

## 700V Half-Bridge Driver

### Features

- Drives IGBT/MOSFET power devices
- Gate drive supplies up to 20V per channel
- Integrated deadtime protection
- Shoot-through (cross-conduction) protection
- Undervoltage lockout for  $V_{CC}$  and 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
- -40°C to 125°C operating range
- RoHS compliant
- Lead-Free

### Product Summary

$V_{OFFSET}$	$\leq 700V$
$V_{OUT}$	10V – 20V
$I_{O+}$ & $I_{O-}$ (typ.)	1.9A / 2.3A
$t_{ON}$ & $t_{OFF}$ (typ.)	680ns & 270ns
Deadtime (typ.)	400ns

### Description

The IR7184S is a high voltage, high speed, power MOSFET and IGBT gate driver with high-side and low-side referenced output channel. 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. Shoot-through protection circuitry and a minimum deadtime circuitry have been integrated into this IC. Propagation delays are matched to simplify the HVIC's use in high frequency applications. The floating channels can be used to drive N-channel power MOSFETs or IGBTs in the high-side configuration, which operate up to 700V.

### Package Options

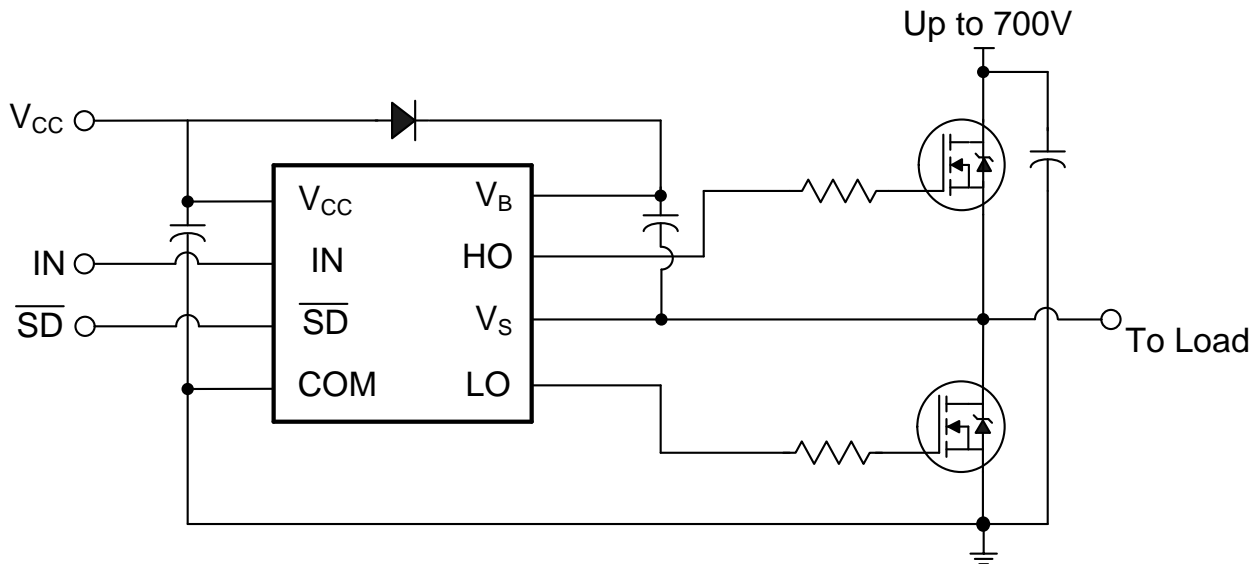


### Typical Applications

- 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	
IR7184SPBF	SO8N	Tube	95	IR7184SPBF
IR7184SPBF	SO8N	Tape and Reel	2500	IR7184STRPBF

## Typical Connection Diagram



(Refer to Lead Assignments for correct pin configuration). This diagram shows electrical connections only. Please refer to our Application Notes & DesignTips 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 <sub>CC</sub>	Low side and logic fixed supply voltage	-0.3	25 <sup>†</sup>	V
V <sub>IN</sub>	Logic input voltage (SD & IN)	COM - 0.3	COM + 5.2	
V <sub>B</sub>	High side floating absolute voltage	-0.3	725	
V <sub>S</sub>	High side floating supply offset voltage	V <sub>B</sub> - 25	V <sub>B</sub> + 0.3	
V <sub>HO</sub>	High side floating output voltage	V <sub>S</sub> - 0.3	V <sub>B</sub> + 0.3	
V <sub>LO</sub>	Low side output voltage	COM - 0.3	V <sub>CC</sub> + 0.3	
COM	Power ground	V <sub>CC</sub> - 25	V <sub>CC</sub> + 0.3	
dV <sub>S</sub> /dt	Allowable offset supply voltage transient	—	50	V/ns
P <sub>D</sub>	Package power dissipation @ T <sub>A</sub> ≤ +25°C	—	0.625	W
R <sub>thJA</sub>	Thermal resistance, junction to ambient	—	200	°C/W
T <sub>J</sub>	Junction temperature	—	150	°C
T <sub>S</sub>	Storage temperature	-55	150	
T <sub>L</sub>	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<sub>CC</sub> - COM) = (V<sub>B</sub> - V<sub>S</sub>) = 15V.

Symbol	Definition	Min	Max	Units
V <sub>CC</sub>	Low-side supply voltage	10	20	V
V <sub>IN</sub>	IN, SD input voltage	0	5 <sup>††</sup>	
V <sub>B</sub>	High-side floating well supply voltage	V <sub>S</sub> + 10	V <sub>S</sub> + 20	
V <sub>S</sub>	High-side floating well supply offset voltage <sup>†</sup>	COM - 5 <sup>†</sup>	700	
V <sub>HO</sub>	Floating gate drive output voltage	V <sub>S</sub>	V <sub>B</sub>	
V <sub>LO</sub>	Low-side output voltage	COM	V <sub>CC</sub>	
COM	Power ground	-5	5	
T <sub>A</sub>	Ambient temperature	-40	125	°C

† Logic operation for V<sub>S</sub> of -8V to 600V. Logic state held for V<sub>S</sub> of -5 V to -V<sub>BS</sub>. Please refer to Design Tip DT97-3 for more details.

†† IN and /SD are internally clamped with a 5.2V zener diode.

## Static Electrical Characteristics

( $V_{CC} - COM$ ) = ( $V_B - V_S$ ) = 15V.  $T_A = 25^\circ\text{C}$  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
$V_{CCUV+}$	$V_{CC}$ supply undervoltage positive going threshold	8	8.9	9.8	V	
$V_{CCUV-}$	$V_{CC}$ supply undervoltage negative going threshold	7.4	8.2	9		
$V_{CCUVHY}$	$V_{CC}$ supply undervoltage hysteresis	0.3	0.7	—		
$V_{BSUV+}$	$V_{BS}$ supply undervoltage positive going threshold	8	8.9	9.8		
$V_{BSUV-}$	$V_{BS}$ supply undervoltage negative going threshold	7.4	8.2	9		
$V_{BSUVHY}$	$V_{BS}$ supply undervoltage hysteresis	0.3	0.7	—		
$I_{LK}$	High-side floating well offset supply leakage	—	—	50	$\mu\text{A}$	$V_B = V_S = 700\text{V}$
$I_{QBS}$	Quiescent $V_{BS}$ supply current	—	60	150		$V_{IN} = 0\text{V}, V_{IN} = 5\text{V}$
$I_{QCC}$	Quiescent $V_{CC}$ supply current	—	1000	1600		
$V_{OH}$	High level output voltage drop, $V_{BIAS} - V_O$	—	—	1.8	V	$I_O = 0\text{A}$
$V_{OL}$	Low level output voltage drop, $V_O$	—	—	0.3		
$I_{O+}$	Output high short circuit pulsed current	1.4	1.9	—	A	$V_O = 0\text{V},$ $PW \leq 10\mu\text{s}$
$I_{O-}$	Output low short circuit pulsed current	1.8	2.3	—		$V_O = 15\text{V},$ $PW \leq 10\mu\text{s}$
$V_{IH}$	Logic "1" input voltage	2.7	—	—	V	
$V_{IL}$	Logic "0" input voltage	—	—	0.8		
$V_{SD,TH+}$	Logic "1" input voltage	2.7	—	—		
$V_{SD,TH-}$	Logic "0" input voltage	—	—	0.8		
$I_{IN+}$	Input bias current (HO = High)	—	25	60	$\mu\text{A}$	$V_{IN} = 5\text{V}, V_{SD} = 0\text{V}$
$I_{IN-}$	Input bias current (HO = Low)	—	—	1		$V_{IN} = 0\text{V}, V_{SD} = 5\text{V}$

## Dynamic Electrical Characteristics

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

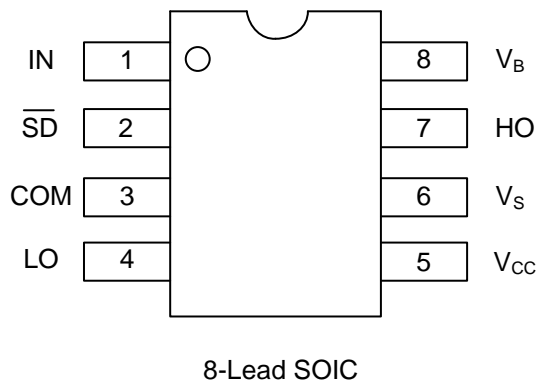
Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
$t_{ON}$	Turn-on propagation delay	—	680	900	ns	$V_S = 0\text{V}$
$t_{OFF}$	Turn-off propagation delay	—	270	400		$V_S = 0\text{V}$ or $700\text{V}$
$t_R$	Turn-on rise time	—	40	60		$V_S = 0\text{V}$
$t_F$	Turn-off fall time	—	20	35		
$MT_{ON}$	Delay matching, HS & LS turn-on	—	0	90		
$MT_{OFF}$	Delay matching, HS & LS turn-off	—	0	50		
$t_{SD}$	Shut-down propagation delay	—	80	270		
DT	Deadtime	280	400	520		
MDT	Deadtime matching time	—	—	50		

The schematic diagram illustrates the HV control logic for the HVPS. It features two main inputs: IN and SD. The IN input is connected to a comparator (represented by a triangle with a vertical line and a horizontal line) and a resistor network. The SD input is also connected to a comparator and a resistor network. A +5V supply is connected to the comparators. The output of the IN comparator is connected to a DEAD TIME block. The output of the SD comparator is connected to a DEAD TIME block and a VSS/COM LEVEL SHIFT block. The DEAD TIME block is connected to the VSS/COM LEVEL SHIFT block. The VSS/COM LEVEL SHIFT block is connected to a PULSE GENERATOR block. The PULSE GENERATOR block is connected to an HV LEVEL SHIFTER block. The HV LEVEL SHIFTER block is connected to a PULSE FILTER block. The PULSE FILTER block is connected to an RSR flip-flop (labeled R, R, Q, S). The RSR flip-flop is connected to a UV DETECT block. The UV DETECT block is connected to a series of transistors and resistors that control the HVPS outputs: VB, HO, VS, VCC, LO, and COM. The circuit is powered by a +5V supply and ground.

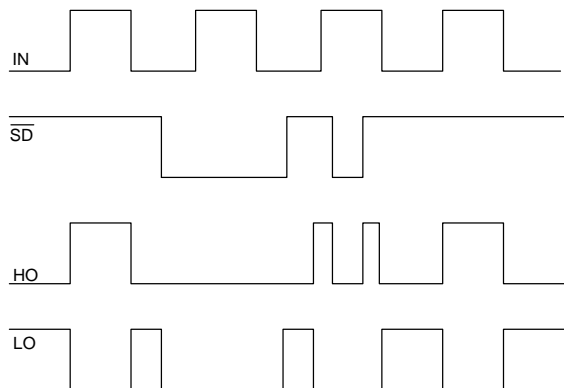
## Lead Definitions

Symbol	Description
VCC	Low-side and logic supply voltage
VB	High-side gate drive floating supply
VS	High voltage floating supply return
IN	Logic inputs for high-side and low-side gate driver outputs
/SD	Logic inputs for shut-down
HO	High-side driver output
LO	Low-side driver output
COM	Low-side gate drive return

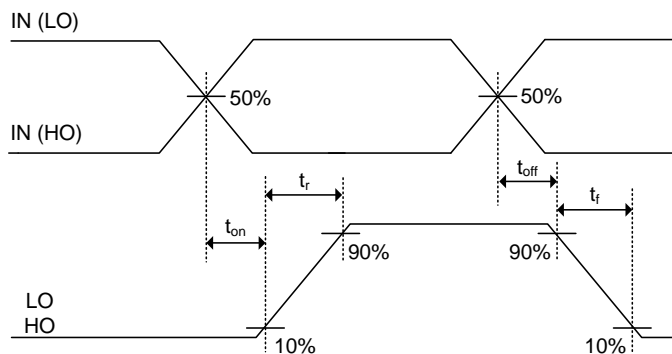
## Lead Assignments



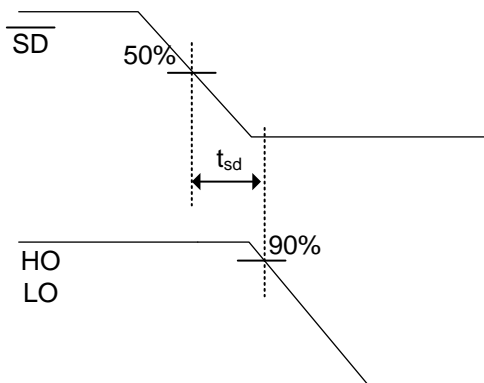
## Application Information and Additional Details



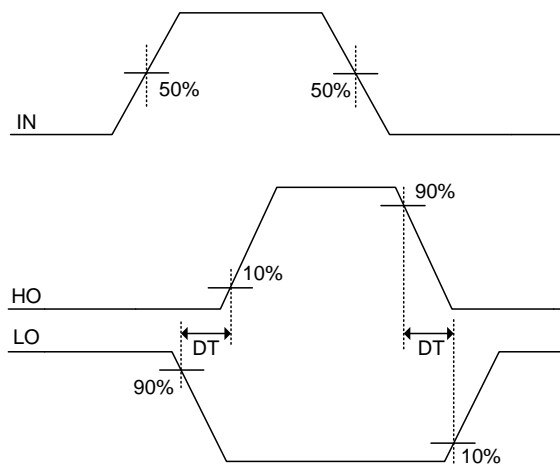
**Figure 1. Input/Output Timing Diagram**



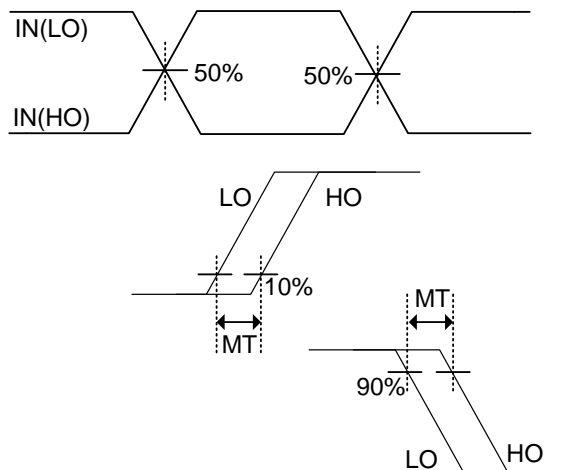
**Figure 2. Switching Time Waveform Definitions**



**Figure 3. Shutdown Waveform Definitions**

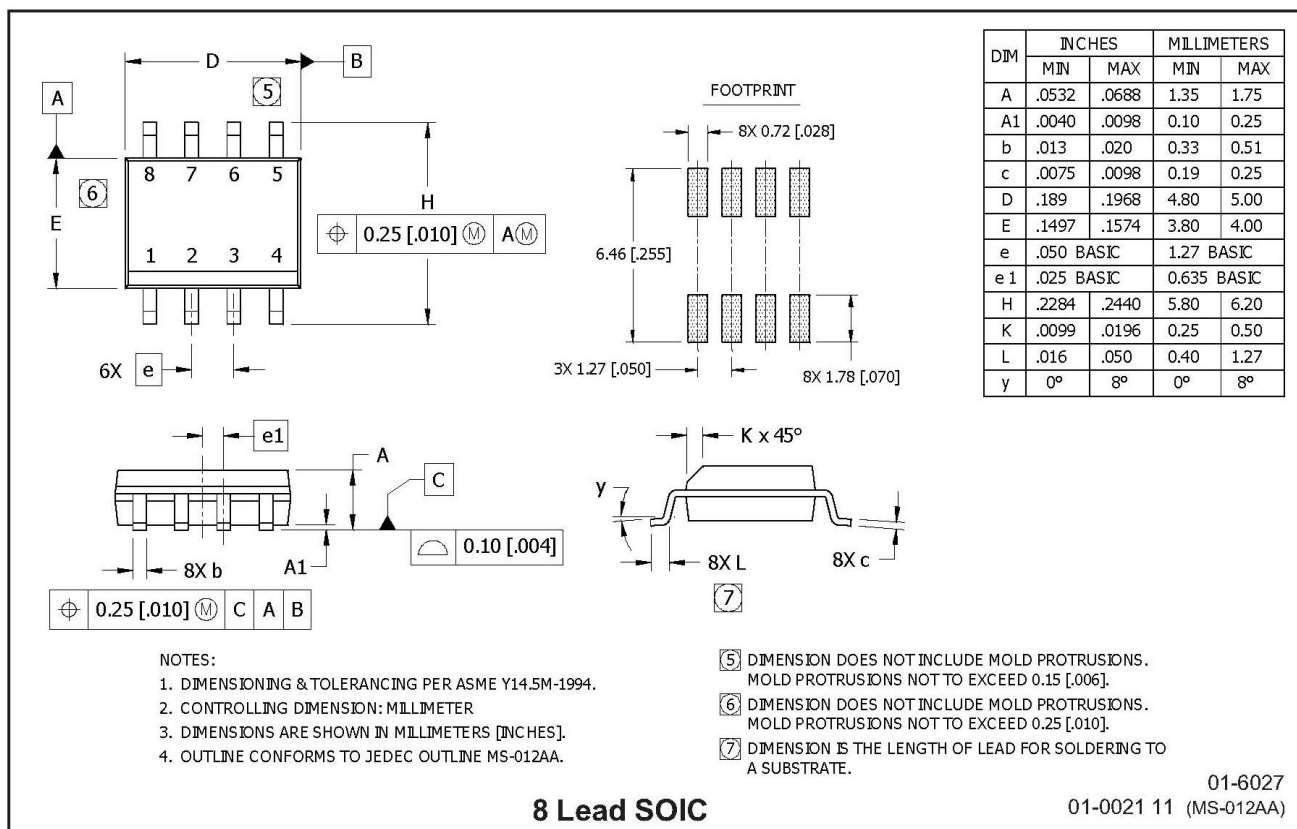


**Figure 4. Deadtime Waveform Definitions**



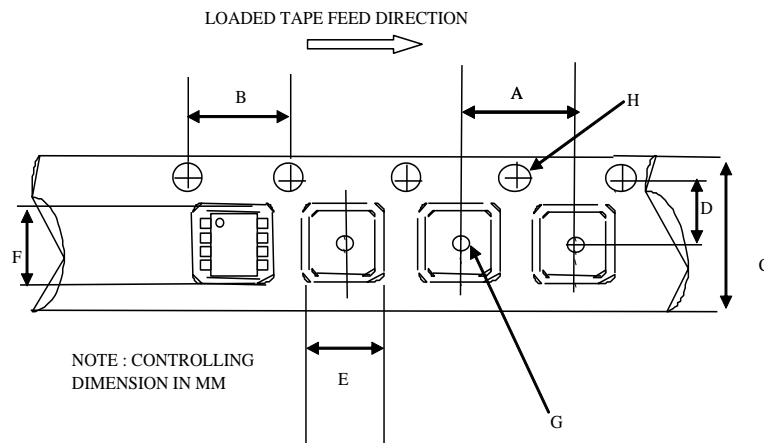
**Figure 5. Delay Matching Waveform Definitions**

## Package Details



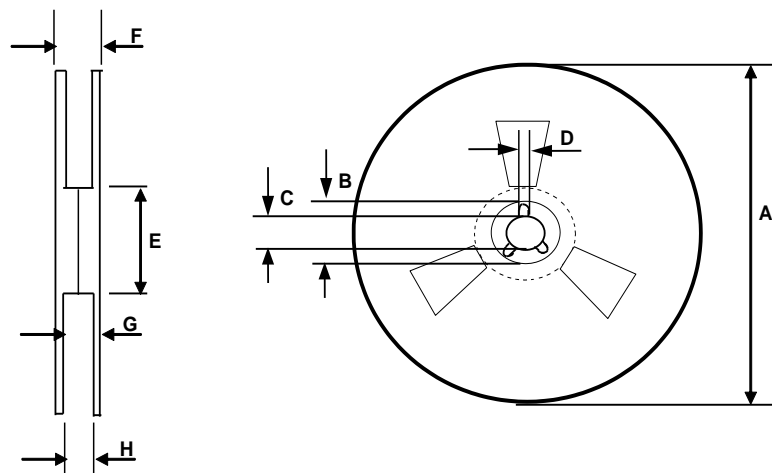


## Tape and Reel Details



CARRIER TAPE DIMENSION FOR 8SOICN

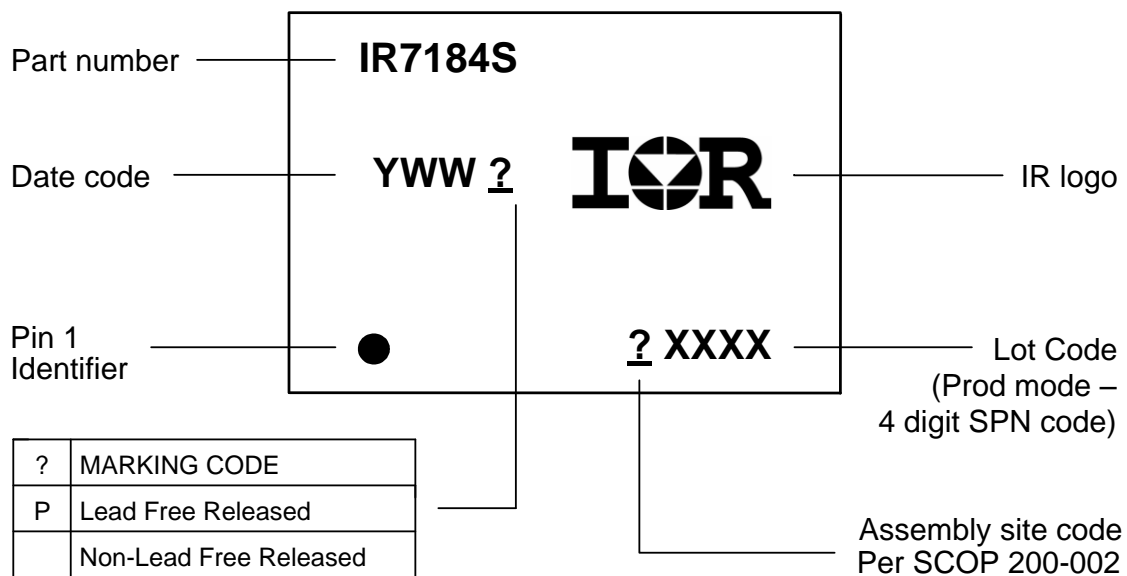
Code	Metric		Imperial	
	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	11.70	12.30	0.46	0.484
D	5.45	5.55	0.214	0.218
E	6.30	6.50	0.248	0.255
F	5.10	5.30	0.200	0.208
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062



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<sup>†</sup>

<b>Qualification Level</b>		Industrial <sup>††</sup>	
		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.	
<b>Moisture Sensitivity Level</b>		8 Lead SOIC	MSL2 <sup>†††</sup> , 260°C (per IPC/JEDEC J-STD-020)
<b>ESD</b>	Human Body Model	Class 1B (per JEDEC standard JEDEC JS-001-2012)	
	Machine Model	Class B (per EIA/JEDEC standard EIA/JESD22-A115)	
<b>IC Latch-Up Test</b>		Class I, Level A (per JESD78)	
<b>RoHS Compliant</b>		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.