

## Description

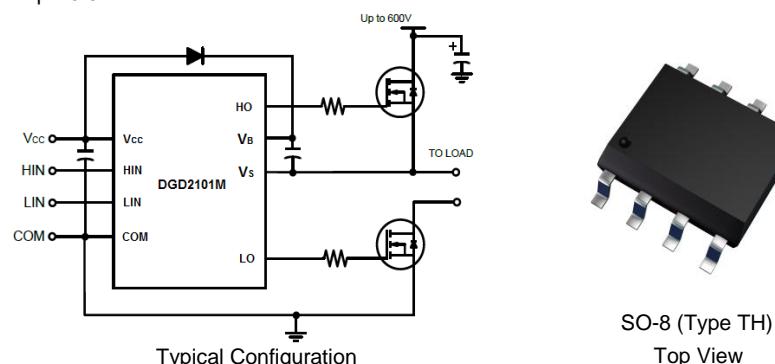
The DGD2101M is a high-voltage / high-speed gate driver capable of driving N-Channel MOSFETs and IGBTs in a high-side/low-side configuration. High-voltage processing techniques enable the DGD2101M's high side to switch to 600V in a bootstrap operation. The 50ns (max) propagation delay matching between the high and the low side drivers allows high frequency switching.

The DGD2101M 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. The low-side gate driver and logic share a common ground.

The DGD2101M is available in a space saving 8-pin SO-8 (Type TH) 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 High-side / Low-side Configuration
- Outputs Tolerant to Negative Transients
- Wide Low-side Gate Driver and Logic Supply: 10V to 20V
- Logic Inputs CMOS and TTL Compatible (Down to 3.3V)
- Schmitt Triggered Logic Inputs with Internal Pull Down
- Undervoltage Lockout for  $V_{CC}$
- Space Saving SO-8 (Type TH) Package Available
- 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)**

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## 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 <sup>(@3)</sup>
- SO-8 (Type TH) Weight: 0.075 grams (Approximate)

## **Ordering Information** (Note 4)

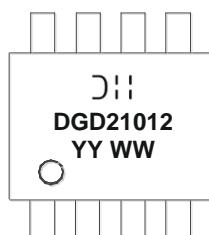
Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
DGD2101MS8-13	DGD21012	13	12	2,500

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 <http://www.diodes.com/products/packages.html>.

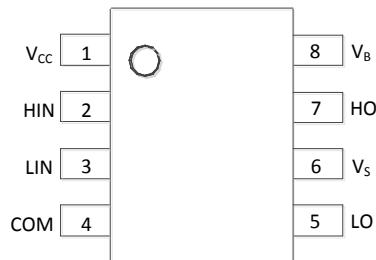
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## Marking Information



DMI = Manufacturer's Marking  
DGD21012 = Product Type Marking Code  
YY = Year (ex: 17 = 2017)  
WW = Week (01 to 53)

## Pin Diagrams

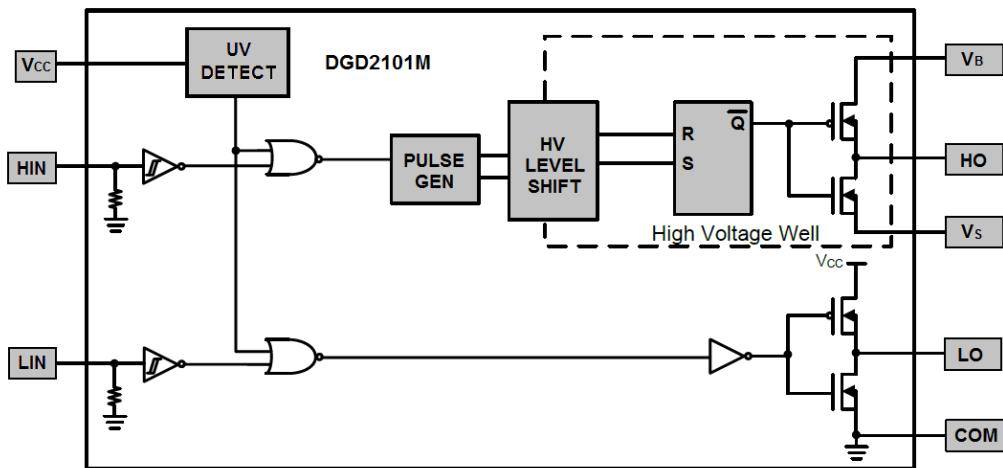


Top View: SO-8 (Type TH)

## Pin Descriptions

Pin Number	Pin Name	Function
1	V <sub>CC</sub>	Low-side and logic fixed supply
2	HIN	Logic input for high-side gate driver output (HO), in phase
3	LIN	Logic input for low-side gate driver output (LO), in phase
4	COM	Low-side return
5	LO	Low-side gate drive output
6	V <sub>S</sub>	High-side floating supply return
7	HO	High-side gate drive output
8	V <sub>B</sub>	High-side floating supply

## Functional Block Diagram



## Absolute Maximum Ratings (@ $T_A = +25^\circ\text{C}$ , 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 (@ $T_A = +25^\circ\text{C}$ , 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
Thermal Resistance, Junction to Case (Note 5)	$R_{\theta JC}$	45	°C/W
Operating Temperature	$T_J$	+150	°C
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 (HIN and LIN)	$V_{IN}$	0	5	V
Ambient Temperature	$T_A$	-40	+125	°C

Note: 6. Logic operation for  $V_S = -5\text{V}$  to  $+600\text{V}$ .

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

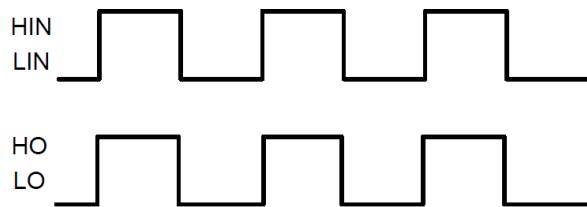
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic "1" Input Voltage	$V_{IH}$	2.5	—	—	V	$V_{CC}$ = 10V to 20V
Logic "0" Input Voltage	$V_{IL}$	—	—	0.8	V	$V_{CC}$ = 10V to 20V
High Level Output Voltage, $V_{BIAS}$ - $V_O$	$V_{OH}$	—	0.05	0.2	V	$I_O$ = 2mA
Low Level Output Voltage, $V_O$	$V_{OL}$	—	0.02	0.1	V	$I_O$ = 2mA
Offset Supply Leakage Current	$I_{LK}$	—	—	50	$\mu A$	$V_B$ = $V_S$ = 600V
Quiescent $V_{BS}$ Supply Current	$I_{BSQ}$	—	30	55	$\mu A$	$V_{IN}$ = 0V or 5V
Quiescent $V_{CC}$ Supply Current	$I_{CCQ}$	—	150	270	$\mu A$	$V_{IN}$ = 0V or 5V
Logic "1" Input Bias Current	$I_{IN+}$	—	3.0	10	$\mu A$	$V_{IN}$ = 5V
Logic "0" Input Bias Current	$I_{IN-}$	—	—	5.0	$\mu A$	$V_{IN}$ = 0V
$V_{CC}$ 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	—
Output High Short Circuit Pulsed Current	$I_{O+}$	130	290	—	mA	$V_O$ = 0V, $V_{IN}$ = Logic "1", PW $\leq$ 10 $\mu s$
Output Low Short Circuit Pulsed Current	$I_{O-}$	270	600	—	mA	$V_O$ = 15V, $V_{IN}$ = Logic "0", PW $\leq$ 10 $\mu s$

Note: 7. The  $V_{IN}$  and  $I_{IN}$  parameters are referenced to COM. The  $V_O$  and  $I_O$  parameters are referenced to COM and are applicable to the respective output pins: HO and LO.

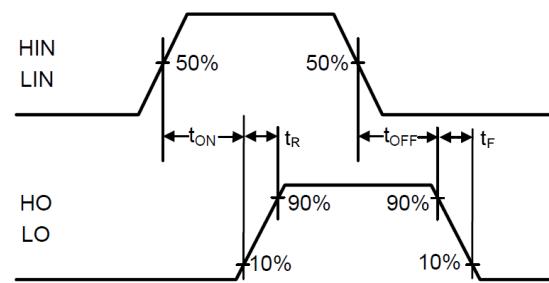
**AC Electrical Characteristics** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V,  $C_L$  = 1000pF, @ $T_A$  = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Turn-on Propagation Delay	$t_{ON}$	—	160	220	ns	$V_S$ = 0V
Turn-off Propagation Delay	$t_{OFF}$	—	150	220	ns	$V_S$ = 600V
Turn-on Rise Time	$t_R$	—	70	170	ns	—
Turn-off Fall Time	$t_F$	—	35	90	ns	—
Delay Matching	$t_{DM}$	—	—	50	ns	—

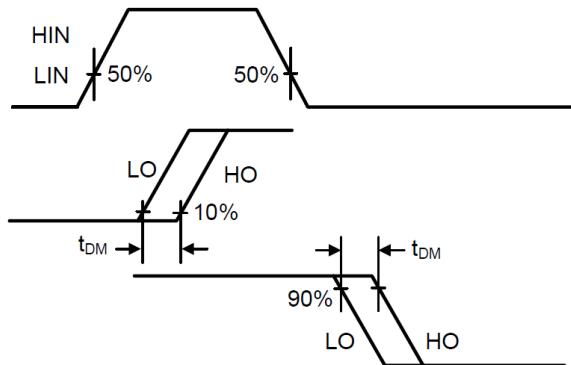
## Timing Waveforms



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

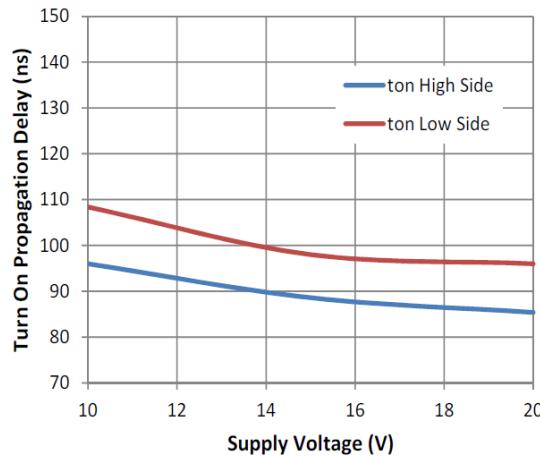


**Figure 2.** Switching Time Waveform Definitions

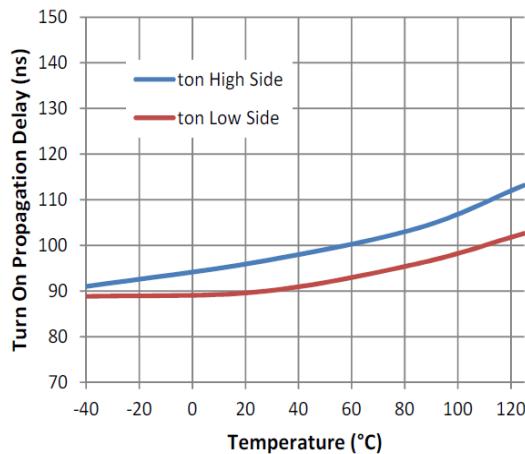


**Figure 3.** Delay Matching Waveform Definitions

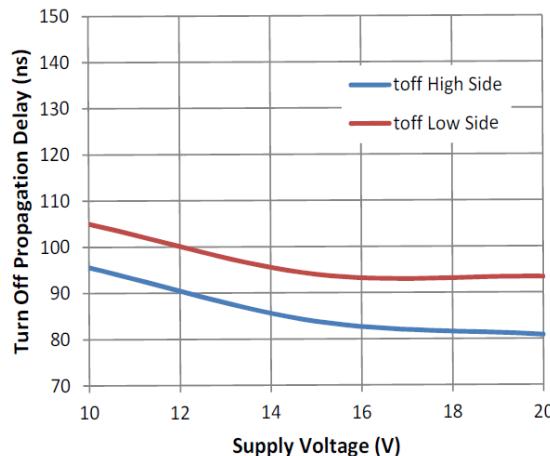
**Typical Performance Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



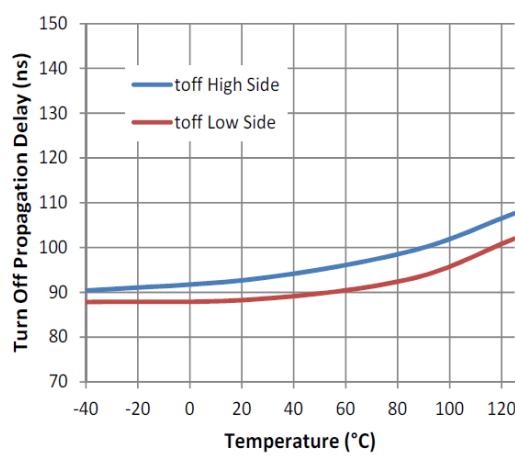
**Figure 4.** Turn-on Propagation Delay vs. Supply Voltage



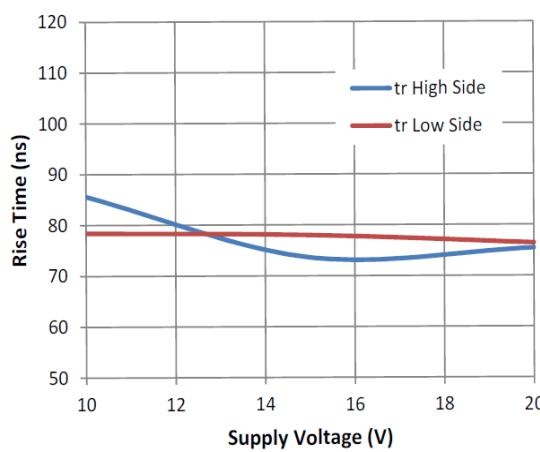
**Figure 5.** Turn-on Propagation Delay vs. Temperature



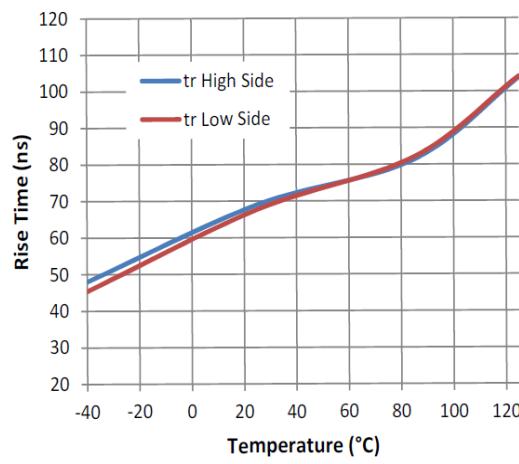
**Figure 6.** Turn-off Propagation Delay vs. Supply Voltage



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

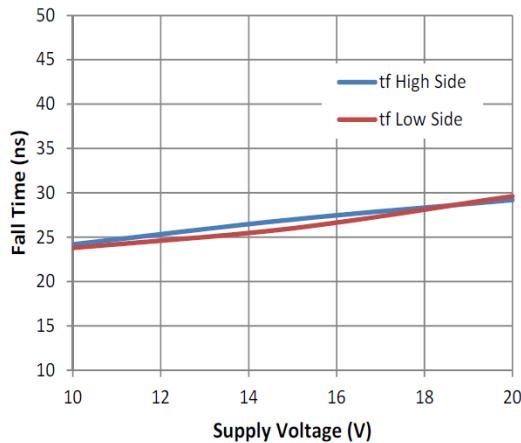


**Figure 8.** Rise Time vs. Supply Voltage

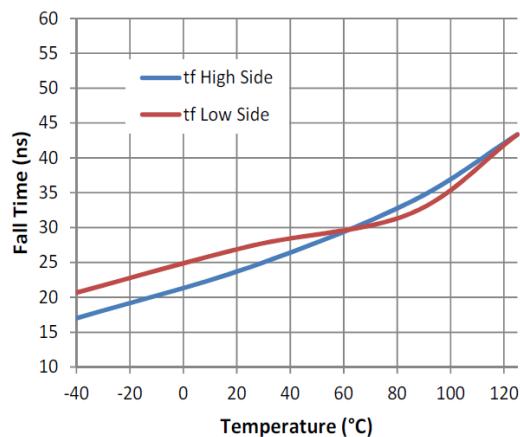


**Figure 9.** Rise Time vs. Temperature

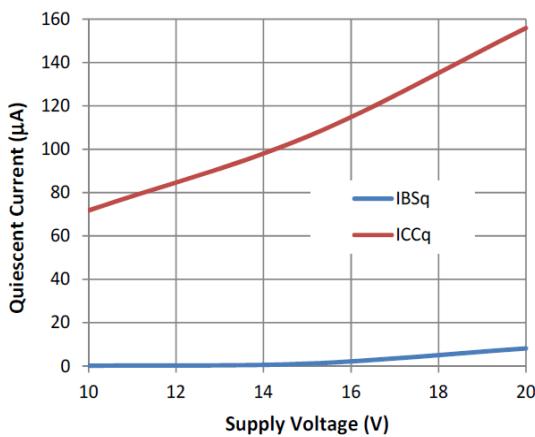
**Typical Performance Characteristics (Cont.)**



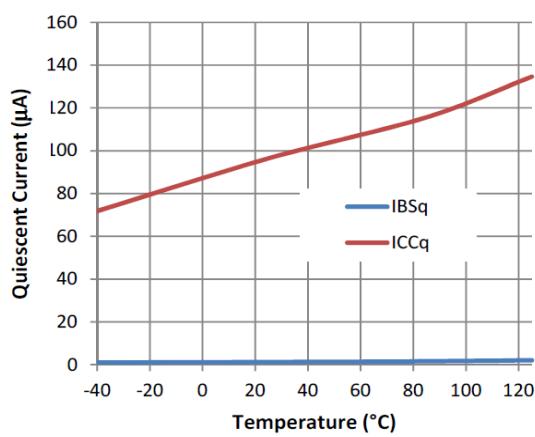
**Figure 10.** Fall Time vs. Supply Voltage



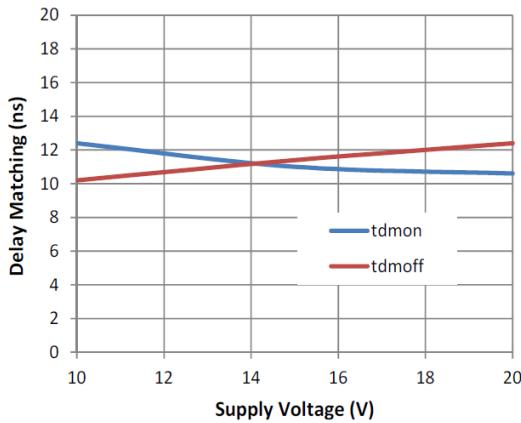
**Figure 11.** Fall Time vs. Temperature



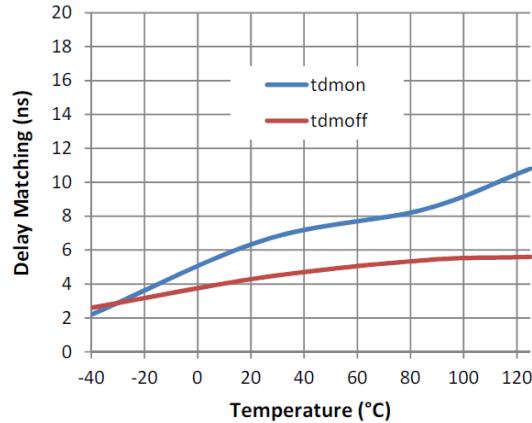
**Figure 12.** Quiescent Current vs. Supply Voltage



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

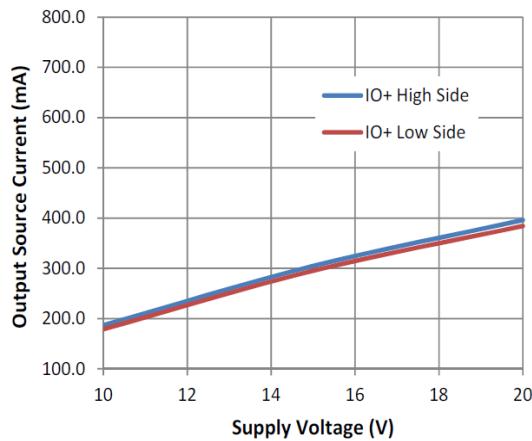


**Figure 14.** Delay Matching vs. Supply Voltage

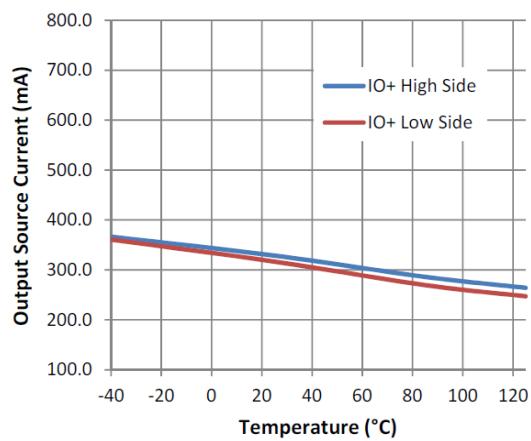


**Figure 15.** Delay Matching vs. Temperature

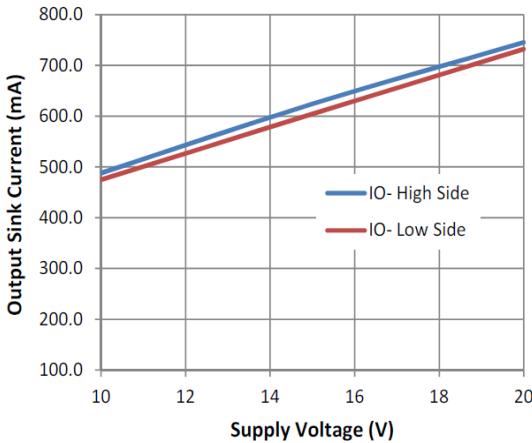
**Typical Performance Characteristics (Cont.)**



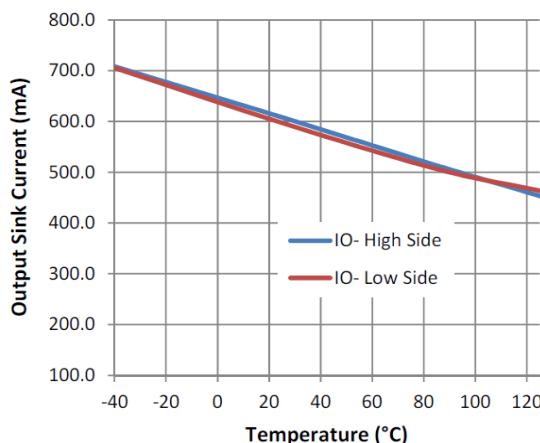
**Figure 16.** Output Source Current vs. Supply Voltage



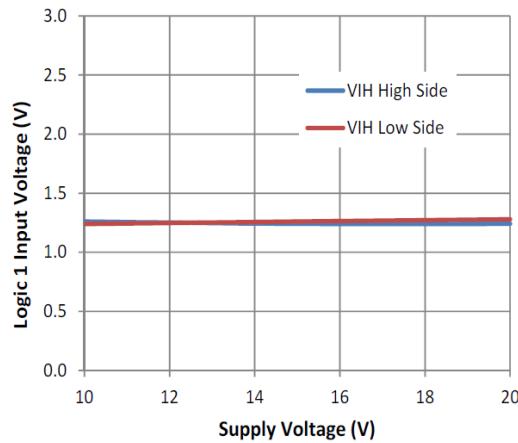
**Figure 17.** Output Source Current vs. Temperature



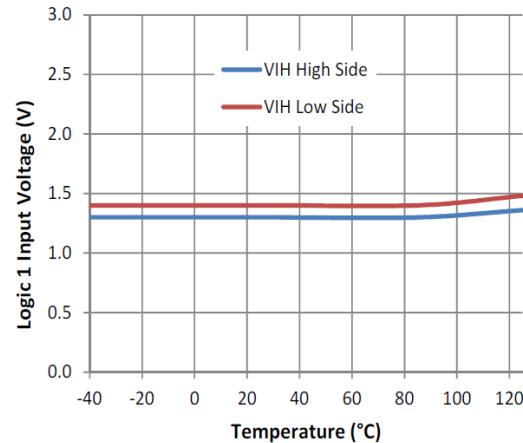
**Figure 18.** Output Sink Current vs. Supply Voltage



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

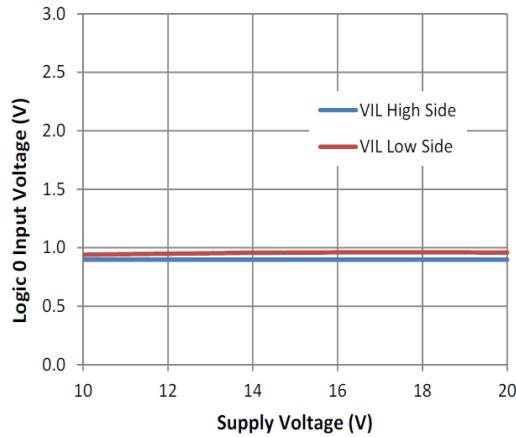


**Figure 20.** Logic 1 Input Voltage vs. Supply Voltage

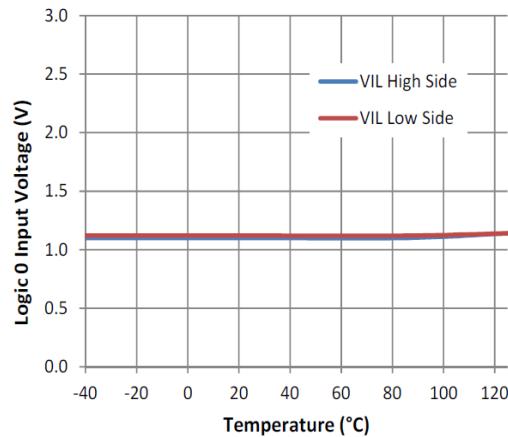


**Figure 21.** Logic 1 Input Voltage vs. Temperature

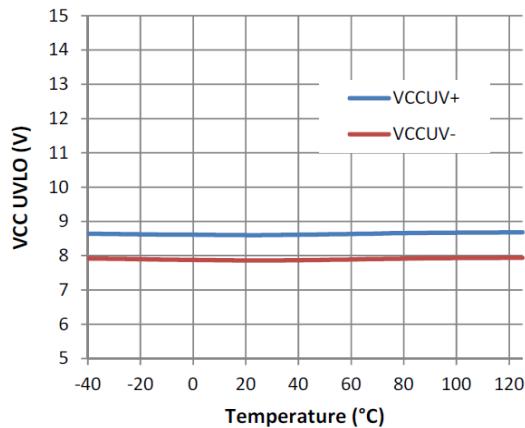
**Typical Performance Characteristics (Cont.)**



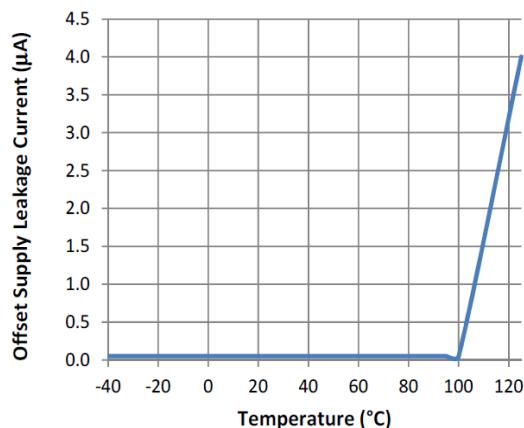
**Figure 22.** Logic 0 Input Voltage vs. Supply Voltage



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



**Figure 24.**  $V_{cc}$  UVLO vs. Temperature

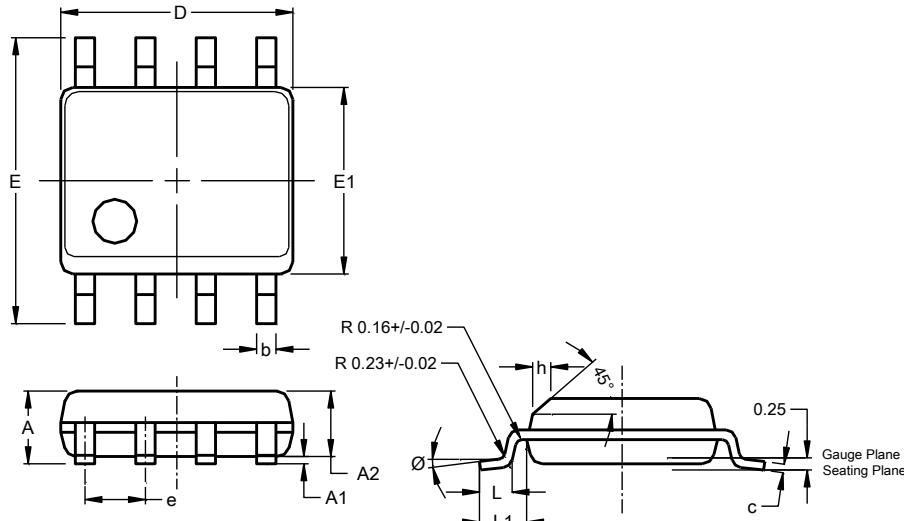


**Figure 25.** Offset Supply Leakage Current vs. Temperature

## Package Outline Dimensions

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

SO-8 (Type TH)



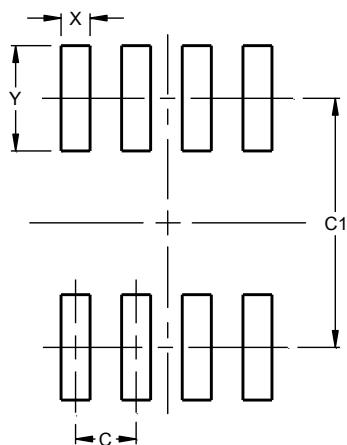
SO-8 (Type TH)			
Dim	Min	Max	Typ
<b>A</b>	1.35	1.75	--
<b>A1</b>	0.10	0.25	--
<b>A2</b>	--	--	1.45
<b>b</b>	0.35	0.51	--
<b>c</b>	0.190	0.248	--
<b>D</b>	4.80	5.00	4.90
<b>E</b>	5.80	6.20	6.00
<b>E1</b>	3.80	4.00	3.90
<b>e</b>	--	--	1.27
<b>h</b>	0.25	0.50	--
<b>L</b>	0.41	1.27	--
<b>L1</b>	--	--	1.04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