

# IR2110(-1-2)(S)PbF/IR2113(-1-2)(S)PbF

International  
IR Rectifier

## 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. Additional information is shown in Figures 28 through 35.

| Symbol     | Definition                                                             | Min.           | Max.           | Units                     |
|------------|------------------------------------------------------------------------|----------------|----------------|---------------------------|
| $V_B$      | High side floating supply voltage (IR2110)                             | -0.3           | 525            | V                         |
|            | (IR2113)                                                               | -0.3           | 625            |                           |
| $V_S$      | High side floating supply offset voltage                               | $V_B - 25$     | $V_B + 0.3$    |                           |
| $V_{HO}$   | High side floating output voltage                                      | $V_S - 0.3$    | $V_B + 0.3$    |                           |
| $V_{CC}$   | Low side fixed supply voltage                                          | -0.3           | 25             |                           |
| $V_{LO}$   | Low side output voltage                                                | -0.3           | $V_{CC} + 0.3$ |                           |
| $V_{DD}$   | Logic supply voltage                                                   | -0.3           | $V_{SS} + 25$  |                           |
| $V_{SS}$   | Logic supply offset voltage                                            | $V_{CC} - 25$  | $V_{CC} + 0.3$ |                           |
| $V_{IN}$   | Logic input voltage (HIN, LIN & SD)                                    | $V_{SS} - 0.3$ | $V_{DD} + 0.3$ |                           |
| $dV_S/dt$  | Allowable offset supply voltage transient (figure 2)                   | —              | 50             | V/ns                      |
| $P_D$      | Package power dissipation @ $T_A \leq +25^\circ\text{C}$ (14 lead DIP) | —              | 1.6            | W                         |
|            | (16 lead SOIC)                                                         | —              | 1.25           |                           |
| $R_{THJA}$ | Thermal resistance, junction to ambient (14 lead DIP)                  | —              | 75             | $^\circ\text{C}/\text{W}$ |
|            | (16 lead SOIC)                                                         | —              | 100            |                           |
| $T_J$      | Junction temperature                                                   | —              | 150            | $^\circ\text{C}$          |
| $T_S$      | Storage temperature                                                    | -55            | 150            |                           |
| $T_L$      | Lead temperature (soldering, 10 seconds)                               | —              | 300            |                           |

## Recommended Operating Conditions

The input/output logic timing diagram is shown in figure 1. For proper operation the device should be used within the recommended conditions. The  $V_S$  and  $V_{SS}$  offset ratings are tested with all supplies biased at 15V differential. Typical ratings at other bias conditions are shown in figures 36 and 37.

| Symbol   | Definition                                        | Min.         | Max.          | Units            |
|----------|---------------------------------------------------|--------------|---------------|------------------|
| $V_B$    | High side floating supply absolute voltage        | $V_S + 10$   | $V_S + 20$    | V                |
| $V_S$    | High side floating supply offset voltage (IR2110) | Note 1       | 500           |                  |
|          | (IR2113)                                          | Note 1       | 600           |                  |
| $V_{HO}$ | High side floating output voltage                 | $V_S$        | $V_B$         |                  |
| $V_{CC}$ | Low side fixed supply voltage                     | 10           | 20            |                  |
| $V_{LO}$ | Low side output voltage                           | 0            | $V_{CC}$      |                  |
| $V_{DD}$ | Logic supply voltage                              | $V_{SS} + 3$ | $V_{SS} + 20$ |                  |
| $V_{SS}$ | Logic supply offset voltage                       | -5 (Note 2)  | 5             |                  |
| $V_{IN}$ | Logic input voltage (HIN, LIN & SD)               | $V_{SS}$     | $V_{DD}$      | $^\circ\text{C}$ |
| $T_A$    | Ambient temperature                               | -40          | 125           |                  |

Note 1: Logic operational for  $V_S$  of -4 to +500V. Logic state held for  $V_S$  of -4V to  $-V_{BS}$ . (Please refer to the Design Tip DT97-3 for more details).

Note 2: When  $V_{DD} < 5\text{V}$ , the minimum  $V_{SS}$  offset is limited to  $-V_{DD}$ .

## Dynamic Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ,  $V_{DD}$ ) = 15V,  $C_L$  = 1000 pF,  $T_A$  = 25°C and  $V_{SS}$  = COM unless otherwise specified. The dynamic electrical characteristics are measured using the test circuit shown in Figure 3.

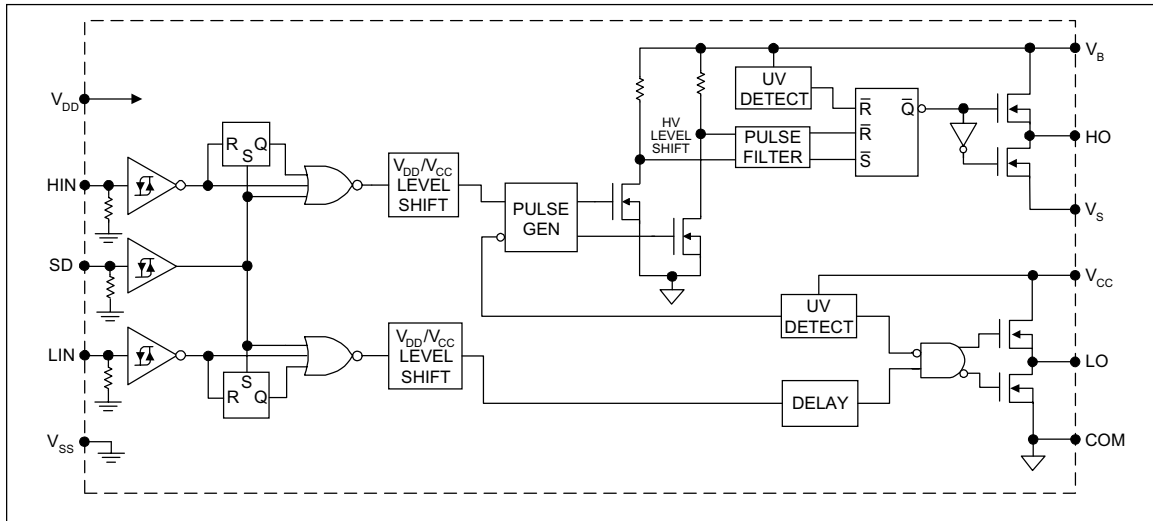
| Symbol    | Definition                          | Figure               | Min. | Typ. | Max. | Units    | Test Conditions   |
|-----------|-------------------------------------|----------------------|------|------|------|----------|-------------------|
| $t_{on}$  | Turn-on propagation delay           | 7                    | —    | 120  | 150  | ns       | $V_S = 0V$        |
| $t_{off}$ | Turn-off propagation delay          | 8                    | —    | 94   | 125  |          | $V_S = 500V/600V$ |
| $t_{sd}$  | Shutdown propagation delay          | 9                    | —    | 110  | 140  |          | $V_S = 500V/600V$ |
| $t_r$     | Turn-on rise time                   | 10                   | —    | 25   | 35   |          |                   |
| $t_f$     | Turn-off fall time                  | 11                   | —    | 17   | 25   |          |                   |
| MT        | Delay matching, HS & LS turn-on/off | (IR2110)<br>(IR2113) | —    | —    | —    | 10<br>20 |                   |

## Static Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ,  $V_{DD}$ ) = 15V,  $T_A$  = 25°C and  $V_{SS}$  = COM unless otherwise specified. The  $V_{IN}$ ,  $V_{TH}$  and  $I_{IN}$  parameters are referenced to  $V_{SS}$  and are applicable to all three logic input leads: HIN, LIN and SD. The  $V_O$  and  $I_O$  parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

| Symbol      | Definition                                            | Figure | Min. | Typ. | Max. | Units   | Test Conditions                                      |
|-------------|-------------------------------------------------------|--------|------|------|------|---------|------------------------------------------------------|
| $V_{IH}$    | Logic "1" input voltage                               | 12     | 9.5  | —    | —    | V       |                                                      |
| $V_{IL}$    | Logic "0" input voltage                               | 13     | —    | —    | 6.0  |         |                                                      |
| $V_{OH}$    | High level output voltage, $V_{BIAS} - V_O$           | 14     | —    | —    | 1.2  |         | $I_O = 0A$                                           |
| $V_{OL}$    | Low level output voltage, $V_O$                       | 15     | —    | —    | 0.1  |         | $I_O = 0A$                                           |
| $I_{LK}$    | Offset supply leakage current                         | 16     | —    | —    | 50   | $\mu A$ | $V_B = V_S = 500V/600V$                              |
| $I_{QBS}$   | Quiescent $V_{BS}$ supply current                     | 17     | —    | 125  | 230  |         | $V_{IN} = 0V$ or $V_{DD}$                            |
| $I_{QCC}$   | Quiescent $V_{CC}$ supply current                     | 18     | —    | 180  | 340  |         | $V_{IN} = 0V$ or $V_{DD}$                            |
| $I_{QDD}$   | Quiescent $V_{DD}$ supply current                     | 19     | —    | 15   | 30   |         | $V_{IN} = 0V$ or $V_{DD}$                            |
| $I_{IN+}$   | Logic "1" input bias current                          | 20     | —    | 20   | 40   |         | $V_{IN} = V_{DD}$                                    |
| $I_{IN-}$   | Logic "0" input bias current                          | 21     | —    | —    | 1.0  |         | $V_{IN} = 0V$                                        |
| $V_{BSUV+}$ | $V_{BS}$ supply undervoltage positive going threshold | 22     | 7.5  | 8.6  | 9.7  | V       |                                                      |
| $V_{BSUV-}$ | $V_{BS}$ supply undervoltage negative going threshold | 23     | 7.0  | 8.2  | 9.4  |         |                                                      |
| $V_{CCUV+}$ | $V_{CC}$ supply undervoltage positive going threshold | 24     | 7.4  | 8.5  | 9.6  |         |                                                      |
| $V_{CCUV-}$ | $V_{CC}$ supply undervoltage negative going threshold | 25     | 7.0  | 8.2  | 9.4  |         |                                                      |
| $I_{O+}$    | Output high short circuit pulsed current              | 26     | 2.0  | 2.5  | —    | A       | $V_O = 0V$ , $V_{IN} = V_{DD}$<br>$PW \leq 10 \mu s$ |
| $I_{O-}$    | Output low short circuit pulsed current               | 27     | 2.0  | 2.5  | —    |         | $V_O = 15V$ , $V_{IN} = 0V$<br>$PW \leq 10 \mu s$    |

## Functional Block Diagram



## Lead Definitions

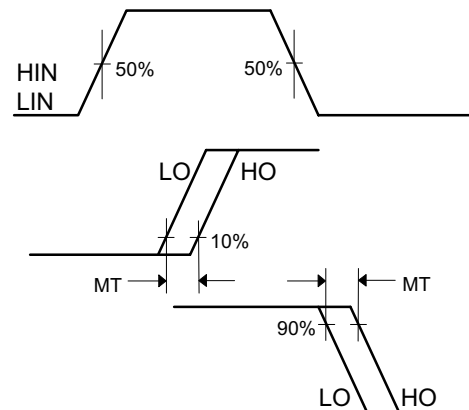
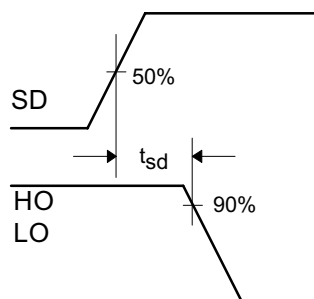
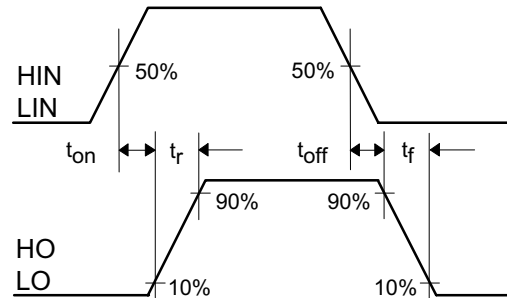
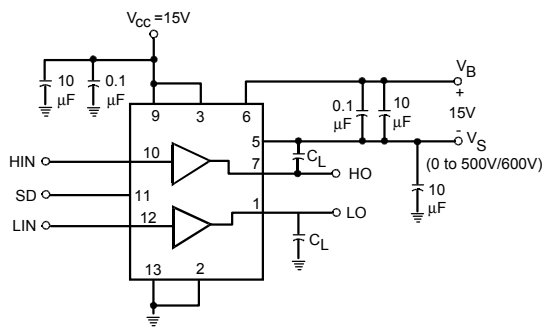
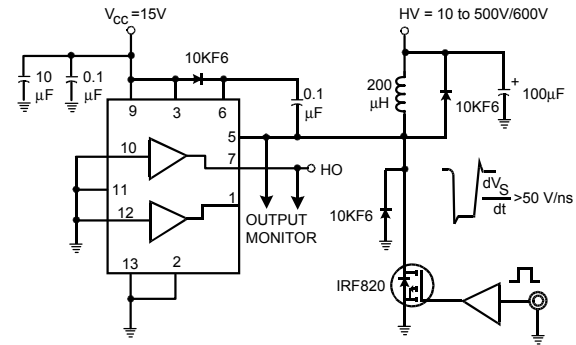
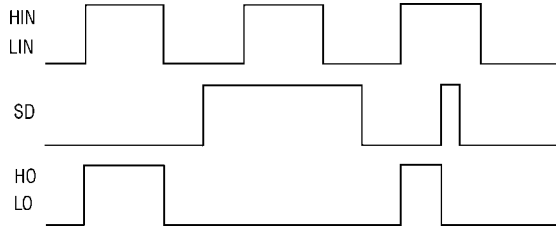
| Symbol | Description                                                 |
|--------|-------------------------------------------------------------|
| VDD    | Logic supply                                                |
| HIN    | Logic input for high side gate driver output (HO), in phase |
| SD     | Logic input for shutdown                                    |
| LIN    | Logic input for low side gate driver output (LO), in phase  |
| VSS    | Logic ground                                                |
| VB     | High side floating supply                                   |
| HO     | High side gate drive output                                 |
| VS     | High side floating supply return                            |
| VCC    | Low side supply                                             |
| LO     | Low side gate drive output                                  |
| COM    | Low side return                                             |

**IR2110(-1-2)(S)PbF/IR2113(-1-2)(S)PbF**

**Lead Assignments**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|---|---|-----|----|---|----|-----|----|---|----|----|--|---|----|-----|-----|---|----|-----|-----|---|----|--|----|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--|----|---|----|-----|----|---|----|-----|----|---|----|-----|--|--|----|-----|-----|---|----|-----|-----|---|----|-----|-----|---|----|--|----|---|
| <table><tr><td>8</td><td></td><td>HO</td><td>7</td></tr><tr><td>9</td><td>VDD</td><td>VB</td><td>6</td></tr><tr><td>10</td><td>HIN</td><td>VS</td><td>5</td></tr><tr><td>11</td><td>SD</td><td></td><td>4</td></tr><tr><td>12</td><td>LIN</td><td>VCC</td><td>3</td></tr><tr><td>13</td><td>VSS</td><td>COM</td><td>2</td></tr><tr><td>14</td><td></td><td>LO</td><td>1</td></tr></table> <p>14 Lead PDIP<br/><b>IR2110/IR2113</b></p>               | 8   |     | HO | 7 | 9 | VDD | VB | 6 | 10 | HIN | VS | 5 | 11 | SD |  | 4 | 12 | LIN | VCC | 3 | 13 | VSS | COM | 2 | 14 |  | LO | 1 | <table><tr><td>9</td><td></td><td>HO</td><td>8</td></tr><tr><td>10</td><td></td><td>VB</td><td>7</td></tr><tr><td>11</td><td>VDD</td><td>VS</td><td>6</td></tr><tr><td>12</td><td>HIN</td><td></td><td></td></tr><tr><td>13</td><td>SD</td><td></td><td></td></tr><tr><td>14</td><td>LIN</td><td>VCC</td><td>3</td></tr><tr><td>15</td><td>VSS</td><td>COM</td><td>2</td></tr><tr><td>16</td><td></td><td>LO</td><td>1</td></tr></table> <p>16 Lead SOIC (Wide Body)<br/><b>IR2110S/IR2113S</b></p> | 9 |  | HO | 8 | 10 |     | VB | 7 | 11 | VDD | VS | 6 | 12 | HIN |  |  | 13 | SD  |     |   | 14 | LIN | VCC | 3 | 15 | VSS | COM | 2 | 16 |  | LO | 1 |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     | HO  | 7  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                    | VDD | VB  | 6  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HIN | VS  | 5  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SD  |     | 4  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                   | LIN | VCC | 3  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VSS | COM | 2  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | LO  | 1  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     | HO  | 8  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | VB  | 7  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VDD | VS  | 6  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HIN |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SD  |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                   | LIN | VCC | 3  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VSS | COM | 2  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | LO  | 1  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
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| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     | HO  | 7  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                    | VDD | VB  | 6  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HIN | VS  | 5  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SD  |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                   | LIN | VCC | 3  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VSS | COM | 2  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | LO  | 1  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     | HO  | 7  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                    | VDD | VB  | 6  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HIN | VS  |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SD  |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                   | LIN | VCC | 3  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VSS | COM | 2  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | LO  | 1  |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |
| <b>Part Number</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |    |   |   |     |    |   |    |     |    |   |    |    |  |   |    |     |     |   |    |     |     |   |    |  |    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |  |    |   |    |     |    |   |    |     |    |   |    |     |  |  |    |     |     |   |    |     |     |   |    |     |     |   |    |  |    |   |

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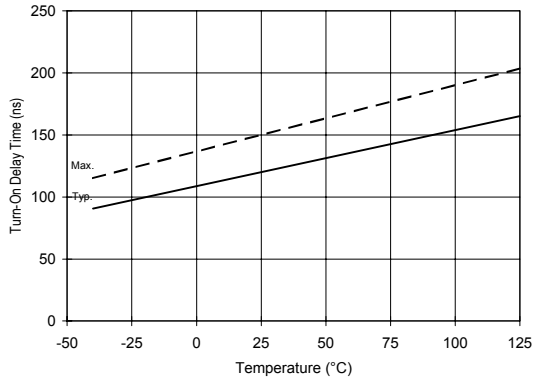


Figure 7A. Turn-On Time vs. Temperature

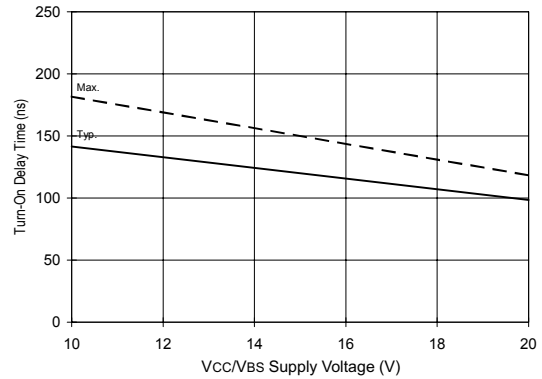


Figure 7B. Turn-On Time vs. Vcc/Vbs Supply Voltage

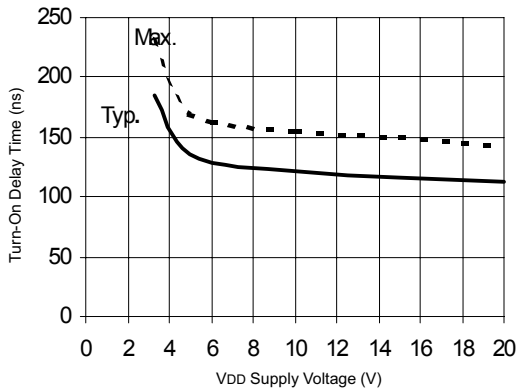


Figure 7C. Turn-On Time vs. VDD Supply Voltage

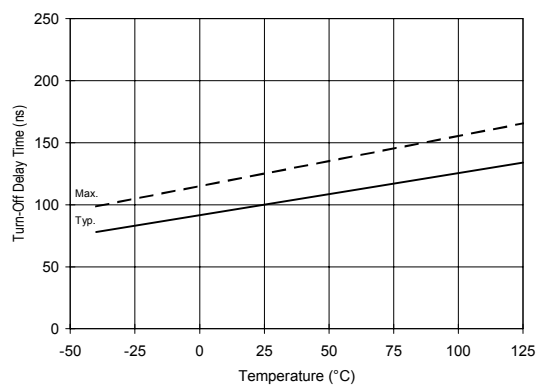


Figure 8A. Turn-Off Time vs. Temperature

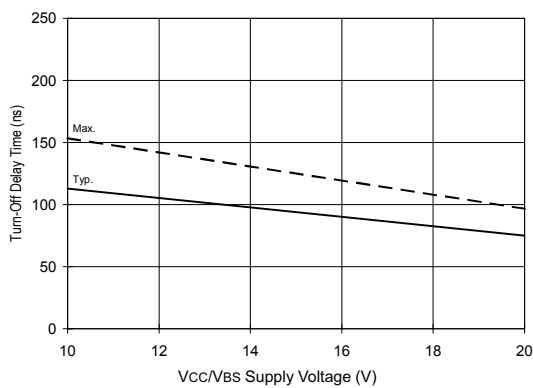


Figure 8B. Turn-Off Time vs. Vcc/Vbs Supply Voltage

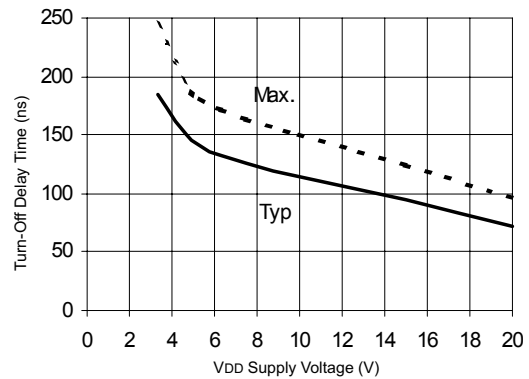
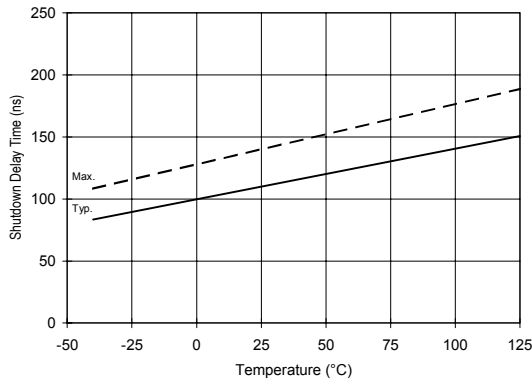
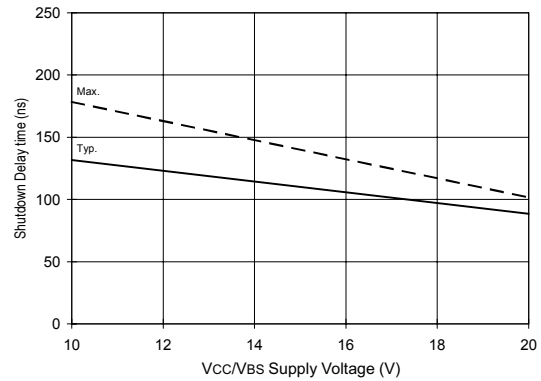


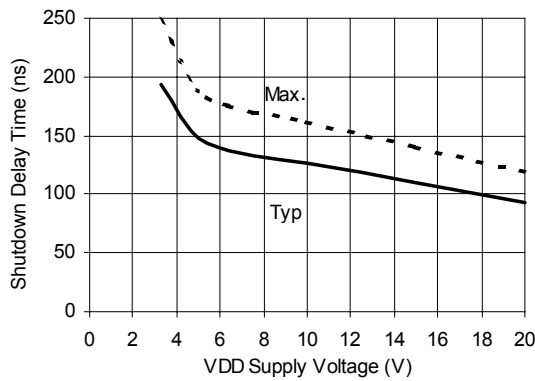
Figure 8C. Turn-Off Time vs. VDD Supply Voltage



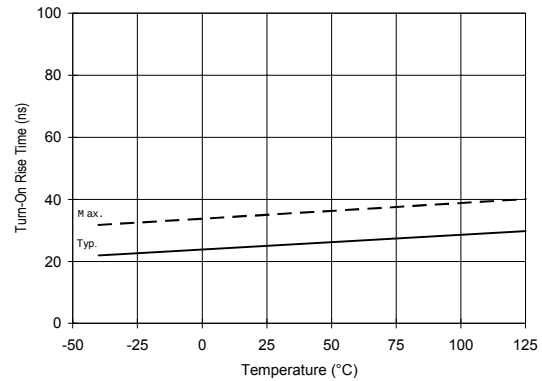
**Figure 9A. Shutdown Time vs. Temperature**



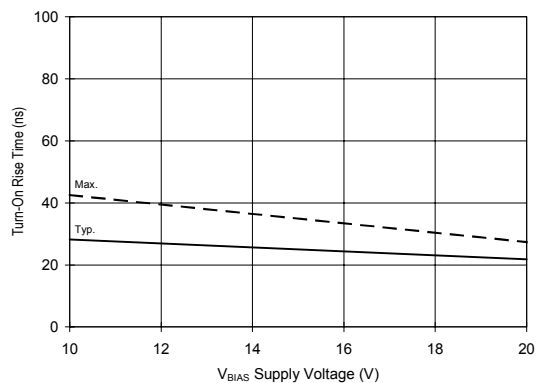
**Figure 9B. Shutdown Time vs. Vcc/Vbs Supply Voltage**



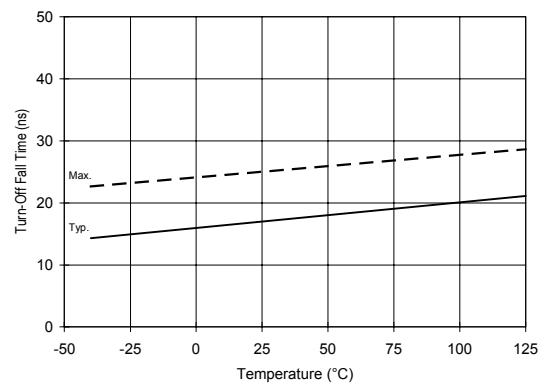
**Figure 9C. Shutdown Time vs. VDD Supply Voltage**



**Figure 10A. Turn-On Rise Time vs. Temperature**



**Figure 10B. Turn-On Rise Time vs. Voltage**



**Figure 11A. Turn-Off Fall Time vs. Temperature**

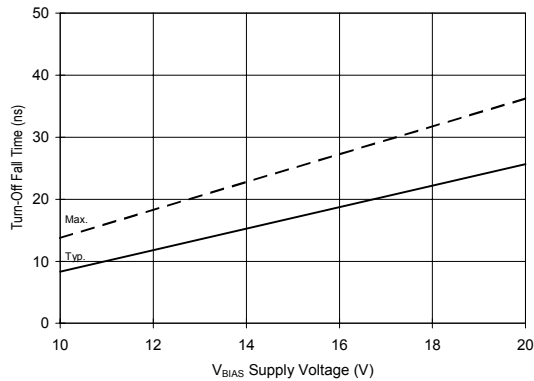


Figure 11B. Turn-Off Fall Time vs. Voltage

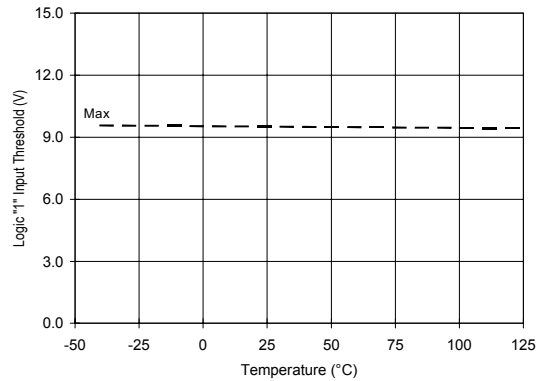


Figure 12A. Logic "1" Input Threshold vs. Temperature

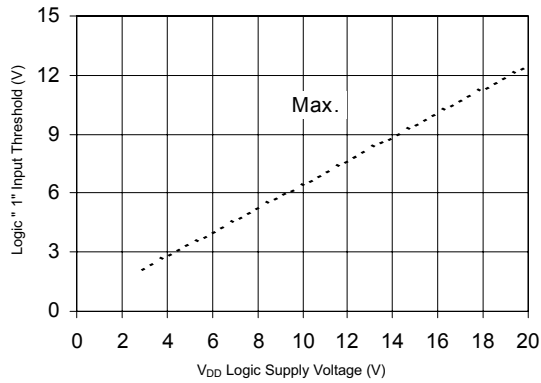


Figure 12B. Logic "1" Input Threshold vs. Voltage

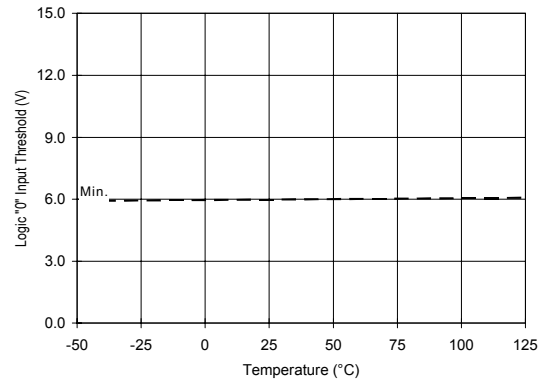


Figure 13A. Logic "0" Input Threshold vs. Temperature

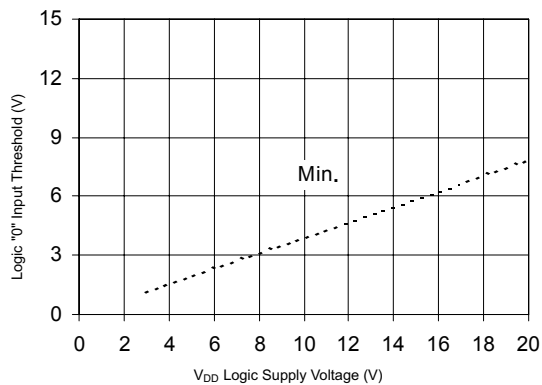


Figure 13B. Logic "0" Input Threshold vs. Voltage

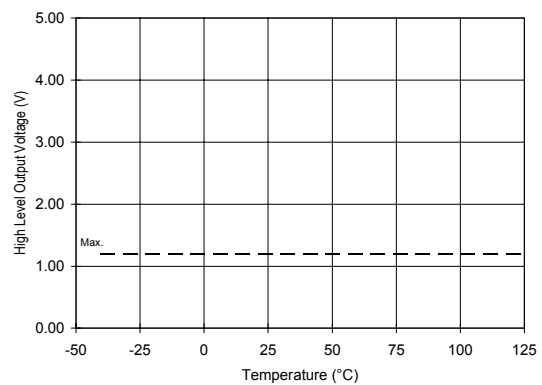


Figure 14A. High Level Output vs. Temperature

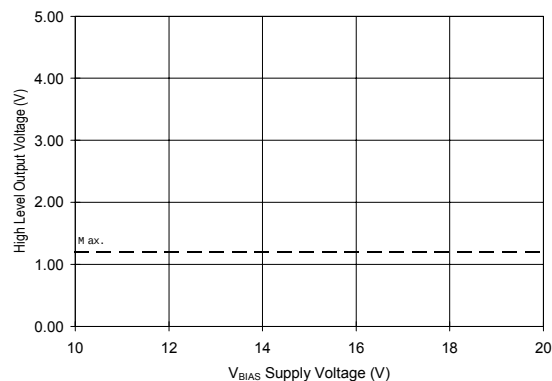


Figure 14B. High Level Output vs. Voltage

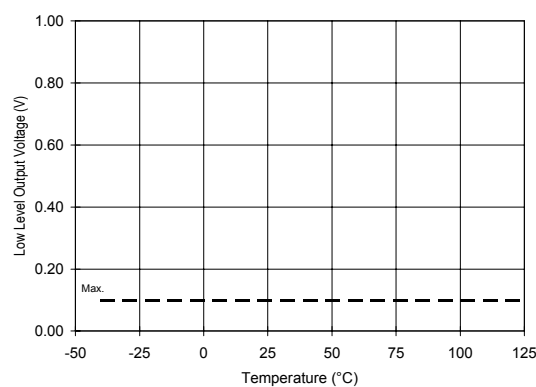


Figure 15A. Low Level Output vs. Temperature

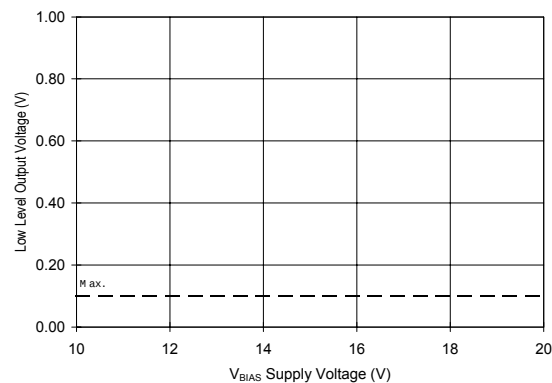


Figure 15B. Low Level Output vs. Voltage

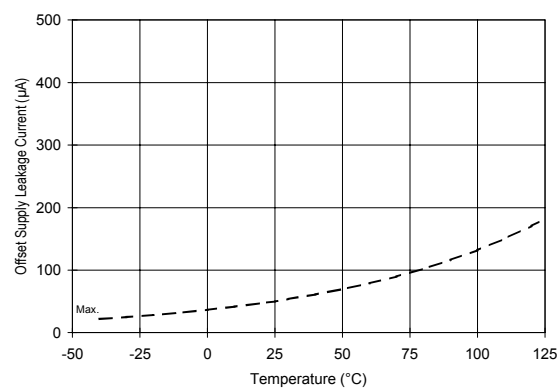


Figure 16A. Offset Supply Current vs. Temperature

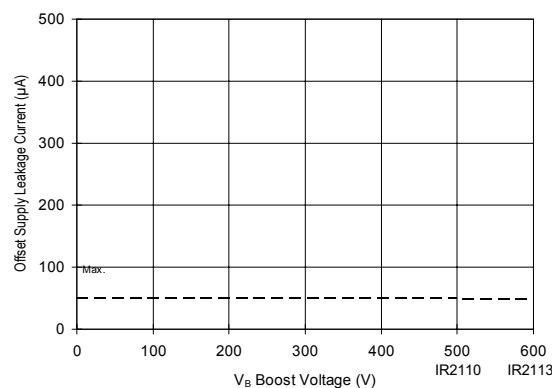


Figure 16B. Offset Supply Current vs. Voltage

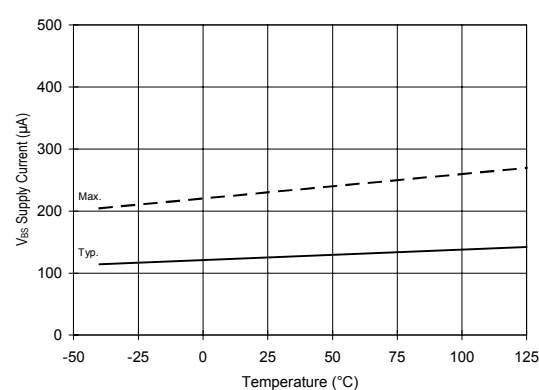


Figure 17A. V<sub>BS</sub> Supply Current vs. Temperature

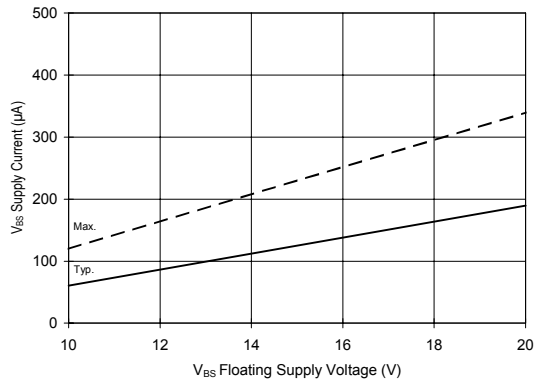


Figure 17B.  $V_{BS}$  Supply Current vs. Voltage

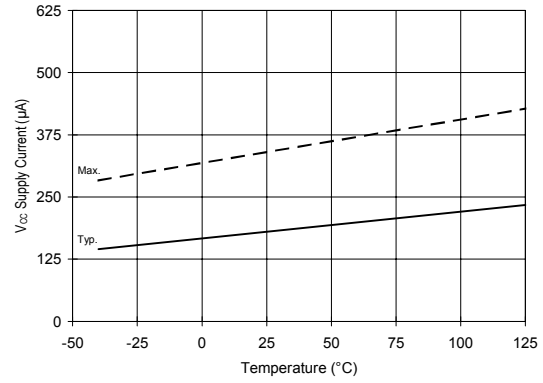


Figure 18A.  $V_{CC}$  Supply Current vs. Temperature

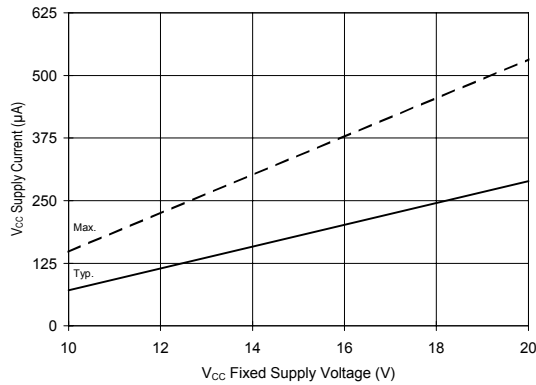


Figure 18B.  $V_{CC}$  Supply Current vs. Voltage

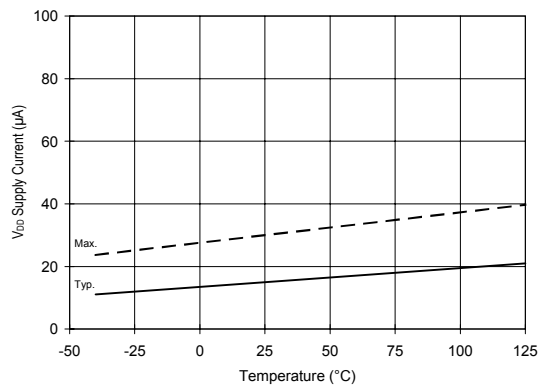


Figure 19A.  $V_{DD}$  Supply Current vs. Temperature

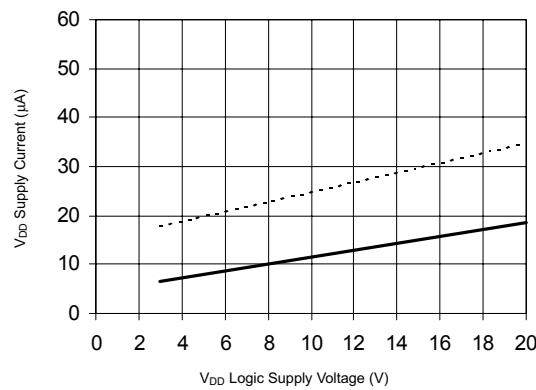


Figure 19B.  $V_{DD}$  Supply Current vs.  $V_{DD}$  Voltage

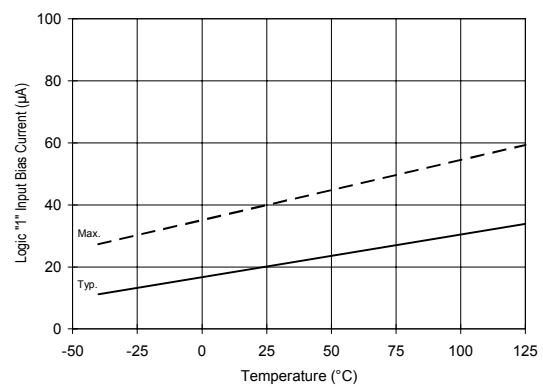


Figure 20A. Logic "1" Input Current vs. Temperature

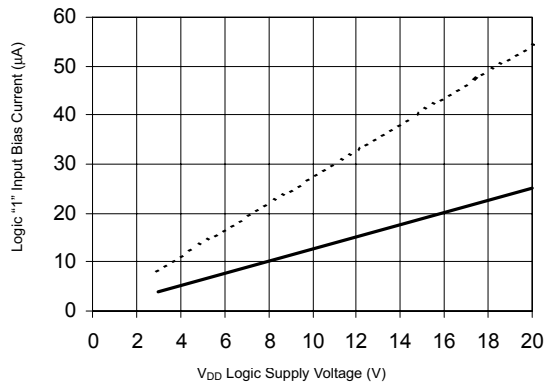


Figure 20B. Logic "1" Input Current vs. V<sub>DD</sub> Voltage

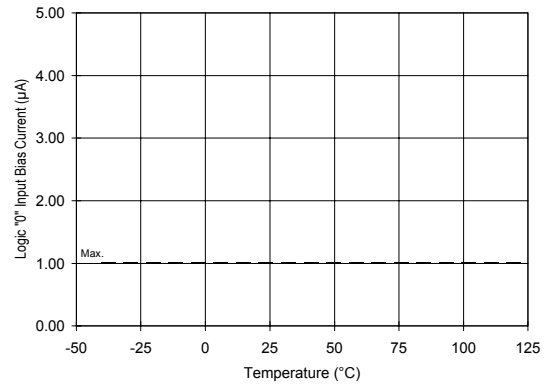


Figure 21A. Logic "0" Input Current vs. Temperature

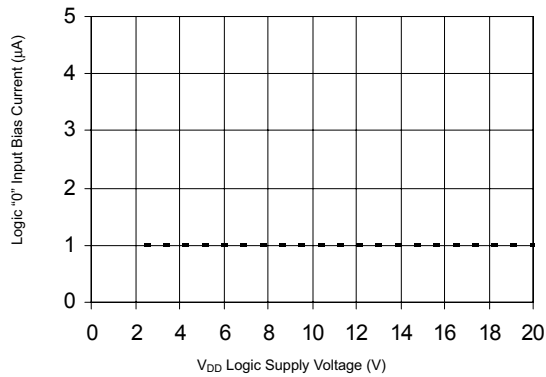


Figure 21B. Logic "0" Input Current vs. V<sub>DD</sub> Voltage

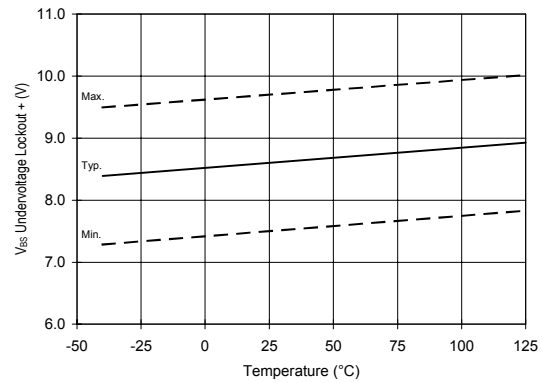


Figure 22. V<sub>BS</sub> Undervoltage Lockout (+) vs. Temperature

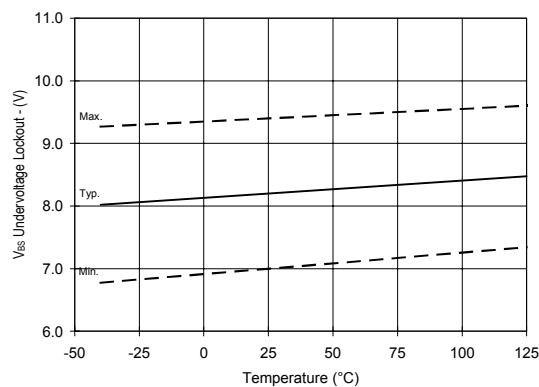


Figure 23. V<sub>BS</sub> Undervoltage Lockout (-) vs. Temperature

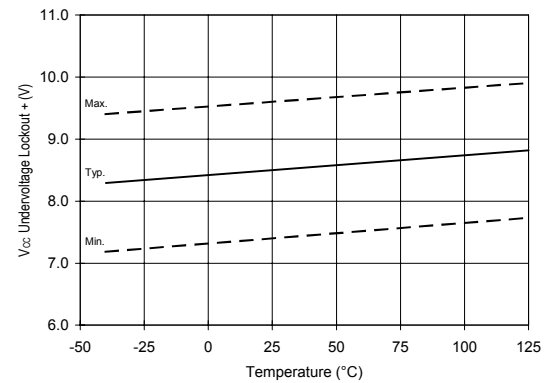


Figure 24. V<sub>CC</sub> Undervoltage Lockout (+) vs. Temperature

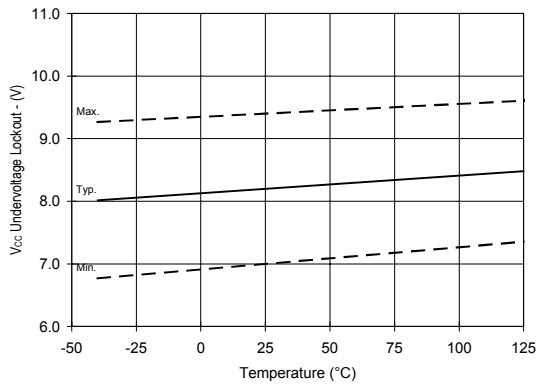


Figure 25. Vcc Undervoltage (-) vs. Temperature

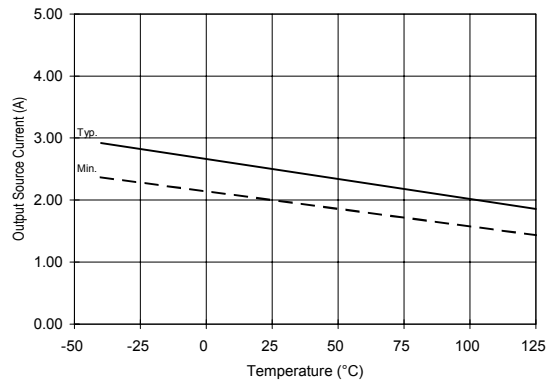


Figure 26A. Output Source Current vs. Temperature

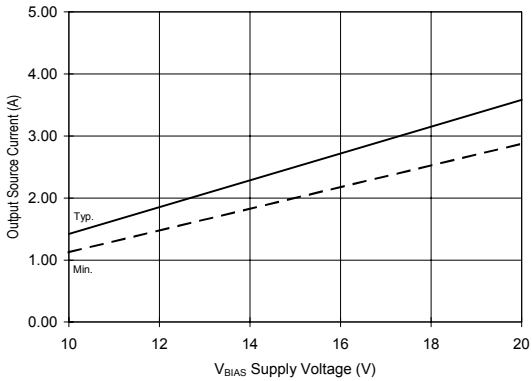


Figure 26B. Output Source Current vs. Voltage

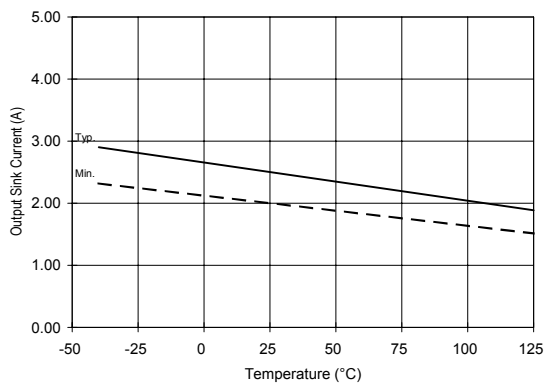


Figure 27A. Output Sink Current vs. Temperature

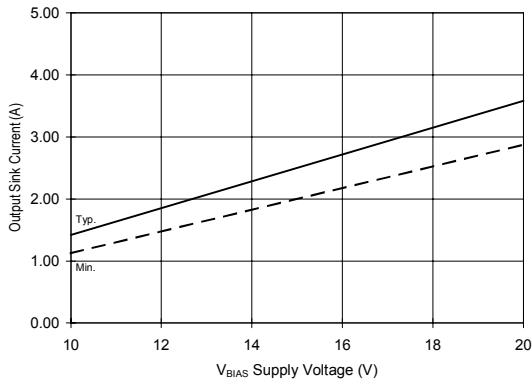


Figure 27B. Output Sink Current vs. Voltage

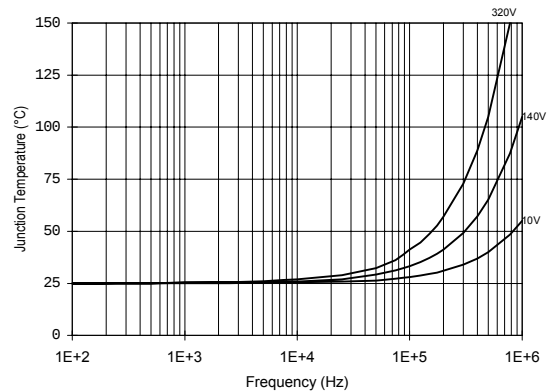
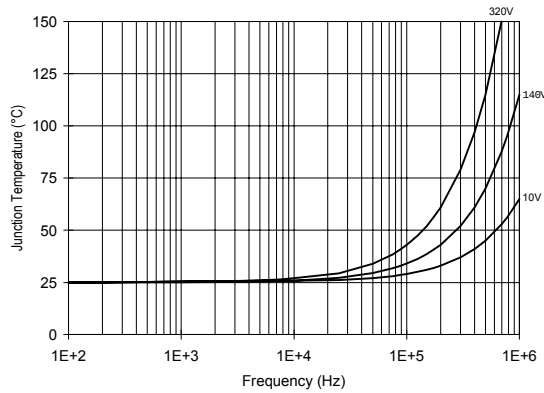
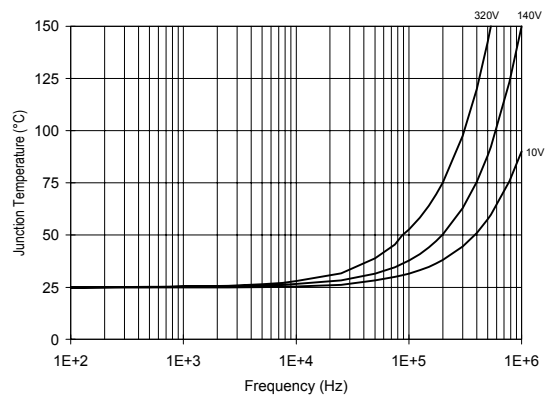


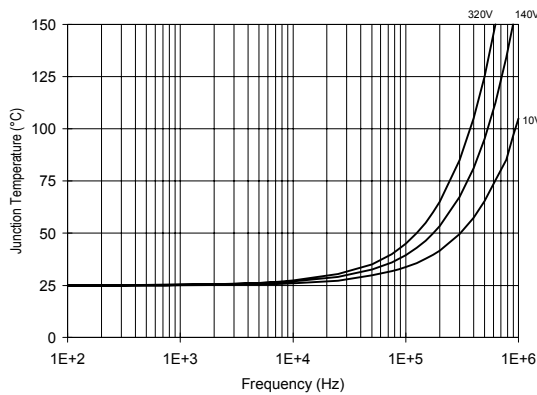
Figure 28. IR2110/IR2113  $T_J$  vs. Frequency  
(IRFBC20)  $R_{GATE} = 33\Omega$ ,  $V_{CC} = 15V$



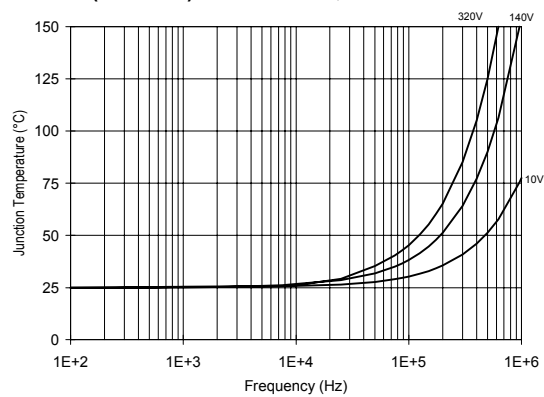
**Figure 29. IR2110/IT2113  $T_J$  vs. Frequency (IRFBC30)  $R_{\text{GATE}} = 22\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



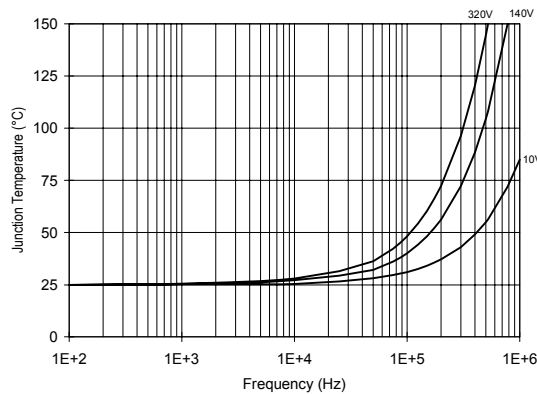
**Figure 30. IR2110/IR2113  $T_J$  vs. Frequency (IRFBC40)  $R_{\text{GATE}} = 15\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



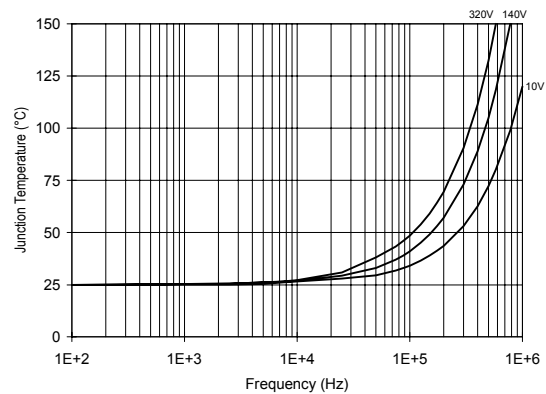
**Figure 31. IR2110/IR2113  $T_J$  vs. Frequency (IRFPE50)  $R_{\text{GATE}} = 10\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



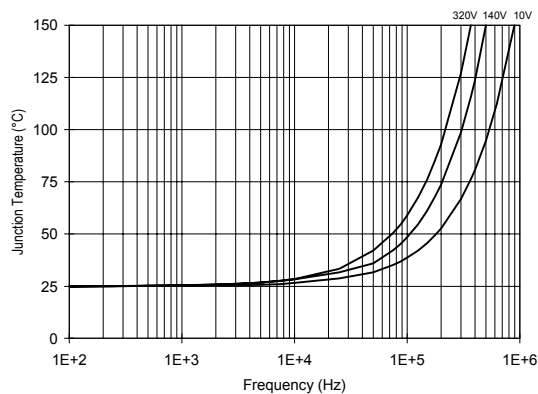
**Figure 32. IR2110S/IR2113S  $T_J$  vs. Frequency (IRFBC20)  $R_{\text{GATE}} = 33\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



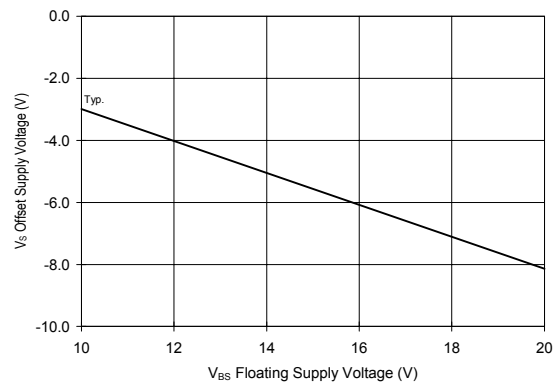
**Figure 33. IR2110S/IR2113S  $T_J$  vs. Frequency (IRFBC30)  $R_{\text{GATE}} = 22\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



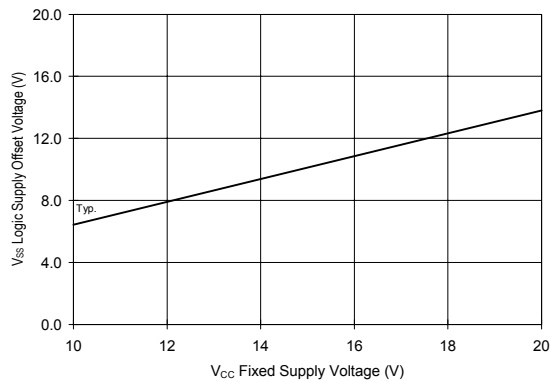
**Figure 34. IR2110S/IR2113S  $T_J$  vs. Frequency (IRFBC40)  $R_{\text{GATE}} = 15\Omega$ ,  $V_{\text{CC}} = 15\text{V}$**



**Figure 35. IR2110S/IR2113S  $T_J$  vs. Frequency (IRFPE50)  $R_{GATE} = 10\Omega$ ,  $V_{CC} = 15V$**



**Figure 36. Maximum  $V_S$  Negative Offset vs.  $V_{BS}$  Supply Voltage**



**Figure 37. Maximum  $V_{SS}$  Positive Offset vs.  $V_{CC}$  Supply Voltage**

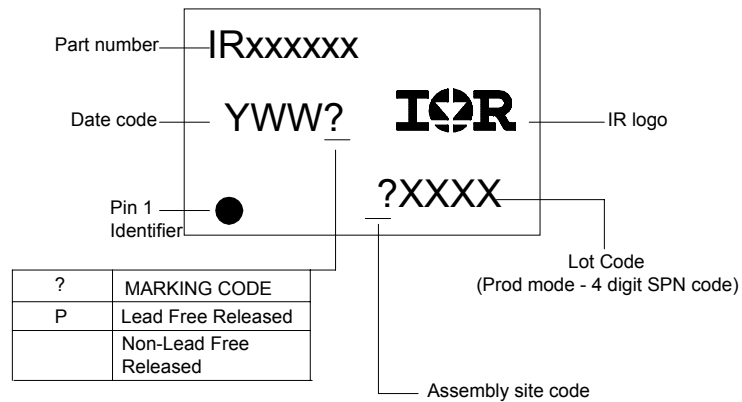




# IR2110(-1-2)(S)PbF/IR2113(-1-2)(S)PbF

International  
**IR** Rectifier

## LEADFREE PART MARKING INFORMATION



## ORDER INFORMATION

**Part only available Lead Free**

14-Lead PDIP IR2110 order IR2110PbF  
14-Lead PDIP IR2110-1 order IR2110-1PbF  
14-Lead PDIP IR2110-2 order IR2110-2PbF  
14-Lead PDIP IR2113 order IR2113PbF  
14-Lead PDIP IR2113-1 order IR2113-1PbF  
14-Lead PDIP IR2113-2 order IR2113-2PbF  
16-Lead SOIC IR2110S order IR2110SPbF  
16-Lead SOIC IR2113S order IR2113SPbF

International  
**IR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245 Tel: (310) 252-7105

**This product has been qualified per industrial level**

*Data and specifications subject to change without notice 3/23/2005*