 0.0189 |
| C | 0.195 | 0.300 | 0.0077 | 0.0118 |
| D | 4.80 | 5.25 | 0.1890 | 0.2028 |
| D1 | 3.91 | 4.31 | 0.1539 | 0.1697 |
| D2 | 4.80 | 5.10 | 0.1890 | 0.1968 |
| E | 5.90 | 6.25 | 0.2323 | 0.2421 |
| E1 | 5.65 | 6.15 | 0.2224 | 0.2362 |
| E2 | 1.10 | — | 0.0594 | — |
| E3 | 3.32 | 3.78 | 0.1307 | 0.1480 |
| E4 | 3.52 | 3.72 | 0.1346 | 0.1409 |
| E5 | 0.13 | 0.32 | 0.0071 | 0.0126 |
| e | 1.27 | BSC | 0.050 | BSC |
| L | 0.51 | 0.86 | 0.0020 | 0.0098 |
| L1 | 0.38 | 0.71 | 0.0150 | 0.0260 |
| L2 | 0.05 | 0.25 | 0.0201 | 0.0339 |
| l | 0 | 0.18 | 0 | 0.0071 |

For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: <http://www.irf.com/technical-info/appnotes/an-1136.pdf>

For more information on package inspection techniques, please refer to application note AN-1154: <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

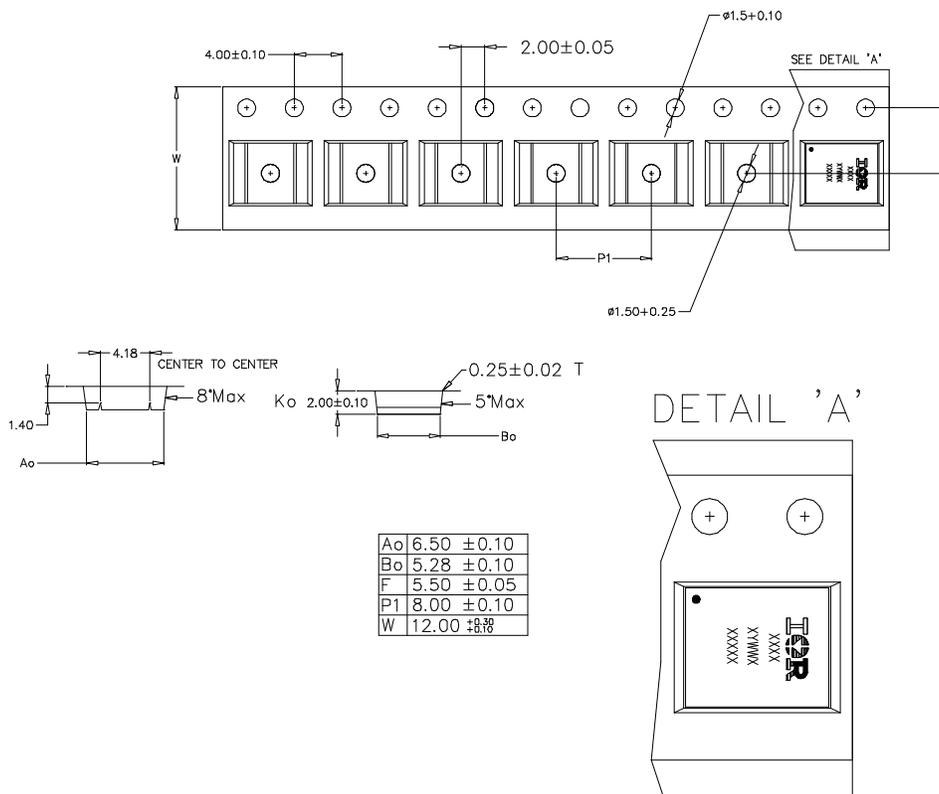
PQFN 5x6 Outline "E" Part Marking


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

PQFN 5x6 Outline "E" Tape and Reel


NOTE: Controlling dimensions in mm Std reel quantity is 4000 parts.

| REEL DIMENSIONS | | | | | | | | |
|-----------------|----------------------------|-------|----------|--------|----------------------|-------|----------|-------|
| CODE | STANDARD OPTION (QTY 4000) | | | | TR1 OPTION (QTY 400) | | | |
| | METRIC | | IMPERIAL | | METRIC | | IMPERIAL | |
| A | 329.5 | 330.5 | 12.972 | 13.011 | 177.5 | 178.5 | 6.988 | 7.028 |
| B | 20.9 | 21.5 | 0.823 | 0.846 | 20.9 | 21.5 | 0.823 | 0.846 |
| C | 12.8 | 13.5 | 0.504 | 0.532 | 13.2 | 13.8 | 0.520 | 0.543 |
| D | 1.7 | 2.3 | 0.067 | 0.091 | 1.9 | 2.3 | 0.075 | 0.091 |
| E | 97 | 99 | 3.819 | 3.898 | 65 | 66 | 2.350 | 2.598 |
| F | Ref | 17.4 | | | Ref | 12 | | |
| G | 13 | 14.5 | 0.512 | 0.571 | 13 | 14.5 | 0.512 | 0.571 |



| | |
|----|-------------|
| Ao | 6.50 ±0.10 |
| Bo | 5.28 ±0.10 |
| F | 5.50 ±0.05 |
| P1 | 8.00 ±0.10 |
| W | 12.00 ±0.10 |

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

Qualification Information[†]

| | | |
|-----------------------------------|--|---|
| Qualification Level | Industrial (per JEDEC JESD47F ^{††} guidelines) | |
| Moisture Sensitivity Level | PQFN 5mm x 6mm | MSL1 (per JEDEC J-STD-020D ^{††}) |
| 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 | Comments |
|-------------|--|
| 2/19/2015 | <ul style="list-style-type: none"> • Updated $E_{AS (L=1mH)} = 146mJ$ on page 2 • Updated note 8 "Limited by T_{Jmax}, starting $T_J = 25^{\circ}C$, $L = 1mH$, $R_G = 50\Omega$, $I_{AS} = 17A$, $V_{GS} = 10V$" on page 2 |



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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