

700V High and Low Side Driver

Features

- Drives IGBT/MOSFET power devices
- Gate drive supplies up to 20V per channel
- Undervoltage lockout for V_{CC} for V_{BS}
- 3.3V, 5V, 15V input logic compatible
- Tolerant to negative transient voltage
- Designed for use with bootstrap power supplies
- Matched propagation delays for all channels
- -40°C to 125°C operating range
- RoHS compliant
- Lead-Free

Description

The IR7106S is a high voltage, high speed, power MOSFET and IGBT gate driver with independent high-side and low-side output channels. This IC is designed to be used with low-cost bootstrap power supplies. Proprietary HVIC and latch immune CMOS technologies have been implemented in a rugged monolithic structure. The floating logic input is compatible with standard CMOS or LSTTL outputs (down to 3.3V logic). The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify the HVIC's use in high frequency applications. The floating channel can be used to drive N-channel power MOSFETs or IGBTs in the high-side configuration, which operates up to 700V.

Product Summary

| | |
|-----------------------------|---------------|
| V_{OFFSET} | $\leq 700V$ |
| V_{OUT} | 10V – 20V |
| I_{O+} & I_{O-} (typ.) | 200mA / 350mA |
| t_{ON} & t_{OFF} (typ.) | 220ns & 200ns |

Package Options



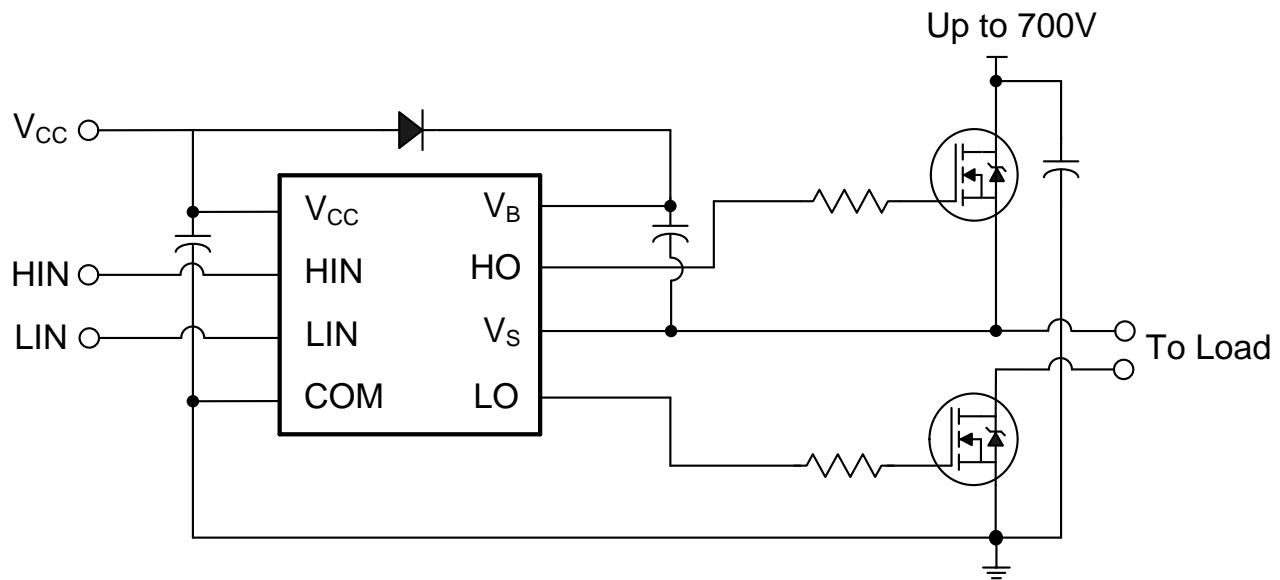
8-Lead SOIC

Typical Applications

- Appliance motor drives
- Servo drives
- Micro inverter drives
- General purpose three phase inverters

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|--------------|---------------|----------|-----------------------|
| | | Form | Quantity | |
| IR7106SPBF | SO8N | Tube | 95 | IR7106SPBF |
| IR7106SPBF | SO8N | Tape and Reel | 2500 | IR7106STRPBF |

Typical Connection Diagram



(Refer to Lead Assignments for correct pin configuration). This diagram shows electrical connections only. Please refer to our Application Notes & Design Tips for proper circuit board layout.

Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM unless otherwise stated in the table. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

| Symbol | Definition | Min. | Max. | Units |
|-------------|--|---------------|-----------------|---------------------------|
| V_{CC} | Low side supply voltage | -0.3 | 25 [†] | V |
| V_{IN} | Logic input voltage | COM - 0.3 | $V_{CC} + 0.3$ | |
| V_B | High-side floating well supply voltage | -0.3 | 725 | |
| V_S | High-side floating well supply return voltage | $V_B - 25$ | $V_B + 0.3$ | |
| V_{HO} | Floating gate drive output voltage | $V_S - 0.3$ | $V_B + 0.3$ | |
| V_{LO} | Low-side output voltage | COM - 0.3 | $V_{CC} + 0.3$ | |
| COM | Power ground | $V_{CC} - 25$ | $V_{CC} + 0.3$ | |
| dV_S/dt | Allowable V_S offset supply transient relative to V_{SS} | — | 50 | V/ns |
| P_D | Package power dissipation @ $T_A \leq 25^\circ\text{C}$ | — | 0.625 | W |
| $R_{th,JA}$ | Thermal resistance, junction to ambient | — | 200 | $^\circ\text{C}/\text{W}$ |
| T_J | Junction temperature | — | 150 | $^\circ\text{C}$ |
| T_S | Storage temperature | -55 | 150 | |
| T_L | Lead temperature (soldering, 10 seconds) | — | 300 | |

[†] All supplies are tested at 25V.

Recommended Operating Conditions

For proper operation, the device should be used within the recommended conditions. All voltage parameters are absolute voltages referenced to COM unless otherwise stated in the table. The offset rating is tested with supplies of $(V_{CC} - COM) = (V_B - V_S) = 15\text{V}$.

| Symbol | Definition | Min | Max | Units |
|----------|--|--------------------|------------|------------------|
| V_{CC} | Low-side supply voltage | 10 | 20 | V |
| V_{IN} | HIN, LIN, & EN input voltage | 0 | V_{CC} | |
| V_B | High-side floating well supply voltage | $V_S + 10$ | $V_S + 20$ | |
| V_S | High-side floating well supply offset voltage [†] | COM-5 [†] | 700 | |
| V_{HO} | Floating gate drive output voltage | V_S | V_B | |
| V_{LO} | Low-side output voltage | COM | V_{CC} | |
| COM | Power ground | -5 | 5 | |
| T_A | Ambient temperature | -40 | 125 | $^\circ\text{C}$ |

[†] Logic operation for V_S of -5 V to 700V . Logic state held for V_S of -5 V to $-V_{BS}$. Please refer to Design Tip DT97-3 for more details.

Static Electrical Characteristics

$(V_{CC} - COM) = (V_B - V_S) = 15V$. $T_A = 25^\circ C$ unless otherwise specified. The V_{IN} and I_{IN} parameters are referenced to COM. The V_O and I_O parameters are referenced to respective V_S and COM and are applicable to the respective output leads HO or LO. The V_{CCUV} parameters are referenced to COM. The V_{BSUV} parameters are referenced to V_S .

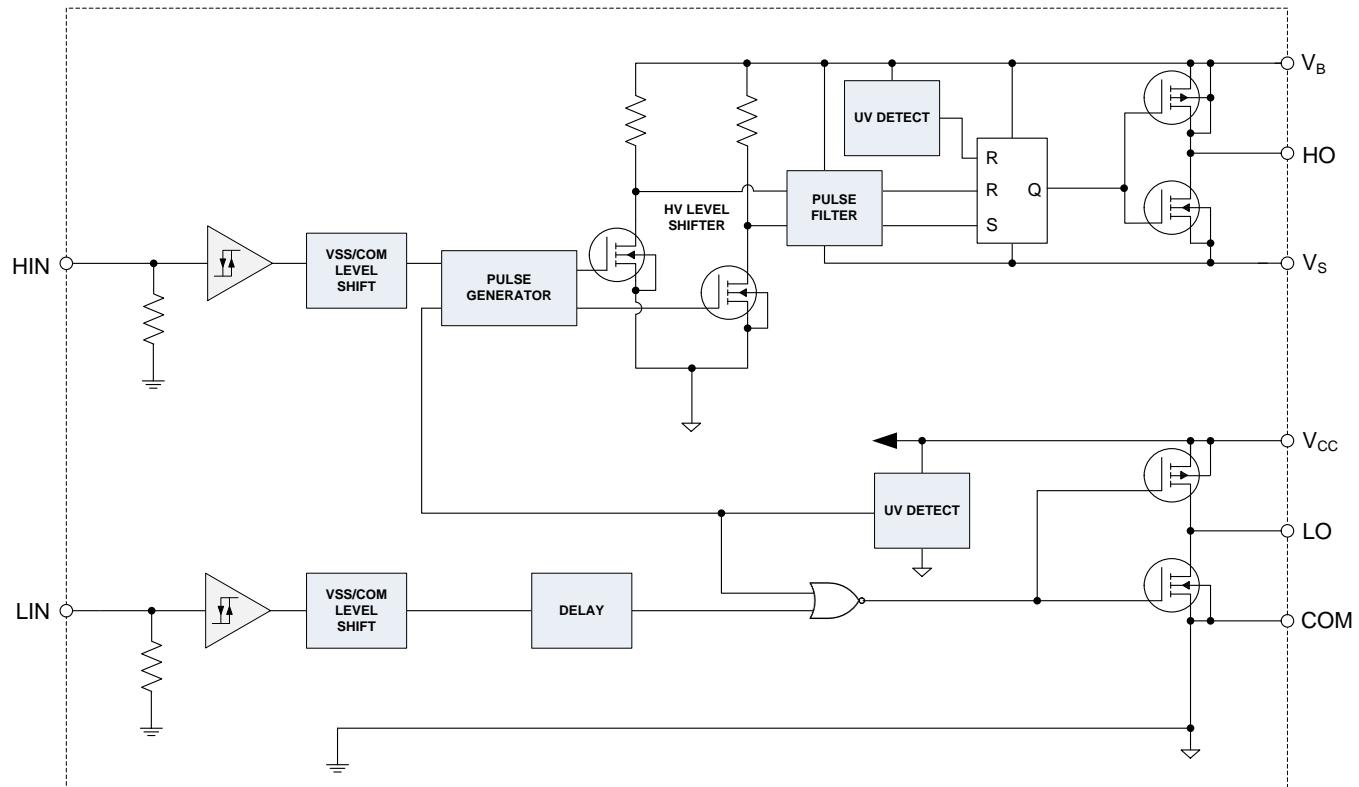
| Symbol | Definition | Min. | Typ. | Max. | Units | Test Conditions |
|--------------|---|------|------|------|---------|------------------------------------|
| V_{BSUV+} | V_{BS} supply undervoltage positive going threshold | 8 | 8.9 | 9.8 | V | |
| V_{BSUV-} | V_{BS} supply undervoltage negative going threshold | 7.4 | 8.2 | 9 | | |
| V_{BSUVHY} | V_{BS} supply undervoltage hysteresis | 0.3 | 0.7 | — | | |
| V_{CCUV+} | V_{CC} supply undervoltage positive going threshold | 8 | 8.9 | 9.8 | | |
| V_{CCUV-} | V_{CC} supply undervoltage negative going threshold | 7.4 | 8.2 | 9 | | |
| V_{CCUVHY} | V_{CC} supply undervoltage hysteresis | 0.3 | 0.7 | — | | |
| I_{LK} | High-side floating well offset supply leakage | — | — | 50 | μA | $V_B = V_S = 700V$ |
| I_{QBS} | Quiescent V_{BS} supply current | — | 75 | 130 | | $V_{IN} = 0V$ or $5V$ |
| I_{QCC} | Quiescent V_{CC} supply current | — | 120 | 180 | | |
| V_{OH} | High level output voltage drop, $V_{BIAS}-V_O$ | — | 0.80 | 1.4 | V | $I_O = 20mA$ |
| V_{OL} | Low level output voltage drop, V_O | — | 0.30 | 0.6 | | |
| I_{O+} | Output high short circuit pulsed current | 120 | 200 | — | mA | $V_O = 0V$, $PW \leq 10\mu s$ |
| I_{O-} | Output low short circuit pulsed current | 250 | 350 | — | | $V_O = 15V$, $PW \leq 10\mu s$ |
| V_{IH} | Logic "1" input voltage | 2.9 | 3 | — | V | $V_{CC} = 10V$ to $20V$ |
| V_{IL} | Logic "0" input voltage | — | — | 0.8 | | |
| I_{IN+} | Input bias current (HO = High) | — | 5 | 20 | μA | $V_{IN} = 5V$ |
| I_{IN-} | Input bias current (HO = Low) | — | — | 2 | | $V_{IN} = 0V$ |

Dynamic Electrical Characteristics

$V_{CC} = V_B = 15V$, $V_S = COM$, $T_A = 25^\circ C$, and $C_L = 1000pF$ unless otherwise specified.

| Symbol | Definition | Min. | Typ. | Max. | Units | Test Conditions |
|-----------|--|------|------|------|-------|----------------------|
| t_{ON} | Turn-on propagation delay | — | 220 | 300 | ns | $V_S = 0V$ |
| t_{OFF} | Turn-off propagation delay | — | 200 | 280 | | $V_S = 0V$ or $700V$ |
| t_R | Turn-on rise time | — | 150 | 220 | | $V_S = 0V$ |
| t_F | Turn-off fall time | — | 50 | 80 | | |
| MT | Delay matching time (t_{ON} , t_{OFF}) | — | 0 | 50 | | |

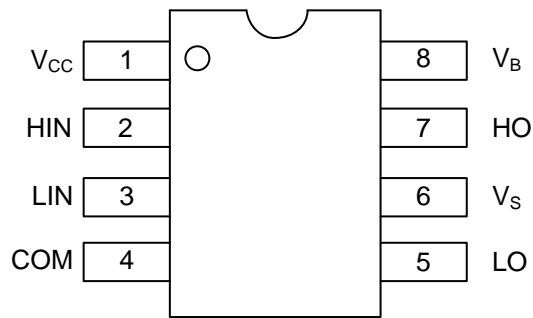
Functional Block Diagram



Lead Definitions

| Symbol | Description |
|--------|---|
| VCC | Low-side and logic supply voltage |
| VB | High-side gate drive floating supply |
| VS | High voltage floating supply return |
| HIN | Logic inputs for high-side gate driver output |
| LIN | Logic inputs for low-side gate driver output |
| HO | High-side driver output |
| LO | Low-side driver output |
| COM | Low-side gate drive return |

Lead Assignments



8-Lead SOIC

Application Information and Additional Details

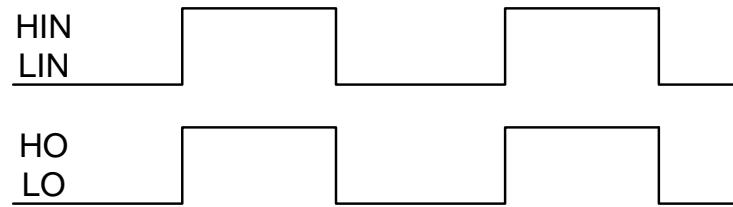


Figure 1. Input/Output Timing Diagrams

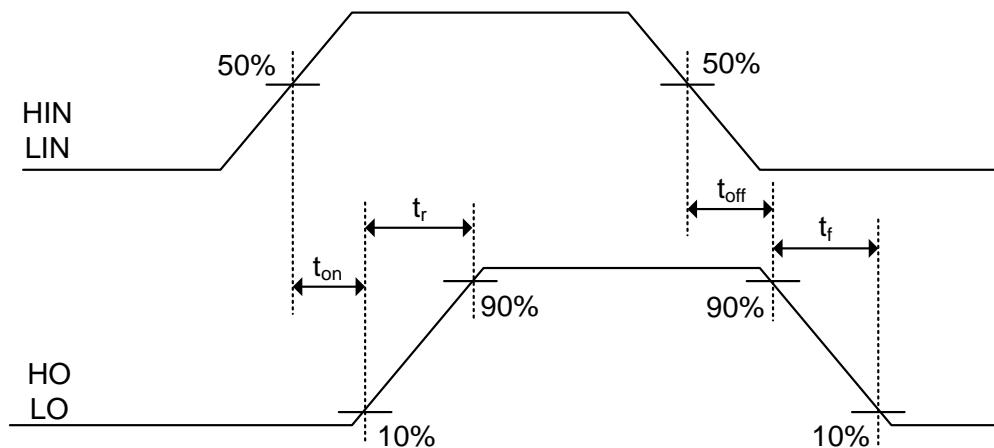


Figure 2. Switching Time Waveform Definitions

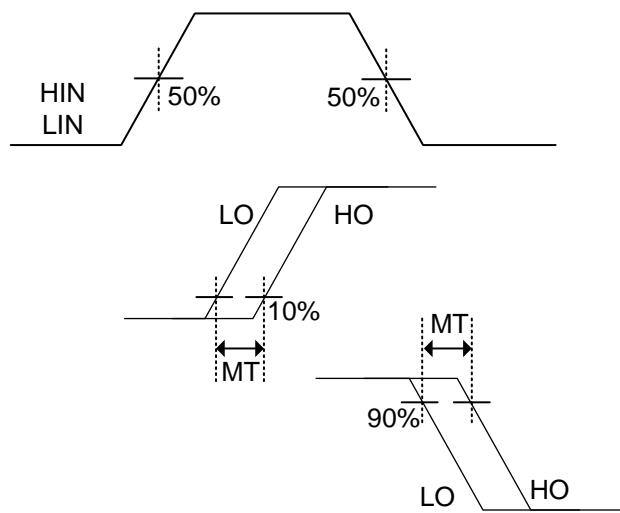
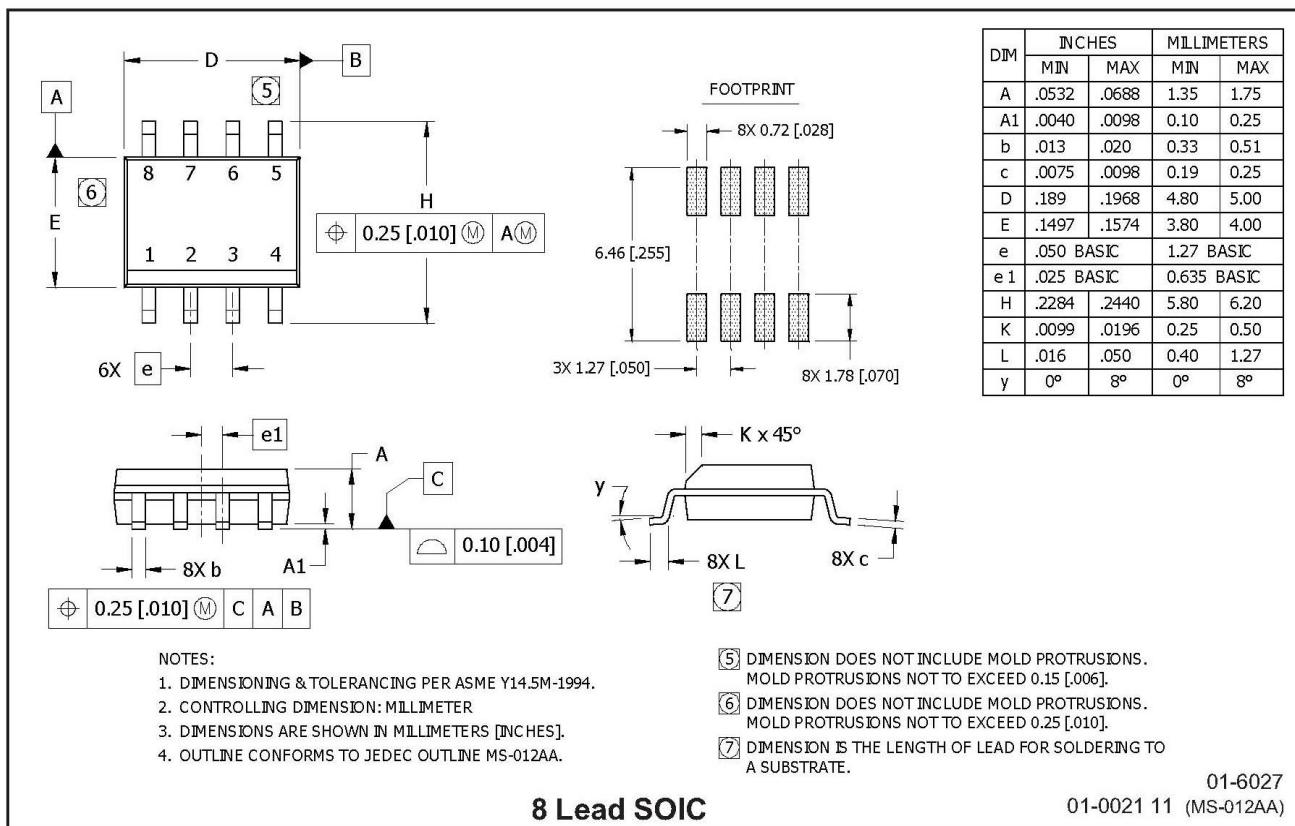
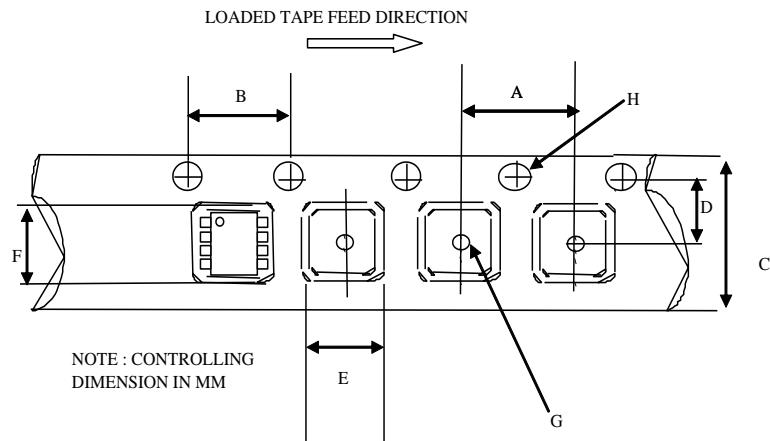


Figure 3. Delay Matching Waveform Definitions

Package Details

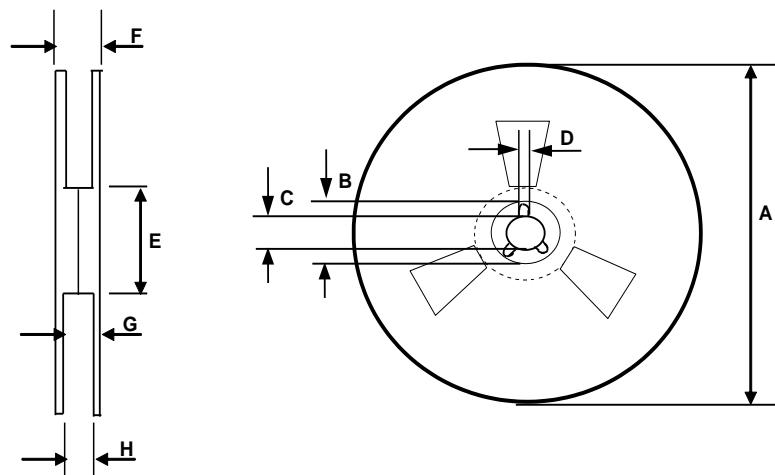


Tape and Reel Details



CARRIER TAPE DIMENSION FOR 8SOICN

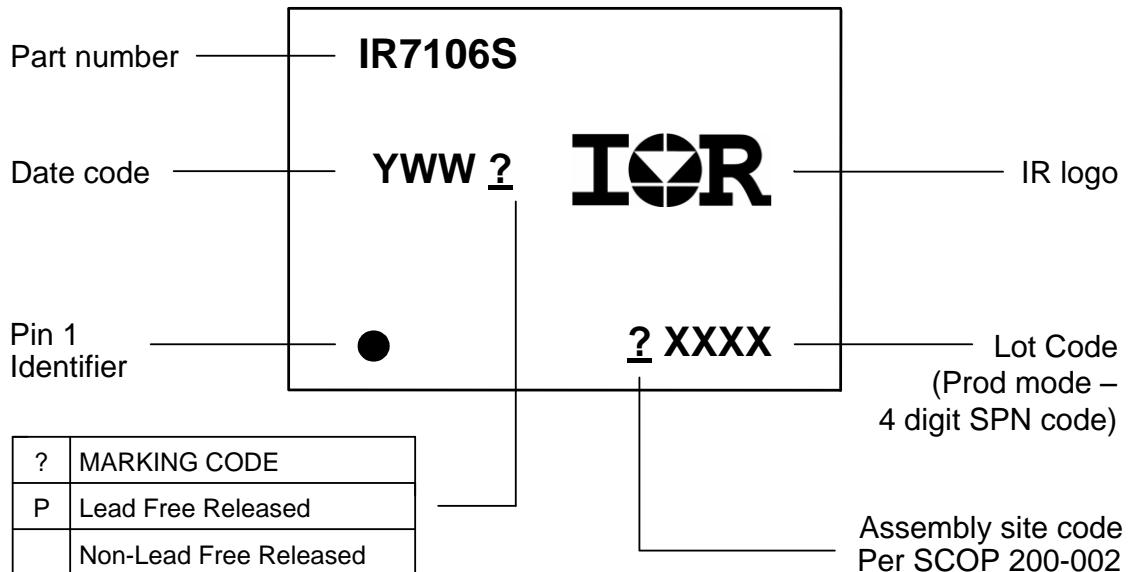
| Code | Metric | | Imperial | |
|------|--------|-------|----------|-------|
| | Min | Max | Min | Max |
| A | 7.90 | 8.10 | 0.311 | 0.318 |
| B | 3.90 | 4.10 | 0.153 | 0.161 |
| C | 11.70 | 12.30 | 0.46 | 0.484 |
| D | 5.45 | 5.55 | 0.214 | 0.218 |
| E | 6.30 | 6.50 | 0.248 | 0.255 |
| F | 5.10 | 5.30 | 0.200 | 0.208 |
| G | 1.50 | n/a | 0.059 | n/a |
| H | 1.50 | 1.60 | 0.059 | 0.062 |



REEL DIMENSIONS FOR 8SOICN

| Code | Metric | | Imperial | |
|------|--------|--------|----------|--------|
| | Min | Max | Min | Max |
| A | 329.60 | 330.25 | 12.976 | 13.001 |
| B | 20.95 | 21.45 | 0.824 | 0.844 |
| C | 12.80 | 13.20 | 0.503 | 0.519 |
| D | 1.95 | 2.45 | 0.767 | 0.096 |
| E | 98.00 | 102.00 | 3.858 | 4.015 |
| F | n/a | 18.40 | n/a | 0.724 |
| G | 14.50 | 17.10 | 0.570 | 0.673 |
| H | 12.40 | 14.40 | 0.488 | 0.566 |

Part Marking Information



Qualification Information[†]

| Qualification Level | | Industrial ^{††} | |
|---|------------------|---|--|
| Comments: This family of ICs has passed JEDEC's Industrial qualification. IR's Consumer qualification level is granted by extension of the higher Industrial level. | | | |
| Moisture Sensitivity Level | | 8 Lead SOIC | MSL2 ^{†††} , 260°C (per IPC/JEDEC J-STD-020) |
| ESD | Human Body Model | Class 1C (per JEDEC standard JEDEC JS-001-2012) | |
| | Machine Model | Class A (per EIA/JEDEC standard EIA/JESD22-A115) | |
| IC Latch-Up Test | | Class I, Level A (per JESD78) | |
| RoHS Compliant | | Yes | |

[†] Qualification standards can be found at International Rectifier's web site <http://www.irf.com/>

^{††} Higher qualification ratings may be available should the user have such requirements. Please contact your International Rectifier sales representative for further information.

^{†††} Higher MSL ratings may be available for the specific package types listed here. Please contact your International Rectifier sales representative for further information.