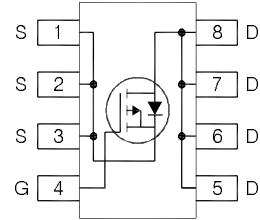


Applications

Charge and Discharge Switch for Notebook PC Battery Application

Features

- $V_{DS(V)} = -30V$
- $I_D = -15A$ ($V_{GS} = -10V$)
- $R_{DS(ON)} < 7.2m\Omega$ ($V_{GS} = -10V$)
- $R_{DS(ON)} < 11.2m\Omega$ ($V_{GS} = -4.5V$)
- Industry-Standard SOP-8 Package
- RoHS Compliant Containing no Lead, no Bromide and no Halogen



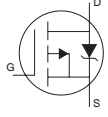
Resulting Benefits

- Environmentally Friendlier
- Multi-Vendor Compatibility

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------|---|--------------|-------|
| V_{DS} | Drain-to-Source Voltage | -30 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -15 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -12 | |
| I_{DM} | Pulsed Drain Current ① | -120 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation ④ | 2.5 | W |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation ④ | 1.6 | |
| | Linear Derating Factor | 0.02 | W/°C |
| T_J | Operating Junction and | -55 to + 150 | °C |
| T_{STG} | Storage Temperature Range | | |

Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

| | 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 | | 5.9 | 7.2 | m Ω | $V_{GS} = -10V, I_D = -15A$ ③ |
| | | | 9.3 | 11.2 | | $V_{GS} = -4.5V, I_D = -12A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | -1.3 | -1.8 | -2.4 | V | $V_{DS} = V_{GS}, I_D = -50\mu A$ |
| $\Delta V_{GS(th)}$ | Gate Threshold Voltage Coefficient | | -5.9 | | mV/ $^\circ\text{C}$ | |
| I_{DSS} | Drain-to-Source Leakage Current | | | -1.0 | μA | $V_{DS} = -24V, V_{GS} = 0V$ |
| | | | | -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 | 30 | | | S | $V_{DS} = -10V, I_D = -12A$ |
| Q_g | Total Gate Charge ⑥ | | 34 | | nC | $V_{DS} = -15V, V_{GS} = -4.5V, I_D = -12A$ |
| Q_g | Total Gate Charge ⑥ | | 65 | 98 | nC | $V_{DS} = -10V$ |
| Q_{gs} | Gate-to-Source Charge ⑥ | | 10 | | | $V_{DS} = -15V$ |
| Q_{gd} | Gate-to-Drain Charge ⑥ | | 16 | | | $I_D = -12A$ |
| R_G | Gate Resistance ⑥ | | 18 | | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | | 21 | | ns | $V_{DD} = -30V, V_{GS} = -4.5V$ ③ |
| t_r | Rise Time | | 79 | | | $I_D = -1.0A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | | 185 | | | $R_G = 6.8\Omega$ |
| t_f | Fall Time | | 145 | | | See Figs. 19a & 19b |
| C_{iss} | Input Capacitance | | 2590 | | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | | 590 | | | $V_{DS} = -25V$ |
| C_{rss} | Reverse Transfer Capacitance | | 360 | | | $f = 1.0\text{MHz}$ |
| E_{AS} | Single Pulse Avalanche Energy ② | | | | | 310 mJ |
| I_{AR} | Avalanche Current ① | | | | | -12 A |
| I_S | Continuous Source Current (Body Diode) | | | -2.5 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | | | -120 | | |
| V_{SD} | Diode Forward Voltage | | | -1.2 | V | $T_J = 25^\circ\text{C}, I_S = -2.5A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | | 38 | 57 | ns | $T_J = 25^\circ\text{C}, I_F = -2.5A, V_{DD} = -24V$ |
| Q_{rr} | Reverse Recovery Charge | | 24 | 36 | nC | $di/dt = 100/\mu s$ ③ |
| $R_{\theta JL}$ | Junction-to-Drain Lead ⑤ | | | | | 20 $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient ④ | | | | | 50 $^\circ\text{C/W}$ |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}, L = 4.3\text{mH}, R_G = 25\Omega, I_{AS} = -12A$.
- ③ Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.
- ④ When mounted on 1 inch square copper board.
- ⑤ R_{θ} is measured at T_J of approximately 90°C .

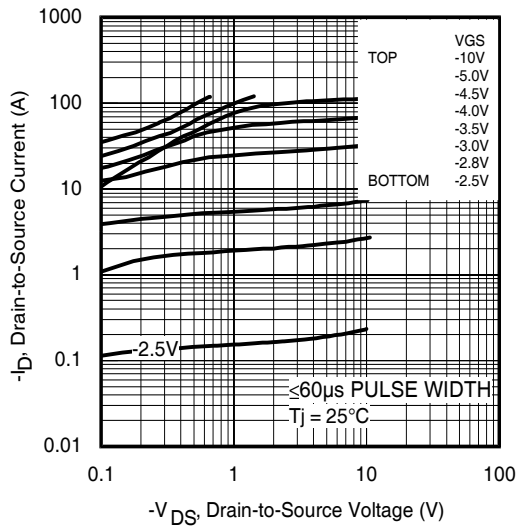


Fig 1. Typical Output Characteristics

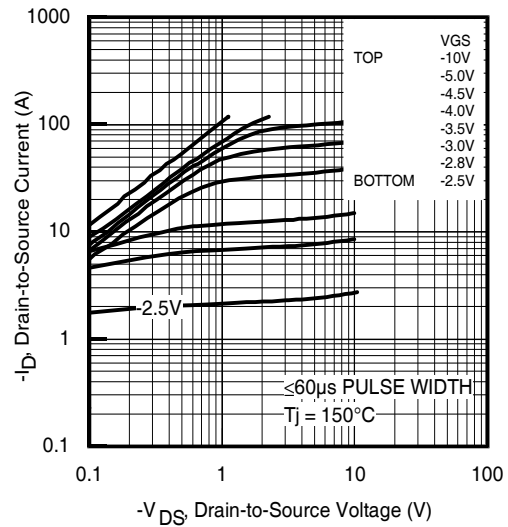


Fig 2. Typical Output Characteristics

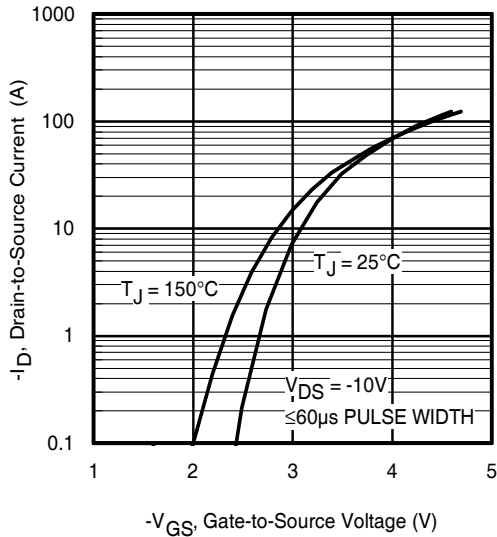


Fig 3. Typical Transfer Characteristics

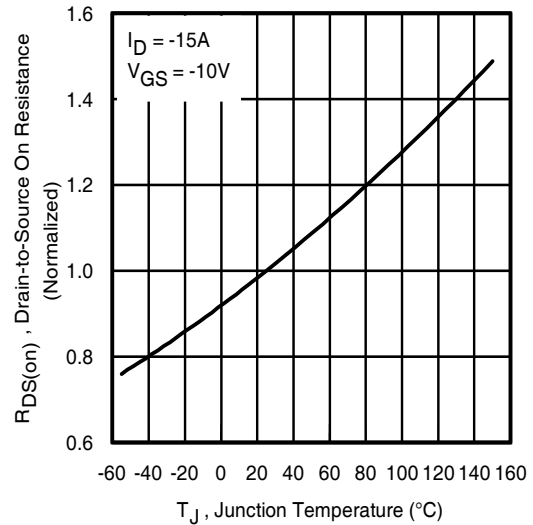


Fig 4. Normalized On-Resistance vs. Temperature

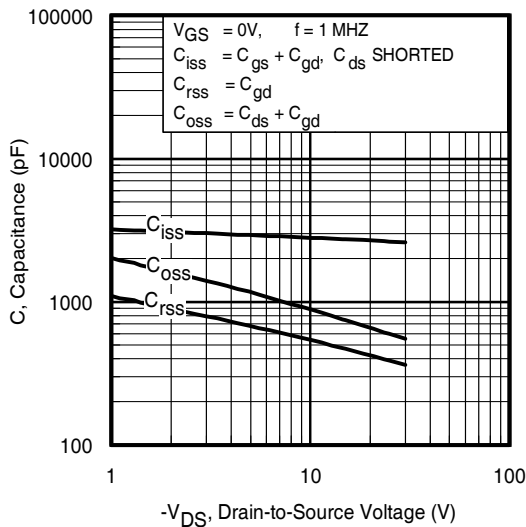


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

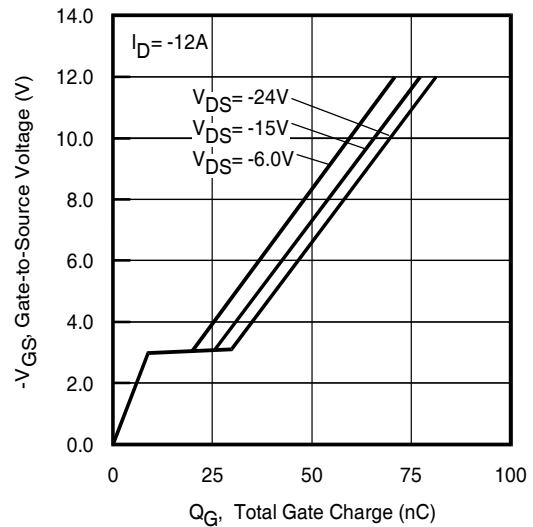


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

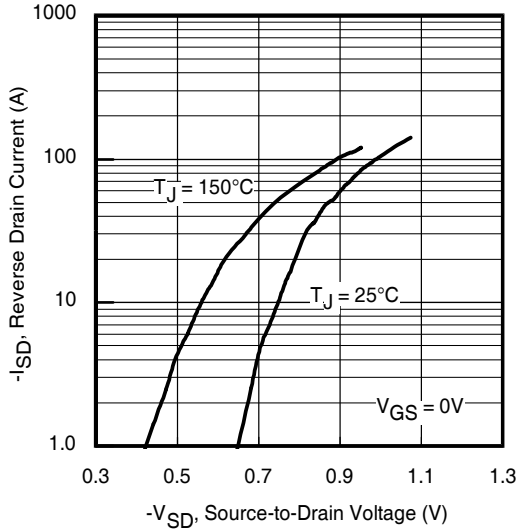


Fig 7. Typical Source-Drain Diode Forward Voltage

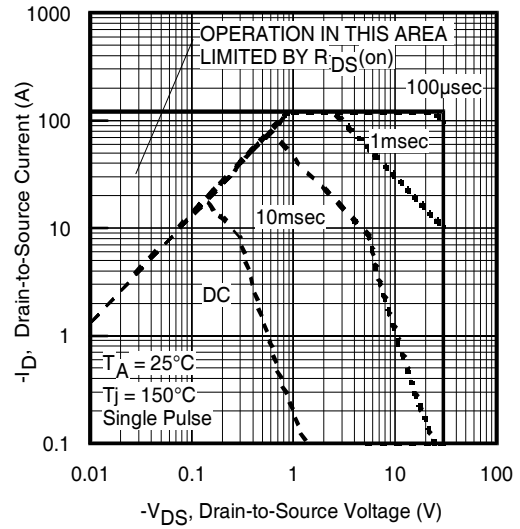


Fig 8. Maximum Safe Operating Area

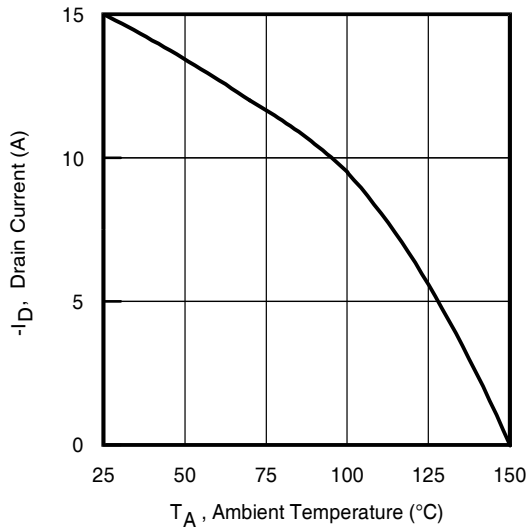


Fig 9. Maximum Drain Current vs. Ambient Temperature

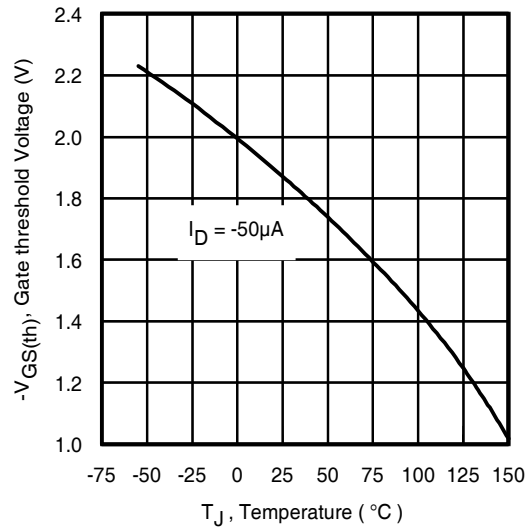


Fig 10. Threshold Voltage vs. Temperature

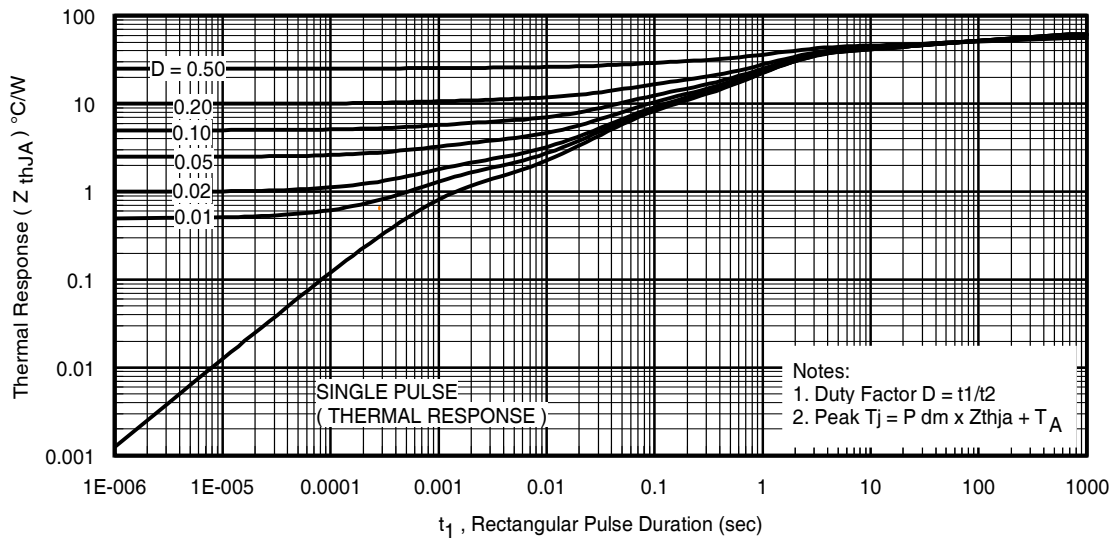


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

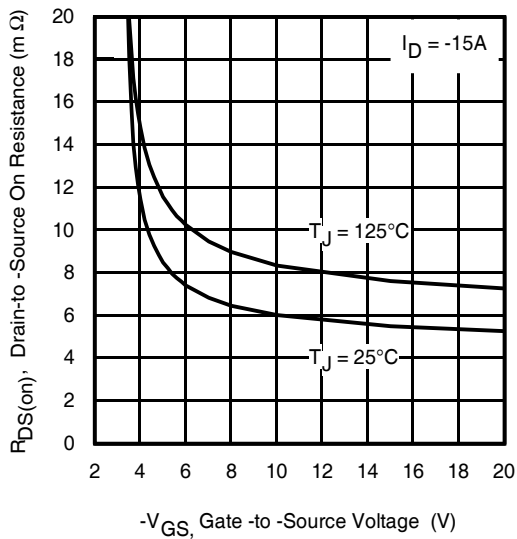


Fig 12. On-Resistance vs. Gate Voltage

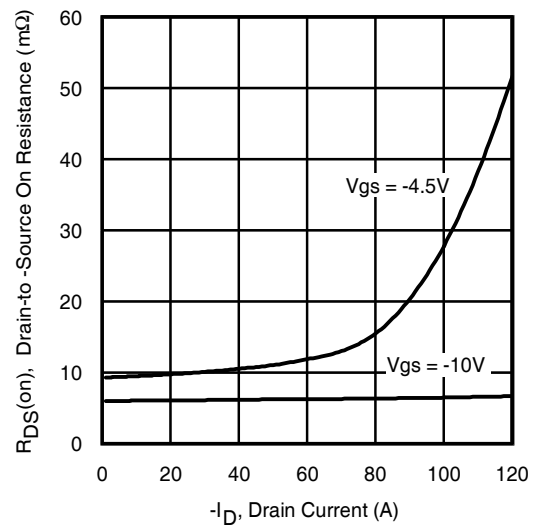


Fig 13. Typical On-Resistance vs. Drain Current

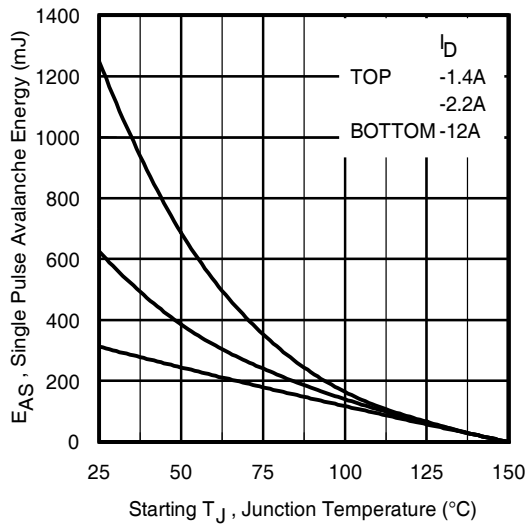


Fig 14. Maximum Avalanche Energy vs. Drain Current

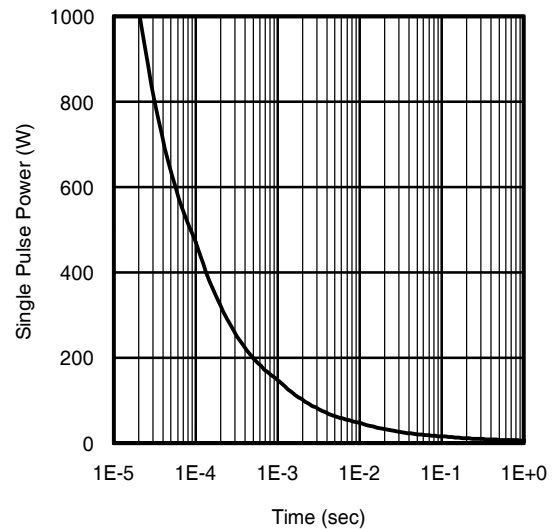
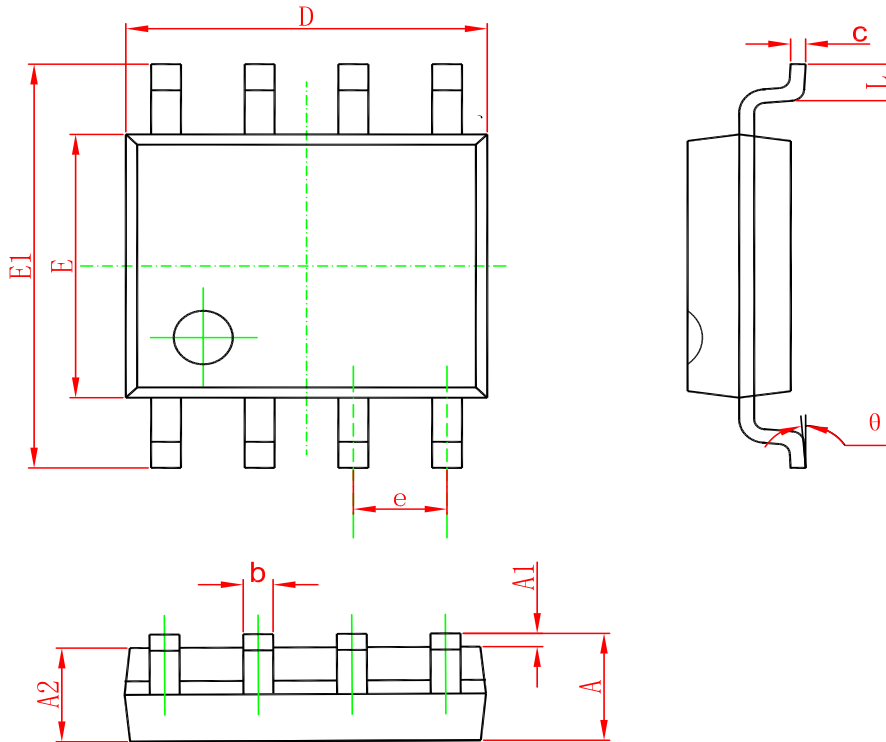


Fig 15. Typical Power vs. Time

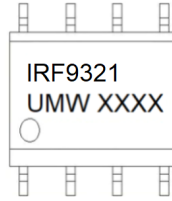
PACKAGE OUTLINE DIMENSIONS

SOP-8



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

Marking



Ordering information

| Order code | Package | Baseqty | Deliverymode |
|---------------|---------|---------|---------------|
| UMW IRF9321TR | SOP-8 | 3000 | Tape and reel |