Description

The DIODES™ DGD21084 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 DGD21084's high-side to switch to 600V in a bootstrap operation.

The DGD21084's 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 dead time, by an external resistor, provides more system level flexibility.

The DGD21084 is offered in SO-14 package, the operating temperature extends from -40°C to +125°C.

Applications

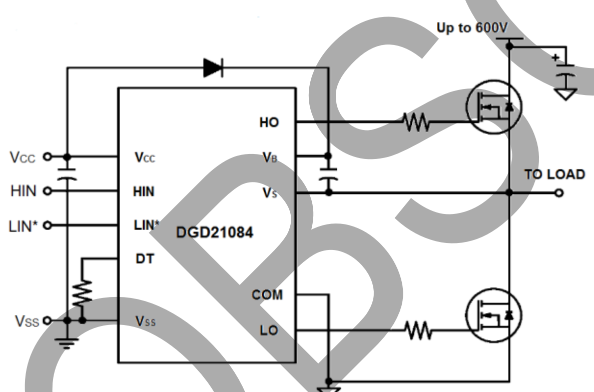
- DC-DC converters
- DC-AC inverters
- AC-DC power supplies
- Motor controls
- Class D power amplifiers

Features

- Floating High-Side Driver in Bootstrap Operation to 600V
- Drives Two N-Channel MOSFETs or IGBTs in a Half Bridge Configuation
- Outputs Tolerant to Negative Transients
- Programmable Dead Time to Protect MOSFETs
- Wide Logic and Low-side Gate Driver Supply Voltage: 10V to 20V
- Wide Logic Supply Voltage Offset Voltage: -5V to 5V
- 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-Q100/101/104/200, 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

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



Typical Configuration

SO-14 (Type TH)

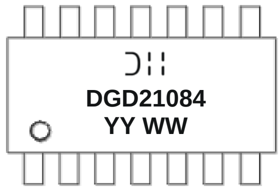
Top View

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DGD21084S14-13	SO-14 (Type TH)	DGD21084	13	16	2,500	Reel

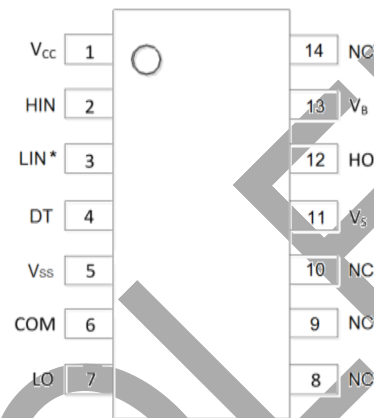
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- 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
DGD21084 = Product Type Marking Code
YY = Year (ex: 22 = 2022)
WW = Week (01 to 53)

Pin Diagrams

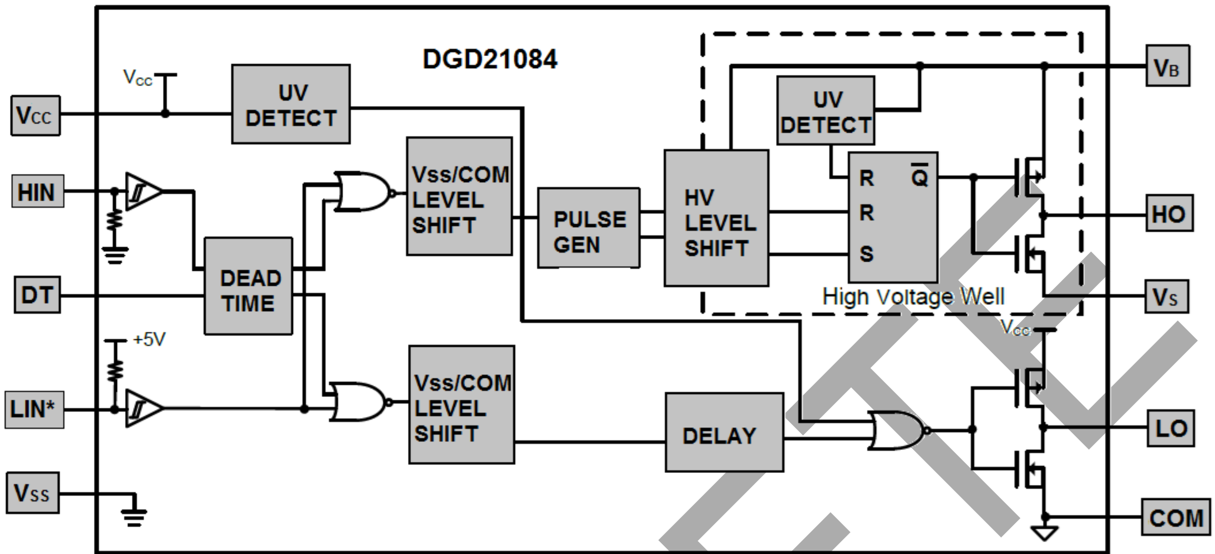


Top View SO-14 (Type TH)

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 (Referenced to V_{SS})
3	LIN*	Logic input for low-side gate driver output, out of phase with LO (Referenced to V_{SS})
4	DT	Programmable dead time lead, referenced to V_{SS}
5	V_{SS}	Logic ground
6	COM	Low-side return
7	LO	Low-side gate drive output
8, 9, 10, 14	NC	No Connect (No Internal Connection)
11	V_S	High-side floating supply return
12	HO	High-side gate drive output
13	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
Programmable Dead Time Pin Voltage	V_{DT}	V_{SS}-0.3 to V_B+0.3	V
Low-Side 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 Supply Voltage	V_{CC}	-0.3 to V_{SS}+24	V
Logic Supply Offset Voltage	V_{SS}	V_{CC}-25 to V_{CC}+0.3	V
Logic Input Voltage (HIN and LIN*)	V_{IN}	V_{SS}-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	1.0	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{θJA}$	120	°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 Fixed Supply Voltage	V_{CC}	10	20	V
Low-Side Output Voltage	V_{LO}	0	V_{CC}	V
Logic Input Voltage (HIN & LIN*)	V_{IN}	V_{SS}	V_{CC}	V
Programmable Dead Time Pin Voltage	V_{DT}	V_{SS}	V_{CC}	V
Logic Ground	V_{SS}	-5	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, V_{SS} = COM, @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}	—	0.02	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}	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, R_{DT} = 0Ω
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 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	—
Hysteresis	V_{CCUV+}	0.3	0.7	—	V	—
	V_{BSUV+}					—
Output High Short Circuit Pulsed Current	I_{O+}	120	200	—	mA	V_O = 0V, P_W ≤ 10µs
Output Low Short Circuit Pulsed Current	I_{O-}	250	600	—	mA	V_O = 15V, P_W ≤ 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 with a minimum pulse width of 2 x Deadtime.

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}	—	220	300	ns	V_S = 0V
Turn-off Propagation Delay	t_{OFF}	—	200	280	ns	V_S = 0V or 600V
Delay Matching, | t_{ON} - t_{OFF}|	t_{DMON}	—	0	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	R_{DT} = 0Ω
		4	5	6	us	R_{DT} = 200kΩ (Note 9)
Deadtime Matching = $t_{DT\ LO\text{-}HO}$ - $t_{DT\ HO\text{-}LO}$	t_{MDT}	—	0	60	ns	R_{DT} = 0Ω
		—	0	600	ns	R_{DT} = 200kΩ

Note: 9. Guaranteed by design, not tested in production.

Timing Waveforms

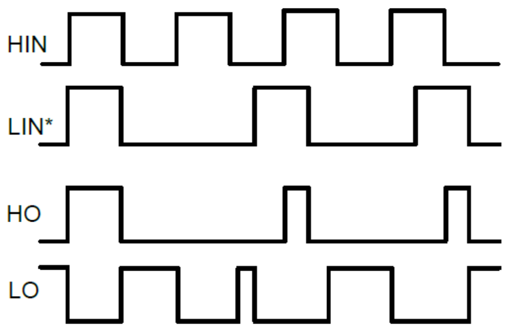


Figure 1. Input / Output Timing Diagram

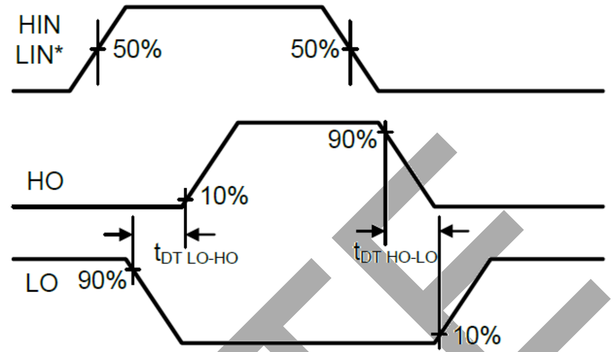


Figure 2. Deadtime Waveform Definitions

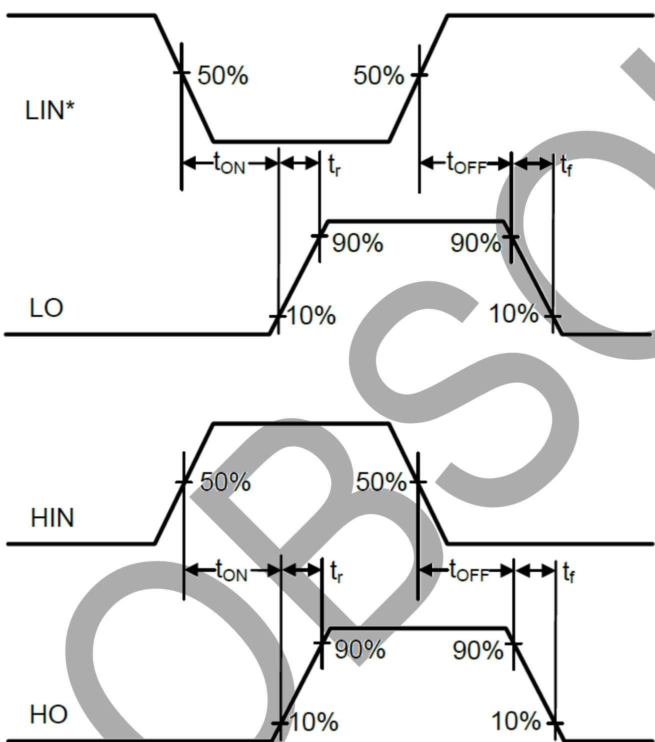


Figure 3. Switching Time Waveform Definitions

Typical Performance Characteristics (VCC = 15V, @TA = +25°C, unless otherwise specified.)

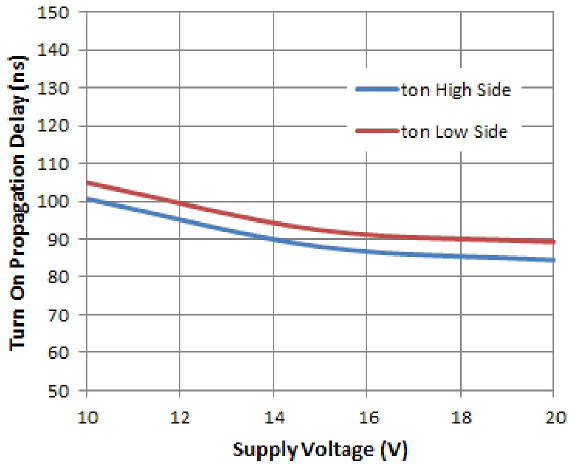


Figure 4. Turn-on Propagation Delay vs. Supply Voltage

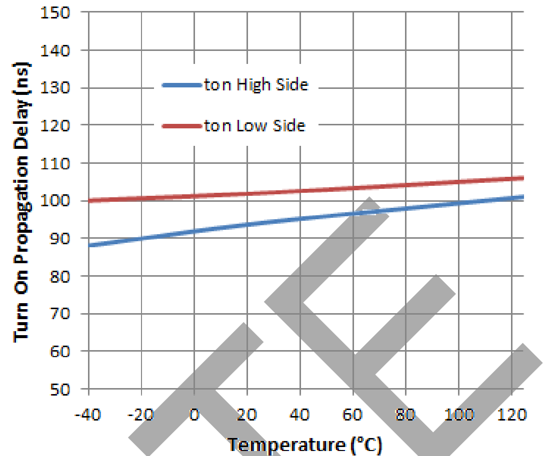


Figure 5. Turn-on Propagation Delay vs. Temperature

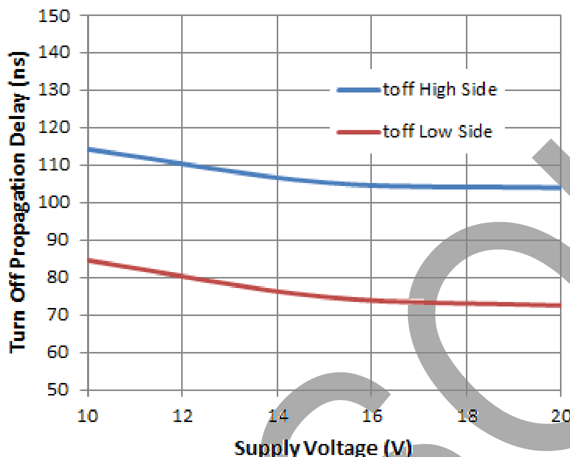


Figure 6. Turn-off Propagation Delay vs. Supply Voltage

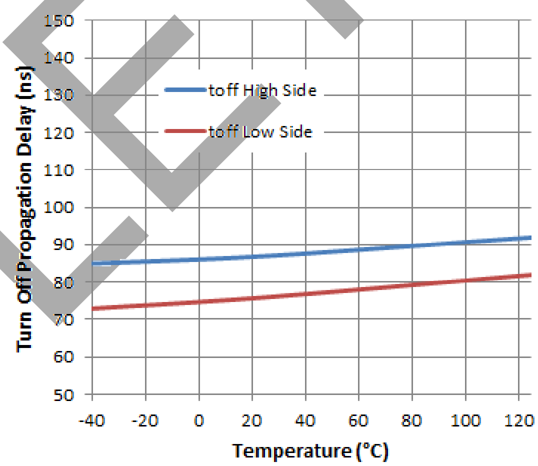


Figure 7. Turn-off Propagation Delay vs. Temperature

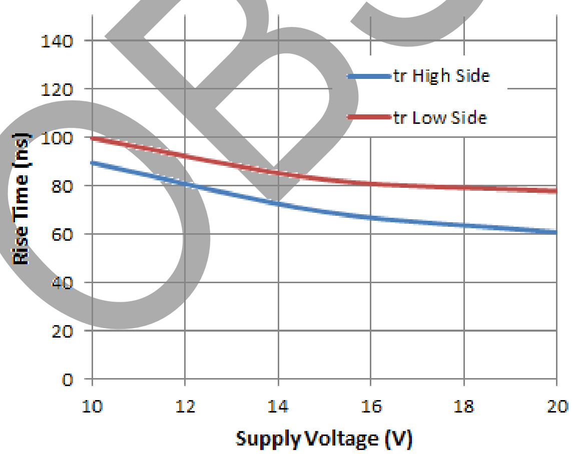


Figure 8. Rise Time vs. Supply Voltage

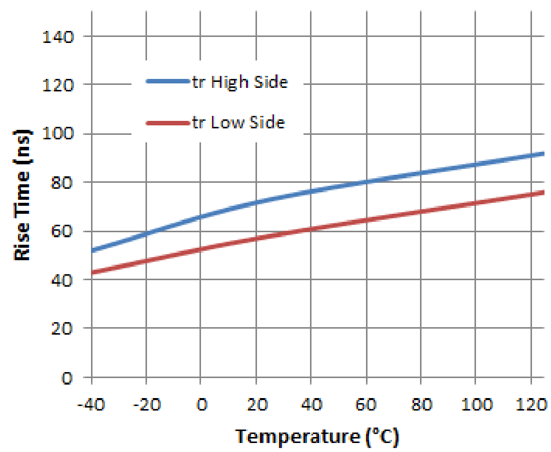


Figure 9. Rise Time vs. Temperature

Typical Performance Characteristics (VCC = 15V, @TA = +25°C, unless otherwise specified.) (continued)

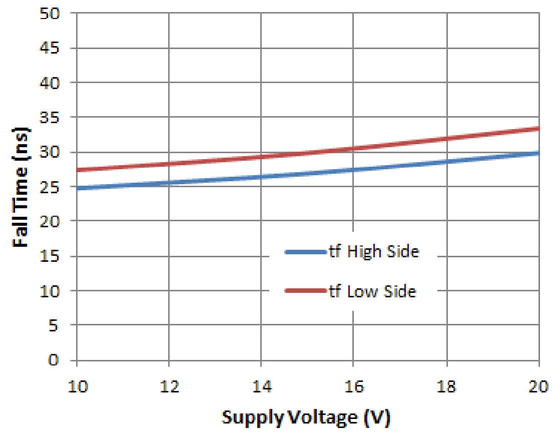


Figure 10. Fall Time vs. Supply Voltage

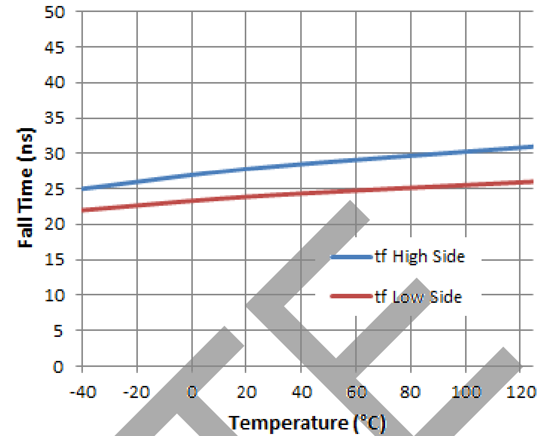


Figure 11. Fall Time vs. Temperature

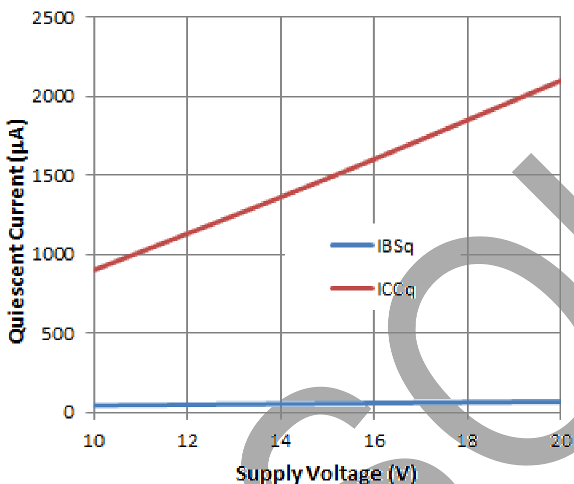


Figure 12. Quiescent Current vs. Supply Voltage

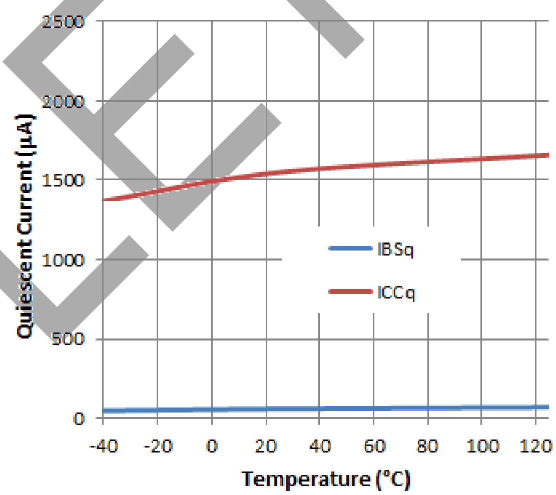


Figure 13. Quiescent Current vs. Temperature

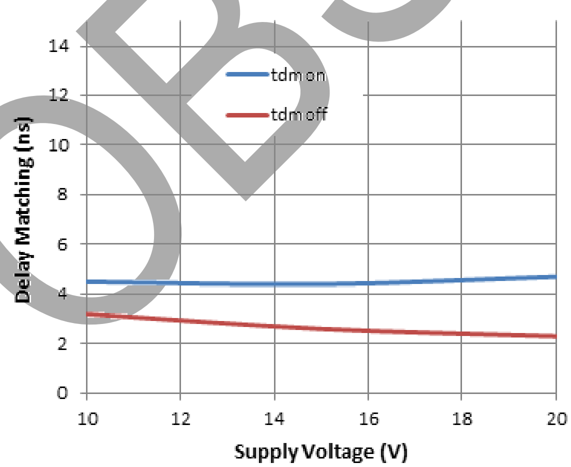


Figure 14. Delay Matching vs. Supply Voltage

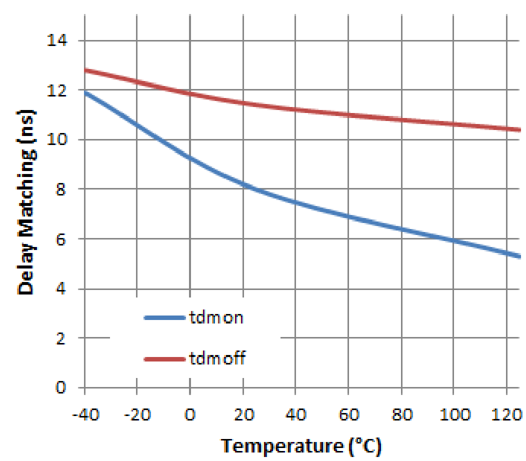


Figure 15. Delay Matching vs. Temperature

Typical Performance Characteristics (VCC = 15V, @TA = +25°C, unless otherwise specified.) (continued)

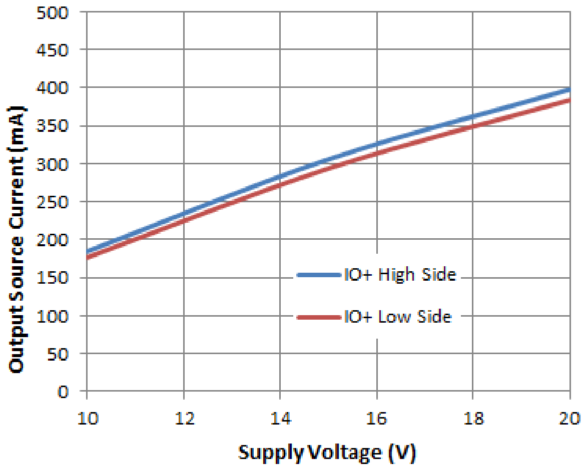


Figure 16. Output Source Current vs. Supply Voltage

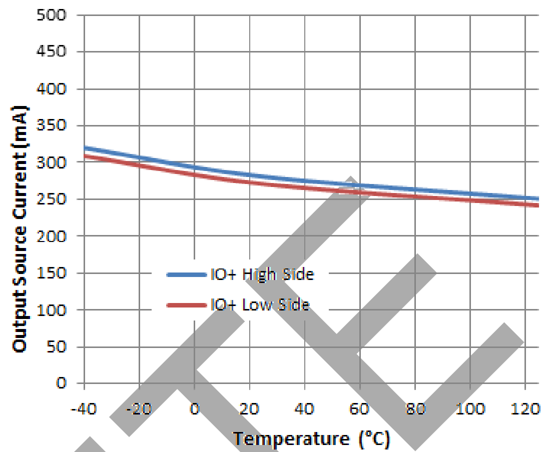


Figure 17. Output Source Current vs. Temperature

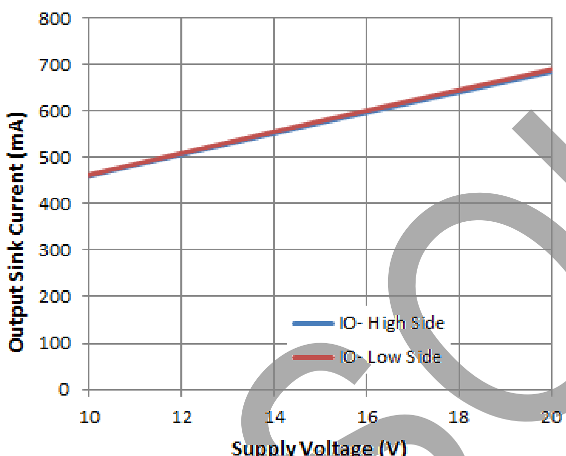


Figure 18. Output Sink Current vs. Supply Voltage

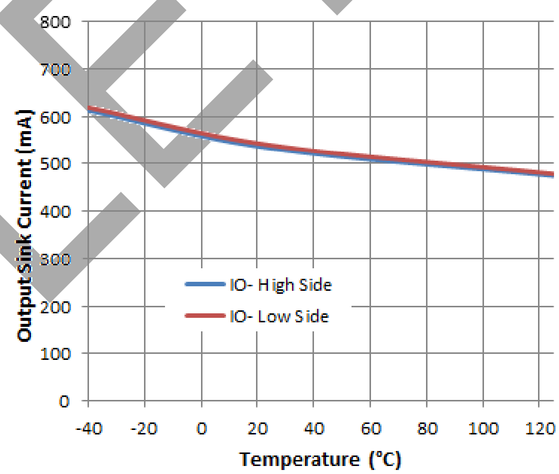


Figure 19. Output Sink Current vs. Temperature

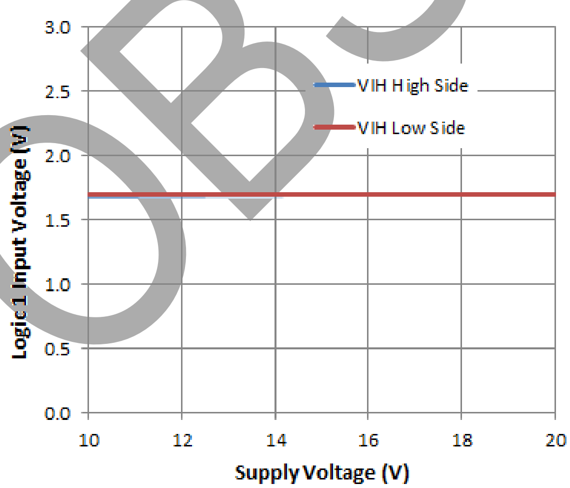


Figure 20. Logic 1 Input Voltage vs. Supply Voltage

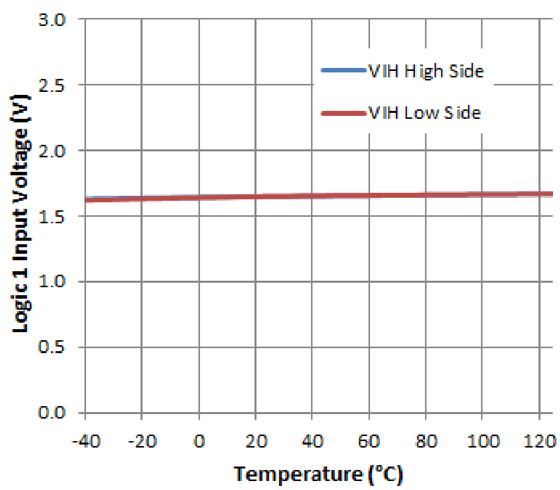


Figure 21. Logic 1 Input Voltage vs. Temperature

Typical Performance Characteristics (VCC = 15V, @TA = +25°C, unless otherwise specified.) (continued)

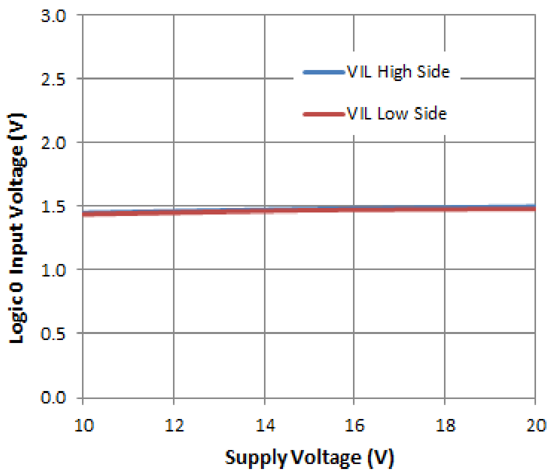


Figure 22. Logic 0 Input Voltage vs. Supply Voltage

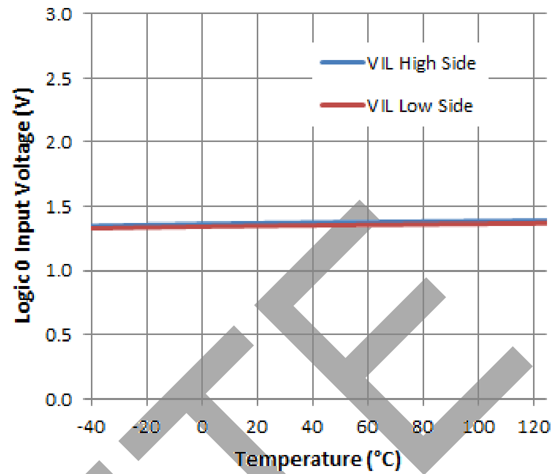


Figure 23. Logic 0 Input Voltage vs. Temperature

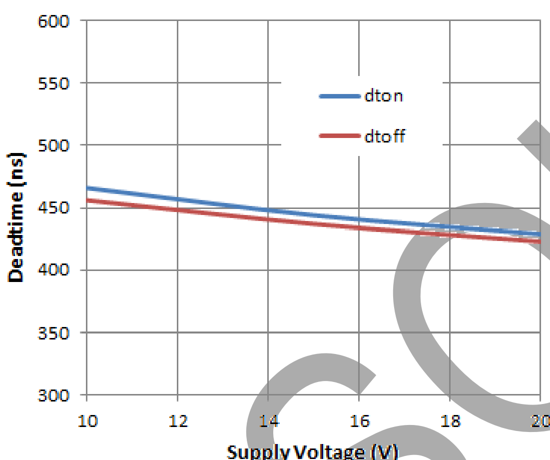


Figure 24. Deadtime vs. Supply Voltage

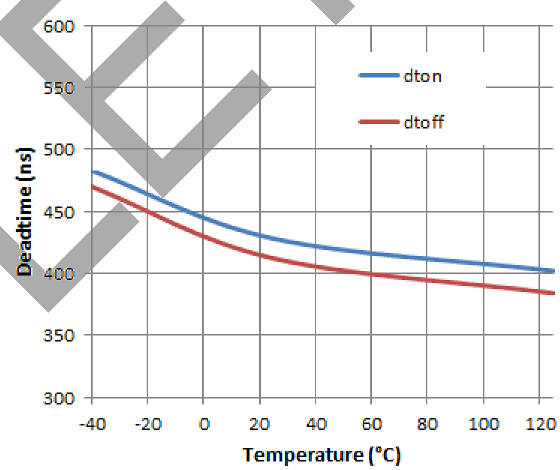


Figure 25. Deadtime vs. Temperature

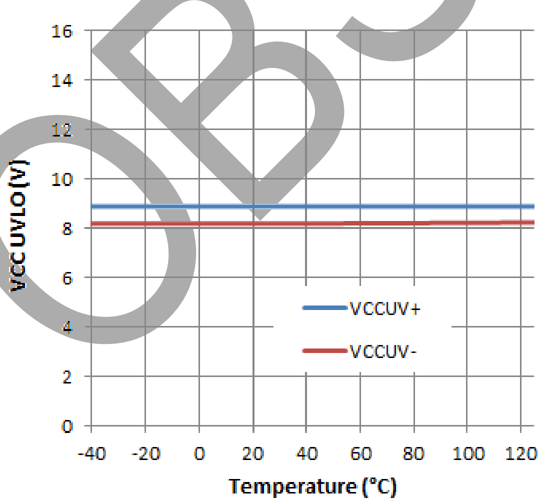


Figure 26. VCC UVLO vs. Temperature

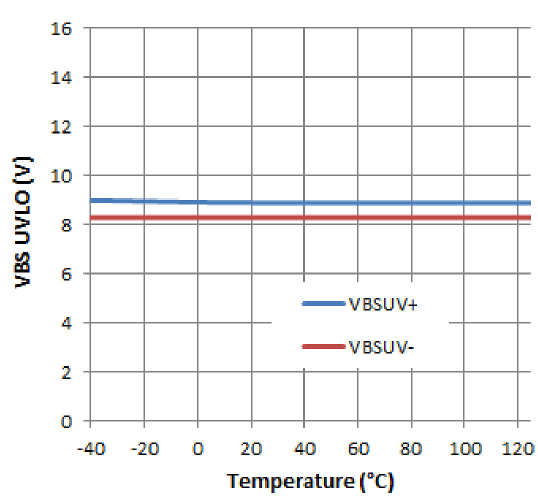


Figure 27. VBS UVLO vs. Temperature

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

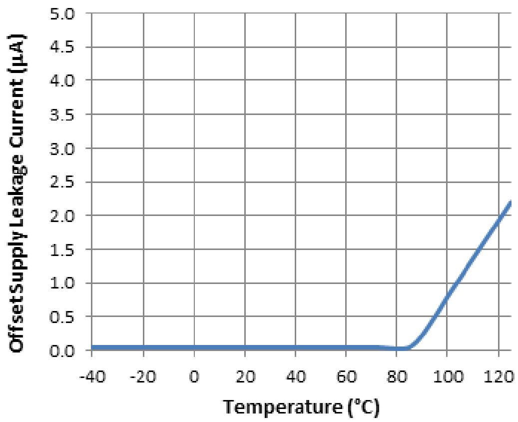
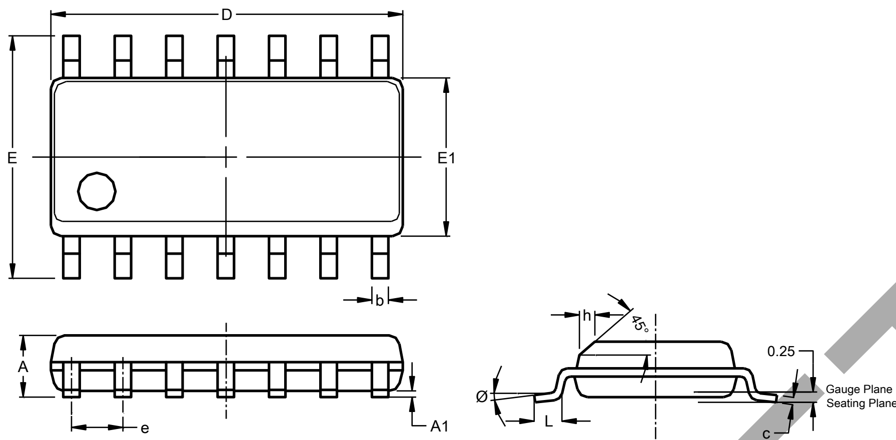


Figure 28. Offset Supply Leakage Current vs. Temperature

Package Outline Dimensions

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

SO-14 (Type TH)

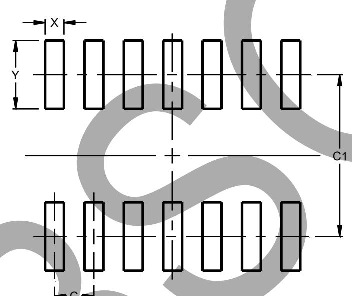


SO-14 (Type TH)			
Dim	**Min**	**Max**	**Typ**
A	1.55	1.73	--
A1	0.10	0.25	--
b	0.35	0.51	--
c	0.190	0.248	--
D	8.56	8.74	8.61
E	5.84	6.20	6.00
E1	3.81	3.99	3.94
e	--	--	1.27
h	--	--	0.33
L	0.41	0.89	--
Ø	0°	8°	--
All Dimensions in mm			

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: 10. 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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