## Description

The DGD2108 is a high-voltage / high-speed gate driver capable of driving N-Channel MOSFETs and IGBTs in a half bridge configuration. High-voltage processing techniques enable the DGD2108's high-side to switch to 600V in a bootstrap operation.

The DGD2108 logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) for easy interfacing with controlling devices. The driver outputs feature high-pulse current buffers designed for minimum driver cross conduction. Internal deadtime protects high-voltage MOSFETs.

The DGD2108 is offered in SO-8 package, the operating temperature extends from -40°C to +125°C.

## Applications

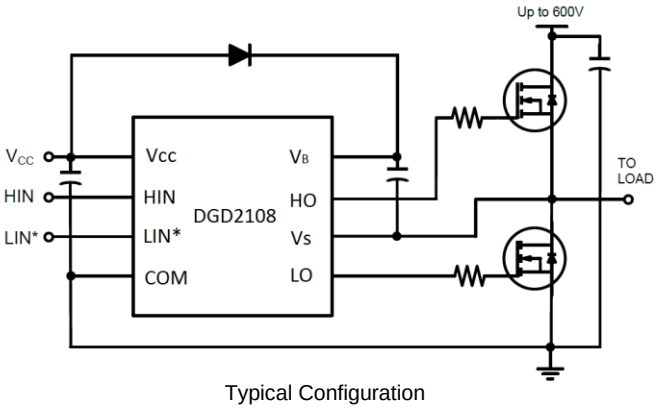
- DC-DC Converters
- DC-AC Inverters
- AC-DC Power Supplies
- Motor Controls
- Class D Power Amplifiers

## Features

- Floating High-Side Driver in Bootstrap Operation to 600V
- Drives Two N-Channel MOSFETs or IGBTs in a Half Bridge Configuation
- Outputs Tolerant to Negative Transients
- Internal Logic and Dead Time of 540ns to Protect MOSFETs
- Wide Logic and Low-Side Gate Driver Supply Voltage: 10V to 20V
- Logic Inputs (HIN and LIN*) 3.3V Capability
- Schmitt Triggered Logic Inputs with Internal Pull Down
- Undervoltage Lockout for High and Low Side Drivers
- Extended Temperature Range: -40°C to +125°C
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q101, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.**
- **https://www.diodes.com/quality/product-definitions/**

## Mechanical Data

- Case: SO-8 (Type TH)
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.075 grams (Approximate)




Typical Configuration

SO-8

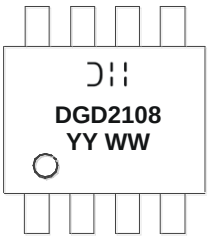
Top View

## Ordering Information (Note 4)

| Product | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|---|---|---|---|---|
| DGD2108S8-13 | DGD2108 | 13 | 12 | 2,500 |

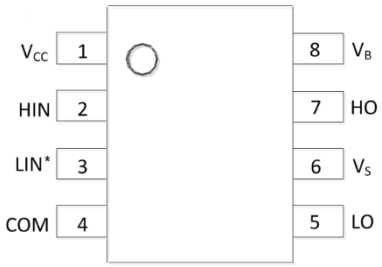
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information




= Manufacturer's Marking
DGD2108 = Product Type Marking Code
YY = Year (ex: 19 = 2019)
WW = Week (01 to 53)

## Pin Diagrams

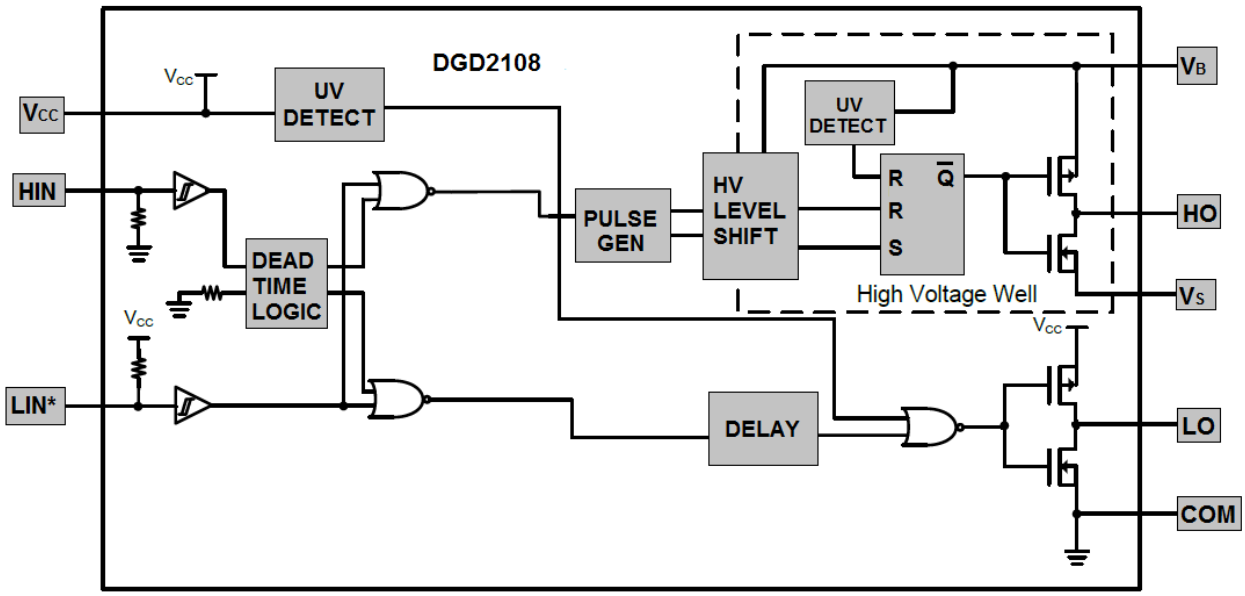



Top view SO-8

## Pin Descriptions

| Pin Number | Pin Name | Function |
|---|---|---|
| 1 | $V_{CC}$ | Low-side and logic fixed supply |
| 2 | HIN | Logic input for high-side gate driver output, in phase with HO |
| 3 | LIN* | Logic input for low-side gate driver output, out of phase with LO |
| 4 | COM | Low-side return |
| 5 | LO | Low-side gate drive output |
| 6 | $V_S$ | High-side floating supply return |
| 7 | HO | High-side gate drive output |
| 8 | $V_B$ | High-side floating supply |

## Functional Block Diagram



## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| High-Side Floating Supply Voltage | $V_B$ | -0.3 to +624 | V |
| High-Side Floating Supply Offset Voltage | $V_S$ | $V_B$-24 to $V_B$+0.3 | V |
| High-Side Floating Output Voltage | $V_{HO}$ | $V_S$-0.3 to $V_B$+0.3 | V |
| Offset Supply Voltage Transient | $dV_S$ / dt | 50 | V/ns |
| Low-Side and Logic Fixed Supply Voltage | $V_{CC}$ | -0.3 to +24 | V |
| Low-Side Output Voltage | $V_{LO}$ | -0.3 to $V_{CC}$+0.3 | V |
| Logic Input Voltage (HIN and LIN*) | $V_{IN}$ | -0.3 to $V_{CC}$+0.3 | V |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation Linear Derating Factor (Note 5) | $P_D$ | 0.625 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 200 | °C/W |
| Operating Temperature | $T_J$ | +150 | °C |
| Lead Temperature (Soldering, 10s) | $T_L$ | +300 | |
| Storage Temperature Range | $T_{STG}$ | -55 to +150 | |

Note: 5. When mounted on a standard JEDEC 2-layer FR-4 board.

## Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| High-Side Floating Supply Absolute Voltage | $V_B$ | $V_S$ + 10 | $V_S$ + 20 | V |
| High-Side Floating Supply Offset Voltage | $V_S$ | (Note 6) | 600 | V |
| High-Side Floating Output Voltage | $V_{HO}$ | $V_S$ | $V_B$ | V |
| Low-Side and Logic Fixed Supply Voltage | $V_{CC}$ | 10 | 20 | V |
| Low-Side Output Voltage | $V_{LO}$ | 0 | $V_{CC}$ | V |
| Logic Input Voltage | $V_{IN}$ | 0 | 5 | V |
| Ambient Temperature | $T_A$ | -40 | +125 | °C |

Note: 6. Logic operation for $V_S$ of -5V to +600V.

## DC Electrical Characteristics ($V_{BIAS}$ ($V_{CC}$, $V_{BS}$) = 15V, @$T_A$ = +25°C, unless otherwise specified.) (Note 7)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| Logic "1" Input Voltage (Note 8) | $V_{IH}$ | 2.5 | — | — | V | $V_{CC}$ = 10V to 20V |
| Logic "0" Input Voltage (Note 8) | $V_{IL}$ | — | — | 0.6 | V | $V_{CC}$ = 10V to 20V |
| High Level Output Voltage, $V_{BIAS}$ - $V_O$ | $V_{OH}$ | — | 0.05 | 0.2 | V | $I_O$ = 2mA |
| Low Level Output Voltage, $V_O$ | $V_{OL}$ | — | 0.2 | 0.1 | V | $I_O$ = 2mA |
| Offset Supply Leakage Current | $I_{LK}$ | — | — | 50 | µA | $V_B$ = $V_S$ = 600V |
| Quiescent $V_{BS}$ Supply Current | $I_{BSQ}$ | 20 | 75 | 130 | µA | $V_{IN}$ = 0V or 5V |
| Quiescent $V_{CC}$ Supply Current | $I_{CCQ}$ | 0.4 | 1.0 | 1.6 | mA | $V_{IN}$ = 0V or 5V |
| Logic "1" Input Bias Current | $I_{IN+}$ | — | 5 | 20 | µA | HIN = 5V, LIN* = 0V |
| Logic "0" Input Bias Current | $I_{IN-}$ | — | — | 5 | µA | HIN = 0V, LIN* = 5V |
| $V_{BS}$ Supply Undervoltage Positive Going Threshold | $V_{BSUV+}$ | 8.0 | 8.9 | 9.8 | V | — |
| $V_{BS}$ Supply Undervoltage Negative Going Threshold | $V_{BSUV-}$ | 7.4 | 8.2 | 9.0 | V | — |
| $V_{CC}$ Supply Undervoltage Positive Going Threshold | $V_{CCUV+}$ | 8.0 | 8.9 | 9.8 | V | — |
| $V_{CC}$ Supply Undervoltage Negative Going Threshold | $V_{CCUV-}$ | 7.4 | 8.2 | 9.0 | V | — |
| Hysteresis | $V_{CCUVH}$ | 0.3 | 0.7 | — | V | — |
| | $V_{BSUVH}$ | | | | | — |
| Output High Short Circuit Pulsed Current | $I_{O+}$ | 120 | 290 | — | mA | $V_O$ = 0V, PW ≤ 10µs |
| Output Low Short Circuit Pulsed Current | $I_{O-}$ | 250 | 600 | — | mA | $V_O$ = 15V, PW ≤ 10µs |

Notes:
7. The $V_{IN}$ and $I_{IN}$ parameters are referenced to $V_{SS}$ and are applicable to the two logic input pins: HIN and LIN*. The $V_O$ and $I_O$ parameters are referenced to COM and are applicable to the respective output pins: HO and LO.
8. For optimal operation, it is recommended that the input pulses (HIN and LIN*) should have a minimum amplitude of 2.5V wiith a minimum pulse width of 1µs.

## AC Electrical Characteristics ($V_{BIAS}$ ($V_{CC}$, $V_{BS}$) = 15V, $C_L$ = 1000pF, @$T_A$ = +25°C, unless otherwise specified.)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| Turn-On Propagation Delay | $t_{ON}$ | — | 220 | 300 | ns | $V_S$ = 0V |
| Turn-Off Propagation Delay | $t_{OFF}$ | — | 200 | 280 | ns | $V_S$ = 0V or 600V |
| Delay Matching, $\lvert t_{ON} - t_{OFF} \rvert$ | $t_{DMON}$ | — | — | 30 | ns | — |
| Turn-On Rise Time | $t_r$ | — | 100 | 220 | ns | $V_S$ = 0V |
| Turn-Off Fall Time | $t_f$ | — | 35 | 80 | ns | $V_S$ = 0V |
| Deadtime: $t_{DT\ LO\text{-}HO}$ & $t_{DT\ HO\text{-}LO}$ | $t_{DT}$ | 400 | 540 | 680 | ns | — |
| Deadtime Matching: $t_{DT\ LO\text{-}HO} - t_{DT\ HO\text{-}LO}$ | $t_{MDT}$ | — | 0 | 60 | ns | — |

## Timing Waveforms

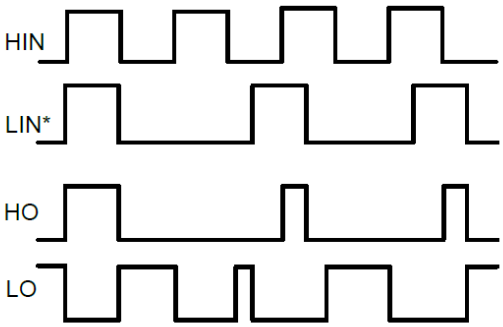



**Figure 1.** Input / Output Timing Diagram

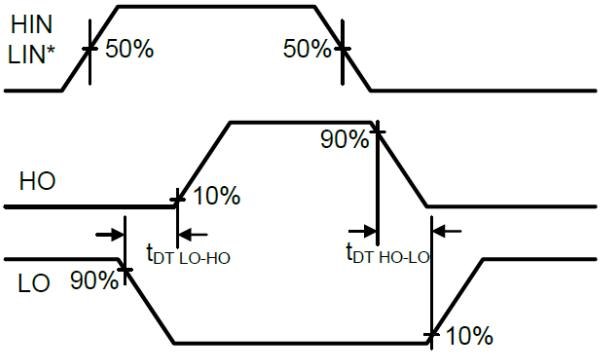



**Figure 2.** Deadtime Waveform Definitions

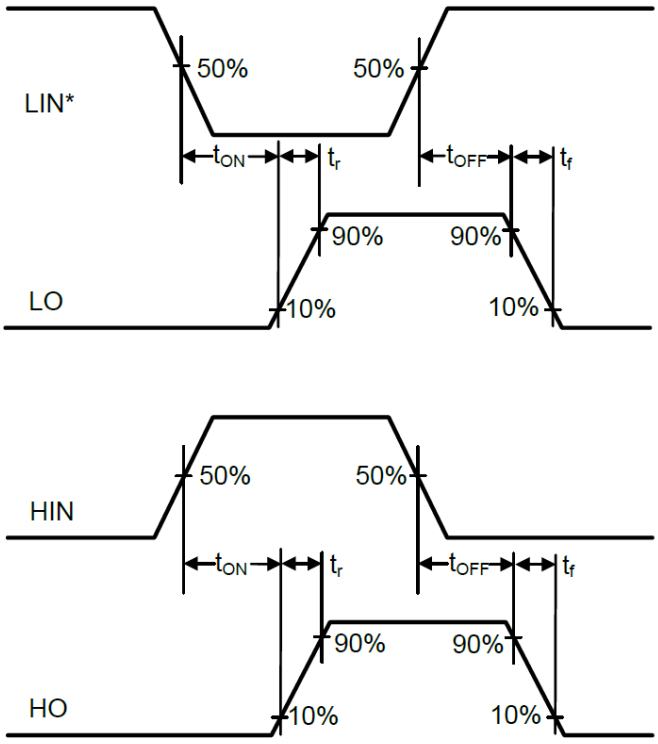



**Figure 3.** Switching Time Waveform Definitions

## Typical Performance Characteristics ($V_{CC}$ = 15V, @$T_A$ = +25°C, unless otherwise specified.)

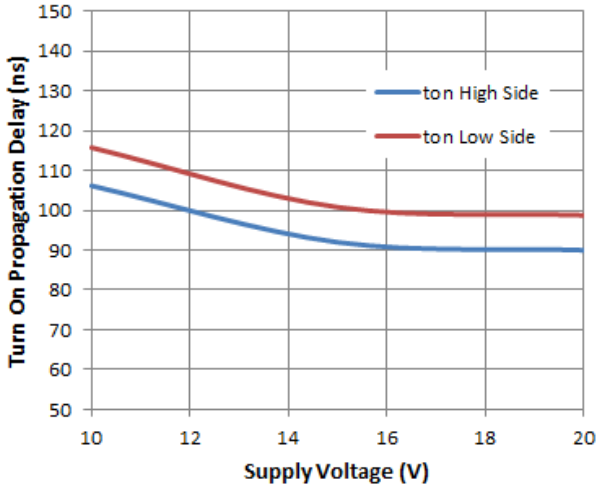



**Figure 4.** Turn-on Propagation Delay vs. Supply Voltage

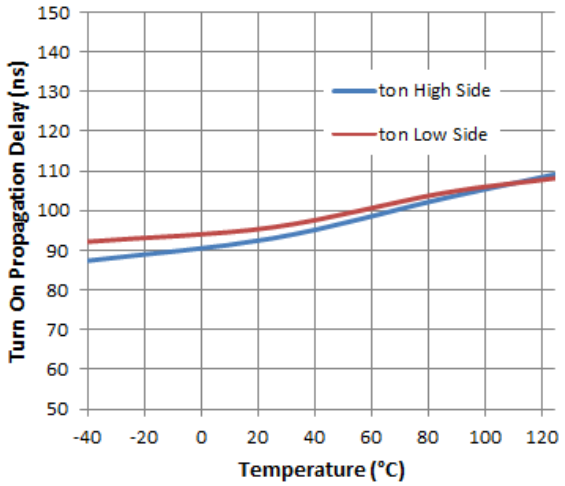



**Figure 5.** Turn-on Propagation Delay vs. Temperature

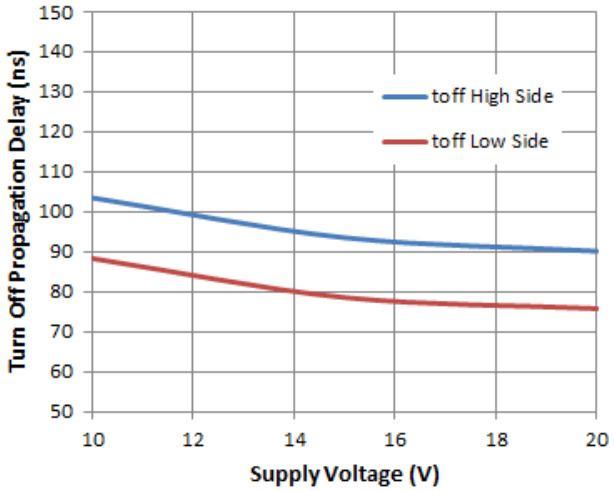



**Figure 6.** Turn-off Propagation Delay vs. Supply Voltage

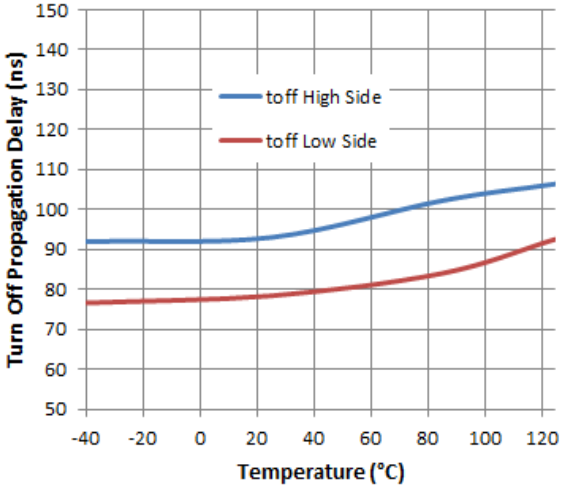



**Figure 7.** Turn-off Propagation Delay vs. Temperature

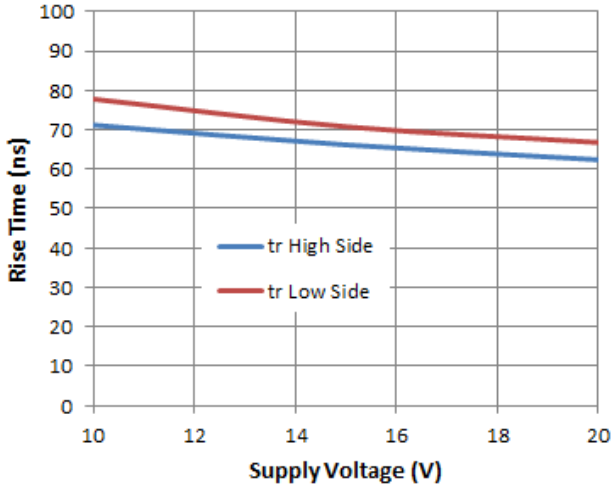



**Figure 8.** Rise Time vs. Supply Voltage

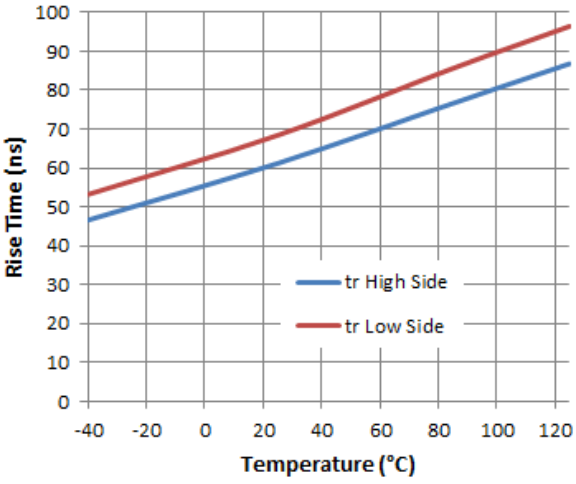



**Figure 9.** Rise Time vs. Temperature

## Typical Performance Characteristics (continued)

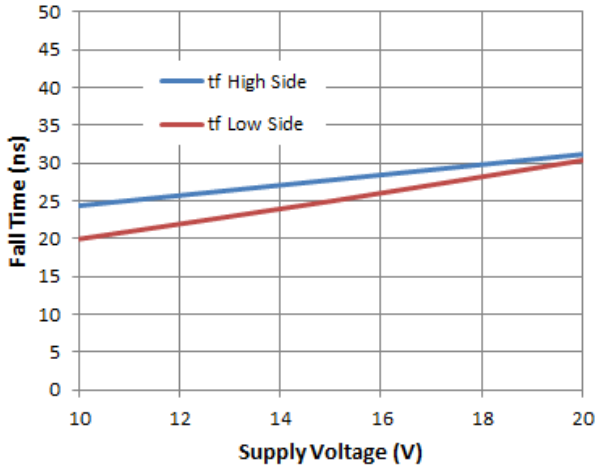



**Figure 10.** Fall Time vs. Supply Voltage

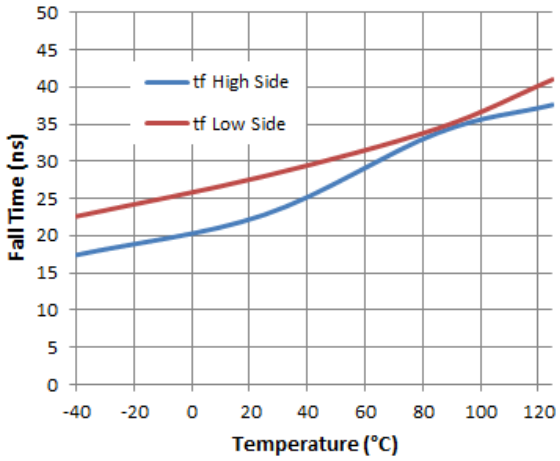



**Figure 11.** Fall Time vs. Temperature

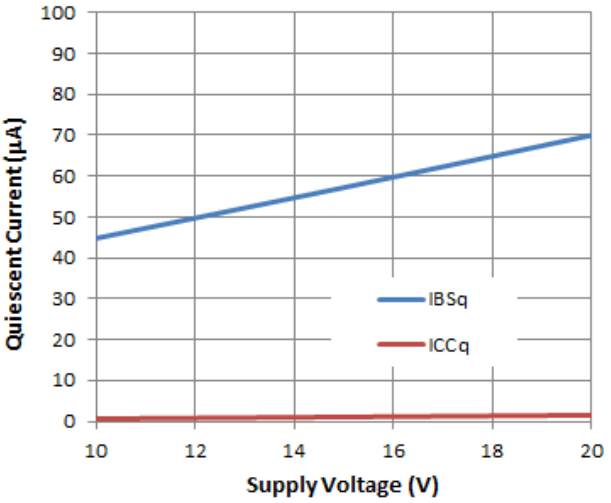



**Figure 12.** Quiescent Current vs. Supply Voltage

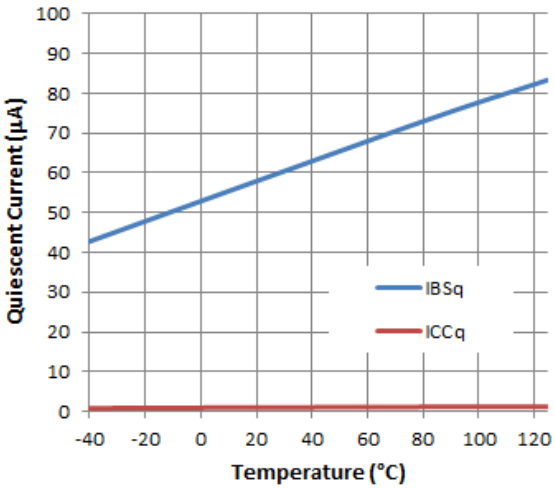



**Figure 13.** Quiescent Current vs. Temperature

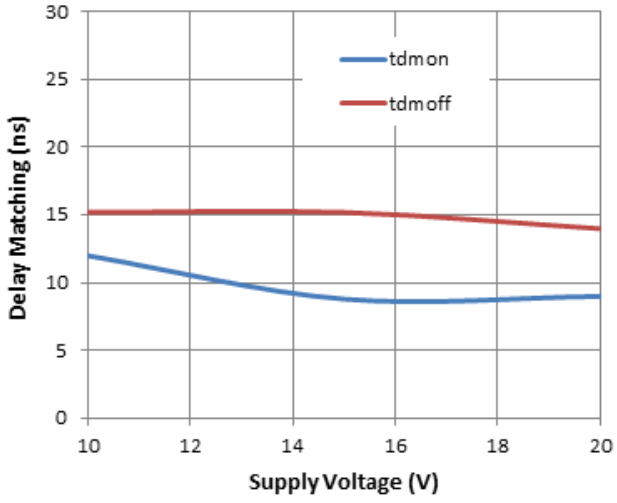



**Figure 14.** Delay Matching vs. Supply Voltage

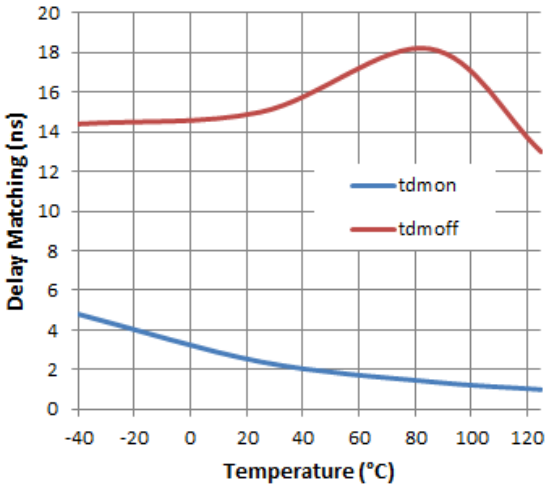



**Figure 15.** Delay Matching vs. Temperature

## Typical Performance Characteristics (continued)

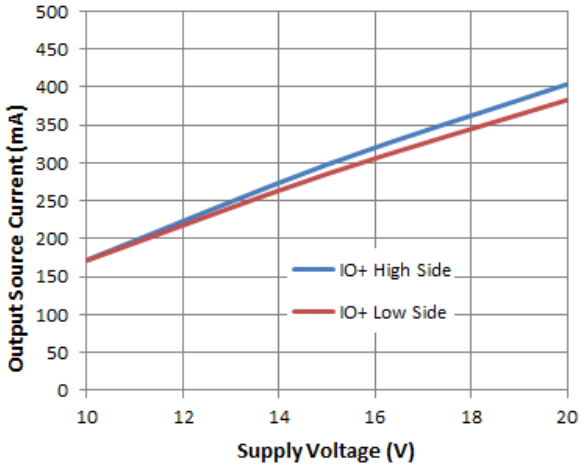



**Figure 16.** Output Source Current vs. Supply Voltage

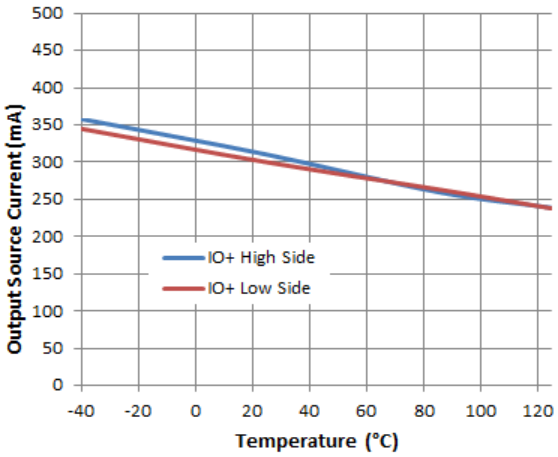



**Figure 17.** Output Source Current vs. Temperature

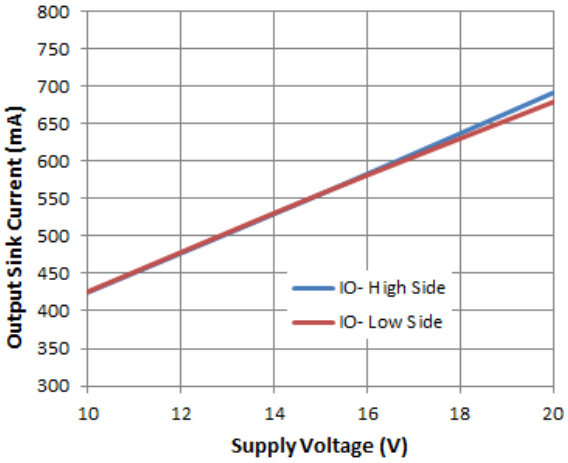



**Figure 18.** Output Sink Current vs. Supply Voltage

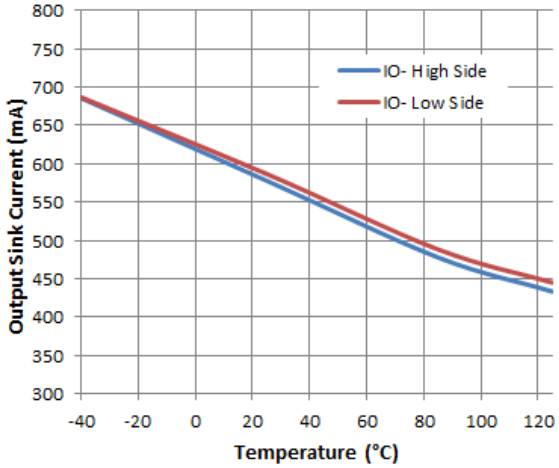



**Figure 19.** Output Sink Current vs. Temperature

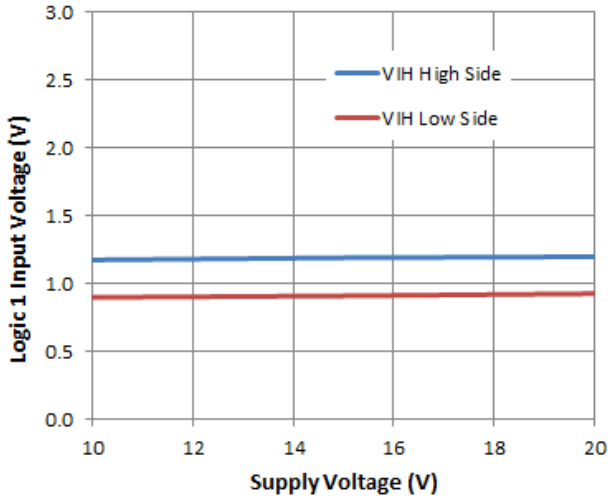



**Figure 20.** Logic 1 Input Voltage vs. Supply Voltage

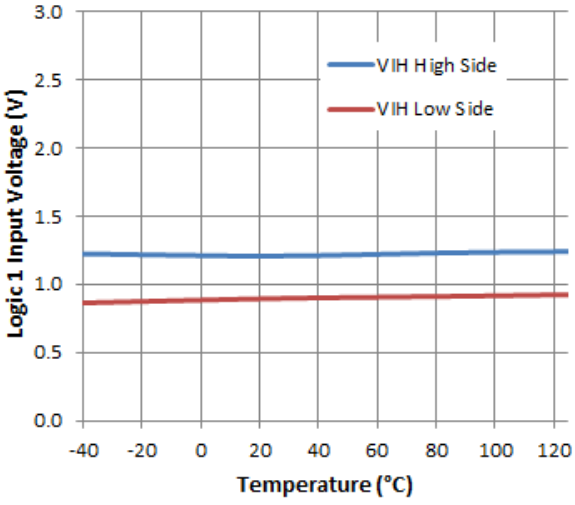



**Figure 21.** Logic 1 Input Voltage vs. Temperature

## Typical Performance Characteristics (continued)

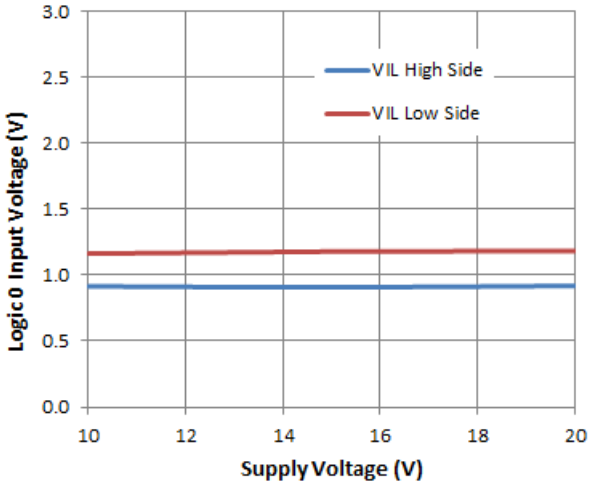



**Figure 22.** Logic 0 Input Voltage vs. Supply Voltage

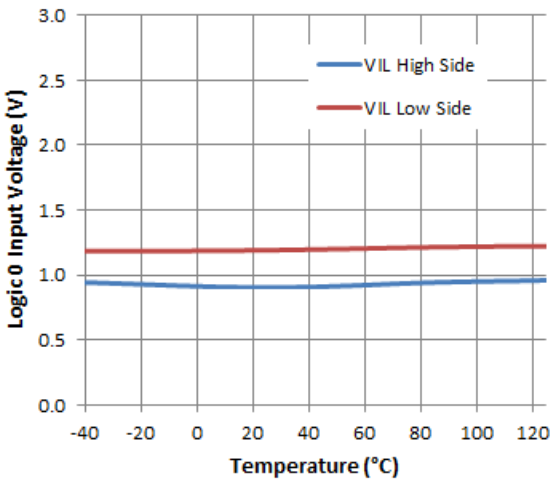



**Figure 23.** Logic 0 Input Voltage vs. Temperature

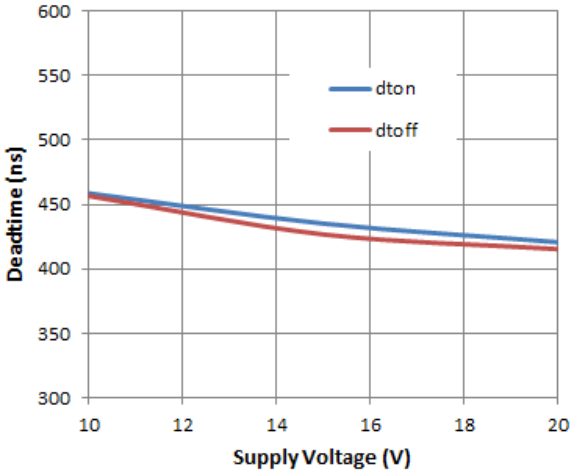



**Figure 24.** Deadtime vs. Supply Voltage

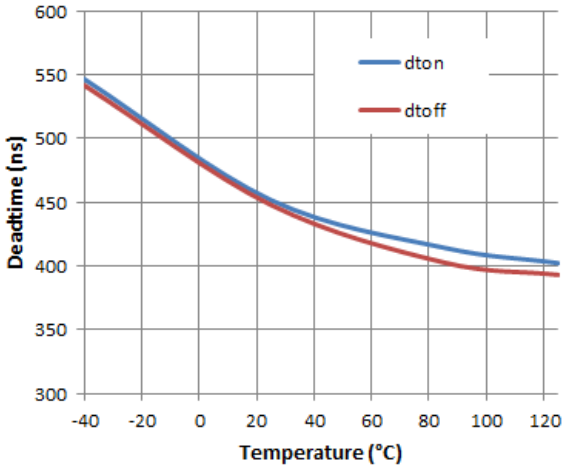



**Figure 25.** Deadtime vs. Temperature

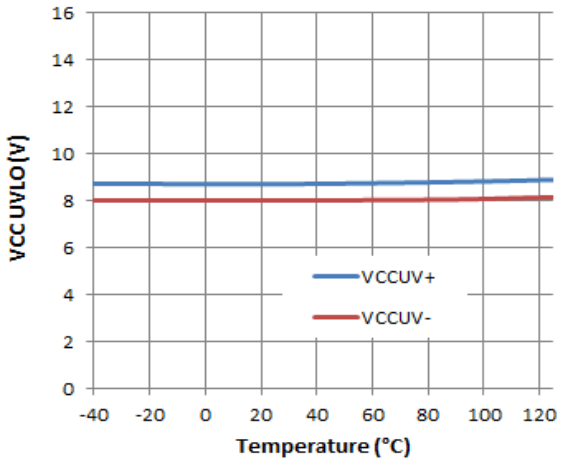



**Figure 26.** VCC UVLO vs. Temperature

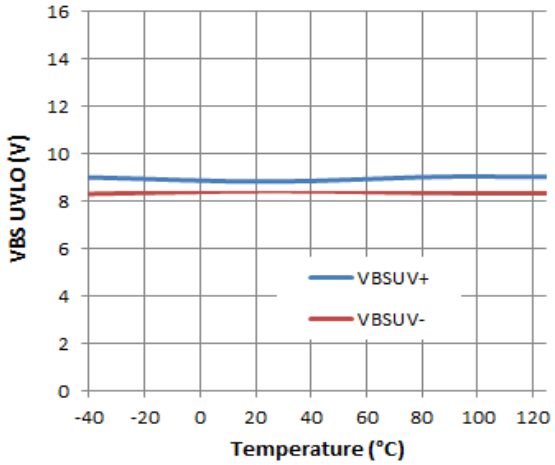



**Figure 27.** VBS UVLO vs. Temperature

## Typical Performance Characteristics (continued)

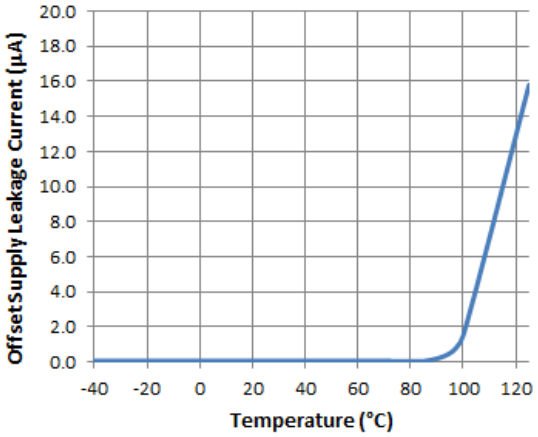
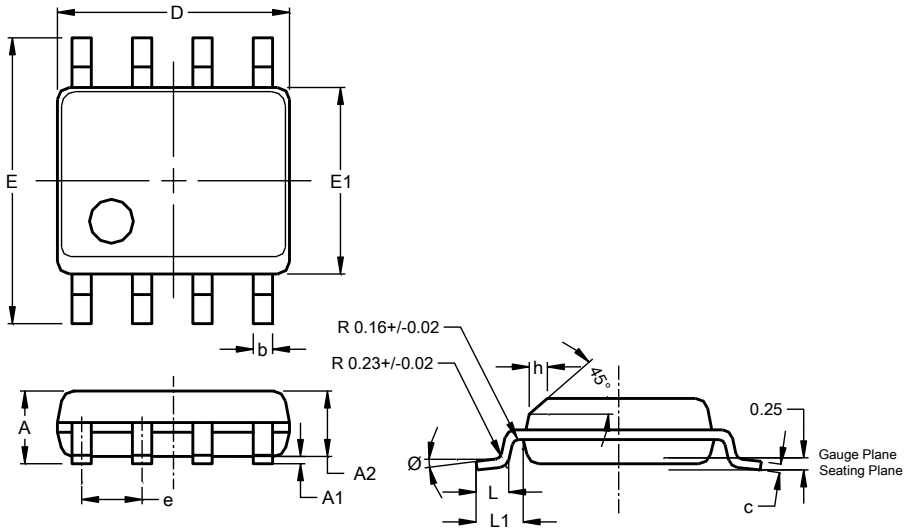



**Figure 28.** Offset Supply Leakage Current vs. Temperature

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8 (Type TH)**

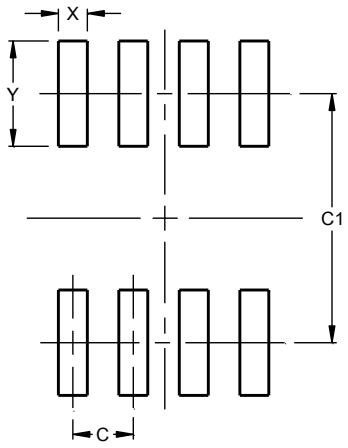



| SO-8 (Type TH) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.35 | 1.75 | -- |
| **A1** | 0.10 | 0.25 | -- |
| **A2** | -- | -- | 1.45 |
| **b** | 0.35 | 0.51 | -- |
| **c** | 0.190 | 0.248 | -- |
| **D** | 4.80 | 5.00 | 4.90 |
| **E** | 5.80 | 6.20 | 6.00 |
| **E1** | 3.80 | 4.00 | 3.90 |
| **e** | -- | -- | 1.27 |
| **h** | 0.25 | 0.50 | -- |
| **L** | 0.41 | 1.27 | -- |
| **L1** | -- | -- | 1.04 |
| **Ø** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8 (Type TH)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.27 |
| **C1** | 5.20 |
| **X** | 0.60 |
| **Y** | 2.20 |

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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