# Half-Bridge Driver

#### Features

- Floating channel designed for bootstrap operation
- Fully operational to +600V
- Tolerant to negative transient voltage
- dV/dt immune
- Gate drive supply range from 10 to 20V
- Undervoltage lockout for both channels
- 3.3V, 5V and 15V input logic compatible
- Cross-conduction prevention logic
- Matched propagation delay for both channels
- Outputs in phase with inputs
- Logic and power ground +/-5V offset
- Internal 540ns dead-time
- Lower di/dt gate driver for better noise immunity

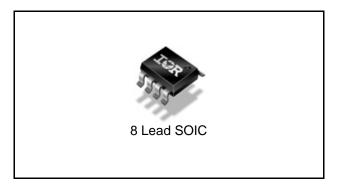
# Description

The IR25606 is a high voltage, high speed power MOSFET and IGBT driver with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates up to 600 V.

# **Product Summary**

| VOFFSET           | 600V max.       |
|-------------------|-----------------|
| I <sub>O+/-</sub> | 200 mA / 350 mA |
| V <sub>OUT</sub>  | 10 – 20V        |
| Ton/off (typ.)    | 220 & 200 ns    |
| Dead time (typ.)  | 540 ns          |

### **Package Options**



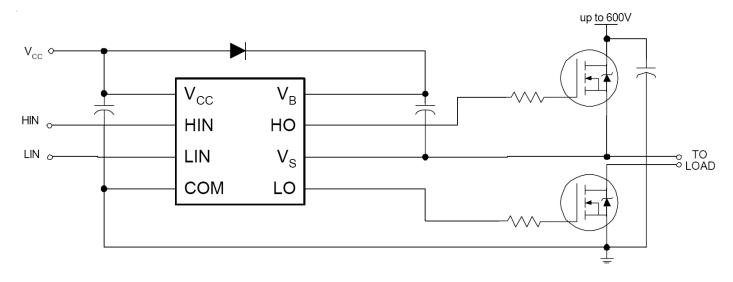
# **Ordering Information**

| Dees Dert Norther |              | Standard Pack |          | Ordershie Bart Number |  |
|-------------------|--------------|---------------|----------|-----------------------|--|
| Base Part Number  | Package Type | Form          | Quantity | Orderable Part Number |  |
| IR25606SPBF       | SO8N         | Tube          | 95       | IR25606SPBF           |  |
| IR25606SPBF       | SO8N         | Tape and Reel | 2500     | IR25606STRPBF         |  |

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# **Typical Connection Diagram**





#### **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. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

| Symbol            | Definition   | Min.                 | Max.                  | Units |
|-------------------|--|----------------------|-----------------------|-------|
| VB                | High side floating absolute voltage                | -0.3                 | 625                   |       |
| Vs                | 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     |
| V <sub>CC</sub>   | Low side and logic fixed supply voltage            | -0.3                 | 25                    |       |
| V <sub>LO</sub>   | Low side output voltage                            | -0.3                 | V <sub>CC</sub> + 0.3 |       |
| V <sub>IN</sub>   | Logic input voltage (HIN & LIN)                    | -0.3                 | V <sub>CC</sub> + 0.3 |       |
| dVs/dt            | Allowable offset supply voltage transient          | —                    | 50                    | V/ns  |
| PD                | Package power dissipation @ $T_A \le +25^{\circ}C$ | —                    | 0.625                 | W     |
| Rth <sub>JA</sub> | Thermal resistance, junction to ambient            | _                    | 200                   | °C/W  |
| ТJ                | Junction temperature                               | _                    | 150                   |       |
| Τ <sub>S</sub>    | Storage temperature                                | -55                  | 150                   | °C    |
| TL                | Lead temperature (soldering, 10 seconds)           |                      | 300                   |       |

#### **Recommended Operating Conditions**

For proper operation the device should be used within the recommended conditions. The  $V_S$  offset rating is tested with all supplies biased at 15V differential.

| Symbol          | Definition                                 | Min.                | Max.                | Units |
|-----------------|--|---------------------|---------------------|-------|
| VB              | High side floating supply absolute voltage | V <sub>S</sub> + 10 | V <sub>S</sub> + 20 |       |
| Vs              | High side floating supply offset voltage   | +                   | 600                 |       |
| V <sub>HO</sub> | High side floating output voltage          | Vs                  | VB                  | V     |
| V <sub>CC</sub> | Low side and logic fixed supply voltage    | 10                  | 20                  |       |
| V <sub>LO</sub> | Low side output voltage                    | 0                   | V <sub>CC</sub>     |       |
| V <sub>IN</sub> | Logic input voltage                        | 0                   | V <sub>CC</sub>     |       |
| T <sub>A</sub>  | Ambient temperature                        | -40                 | 125                 | °C    |

<sup>+</sup> Logic operational for VS of -5 to +600V. Logic state held for VS of -5V to -VBS. (Please refer to Design Tip DT97-3 for more details).

#### **Dynamic Electrical Characteristics**

 $V_{BIAS}$  (V<sub>CC</sub>, V<sub>BS</sub>) = 15V, CL = 1000 pF and T<sub>A</sub> = 25°C unless otherwise specified.

| Symbol | Definition                          | Min. | Тур. | Max. | Units | Test Conditions               |
|--------|-------------------------------------|------|------|------|-------|-------------------------------|
| ton    | Turn-on propagation delay           |      | 220  | 300  |       | $V_{\rm S} = 0V$              |
| toff   | Turn-off propagation delay          |      | 200  | 280  |       | $V_{S} = 0V \text{ or } 600V$ |
| tr     | Turn-on rise time                   |      | 150  | 220  | ns    | $V_{S} = 0V$                  |
| tf     | Turn-off fall time                  |      | 50   | 80   | 115   | $V_{S} = 0V$                  |
| DT     | Deadtime                            | 400  | 540  | 680  |       |                               |
| MT     | Delay matching, HS & LS turn-on/off |      | 0    | 46   |       |                               |

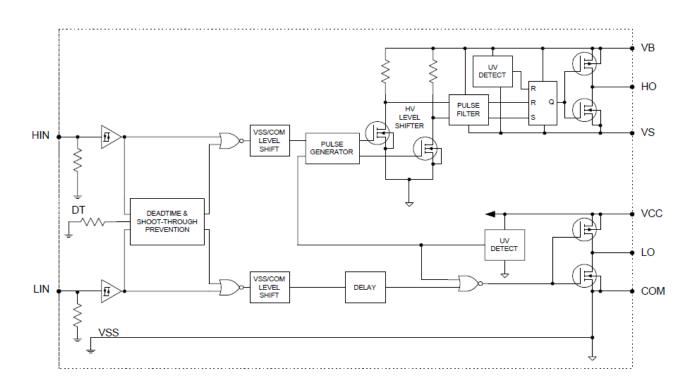
#### **Static Electrical Characteristics**

 $V_{BIAS}$  (V<sub>CC</sub>, V<sub>BS</sub>) = 15V and T<sub>A</sub> = 25°C unless otherwise specified. The V<sub>IN</sub>, V<sub>TH</sub> and I<sub>IN</sub> parameters are referenced to COM. The V<sub>O</sub> and I<sub>O</sub> parameters are referenced to COM and are applicable to the respective output leads: HO and LO.

| Symbol                                   | Definition   | Min. | Тур. | Max. | Units | Test Conditions                    |
|--|--|------|------|------|-------|------------------------------------|
| VIH                                      | Logic "1" input voltage  | 2.9  | —    | _    |       | $V_{CC}$ = 10V to 20V              |
| VIL                                      | Logic "0" input voltage  | —    |      | 0.8  |       | $V_{CC}$ = 10V to 20V              |
| V <sub>OH</sub>                          | High level output voltage, V <sub>BIAS</sub> -<br>V <sub>O</sub>                 | _    | 0.8  | 1.4  | V     | I <sub>O</sub> = 20 mA             |
| V <sub>OL</sub>                          | Low level output voltage, V <sub>O</sub>   | —    | 0.3  | 0.6  |       | I <sub>O</sub> = 20 mA             |
| I <sub>LK</sub>                          | Offset supply leakage current  | —    |      | 50   |       | $V_{B} = V_{S} = 600V$             |
| I <sub>QBS</sub>                         | Quiescent V <sub>BS</sub> supply current   | 20   | 60   | 150  | μA    | $V_{IN} = 0V \text{ or } 5V$       |
| IQCC                                     | Quiescent V <sub>CC</sub> supply current   | 0.4  | 1.0  | 1.6  | mA    | $V_{IN} = 0V \text{ or } 5V$       |
| I <sub>IN+</sub>                         | Logic "1" input bias current   | —    | 5    | 20   | μA    | $V_{IN} = 5V$                      |
| I <sub>IN-</sub>                         | Logic "0" input bias current   | —    | 1    | 2    | μ     | $V_{IN} = 0V$                      |
| V <sub>CCUV+</sub><br>V <sub>BSUV+</sub> | V <sub>CC</sub> and V <sub>BS</sub> supply undervoltage positive going threshold | 8    | 8.9  | 10   |       |                                    |
| V <sub>CCUV-</sub><br>V <sub>BSUV-</sub> | V <sub>CC</sub> and V <sub>BS</sub> supply undervoltage negative going threshold | 7.4  | 8.2  | 9    | V     |                                    |
| V <sub>CCUVH</sub><br>V <sub>BSUVH</sub> | Hysteresis   | 0.3  | 0.7  |      |       |                                    |
| I <sub>O+</sub>                          | Output high short circuit pulsed<br>current                                      | 97   | 200  | _    | - mA  | V <sub>O</sub> = 0V<br>PW ≤ 10 µs  |
| I <sub>O-</sub>                          | Output low short circuit pulsed<br>current                                       | 250  | 350  | _    |       | V <sub>O</sub> = 15V<br>PW ≤ 10 µs |



# **Functional Block Diagram**

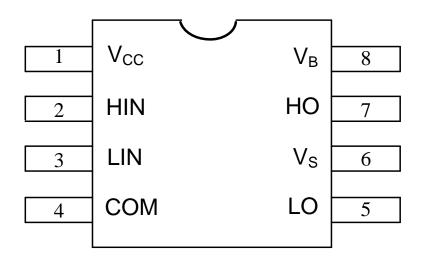




# Lead Definitions

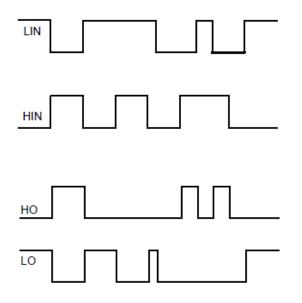
| Symbol          | Description  |
|-----------------|--|
| HIN             | Logic input for high side gate driver outputs (HO), in phase |
| LIN             | Logic input for low side gate driver outputs (LO), in phase  |
| VB              | High side floating supply                                    |
| HO              | High side gate drive output                                  |
| VS              | High side floating supply return                             |
| V <sub>CC</sub> | Low side and logic fixed supply                              |
| LO              | Low side gate drive output                                   |
| COM             | Low side return  |

# Lead Assignments





# **Application Information and Additional Details**



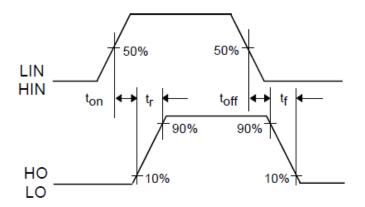




Figure 1. Input/Output Timing Diagram

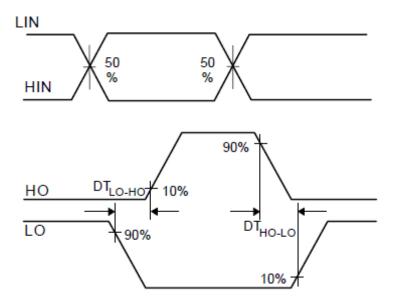
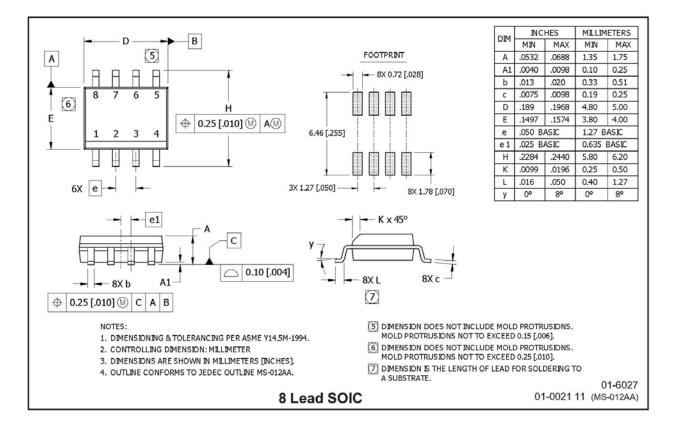


Figure 3. Deadtime Waveform Definitions

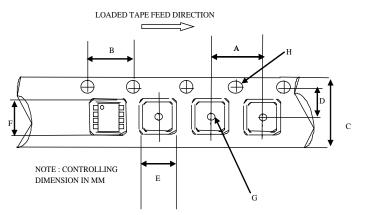


#### **Package Details**



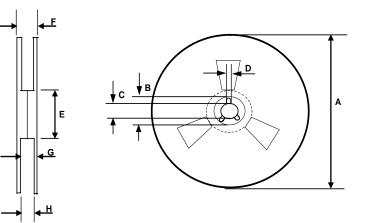


### **Tape and Reel Details**



#### CARRIER TAPE DIMENSION FOR 8SOICN

|      | Me    | tric  | Imp   | erial |
|------|-------|-------|-------|-------|
| Code | Min   | Max   | Min   | Max   |
| A    | 7.90  | 8.10  | 0.311 | 0.318 |
| В    | 3.90  | 4.10  | 0.153 | 0.161 |
| С    | 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   |
| Н    | 1.50  | 1.60  | 0.059 | 0.062 |

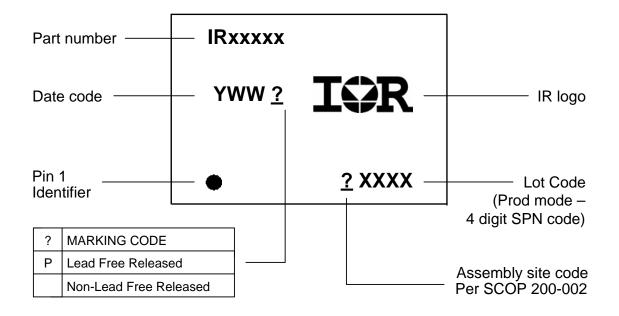


#### REEL DIMENSIONS FOR 8SOICN

|      | Me     | tric   | Imp    | erial  |
|------|--------|--------|--------|--------|
| Code | Min    | Max    | Min    | Max    |
| A    | 329.60 | 330.25 | 12.976 | 13.001 |
| В    | 20.95  | 21.45  | 0.824  | 0.844  |
| С    | 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  |
| Н    | 12.40  | 14.40  | 0.488  | 0.566  |



#### **Part Marking Information**



#### **Qualification Information**<sup>†</sup>

|                            | (per JEDEC JESD 47)  |  |  |
|----------------------------|--|--|--|
| Qualification Level        | 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.           |  |  |
| Maiatura Sanaitivity Laval | MSL2 <sup>†††</sup>  |  |  |
| Moisture Sensitivity Level | (per IPC/JEDEC J-STD-020)                                      |  |  |
| 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.

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