

## Description

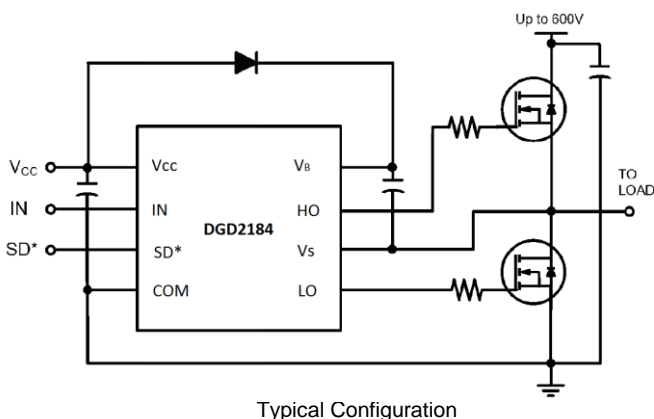
The DGD2184 is a high voltage / high speed gate driver capable of driving N-Channel MOSFETs and IGBTs in a half bridge configuration. High voltage processing techniques enable the DGD2184's high-side to switch to 600V in a bootstrap operation.

The DGD2184 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 DGD2184 has a fixed internal deadtime of 400ns (typ).

The DGD2184 is offered in 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 Half Bridge Configuration
- 1.4A Source / 1.8A Sink Output Current Capability
- Outputs Tolerant to Negative Transients
- Internal Dead Time of 400ns to Protect MOSFETs
- Wide Low-side Gate Driver and Logic Supply: 10V to 20V
- Logic Input (IN and SD\*) 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)**

## 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 Ⓔ
- Weight: 0.075 grams (Approximate)



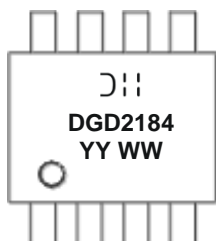
SO-8 (Type TH)  
Top View

## Ordering Information (Note 4)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
DGD2184S8-13	DGD2184	13	12	2,500

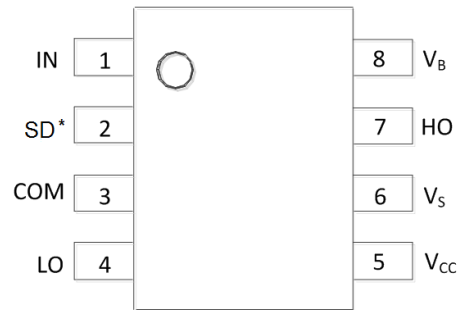
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "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>.

## Marking Information



- DGD2184 = Manufacturer's marking  
 DGD2184 = Product Type Marking Code  
 YY = Year (ex: 16 = 2016)  
 WW = Week (01 to 53)

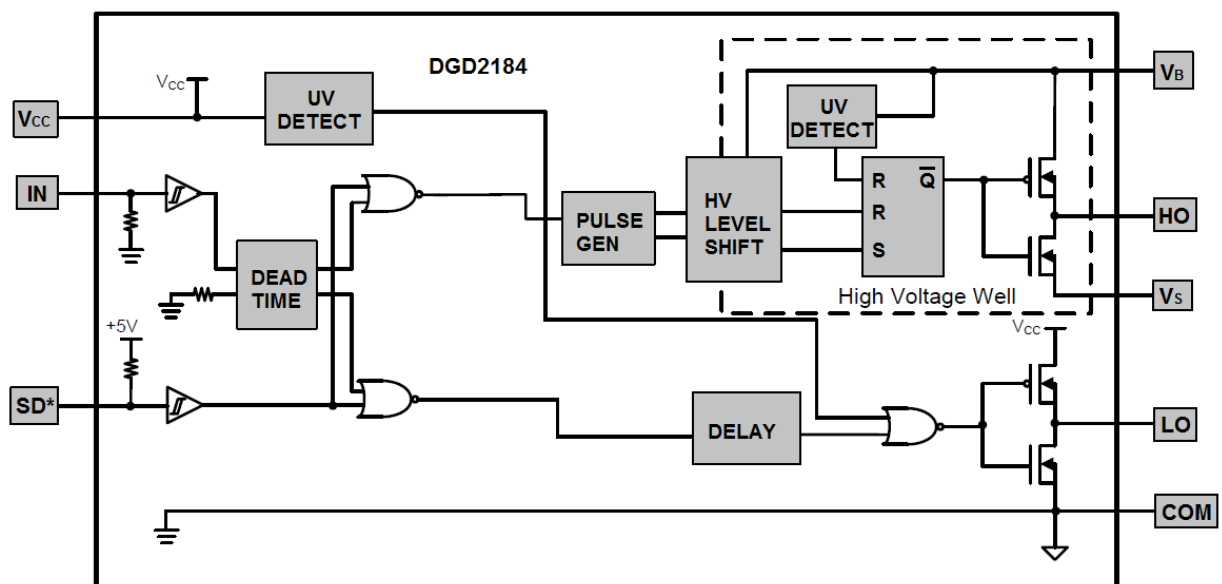
## Pin Diagrams



## Pin Descriptions

Pin Number	Pin Name	Function
1	IN	Logic input for High-side and Low-side Gate Driver Outputs (HO and LO), in Phase with HO
2	SD*	Logic Input for Shutdown, Enabled Low
3	COM	Low-side and Logic Return
4	LO	Low-side Gate Drive Output
5	V <sub>CC</sub>	Low-side and Logic Fixed Supply
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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
High-side Floating Supply Voltage	V <sub>B</sub>	-0.3 to +624	V
High-side Floating Supply Offset Voltage	V <sub>S</sub>	V <sub>B</sub> -24 to V <sub>B</sub> +0.3	V
High-side Floating Output Voltage	V <sub>HO</sub>	V <sub>S</sub> -0.3 to V <sub>B</sub> +0.3	V
Offset Supply Voltage Transient	dV <sub>S</sub> / dt	50	V/ns
Low-side Fixed Supply Voltage	V <sub>CC</sub>	-0.3 to +24	V
Low-side Output Voltage	V <sub>LO</sub>	-0.3 to V <sub>CC</sub> +0.3	V
Logic Input Voltage (IN and SD*)	V <sub>IN</sub>	-0.3 to V <sub>CC</sub> +0.3	V

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation Linear derating factor (Note 5)	P <sub>D</sub>	0.625	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	200	°C/W
Operating Temperature	T <sub>J</sub>	+150	°C
Lead Temperature (Soldering, 10s)	T <sub>L</sub>	+300	
Storage Temperature Range	T <sub>STG</sub>	-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 <sub>B</sub>	V <sub>S</sub> + 10	V <sub>S</sub> + 20	V
High-side Floating Supply Offset Voltage	V <sub>S</sub>	(Note 6)	600	V
High-side Floating Output Voltage	V <sub>HO</sub>	V <sub>S</sub>	V <sub>B</sub>	V
Low-side Fixed Supply Voltage	V <sub>CC</sub>	10	20	V
Low-side Output Voltage	V <sub>LO</sub>	0	V <sub>CC</sub>	V
Logic Input Voltage (IN and SD*)	V <sub>IN</sub>	0	V <sub>CC</sub>	V
Ambient Temperature	T <sub>A</sub>	-40	+125	°C

Note: 6. Logic operation for V<sub>S</sub> of -5V to +600V. Logic state held for V<sub>S</sub> of -5V to -V<sub>BS</sub>.

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

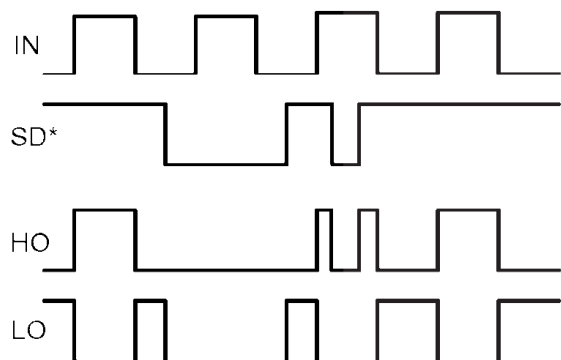
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic "1" Input Voltage	$V_{IH}$	2.5	–	–	V	$V_{CC} = 10V$ to 20V
Logic "0" Input Voltage	$V_{IL}$	–	–	0.8	V	$V_{CC} = 10V$ to 20V
SD* Input Positive Going Threshold	$V_{SDTH+}$	2.5	50	–	V	$V_{CC} = 10V$ to 20V
SD* Input Negative Going Threshold	$V_{SDTH-}$	–	20	0.8	V	$V_{CC} = 10V$ to 20V
High Level Output Voltage, $V_{BIAS} - V_O$	$V_{OH}$	–	–	1.2	V	$I_O = 0mA$
Low Level Output Voltage, $V_O$	$V_{OL}$	–	–	0.1	V	$I_O = 20mA$
Offset Supply Leakage Current	$I_{LK}$	–	–	50	$\mu A$	$V_B = V_S = 600V$
Quiescent $V_{BS}$ Supply Current	$I_{BSQ}$	20	60	150	$\mu A$	$V_{IN} = 0V$ or 5V
Quiescent $V_{CC}$ Supply Current	$I_{CCQ}$	0.4	1.0	1.8	mA	$V_{IN} = 0V$ or 5V
Logic "1" Input Bias Current	$I_{IN+}$	–	25	60	$\mu A$	$I_N = 5V$ , $SD^* = 0V$
Logic "0" Input Bias Current	$I_{IN-}$	–	–	1.0	$\mu A$	$I_N = 0V$ , $SD^* = 5V$
$V_{BS}$ Supply Under-voltage Positive Going Threshold	$V_{BSUV+}$	8.0	8.9	9.8	V	–
$V_{BS}$ Supply Under- voltage Negative Going Threshold	$V_{BSUV-}$	7.4	8.2	9.0	V	–
$V_{CC}$ Supply Under- voltage Positive Going Threshold	$V_{CCUV+}$	8.0	8.9	9.8	V	–
$V_{CC}$ Supply Under-voltage Negative Going Threshold	$V_{CCUV-}$	7.4	8.2	9.0	V	–
Output High Short Circuit Pulsed Current	$I_{O+}$	1.4	1.9	–	A	$V_O = 0V$ , $PW \leq 10\mu s$
Output Low Short Circuit Pulsed Current	$I_{O-}$	1.7	2.3	–	A	$V_O = 15V$ , $PW \leq 10\mu s$

Note: 7. The  $V_{IN}$  and  $I_{IN}$  parameters are applicable to the two logic input pins:  $I_N$  and  $SD^*$ . The  $V_O$  and  $I_O$  parameters are applicable to the respective output pins:  $H_O$  and  $L_O$ .

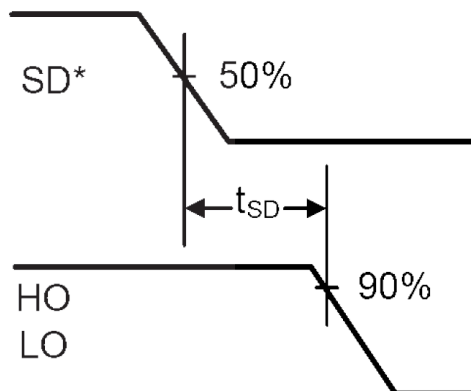
**AC Electrical Characteristics** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V,  $C_L = 1000pF$ , @  $T_A$  = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Turn-on Propagation Delay	$t_{ON}$	–	680	900	ns	$V_S = 0V$
Turn-off Propagation Delay	$t_{OFF}$	–	270	400	ns	$V_S = 0V$ or 600V
Shut-down Propagation Delay	$t_{SD}$	–	180	270	ns	–
Delay Matching, $H_O$ & $L_O$ Turn-on	$t_{DMON}$	–	–	90	ns	–
Delay Matching, $H_O$ & $L_O$ Turn-off	$t_{DMOFF}$	–	–	40	ns	$I_O = 0A$
Turn-on Rise Time	$t_R$	–	40	60	ns	$V_S = 0V$
Turn-off Fall Time	$t_F$	–	20	35	ns	$V_S = 0V$
Deadtime: $t_{DT L_O-H_O}$ & $t_{DT H_O-L_O}$	$t_{DT}$	280	400	520	ns	–

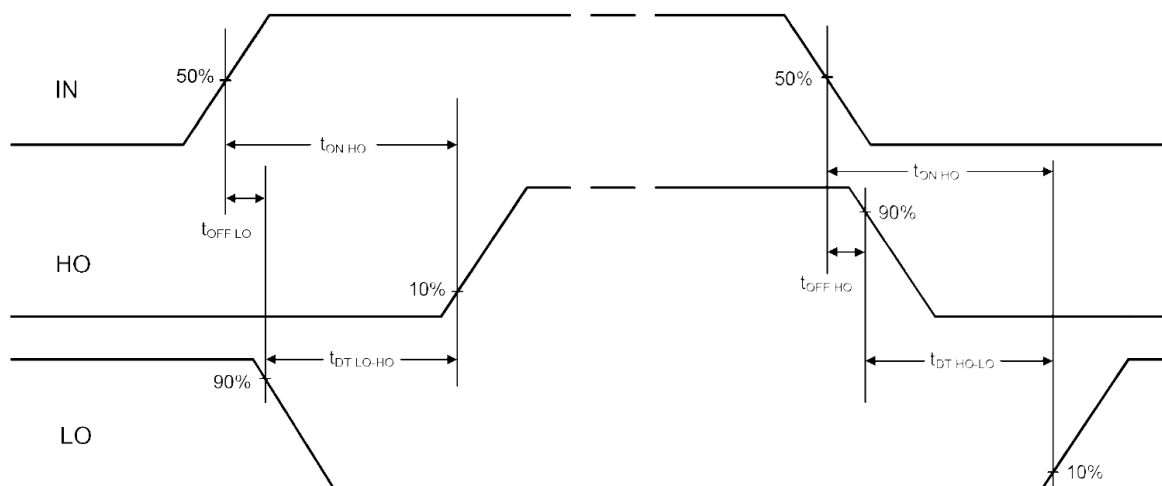
## Timing Waveforms



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



**Figure 2.** Shutdown Waveform Definitions



$$\text{Deadtime } t_{DT\ LO-HO} = t_{ON\ HO} - t_{OFF\ LO}$$

$$t_{DT\ HO-LO} = t_{ON\ LO} - t_{OFF\ HO}$$

Deadtime matching

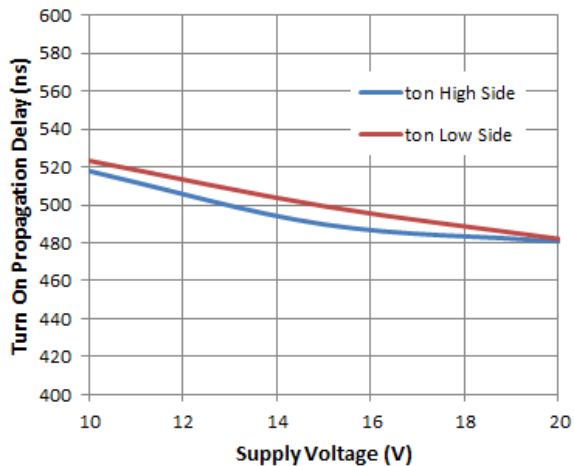
$$t_{MDT} = t_{DT\ LO-HO} - t_{DT\ HO-LO}$$

Delay matching

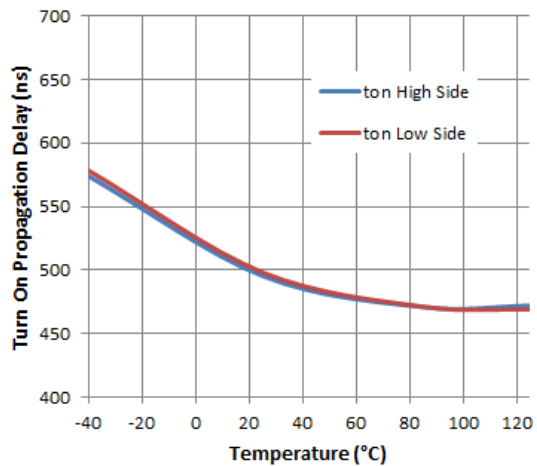
$$t_{DM\ OFF} = t_{OFF\ LO} - t_{OFF\ HO}$$

**Figure 3.** Switching Time Waveform Definitions

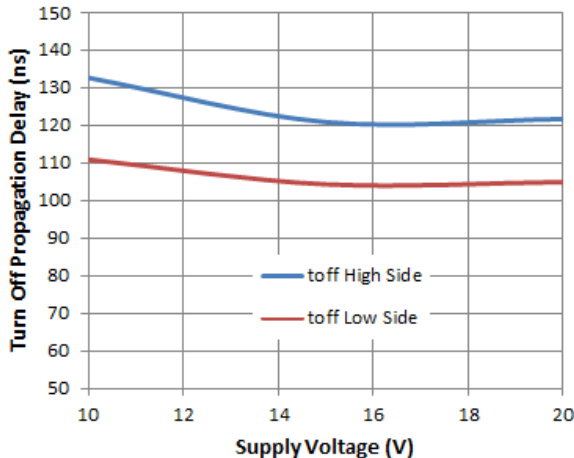
**Typical Performance Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



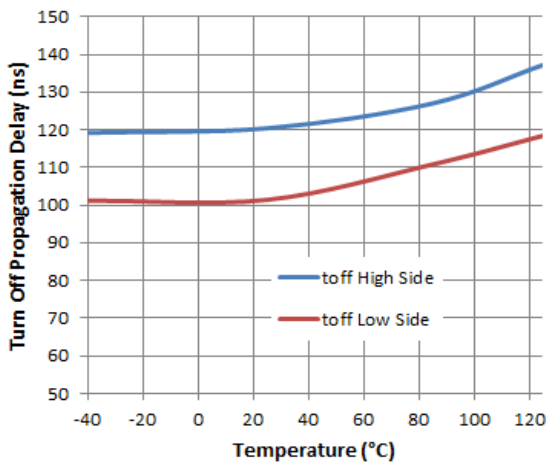
**Figure 4.** Turn-on Propagation Delay vs. Supply Voltage



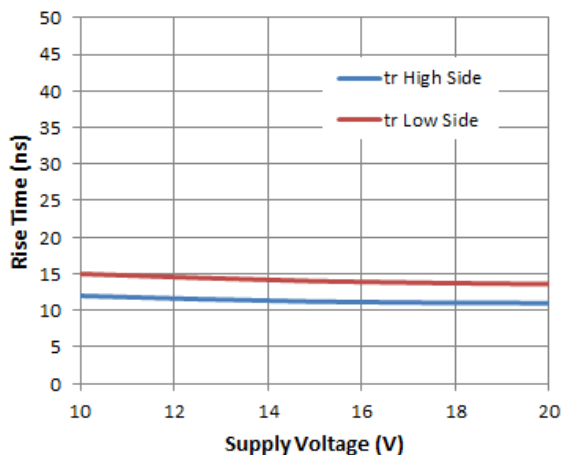
**Figure 5.** Turn-on Propagation Delay vs. Temperature



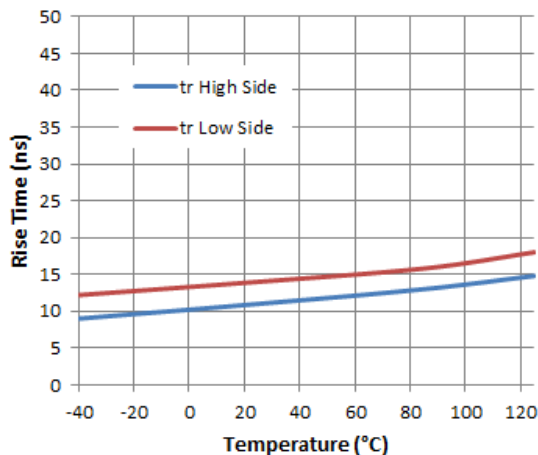
**Figure 6.** Turn-off Propagation Delay vs. Supply Voltage



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



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



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

# Typical Performance Characteristics (Cont.)

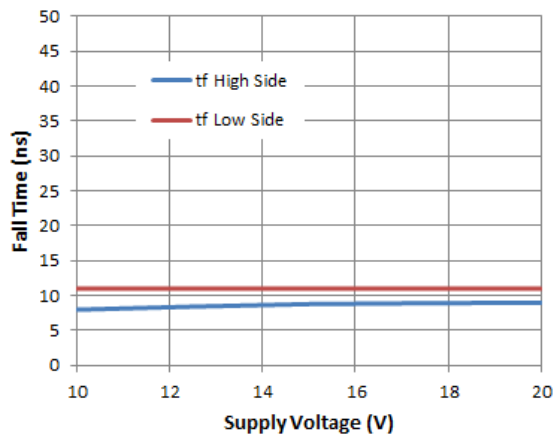


Figure 10. Fall Time vs. Supply Voltage

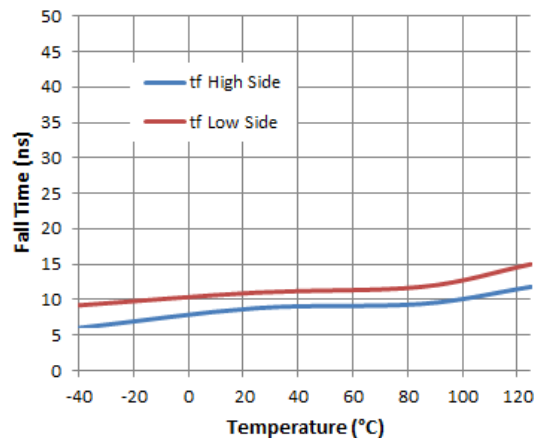


Figure 11. Fall Time vs. Temperature

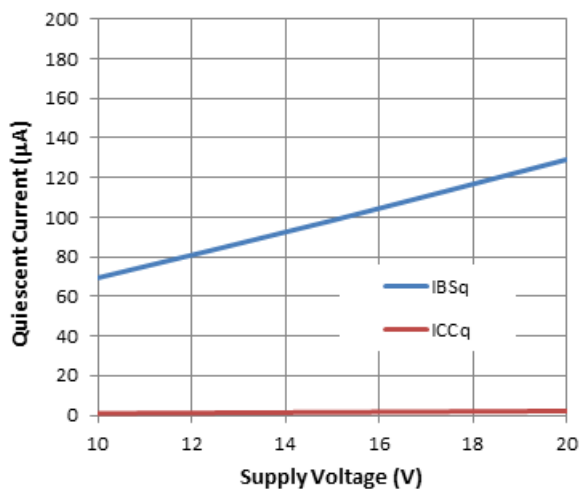


Figure 12. Quiescent Current vs. Supply Voltage

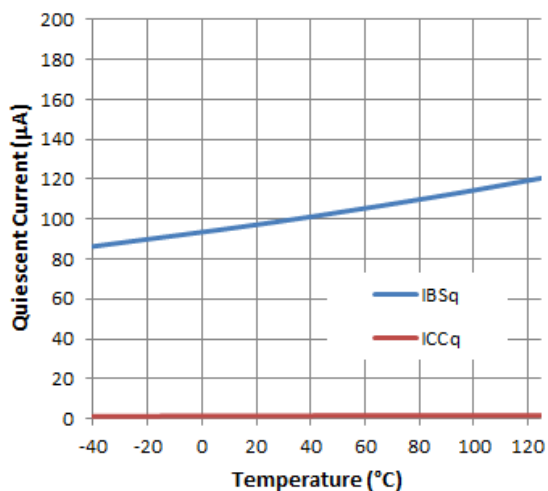


Figure 13. Quiescent Current vs. Temperature

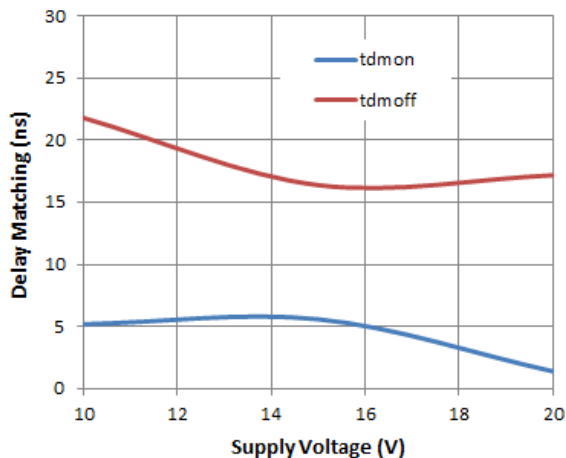


Figure 14. Delay Matching vs. Supply Voltage

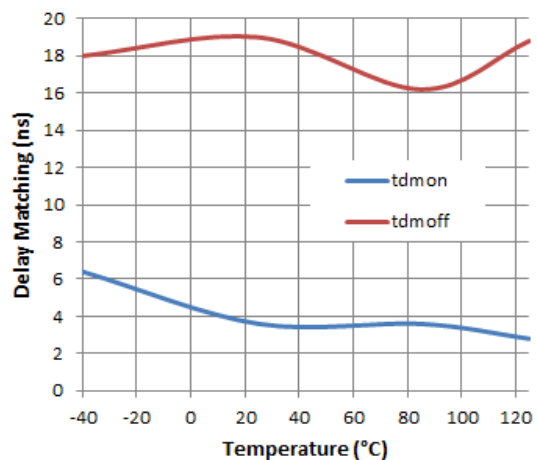
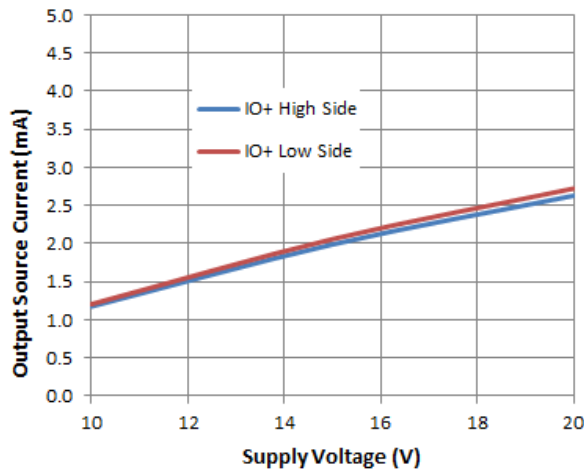
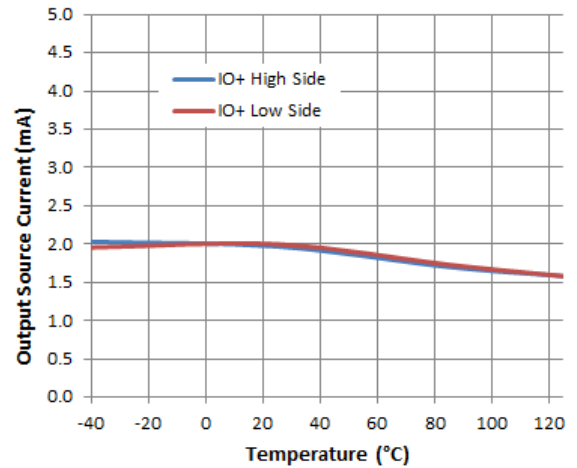


Figure 15. Delay Matching vs. Temperature

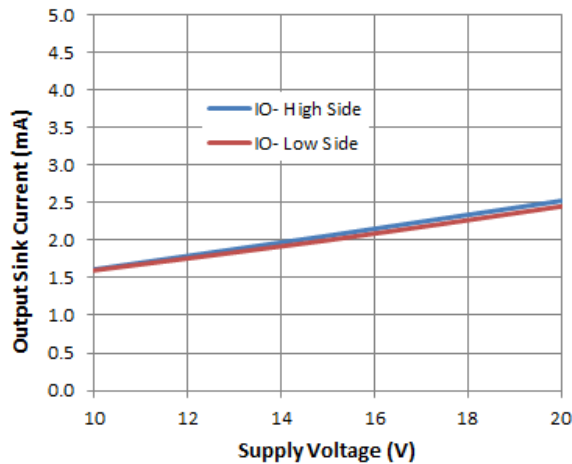
## Typical Performance Characteristics (Cont.)



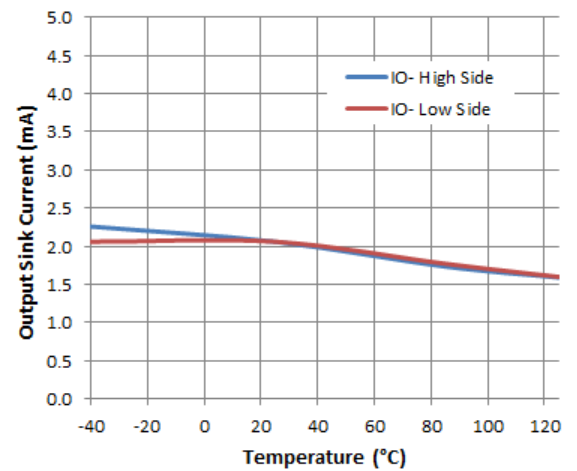
**Figure 16.** Output Source Current vs. Supply Voltage



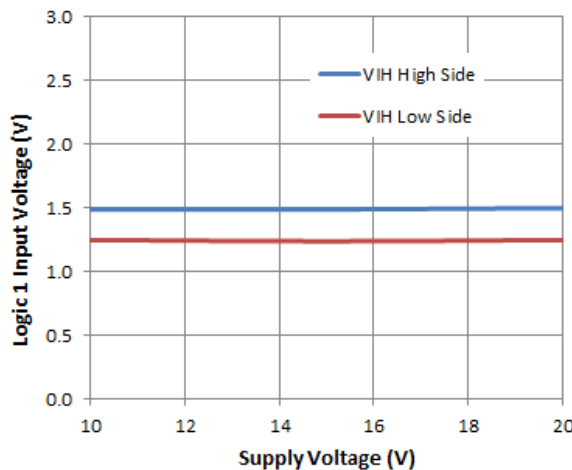
**Figure 17.** Output Source Current vs. Temperature



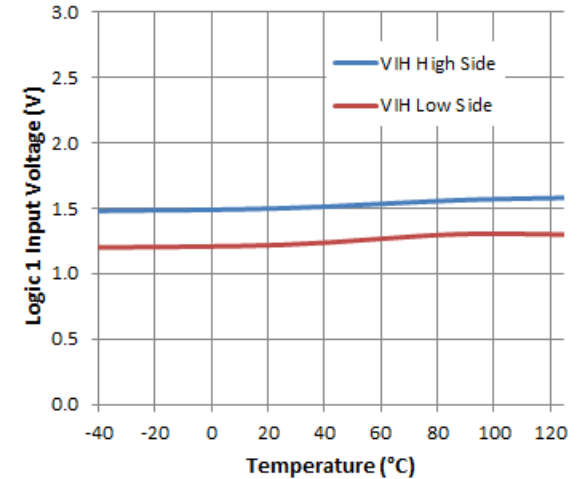
**Figure 18.** Output Sink Current vs. Supply Voltage



**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.)

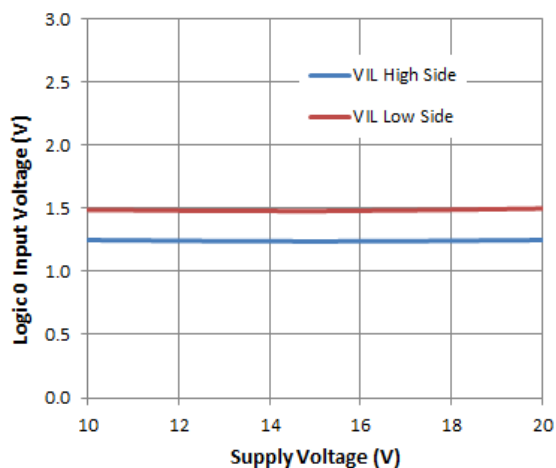


Figure 22. Logic 0 Input Voltage vs. Supply Voltage

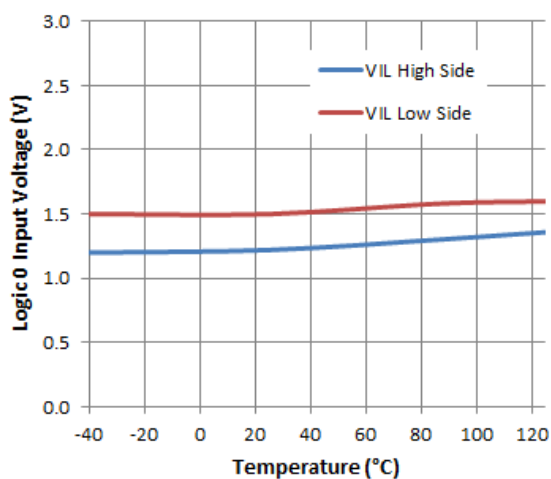


Figure 23. Logic 0 Input Voltage vs. Temperature

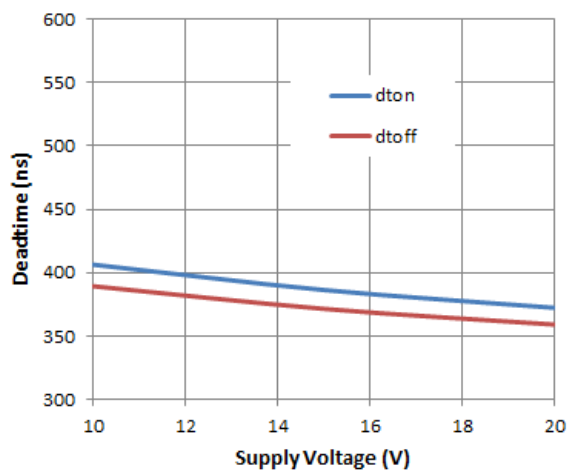


Figure 24. Deadtime vs. Supply Voltage

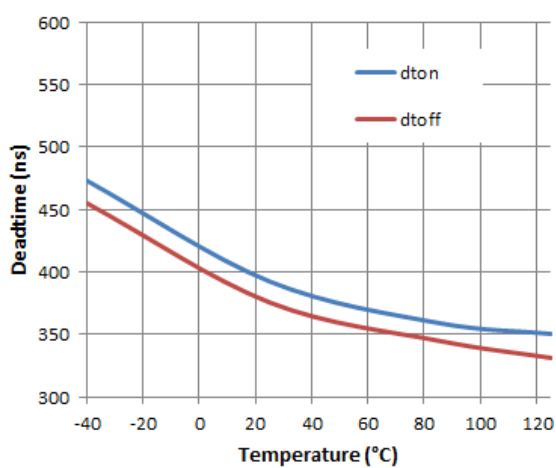


Figure 25. Deadtime vs. Temperature

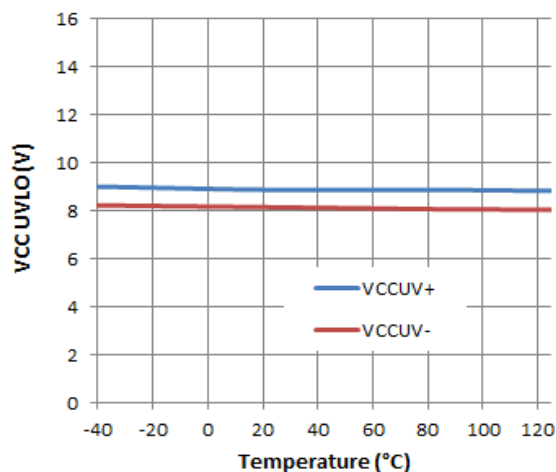


Figure 26. VCC UVLO vs. Temperature

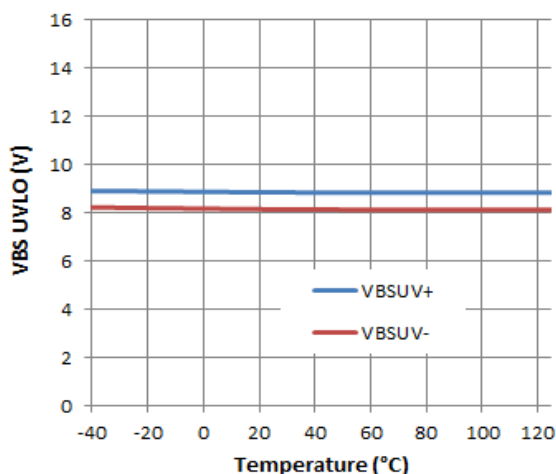
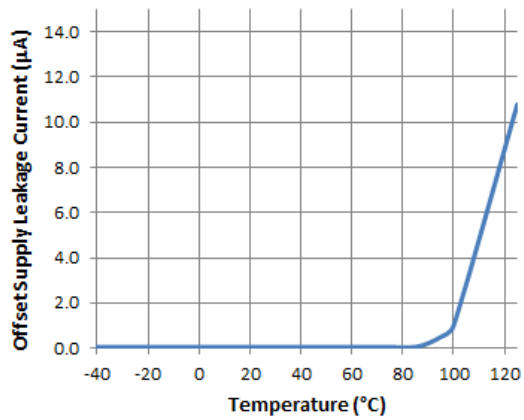


Figure 27. VBS UVLO vs. Temperature

## Typical Performance Characteristics (Cont.)

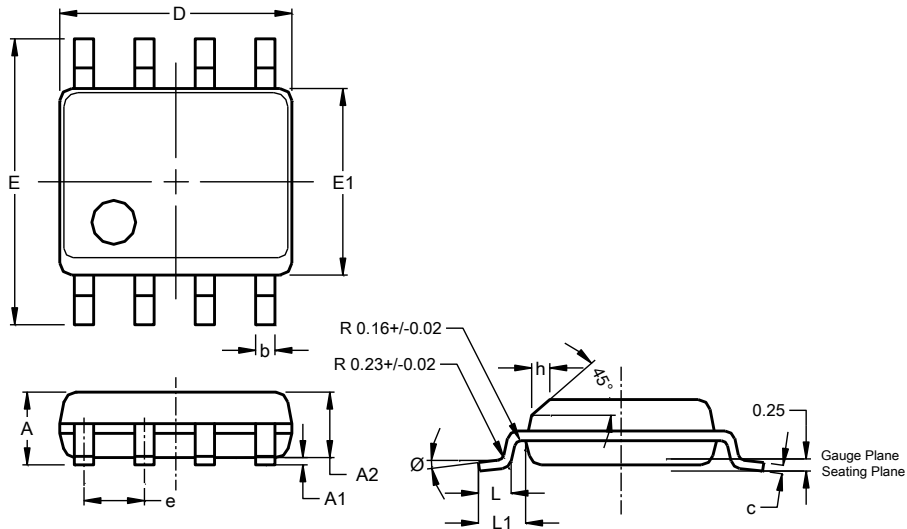


**Figure 28.** Offset Supply Leakage Current vs. Temperature

## Package Outline Dimensions

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.

### SO-8 (Type TH)

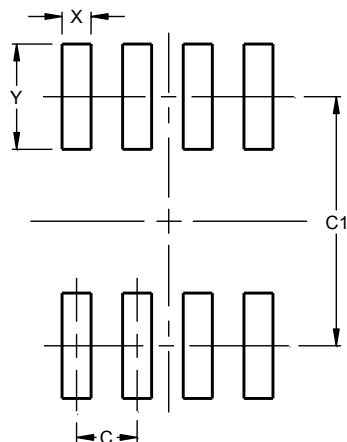


SO-8 (Type TH)			
Dim	Min	Max	Typ
A	1.35	1.75	--
A1	0.10	0.25	--
A2	--	--	1.45
b	0.35	0.51	--
c	0.190	0.248	--
D	4.80	5.00	4.90
E	5.80	6.20	6.00
E1	3.80	4.00	3.90
e	--	--	1.27
h	0.25	0.50	--
L	0.41	1.27	--
L1	--	--	1.04
Ø	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) 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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