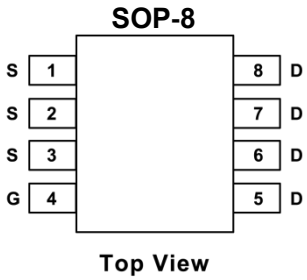
# IRF7416TRPBF-HX P-Channel 30-V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | Qg (Typ.) | $I_D$ (A) |
| -30 | 0.018 at $V_{GS}$ = - 10 V | 13nC | -9.0 |
| | 0.024 at $V_{GS}$ = - 4.5 V | | -7.8 |




Top View

## FEATURES

- TrenchFET® Power MOSFET
- 100 % $R_g$ Tested

## APPLICATIONS

- Load Switch
- Battery Switch

## Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ -10V | -10 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ -10V | -7. 1 | |
| $I_{DM}$ | Pulsed Drain Current ① | -45 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation | 2.5 | W |
| | Linear Derating Factor | 0.02 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy ② | 370 | mJ |
| dv/dt | Peak Diode Recovery dv/ dt ③ | -5.0 | V/ns |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | °C |

## Thermal Resistance

| | Parameter | Max | Units |
|---|---|---|---|
| $R_{\theta JA}$ | Junction-to-Ambient ⑤ | 50 | °C/W |

| Static Electrical Characteristics @ TJ = 25° C (unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| | **Parameter** | **Min.** | **Typ.** | **Max.** | **Units** | **Conditions** |
| $V_{(BR)DSS}$ | Drain- to- Source Breakdown Voltage | -30 | | | V | $V_{GS}$=0V,$I_D$=-250μA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | | -0.024 | | V/°C | Reference to 25°C,$I_D$=-1mA |
| $R_{DS(on)}$ | Static Drain- to- SourceOn- Resistance | | | 0.020 | Ω | $V_{GS}$=-10V,$I_D$=-5.6A ④ |
| | | | | 0.035 | | $V_{GS}$=-4.5V,$I_D$=-2.8A ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | -1.0 | | -2.04 | V | $V_{DS}$=$V_{GS}$,$I_D$=-250μA |
| gfs | Forward Transconductance | 5.6 | | | S | $V_{DS}$=-10V,$I_D$=-2.8A |
| $I_{DSS}$ | Drain- to- Source Leakage Current | | | -1.0 | μA | $V_{DS}$=-24V,$V_{GS}$=0V |
| | | | | -25 | | $V_{DS}$=-24V,$V_{GS}$=0V,$T_J$=125°C |
| $I_{GSS}$ | Gate- to- Source Forward Leakage | | | -100 | nA | $V_{GS}$=-20V |
| | Gate- to- Source Reverse Leakage | | | 100 | | $V_{GS}$=20V |

| Dynamic Electrical Characteristics @ TJ = 25° C (unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| | **Parameter** | **Min.** | **Typ.** | **Max.** | **Units** | **Conditions** |
| $Q_g$ | Total Gate Charge | | 61 | 92 | nC | $I_D$ = -5.6A<br>$V_{DS}$ = -24V<br>$V_{GS}$ = - 10V ④ |
| $Q_{gs}$ | Gate- to- Source Charge | | 8.0 | 12 | | |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | | 22 | 32 | | |
| $t_{d(on)}$ | Turn- On Delay Time | | 18 | | ns | $V_{DD}$ = - 15V<br>$I_D$ = -5.6A<br>$R_G$ = 6.2Ω<br>$R_D$ = 2.7Ω ④ |
| $t_r$ | Rise Time | | 49 | | | |
| $t_{d(off)}$ | Turn- Off Delay Time | | 59 | | | |
| $t_f$ | Fall Time | | 60 | | | |
| $C_{iss}$ | Input Capacitance | | 1700 | | pF | $V_{GS}$ = 0V<br>$V_{DS}$ = -25V<br>f = 1.0MHz |
| $C_{oss}$ | Output Capacitance | | 890 | | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | 410 | | | |

| 1 Diode Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| | **Parameter** | **Min.** | **Typ.** | **Max.** | **Units** | **Conditions** |
| $I_S$ | Continuous Source Current (Body Diode) | | | -3.1 | A | |
| $I_{SM}$ | Pulsed Source Current (Body Diode)① | | | -4.5 | | |
| $V_{SD}$ | Diode Forward Voltage | | | -1.0 | V | $T_J$=25°C,$I_S$=-5.6$V_{GS}$=0V③ |
| $t_{rr}$ | Reverse Recovery Time | | 56 | 85 | ns | $T_J$=25°C,$I_F$= -5.6A<br>di/dt = 100A/μs③ |
| $Q_{rr}$ | Reverse Recovery Charge | | 99 | 150 | nC | |

## Notes

①Repetitive rating; pulse width limited by max. junction temperature.
②starting $T_J$ = 25°C, L = 25mH,$R_G$= 25Ω, $I_{AS}$ = .5.6A.
③$I_{SD}$ ≤ .5.6A, di/dt ≤ 100A/us, VDD ≤ $V_{(BR)DSS}$ , $T_J$ ≤ 150°C
④Pulse width ≤ 300us; duty cycle ≤ 2%.
⑤Surface mounted on FR.4 board, t ≤ 10sec.

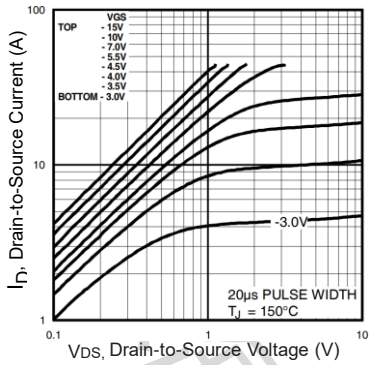



Fig 1. Typical Output Characteristics

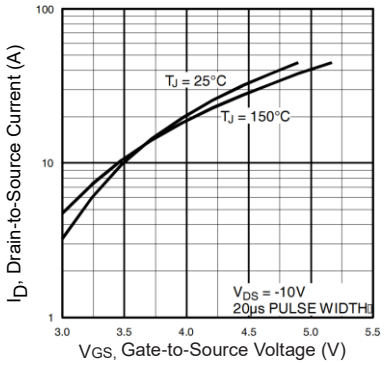



Fig 2. Typical Transfer Characteristics

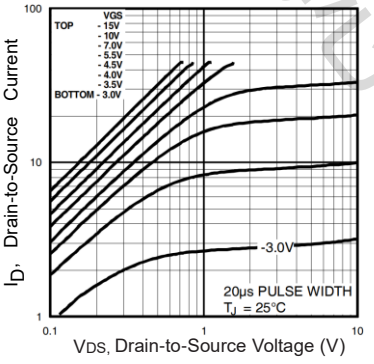



Fig 3. Typical Output

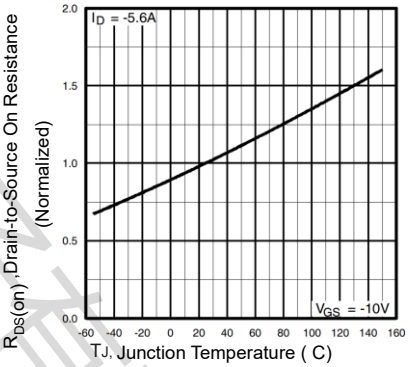



Fig 4. Normalized On-Resistance Vs. Temperature

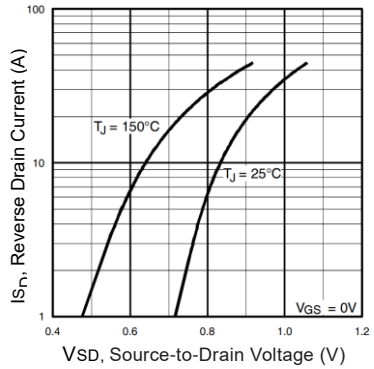



Fig 5. Typical Source-Drain Diode Forward Voltage

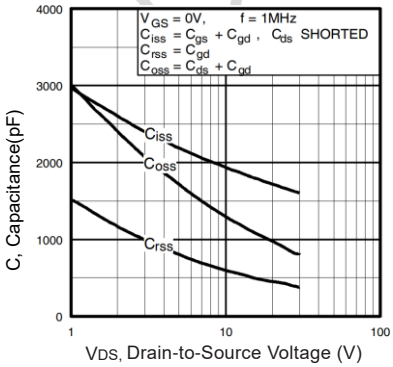



Fig 6. Typical Capacitance Vs. Drain-to-Source Voltage

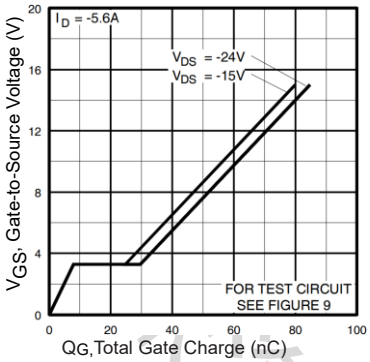



Fig 7. Typical Gate Charge Vs. Gate-to-Source Voltage

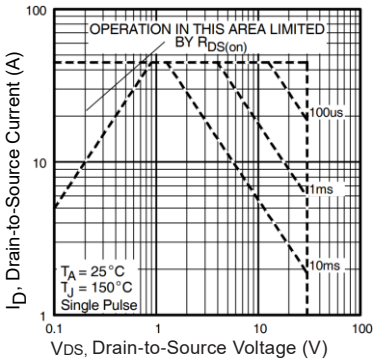



Fig 8. Maximum Safe Operating

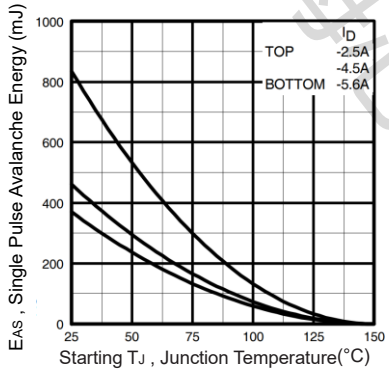



Fig 9. Maximum Avalanche Energy Vs. Drain Current

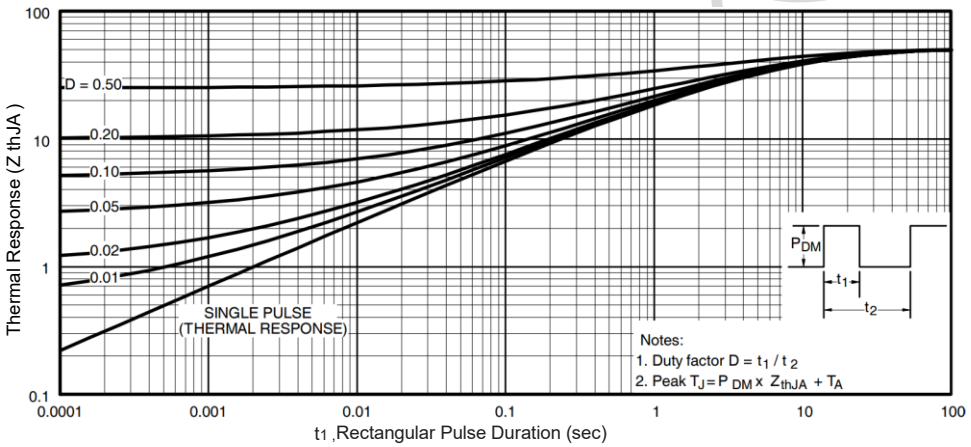
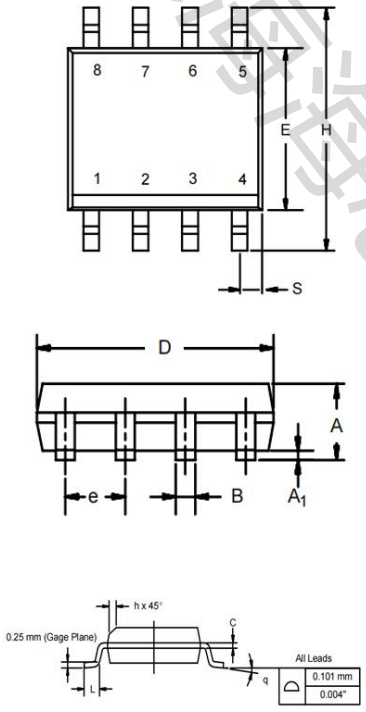



Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

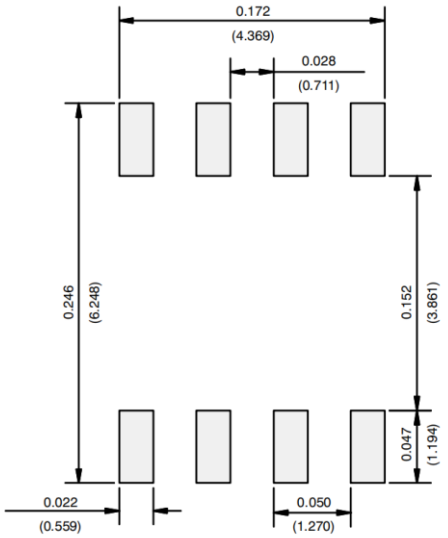
## SO-8 Package Outline

Dimensions are shown in millimeters (inches)



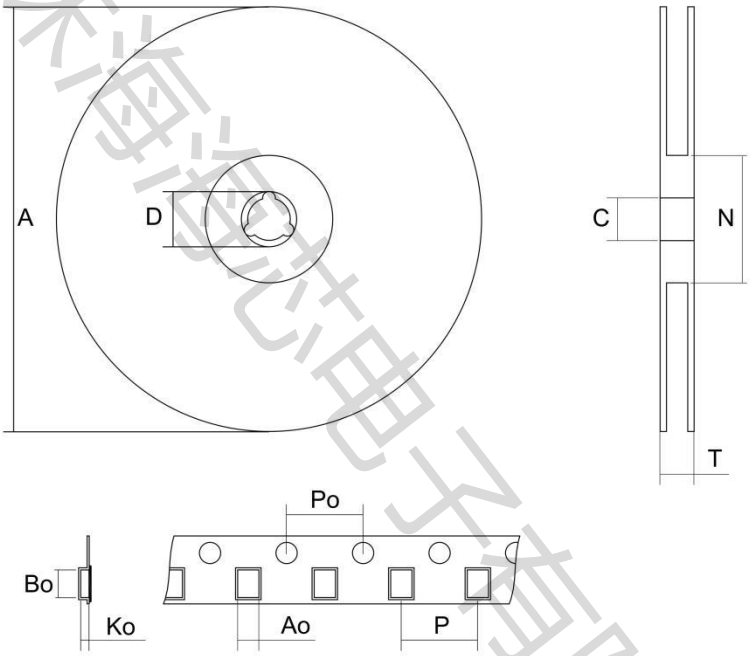

| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| $A_1$ | 0.10 | 0.20 | 0.004 | 0.008 |
| B | 0.35 | 0.51 | 0.014 | 0.020 |
| C | 0.19 | 0.25 | 0.007 5 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.196 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| H | 5.80 | 6.20 | 0.228 | 0.244 |
| h | 0.25 | 0.50 | 0.010 | 0.020 |
| L | 0.50 | 0.93 | 0.020 | 0.037 |
| q | 0° | 8° | 0° | 8° |
| S | 0.44 | 0.64 | 0.018 | 0.026 |

## RECOMMENDED MINIMUM PADS FOR SO-8

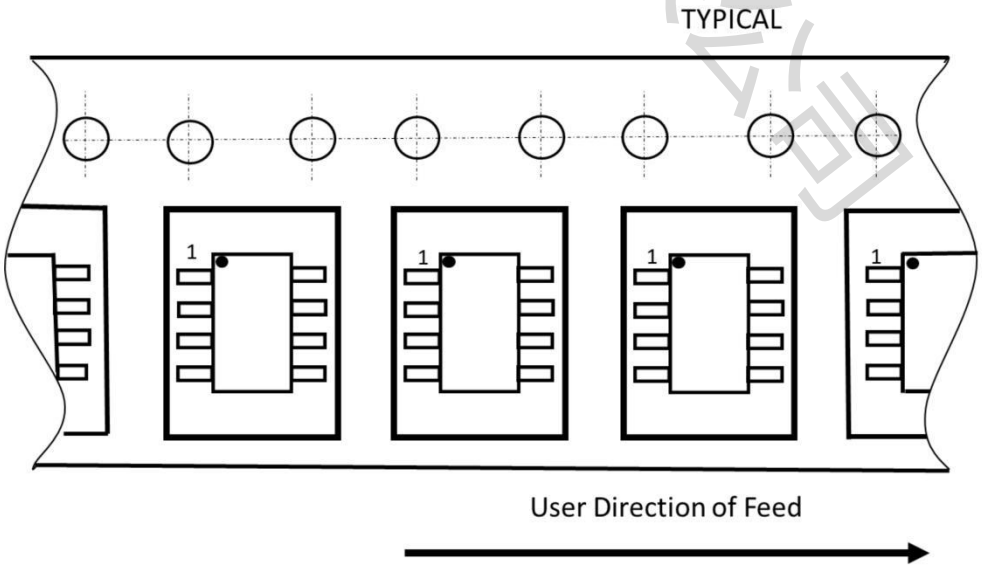


# SOP-8 packing information

## SOP-8 tape and reel




## Tape orientation



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