

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 SO-8 package, the operating temperature extends from -40°C to +125°C.

Applications

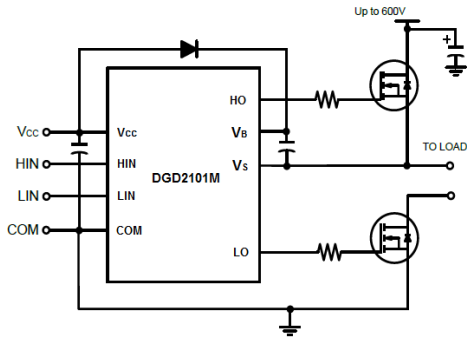
- DC-DC Converters
- DC-AC Inverters
- AC-DC Power Supplies
- Motor Controls
- Class D Power Amplifiers

Features

- Floating High-Side Driver in Bootstrap Operation to 600V
- Drives Two N-Channel MOSFETs or IGBTs in 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}
- 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 Ⓔ3
- Weight: 0.075 grams (Approximate)



Typical Configuration



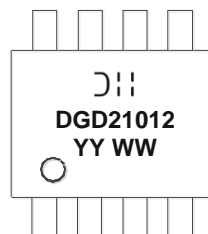
SO-8
Top View

Ordering Information (Note 4)

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

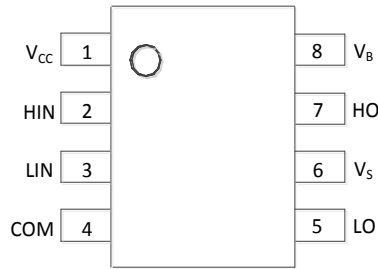
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- 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
- DGD21012 = Product Type Marking Code
- YY = Year (ex: 19 = 2019)
- WW = Week (01 to 53)

Pin Diagrams

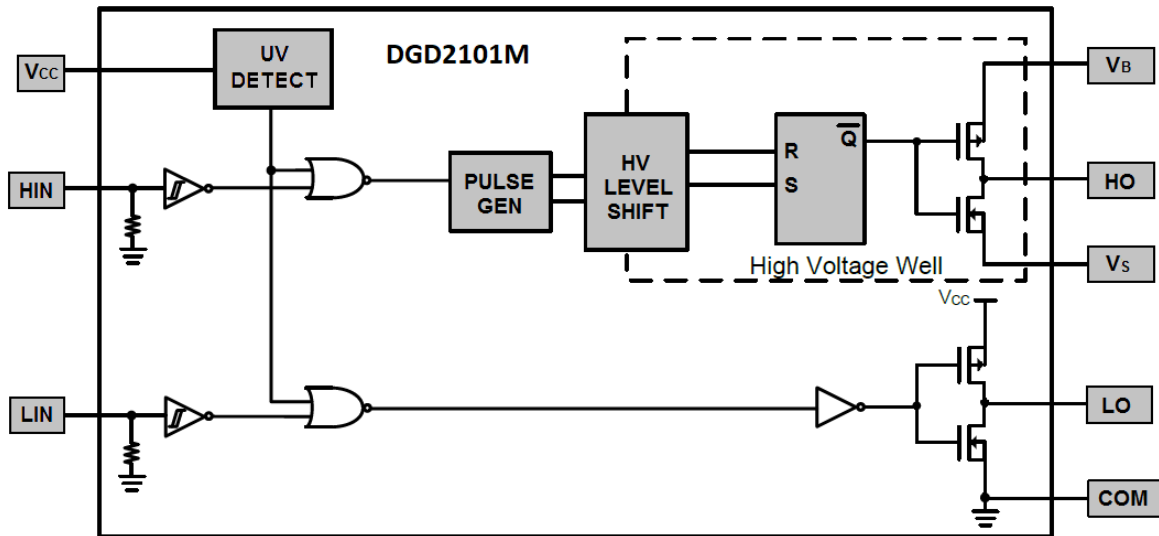


Top View: SO-8

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 (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 _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 _{θJA}	200	°C/W
Thermal Resistance, Junction to Case (Note 5)	R _{θJC}	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 = -5V to +600V.

DC Electrical Characteristics ($V_{BIAS} (V_{CC}, V_{BS}) = 15V, @T_A = +25^\circ C$, 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}	—	—	0.8	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	μA	$V_B = V_S = 600V$
Quiescent V_{BS} Supply Current	I_{BSQ}	—	30	55	μA	$V_{IN} = 0V$ or $5V$
Quiescent V_{CC} Supply Current	I_{CCQ}	—	150	270	μA	$V_{IN} = 0V$ or $5V$
Logic "1" Input Bias Current	I_{IN+}	—	3.0	10	μA	$V_{IN} = 5V$
Logic "0" Input Bias Current	I_{IN-}	—	—	5.0	μA	$V_{IN} = 0V$
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	$V_O = 0V, V_{IN} = \text{Logic "1"}, PW \leq 10\mu s$
Output Low Short Circuit Pulsed Current	I_{O-}	270	600	—	mA	$V_O = 15V, V_{IN} = \text{Logic "0"}, PW \leq 10\mu s$

- Notes:
- 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.
 - For optimal operation, it is recommended that the input pulses (H_{IN} and L_{IN}) should have a minimum amplitude of 2.5V with a minimum pulse width of 300ns.

AC Electrical Characteristics ($V_{BIAS} (V_{CC}, V_{BS}) = 15V, C_L = 1000pF, @T_A = +25^\circ C$, 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

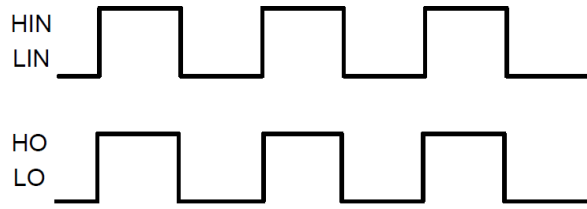


Figure 1. Input / Output Timing Diagram

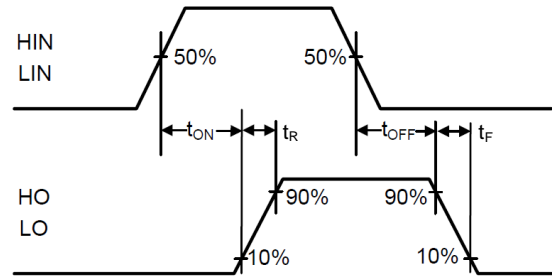


Figure 2. Switching Time Waveform Definitions

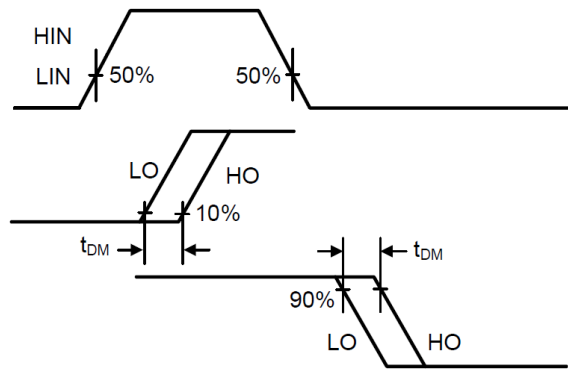


Figure 3. Delay Matching Waveform Definitions

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

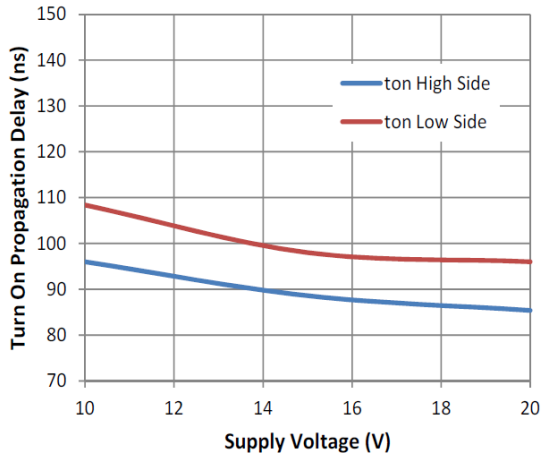


Figure 4. Turn-on Propagation Delay vs. Supply Voltage

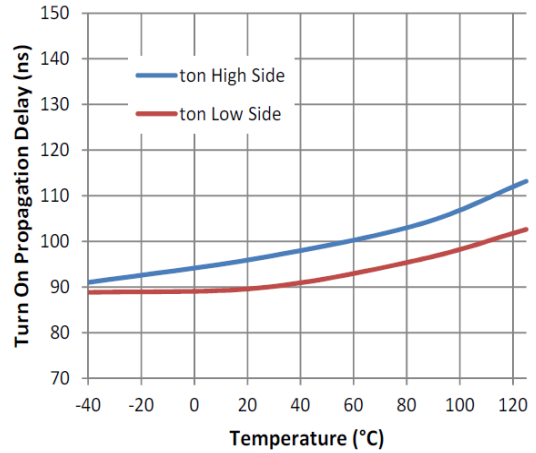


Figure 5. Turn-on Propagation Delay vs. Temperature

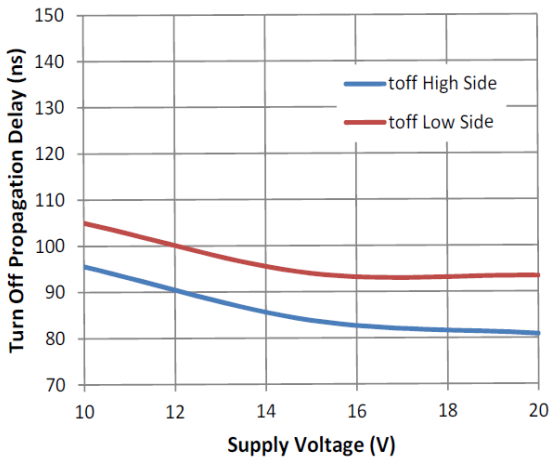


Figure 6. Turn-off Propagation Delay vs. Supply Voltage

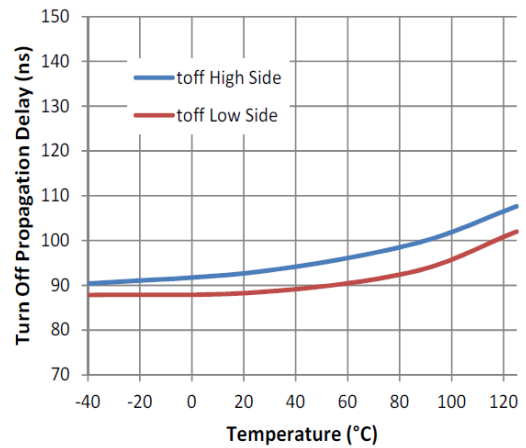


Figure 7. Turn-off Propagation Delay vs. Temperature

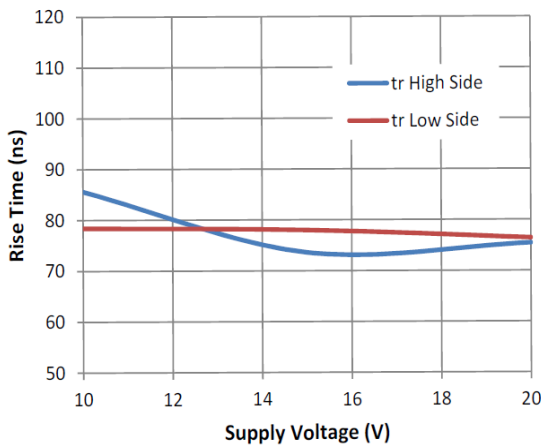


Figure 8. Rise Time vs. Supply Voltage

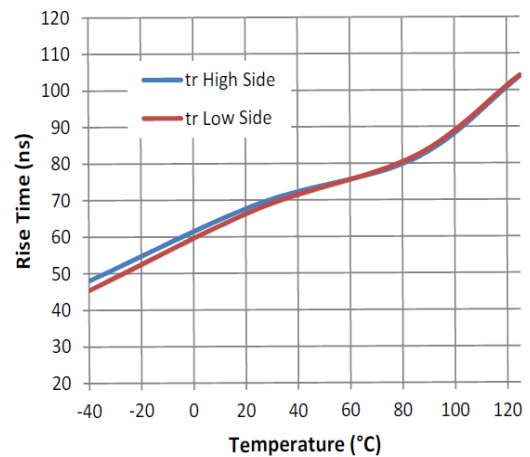


Figure 9. Rise Time vs. Temperature

Typical Performance Characteristics (continued)

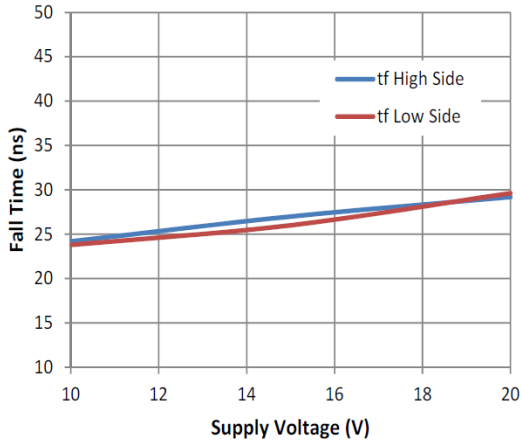


Figure 10. Fall Time vs. Supply Voltage

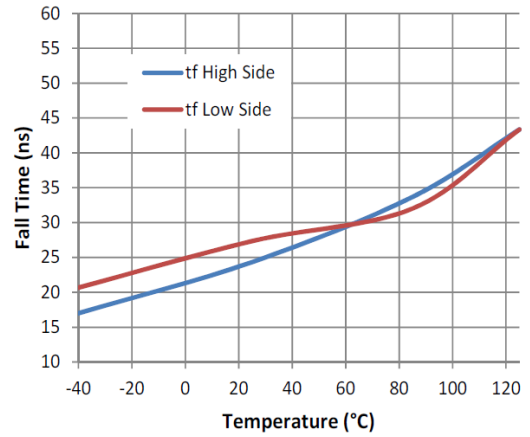


Figure 11. Fall Time vs. Temperature

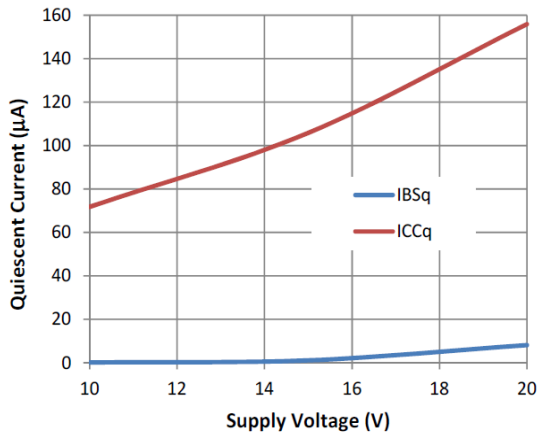


Figure 12. Quiescent Current vs. Supply Voltage

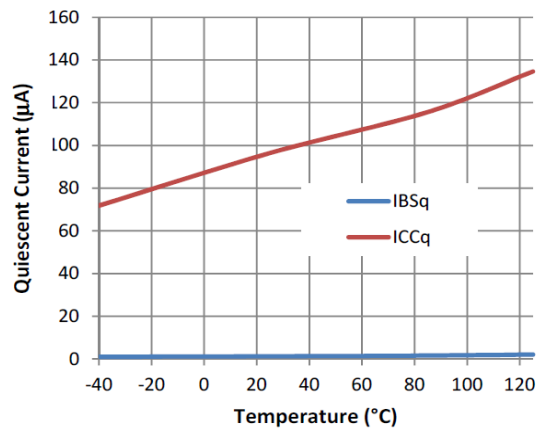


Figure 13. Quiescent Current vs. Temperature

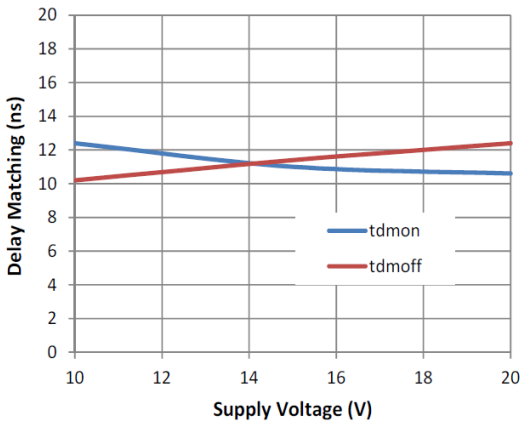


Figure 14. Delay Matching vs. Supply Voltage

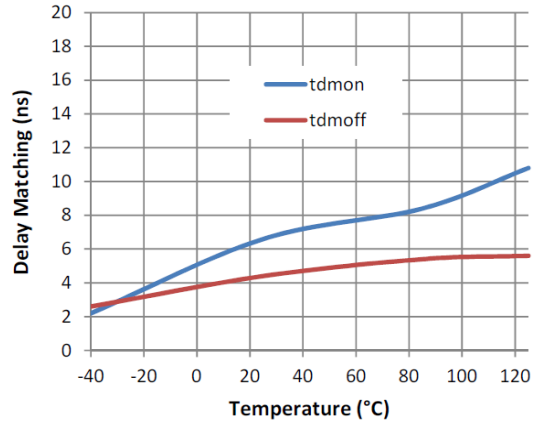


Figure 15. Delay Matching vs. Temperature

Typical Performance Characteristics (continued)

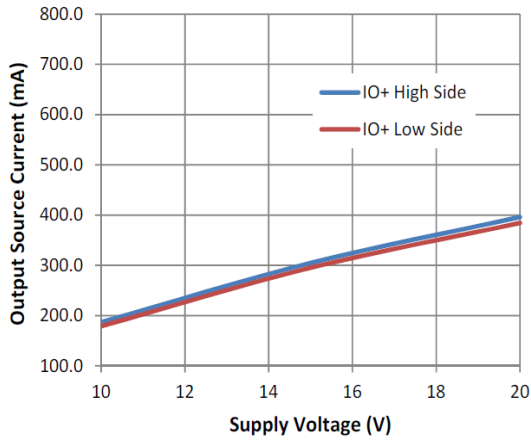


Figure 16. Output Source Current vs. Supply Voltage

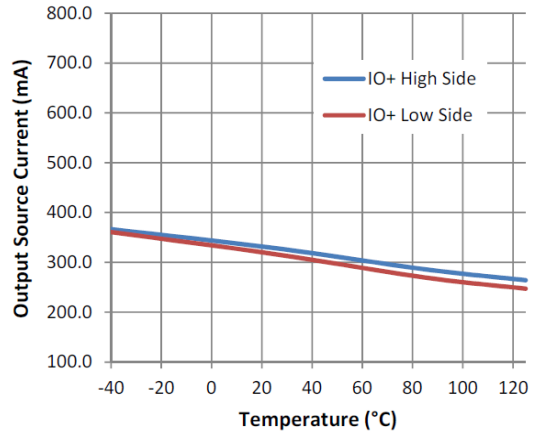


Figure 17. Output Source Current vs. Temperature

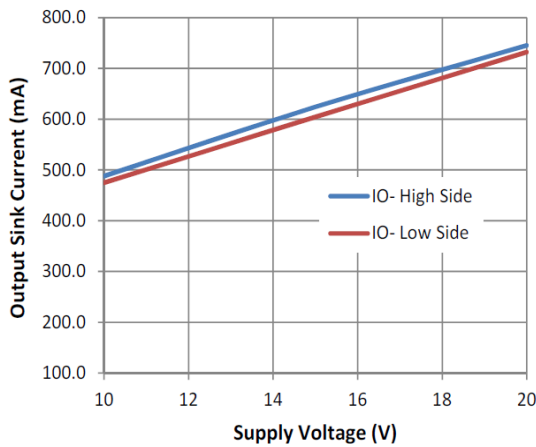


Figure 18. Output Sink Current vs. Supply Voltage

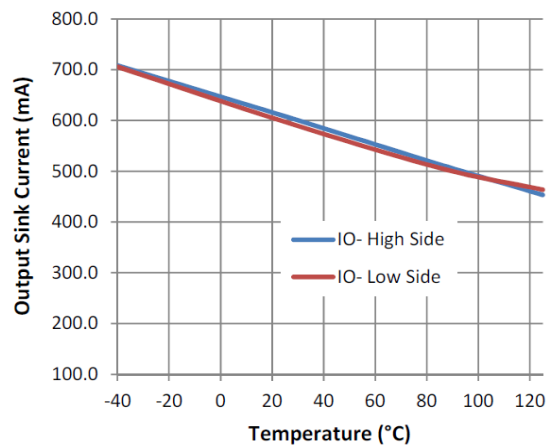


Figure 19. Output Sink Current vs. Temperature

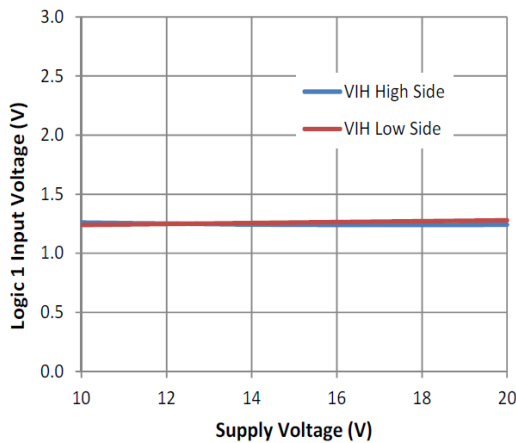


Figure 20. Logic 1 Input Voltage vs. Supply Voltage

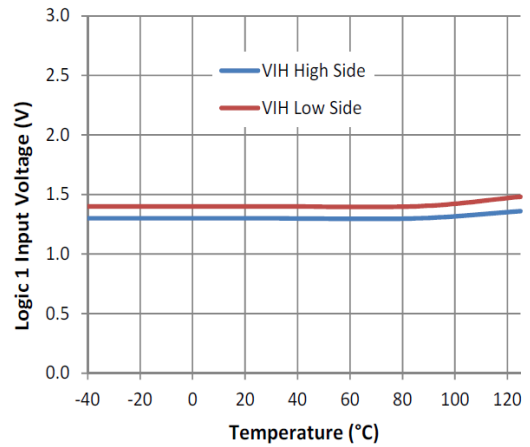


Figure 21. Logic 1 Input Voltage vs. Temperature

Typical Performance Characteristics (continued)

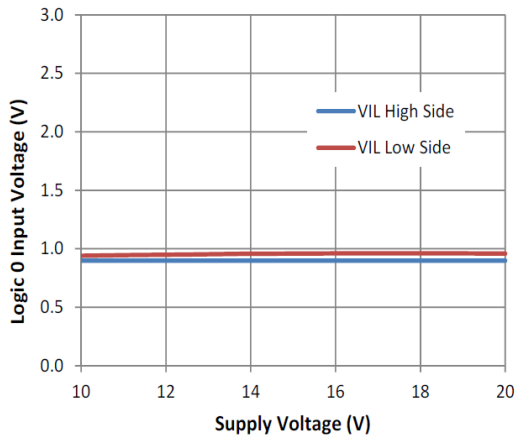


Figure 22. Logic 0 Input Voltage vs. Supply Voltage

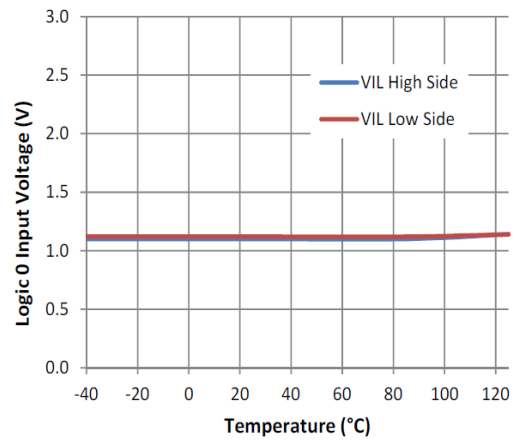


Figure 23. Logic 0 Input Voltage vs. Temperature

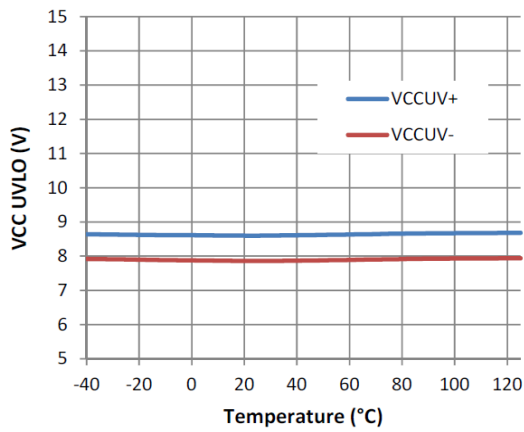


Figure 24. V_{CC} UVLO vs. Temperature

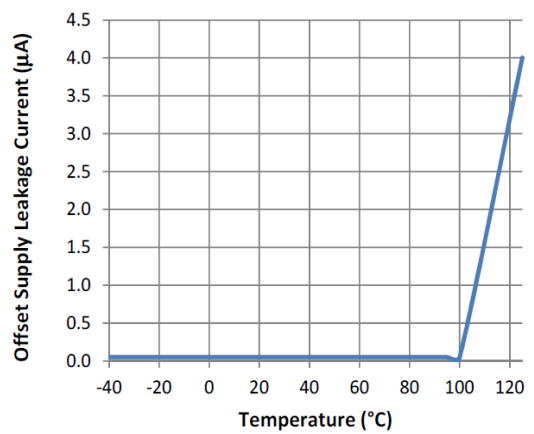
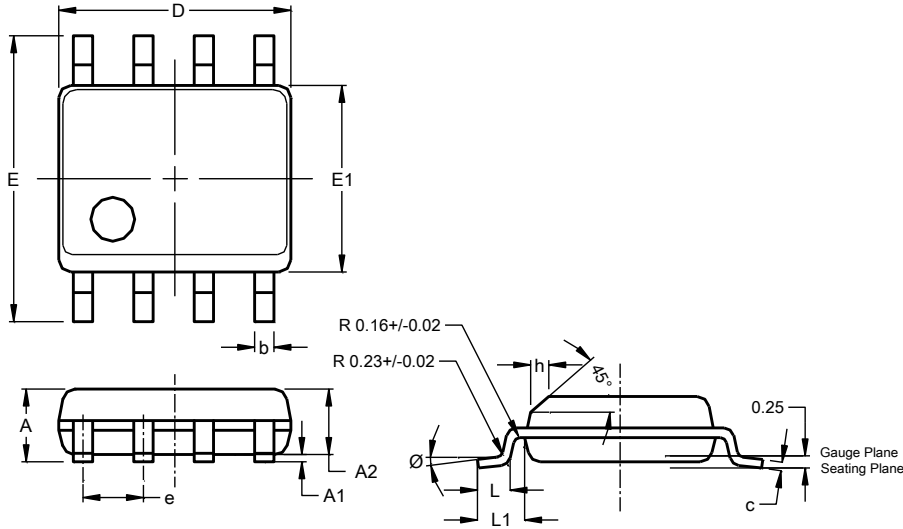


Figure 25. Offset Supply Leakage Current Temperature

Package Outline Dimensions

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

SO-8 (Type TH)

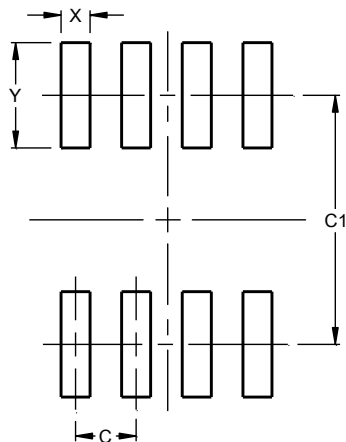


SO-8 (Type TH)			
Dim	Min	Max	Typ
A	1.35	1.75	--
A1	0.10	0.25	--
A2	--	--	1.45
b	0.35	0.51	--
c	0.190	0.248	--
D	4.80	5.00	4.90
E	5.80	6.20	6.00
E1	3.80	4.00	3.90
e	--	--	1.27
h	0.25	0.50	--
L	0.41	1.27	--
L1	--	--	1.04
Ø	0°	8°	--
All Dimensions in mm			

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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