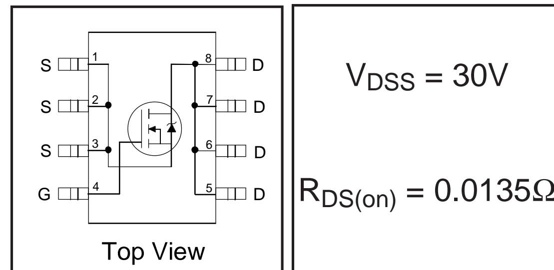
PD - 95168

International
IOR Rectifier

# Si4410DYPbF

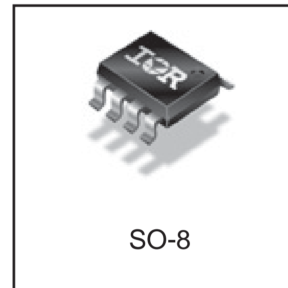
HEXFET® Power MOSFET

- N-Channel MOSFET
- Low On-Resistance
- Low Gate Charge
- Surface Mount
- Logic Level Drive
- Lead-Free




$V_{DSS}$ = 30V

$R_{DS(on)}$ = 0.0135Ω



SO-8

## Description

This N-channel HEXFET® Power MOSFET is produced using International Rectifier's advanced HEXFET power MOSFET technology. The low on-resistance and low gate charge inherent to this technology make this device ideal for low voltage or battery driven power conversion applications

The SO-8 package with copper leadframe offers enhanced thermal characteristics that allow power dissipation of greater that 800mW in typical board mount applications.

## Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|---|---|
| $V_{DS}$ | Drain- Source Voltage | 30 | V |
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | ±10 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 10V | ±8.0 | |
| $I_{DM}$ | Pulsed Drain Current ① | ±50 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation ③ | 2.5 | W |
| $P_D$ @$T_A$ = 70°C | Power Dissipation ③ | 1.6 | |
| | Linear Derating Factor | 0.02 | W/°C |
| dv/dt | Peak Diode Recovery dv/dt ⑤ | 5.0 | V/ns |
| $E_{AS}$ | Single Pulse Avalanche Energy④ | 400 | mJ |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $T_J$, $T_{STG}$ | Junction and Storage Temperature Range | -55 to + 150 | °C |

## Thermal Resistance

| | Parameter | Max. | Units |
|---|---|---|---|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient③ | 50 | °C/W |



09/22/04

## Electrical Characteristics @ $T_J$ = 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 | —— | 0.029 | —— | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | —— | 0.010 | 0.0135 | Ω | $V_{GS}$ = 10V, $I_D$ = 10A ② |
| | | —— | 0.015 | 0.020 | | $V_{GS}$ = 4.5V, $I_D$ = 5.0A ② |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.0 | —— | —— | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| $g_{fs}$ | Forward Transconductance | —— | 35 | —— | S | $V_{DS}$ = 15V, $I_D$ = 10A |
| $I_{DSS}$ | Drain-to-Source Leakage Current | —— | —— | 1.0 | μA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| | | —— | —— | 25 | | $V_{DS}$ = 30V, $V_{GS}$ = 0V, $T_J$ = 55°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | —— | —— | -100 | nA | $V_{GS}$ = -20V |
| | Gate-to-Source Reverse Leakage | —— | —— | 100 | | $V_{GS}$ = 20V |
| $Q_g$ | Total Gate Charge | —— | 30 | 45 | nC | $I_D$ = 10A |
| $Q_{gs}$ | Gate-to-Source Charge | —— | 5.4 | —— | | $V_{DS}$ = 15V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | —— | 6.5 | —— | | $V_{GS}$ = 10V, See Fig. 10 ② |
| $t_{d(on)}$ | Turn-On Delay Time | —— | 11 | —— | ns | $V_{DD}$ = 25V |
| $t_r$ | Rise Time | —— | 7.7 | —— | | $I_D$ = 1.0A |
| $t_{d(off)}$ | Turn-Off Delay Time | —— | 38 | —— | | $R_G$ = 6.0Ω |
| $t_f$ | Fall Time | —— | 44 | —— | | $R_D$ = 25Ω, ② |
| $C_{iss}$ | Input Capacitance | —— | 1585 | —— | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | —— | 739 | —— | | $V_{DS}$ = 15V |
| $C_{rss}$ | Reverse Transfer Capacitance | —— | 106 | —— | | $f$ = 1.0MHz, See Fig. 9 |

## Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Diode Conduction)③ | —— | —— | 2.3 | A | MOSFET symbol showing the integral reverse p-n junction diode. (D, G, S) |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | —— | —— | 50 | | |
| $V_{SD}$ | Diode Forward Voltage | —— | 0.7 | 1.1 | V | $T_J$ = 25°C, $I_S$ = 2.3A, $V_{GS}$ = 0V ② |
| $t_{rr}$ | Reverse Recovery Time | —— | 50 | 80 | ns | $T_J$ = 25°C, $I_F$ = 2.3A |

**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 300μs; duty cycle ≤ 2%.

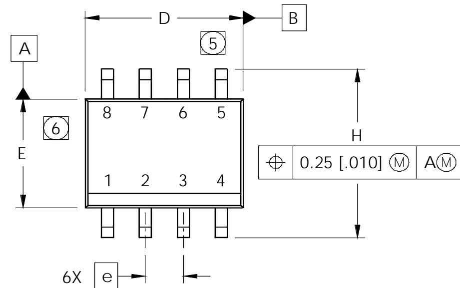
③ When mounted on FR4 Board, t ≤10 sec

④ Starting $T_J$ = 25°C, L = 8.0mH $R_G$ = 25Ω, $I_{AS}$ = 10A. (See Figure 15)

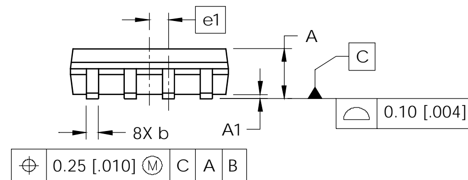
⑤ $I_{SD}$ ≤2.3A, di/dt ≤ 130A/μs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 150°C

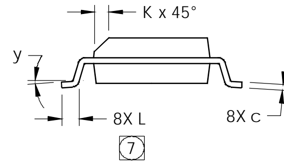
## SO-8 Package Outline

Dimensions are shown in millimeters (inches)




| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
| e | .050 BASIC | | 1.27 BASIC | |
| e1 | .025 BASIC | | 0.635 BASIC | |
| H | .2284 | .2440 | 5.80 | 6.20 |
| K | .0099 | .0196 | 0.25 | 0.50 |
| L | .016 | .050 | 0.40 | 1.27 |
| y | 0° | 8° | 0° | 8° |

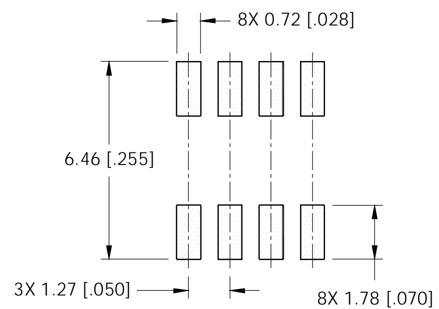


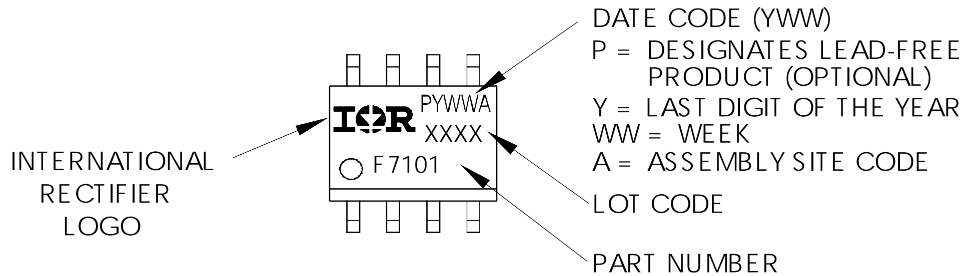

NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.

5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

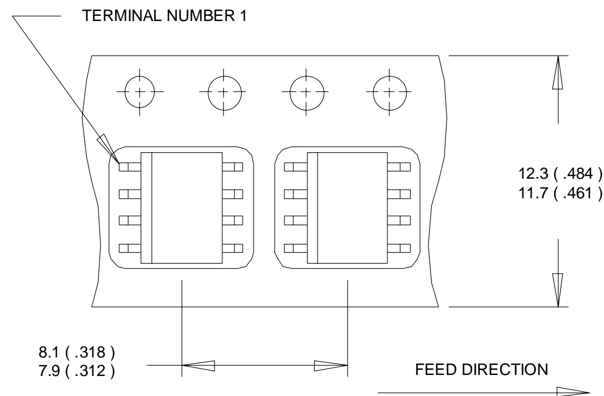



## SO-8 Part Marking

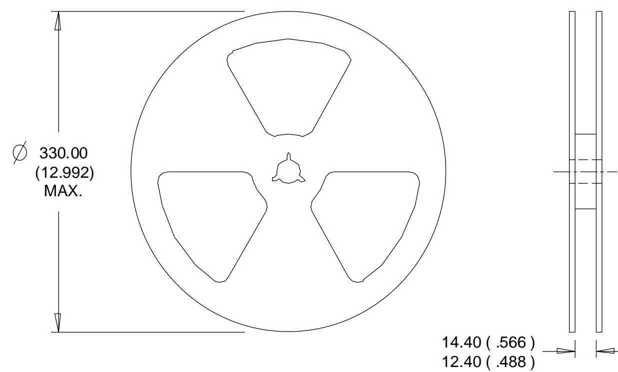


## SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)




NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.




NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.

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