

## Description

The DGD21844M 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 DGD21844M's high-side to switch to 600V in a bootstrap operation.

The DGD21844M 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. Programmable Deadtime, by an external resistor, provides more system level flexibility.

The DGD21844M is offered in SO-14 package, the operating temperature extends from -40°C to +125°C.

## Applications

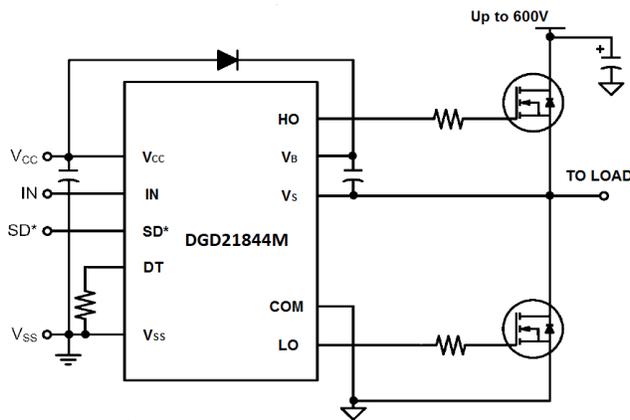
- DC-DC Converters
- DC-AC Inverters
- AC-DC Power Supplies
- Motor Controls
- Class D Power Amplifiers

## 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
- Programmable Deadtime to Protect MOSFETs
- Wide Low-Side Gate Driver and Logic Supply: 10V to 20V
- Wide Logic Supply Voltage Offset Voltage: -5V to 5V
- 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)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

## Mechanical Data

- Case: SO-14 (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: 0.142 grams (Approximate)



Typical Configuration



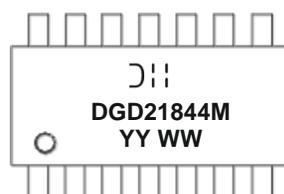
Top View

## Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
DGD21844MS14-13	DGD21844M	13	16	2,500

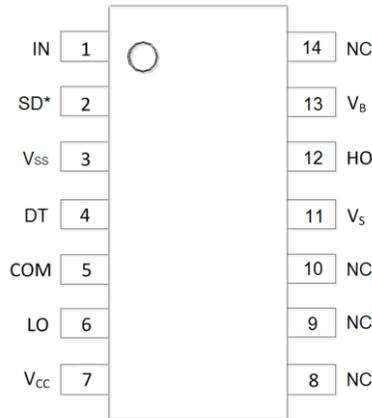
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. 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  
 DGD21844M = Product Type Marking Code  
 YY = Year (ex: 19 = 2019)  
 WW = Week (01 to 53)

## Pin Diagrams

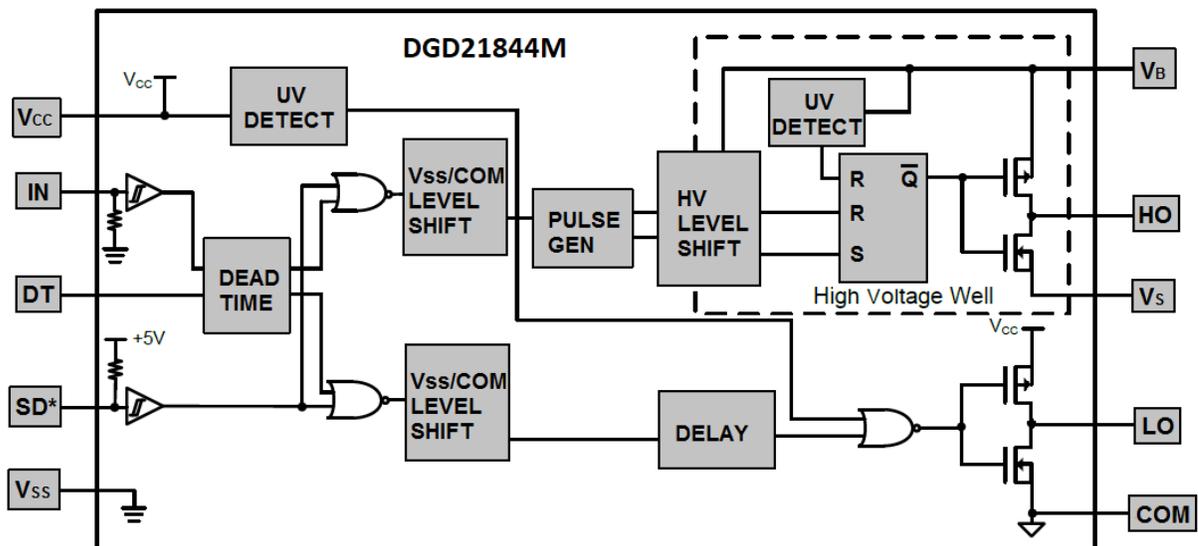


Top View SO-14

## 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 (referenced to Vss)
2	SD*	Logic input for shutdown (referenced to Vss), enabled low
3	Vss	Logic ground
4	DT	Programmable Deadtime lead, referenced to Vss
5	COM	Low-side return
6	LO	Low-side gate drive output
7	Vcc	Low-side and logic fixed supply
8, 9, 10, 14	NC	No Connection (No Internal Connection)
11	Vs	High-side floating supply return
12	HO	High-side gate drive output
13	Vb	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
Programmable Dead Time Pin Voltage	V <sub>DT</sub>	V <sub>SS</sub> -0.3 to V <sub>CC</sub> +0.3	V
Logic and 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 Supply Offset Voltage	V <sub>SS</sub>	V <sub>CC</sub> -24 to V <sub>CC</sub> +0.3	V
Logic Input Voltage (IN and SD*)	V <sub>IN</sub>	V <sub>SS</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>	1.0	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	120	°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
Logic and 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>	V <sub>SS</sub>	5	V
Programmable Dead Time Pin Voltage	V <sub>DT</sub>	V <sub>SS</sub>	V <sub>CC</sub>	V
Logic Ground	V <sub>SS</sub>	-5	5	V
Ambient Temperature	T <sub>A</sub>	-40	+125	°C

Note: 6. Logic operation for V<sub>S</sub> = -5V to +600V.

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

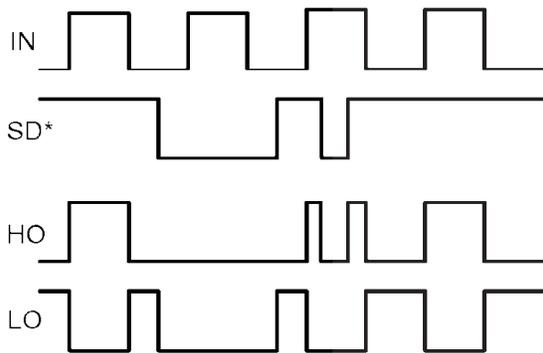
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic "1" Input Voltage for HO & Logic "0" for LO (Note 8)	$V_{IH}$	2.5	—	—	V	$V_{CC}$ = 10V to 20V
Logic "0" Input Voltage for HO & Logic "1" for LO (Note 8)	$V_{IL}$	—	—	0.8	V	$V_{CC}$ = 10V to 20V
SD* Input Positive Going Threshold	$V_{SDTH+}$	2.5	—	—	V	$V_{CC}$ = 10V to 20V
SD* Input Negative Going Threshold	$V_{SDTH-}$	—	—	0.8	V	$V_{CC}$ = 10V to 20V
High Level Output Voltage, $V_{BIAS} - V_O$	$V_{OH}$	—	—	1.4	V	$I_O$ = 0mA
Low Level Output Voltage, $V_O$	$V_{OL}$	—	—	0.2	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	$V_O = 15V$ , $PW \leq 10\mu s$

- Notes:
- The  $V_{IN}$  and  $I_{IN}$  parameters are referenced to  $V_{SS}$  and are applicable to the two logic input pins:  $I_N$  and  $SD^*$ . 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 ( $I_N$  and  $SD^*$ ) should have a minimum amplitude of 2.5V with a minimum pulse width of  $2 \times \text{Deadtime}$  ( $t_{DT}$ ).

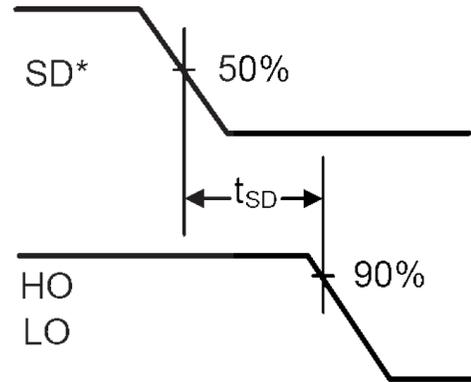
**AC Electrical Characteristics** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V,  $V_{SS}$  = COM,  $C_L$  = 1000pF, @ $T_A$  = +25°C, unless otherwise specified.)

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, HO & LO Turn-On	$t_{DMON}$	—	—	90	ns	—
Delay Matching, HO & LO Turn-Off	$t_{DMOFF}$	—	—	40	ns	—
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: $t_{DT LO-HO}$ & $t_{DT HO-LO}$	$t_{DT}$	280	400	520	ns	$R_{DT} = 0\Omega$
		4	5	6	$\mu$ s	$R_{DT} = 200k\Omega$
Deadtime Matching = $t_{DT LO-HO} - t_{DT HO-LO}$	$t_{MDT}$	—	0	50	ns	$R_{DT} = 0\Omega$
		—	0	600	ns	$R_{DT} = 200k\Omega$

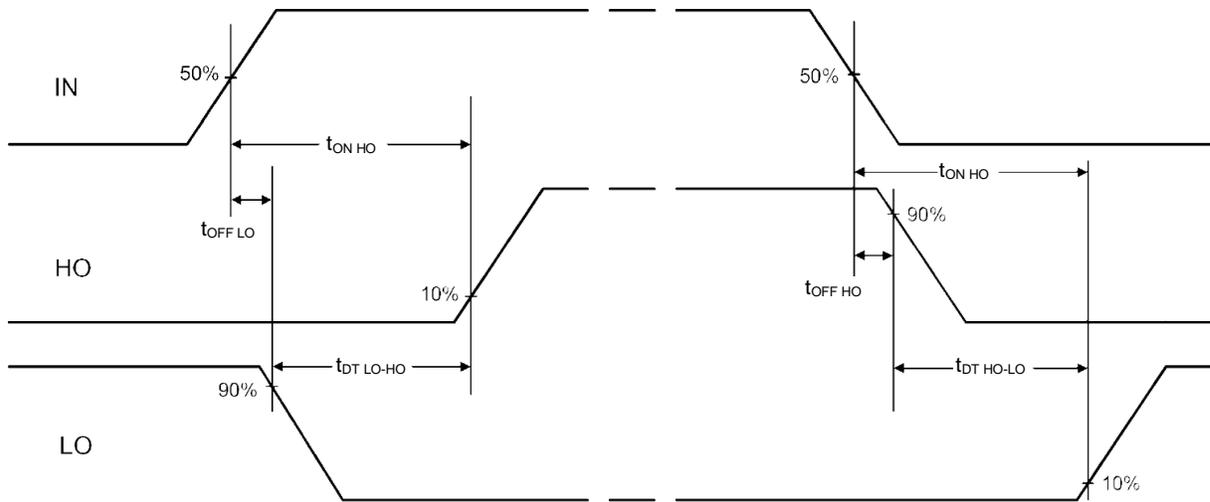
**Timing Waveforms**



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



**Figure 2.** Shutdown Waveform Definitions

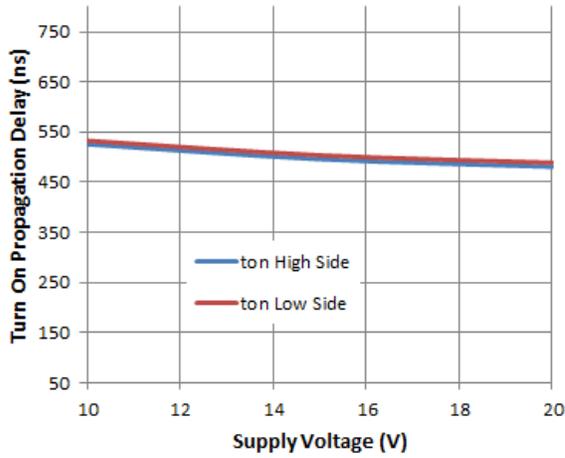


$t_{DT\ LO-HO} = t_{ON\ HO} - t_{OFF\ LO}$   
 $t_{DT\ HO-LO} = t_{ON\ LO} - t_{OFF\ HO}$   
 Deadtime matching  
 $t_{MDT} = t_{DT\ LO-HO} - t_{DT\ HO-LO}$

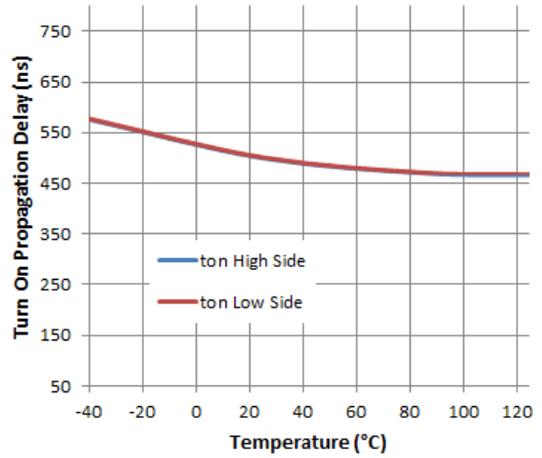
Delay matching  
 $t_{DM\ OFF} = t_{OFF\ LO} - t_{OFF\ HO}$

**Figure 3.** Switching Time Waveform Definitions

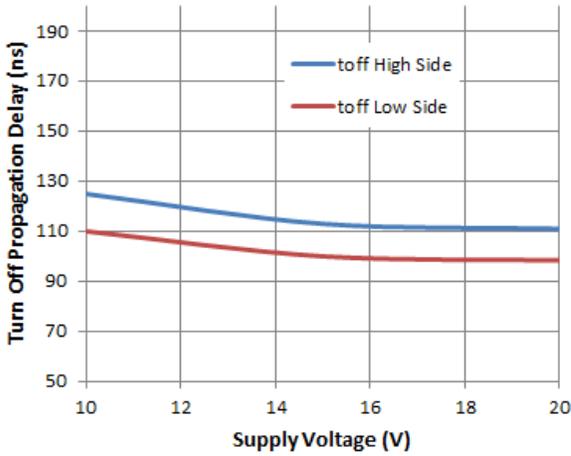
**Typical Performance Characteristics** ( $V_{CC} = 15V$ ,  $@T_A = +25^\circ C$ , unless otherwise specified.)



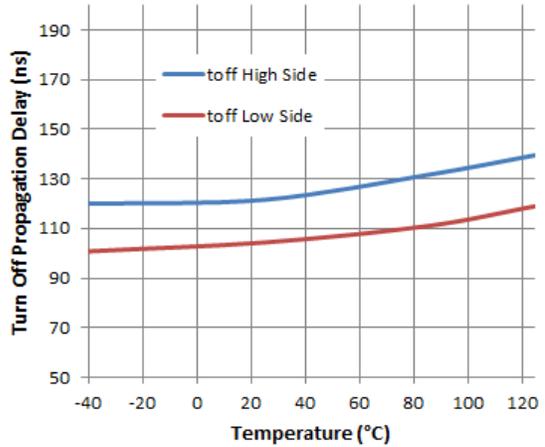
**Figure 4.** Turn-on Propagation Delay vs. Supply Voltage



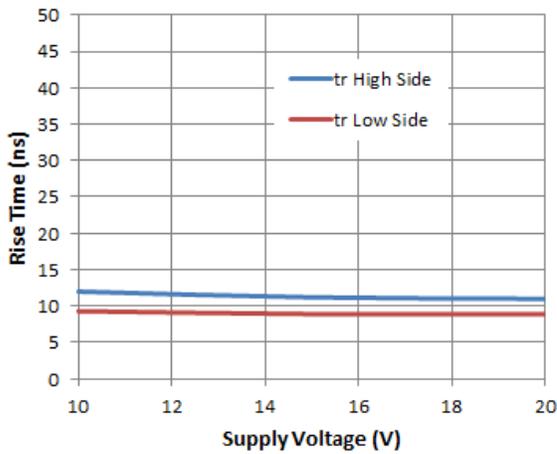
**Figure 5.** Turn-on Propagation Delay vs. Temperature



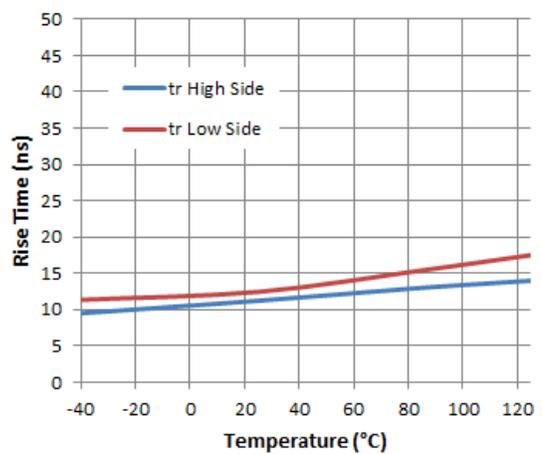
**Figure 6.** Turn-off Propagation Delay vs. Supply Voltage



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

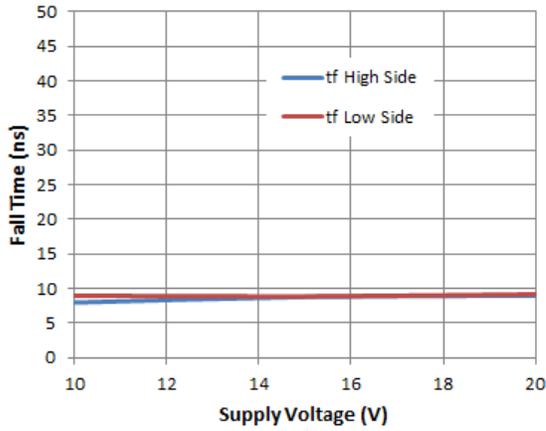


**Figure 8.** Rise Time vs. Supply Voltage

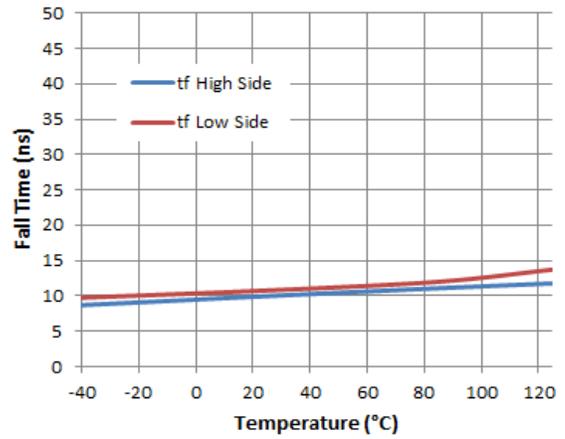


**Figure 9.** Rise Time vs. Temperature

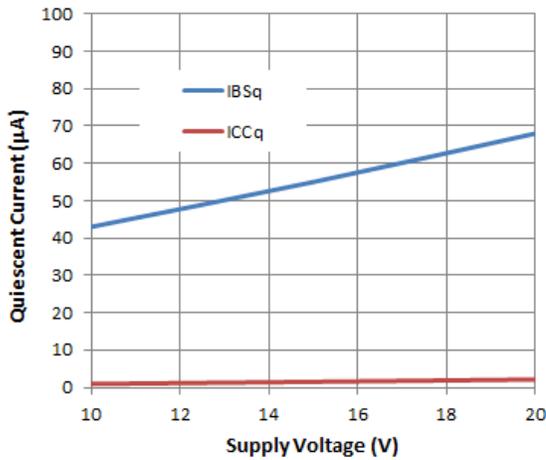
**Typical Performance Characteristics** (continued)



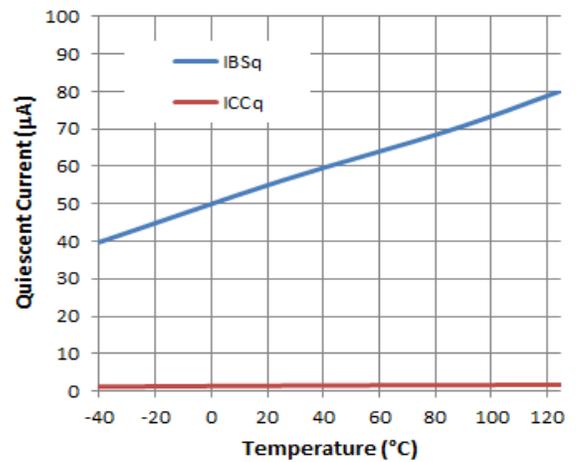
**Figure 10.** Fall Time vs. Supply Voltage



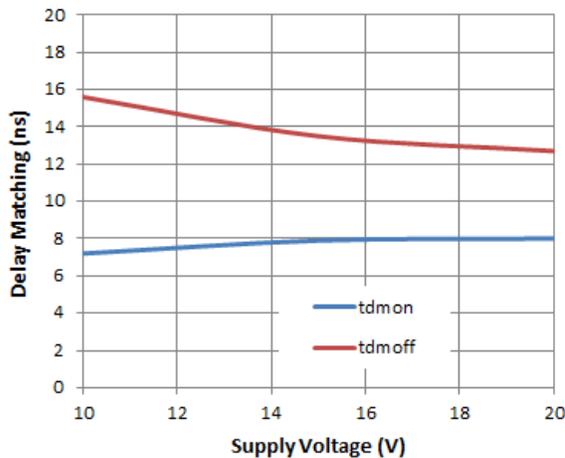
**Figure 11.** Fall Time vs. Temperature



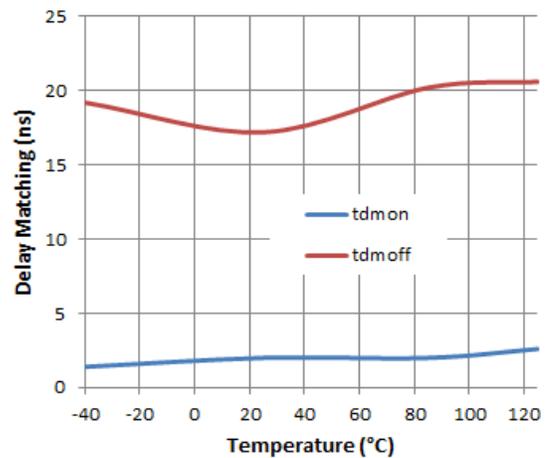
**Figure 12.** Quiescent Current vs. Supply Voltage



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

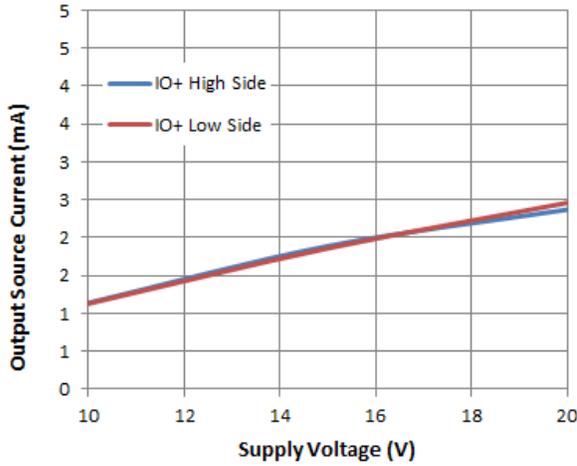


**Figure 14.** Delay Matching vs. Supply Voltage

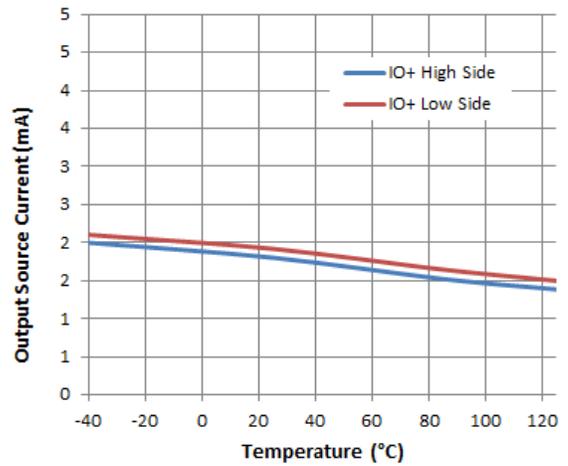


**Figure 15.** Delay Matching vs. Temperature

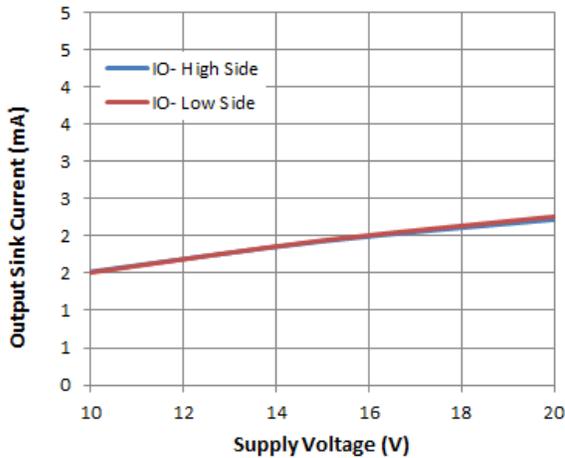
**Typical Performance Characteristics** (continued)



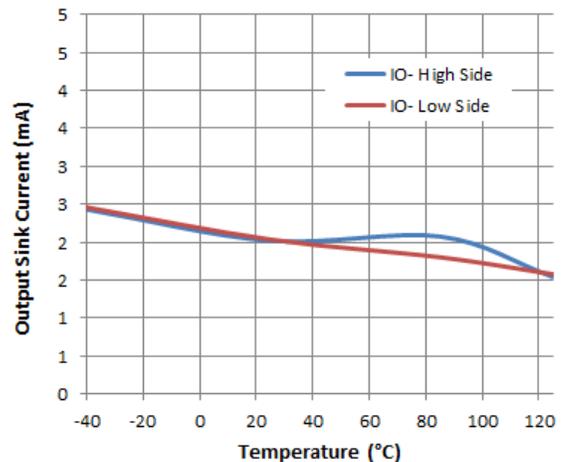
**Figure 16.** Output Source Current vs. Supply Voltage



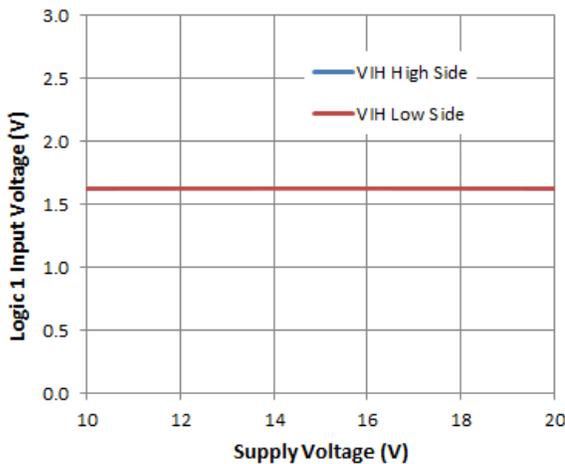
**Figure 17.** Output Source Current vs. Temperature



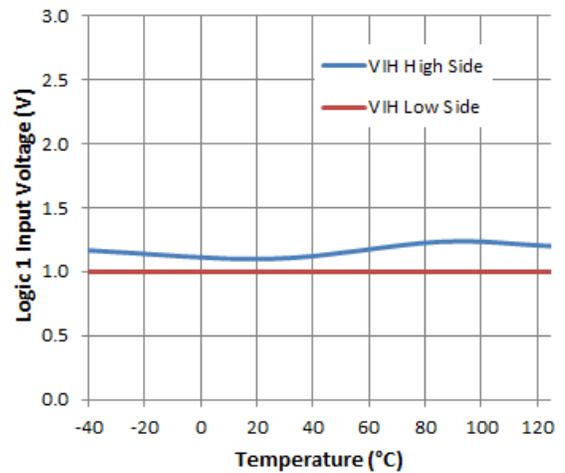
**Figure 18.** Output Sink Current vs. Supply Voltage



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

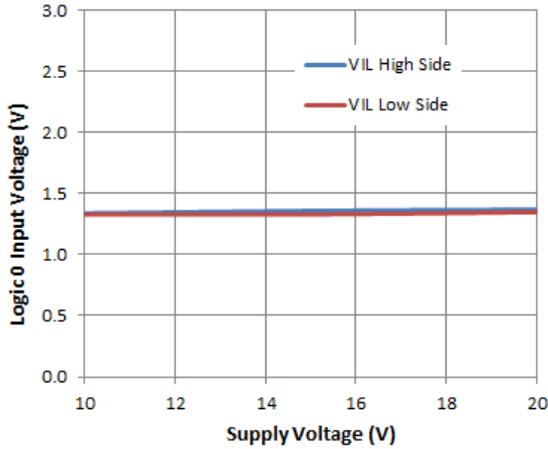


**Figure 20.** Logic 1 Input Voltage vs. Supply Voltage

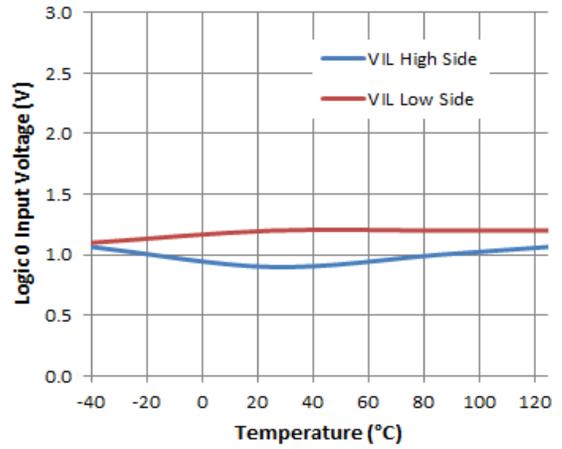


**Figure 21.** Logic 1 Input Voltage vs. Temperature

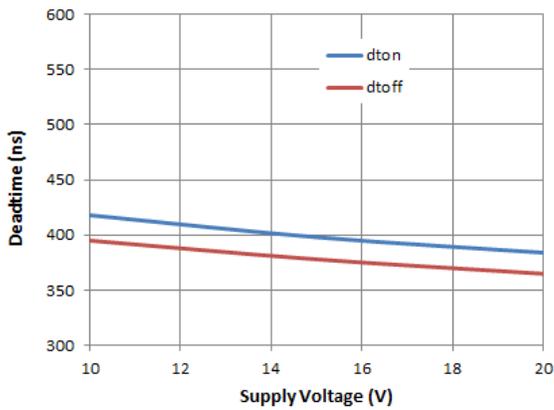
**Typical Performance Characteristics** (continued)



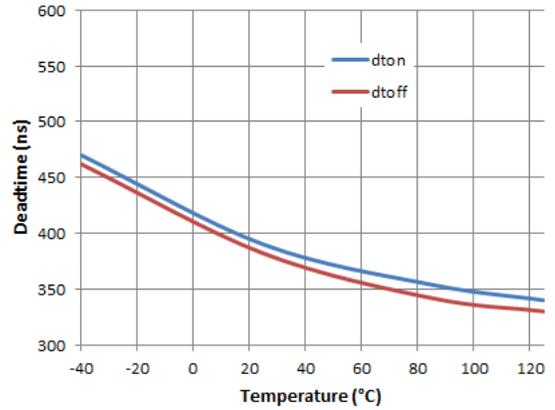
**Figure 22.** Logic 0 Input Voltage vs. Supply Voltage



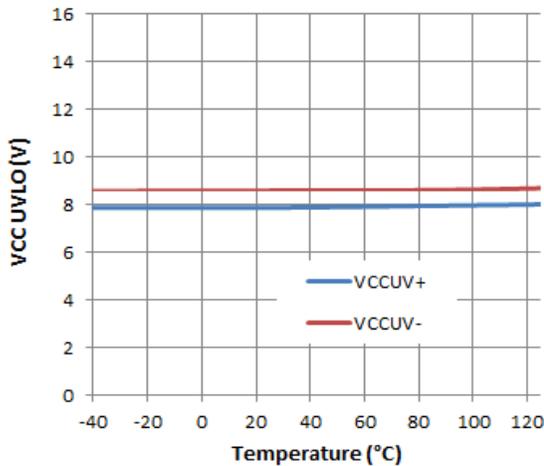
**Figure 23.** Logic 0 Input Voltage vs. Temperature



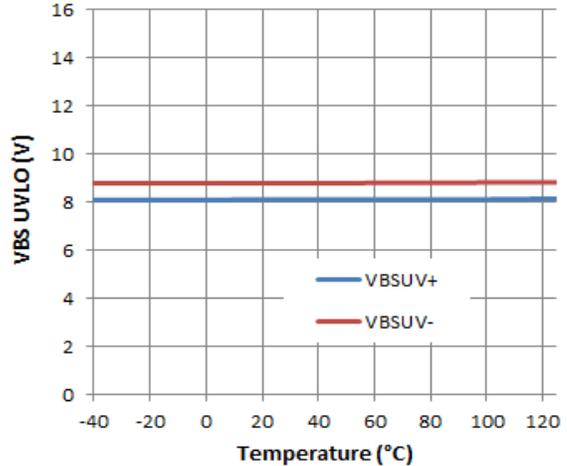
**Figure 24.** Deadtime vs. Supply Voltage



**Figure 25.** Deadtime vs. Temperature

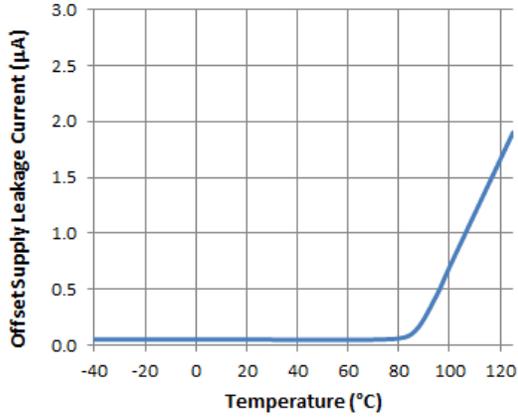


**Figure 26.** VCC UVLO vs. Temperature



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

**Typical Performance Characteristics** (continued)

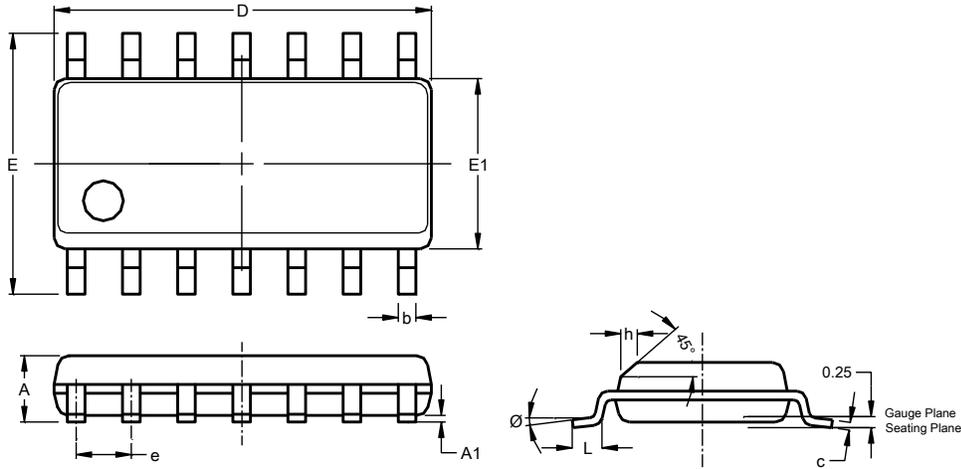


**Figure 28.** Offset Supply Leakage Current vs. Temperature

**Package Outline Dimensions**

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

**SO-14 (Type TH)**

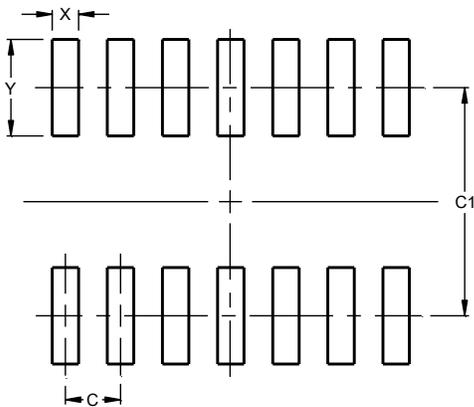


SO-14 (Type TH)			
Dim	Min	Max	Typ
A	1.55	1.73	--
A1	0.10	0.25	--
b	0.35	0.51	--
c	0.190	0.248	--
D	8.56	8.74	8.61
E	5.84	6.20	6.00
E1	3.81	3.99	3.94
e	--	--	1.27
h	--	--	0.33
L	0.41	0.89	--
Ø	0°	8°	--
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**SO-14 (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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