

Description

The DGD21844M is a high-voltage and 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 the SO-14 (Type TH) package and the device's operating temperature extends from -40°C to +125°C.

Applications

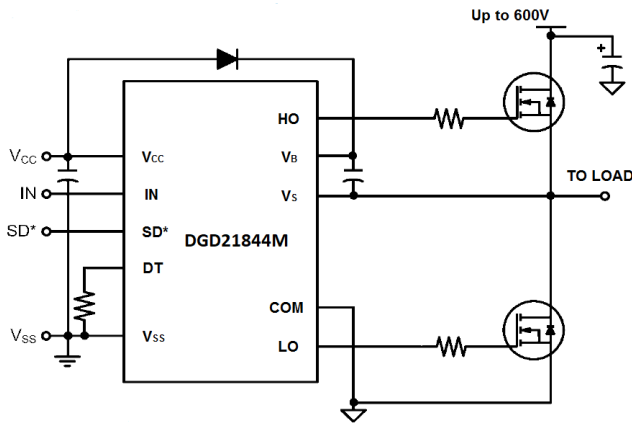
- DC-DC converters
- DC-AC inverters
- AC-DC power supplies
- Motor controls
- Class-D power amplifiers

Features

- Floating High-Side Driver in Bootstrap Operation to 600V
- Drives Two N-Channel MOSFETs or IGBTs in Half Bridge Configuration
- 1.9A Source / 2.3A 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-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.**

Mechanical Data

- Package: SO-14 (Type TH)
- 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



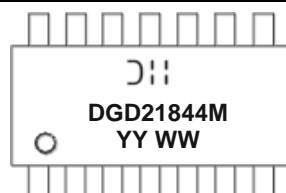
Top View

Ordering Information (Note 4)

Orderable Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DGD21844MS14-13	SO-14 (Type TH)	DGD21844M	13	16	2,500	Reel

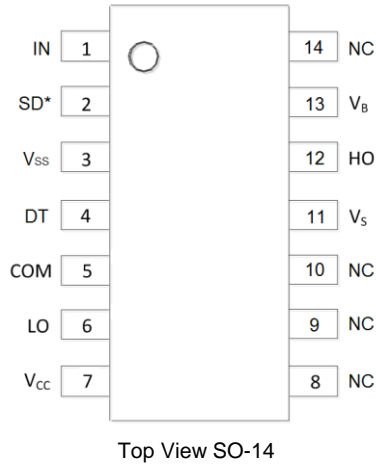
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- 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



Di = Manufacturer's Marking
DGD21844M = Product Type Marking Code
YY = Year (ex: 23 = 2023)
WW = Week (01 to 53)

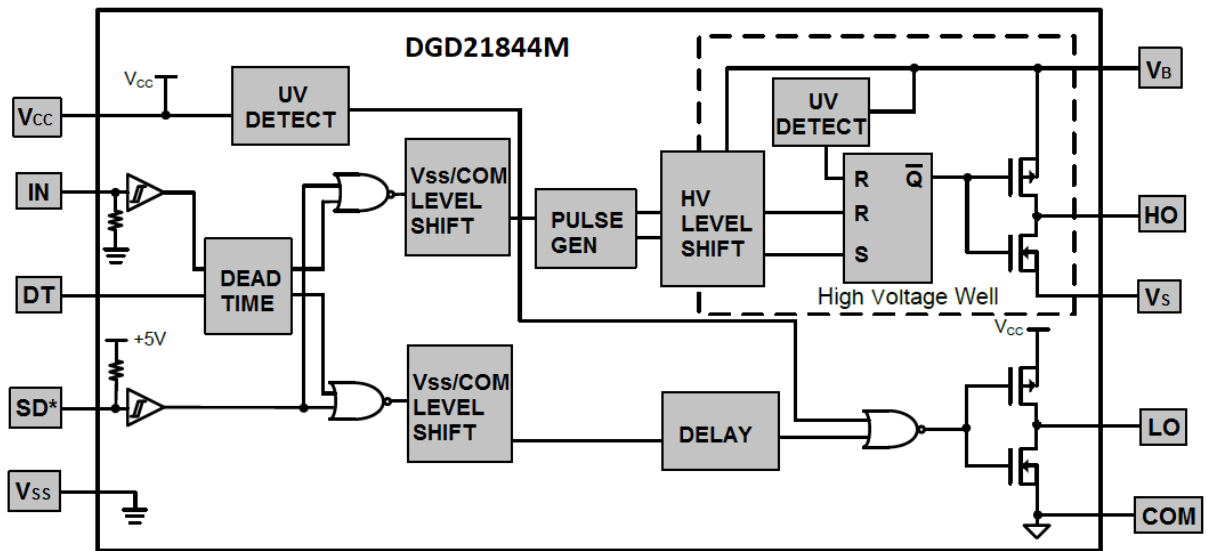
Pin Diagrams



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 (referenced to V _{SS})
2	SD*	Logic input for shutdown (referenced to V _{SS}), enabled low
3	V _{SS}	Logic ground
4	DT	Programmable Deadtime lead, referenced to V _{SS}
5	COM	Low-side return
6	LO	Low-side gate drive output
7	V _{CC}	Low-side and logic fixed supply
8, 9, 10, 14	NC	No connection (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 _{CC} +0.3	V
Logic and 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 Offset Voltage	V _{SS}	V _{CC} -24 to V _{CC} +0.3	V
Logic Input Voltage (IN and SD*)	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
Logic and Low Side Fixed Supply Voltage	V _{CC}	10	20	V
Low Side Output Voltage	V _{LO}	0	V _{CC}	V
Logic Input Voltage (IN and SD*)	V _{IN}	V _{SS}	5	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 ($V_{BIAS} (V_{CC}, V_{BS}) = 15V, V_{SS} = COM, @T_A = +25^\circ C$, unless otherwise specified.) (Note 7)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic "1" Input Voltage for HO & Logic "0" for LO	V_{IH}	2.5	—	—	V	$V_{CC} = 10V$ to $20V$
Logic "0" Input Voltage for HO & Logic "1" for LO	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	μA	$V_B = V_S = 600V$
Quiescent V_{BS} Supply Current	I_{BSQ}	20	60	150	μA	$V_{IN} = 0V$ 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	μA	$IN = 5V, SD^* = 0V$
Logic "0" Input Bias Current	I_{IN-}	—	—	1.0	μA	$IN = 0V, SD^* = 5V$
V_{BS} Supply Undervoltage Positive Going Threshold	V_{BSUV+}	8.0	8.9	9.8	V	—
V_{BS} Supply Undervoltage Negative Going Threshold	V_{BSUV-}	7.4	8.2	9.0	V	—
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+}	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 referenced to V_{SS} and are applicable to the two logic input pins: IN and SD*. 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 ($V_{BIAS} (V_{CC}, V_{BS}) = 15V, V_{SS} = COM, C_L = 1000pF, @T_A = +25^\circ C$, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Turn-On Propagation Delay	t_{ON}	—	585	900	ns	$V_S = 0V$
Turn-Off Propagation Delay	t_{OFF}	—	170	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	μs	$R_{DT} = 200k\Omega$
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

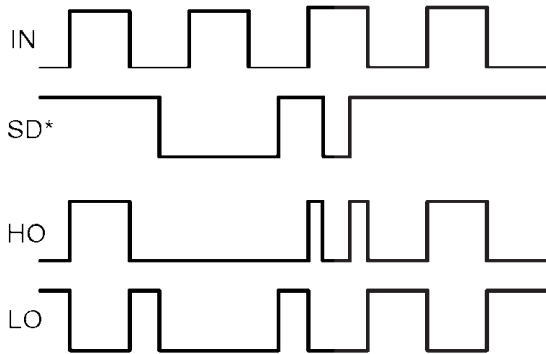


Figure 1. Input / Output Timing Diagram

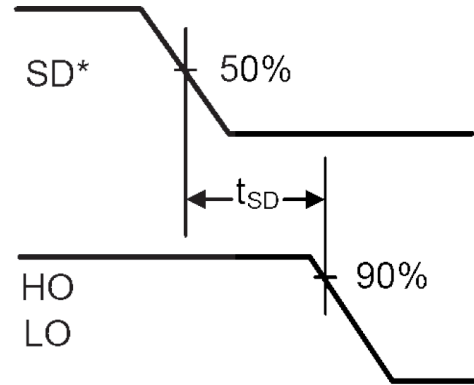
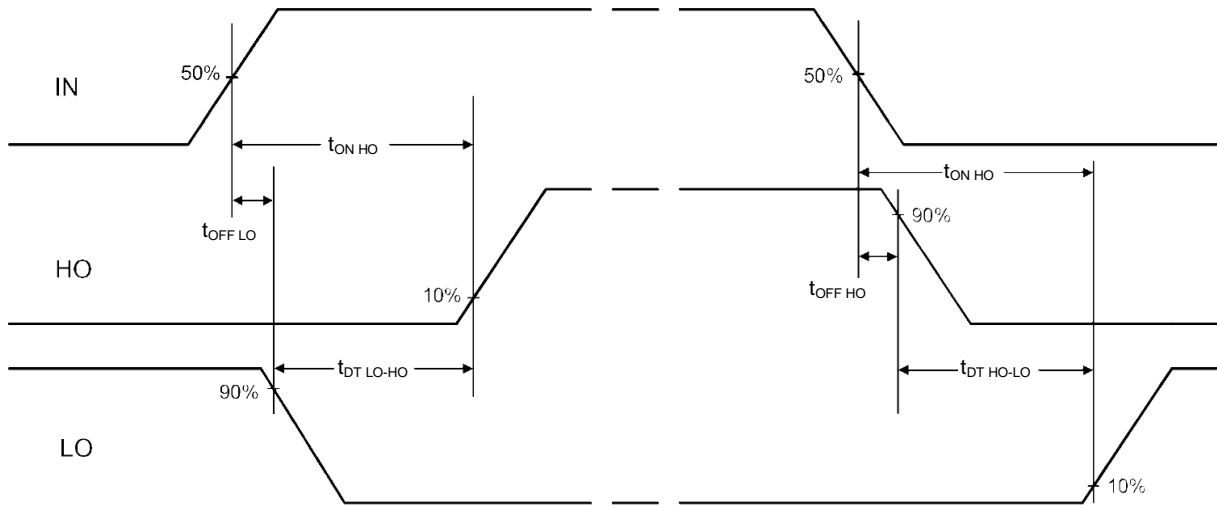


Figure 2. Shutdown Waveform Definitions



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

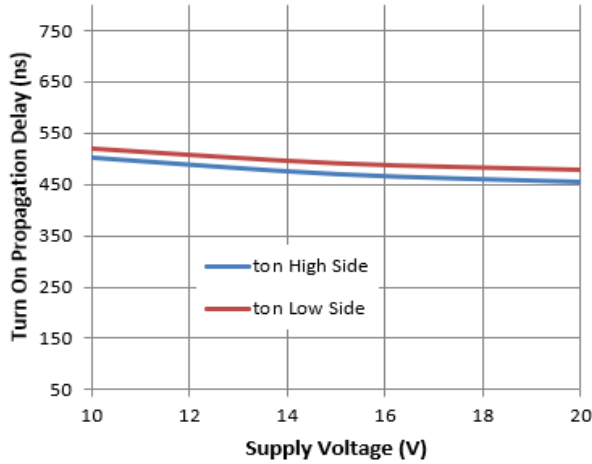


Figure 4. Turn-on Propagation Delay vs. Supply Voltage

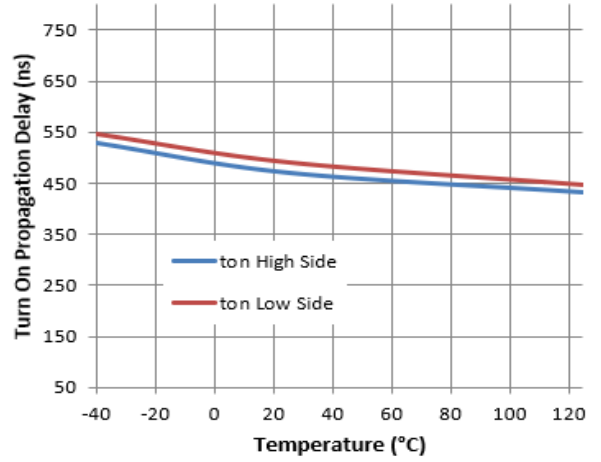


Figure 5. Turn-on Propagation Delay vs. Temperature

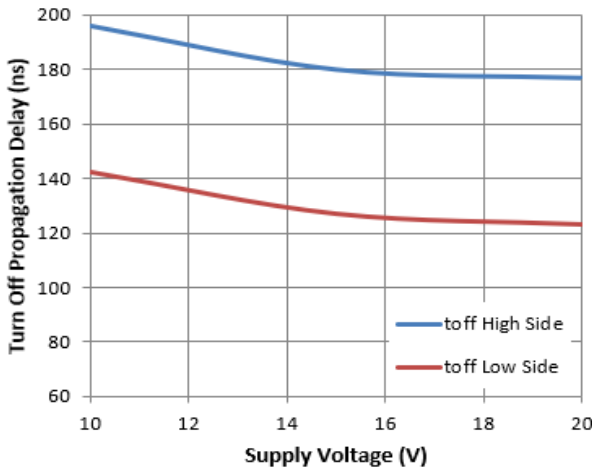


Figure 6. Turn-off Propagation Delay vs. Supply Voltage

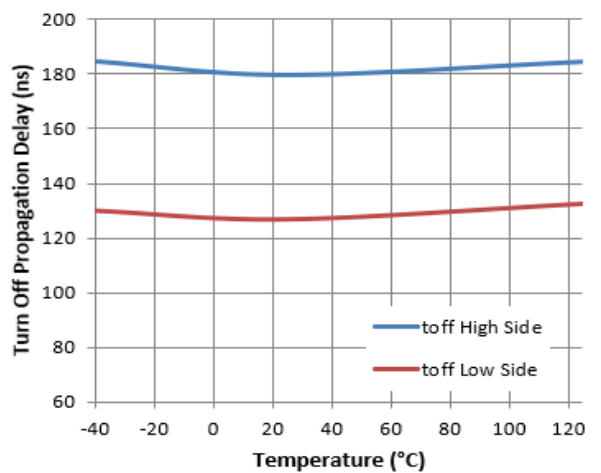


Figure 7. Turn-off Propagation Delay vs. Temperature

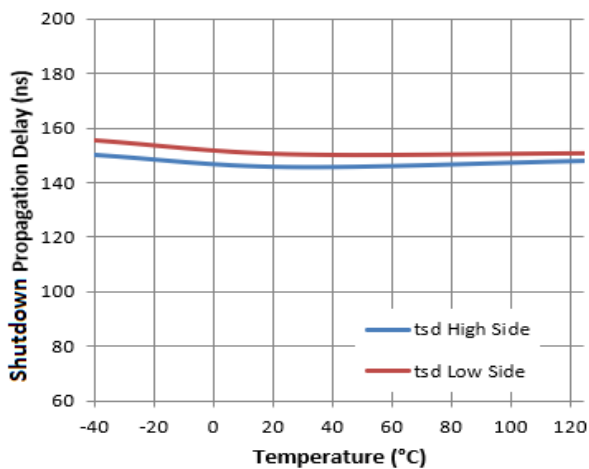


Figure 8. SD Propagation Delay vs. Temperature

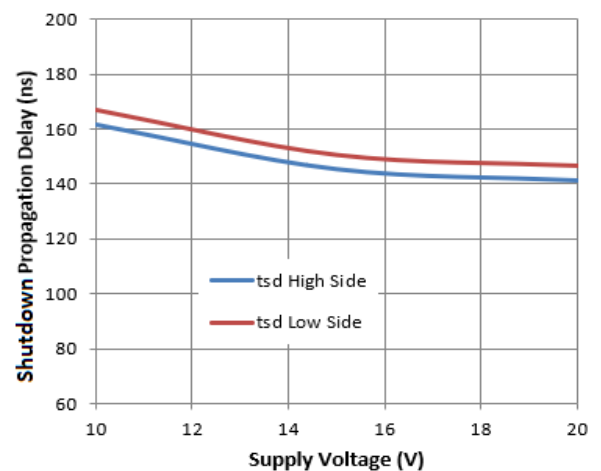


Figure 9. SD Propagation Delay vs. Supply Voltage

Typical Performance Characteristics (continued)

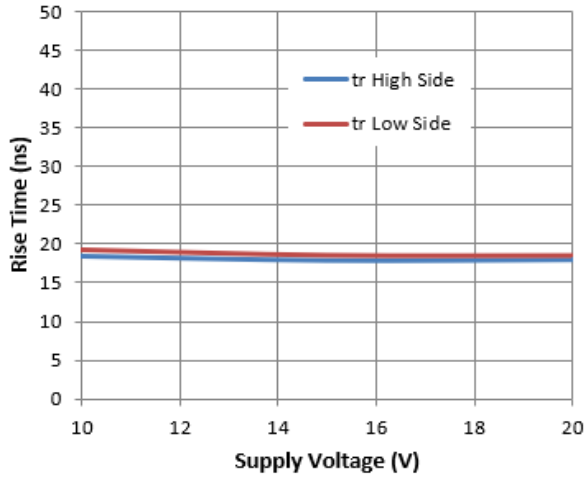


Figure 10. Rise Time vs. Supply Voltage

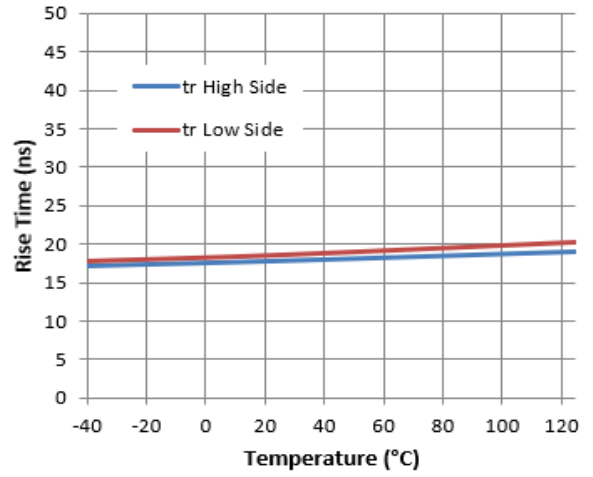


Figure 11. Rise Time vs. Temperature

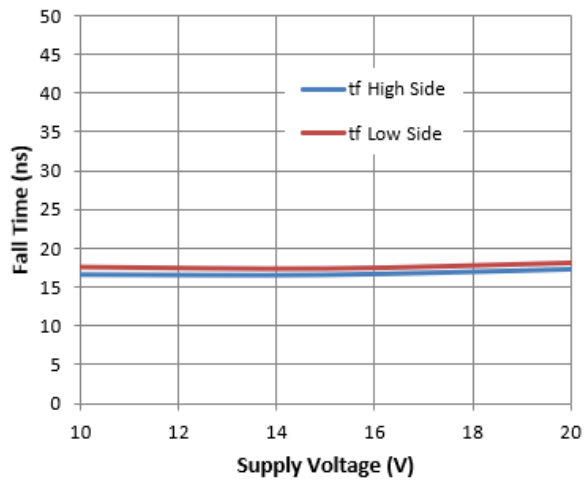


Figure 12. Fall Time vs. Supply Voltage

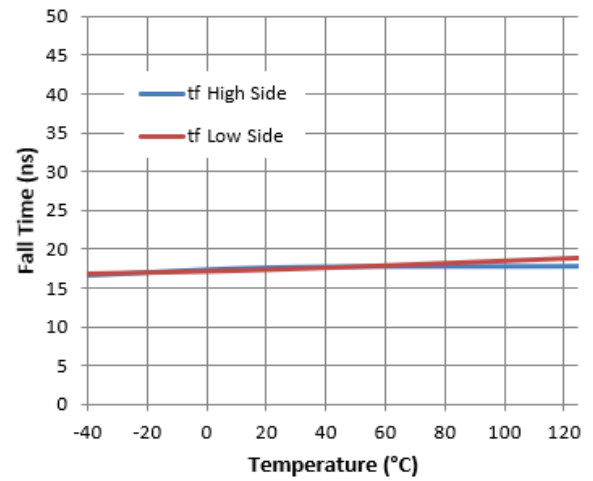


Figure 13. Fall Time vs. Temperature

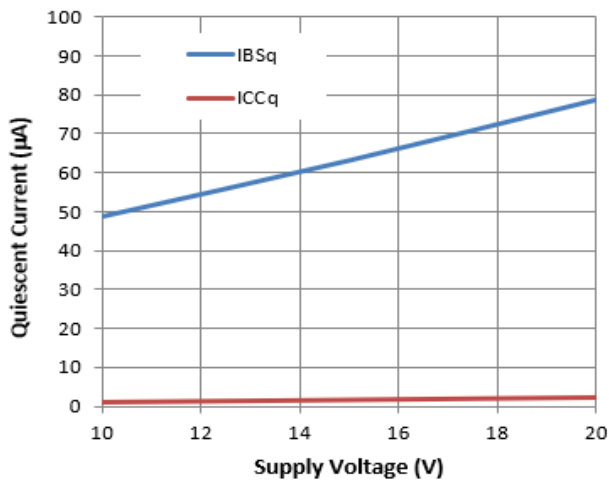


Figure 14. Quiescent Current vs. Supply Voltage

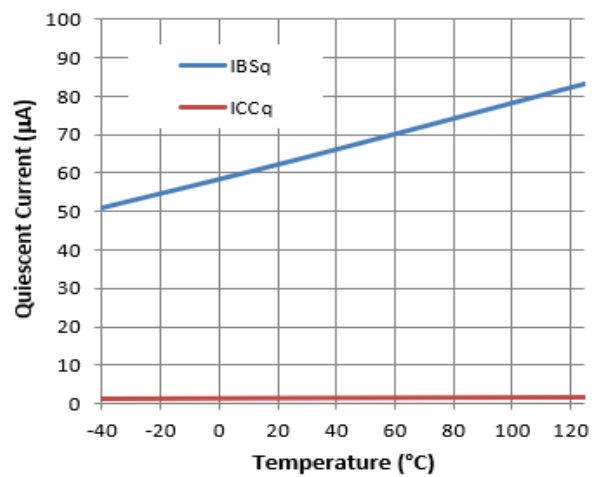


Figure 15. Quiescent Current vs. Temperature

Typical Performance Characteristics (continued)

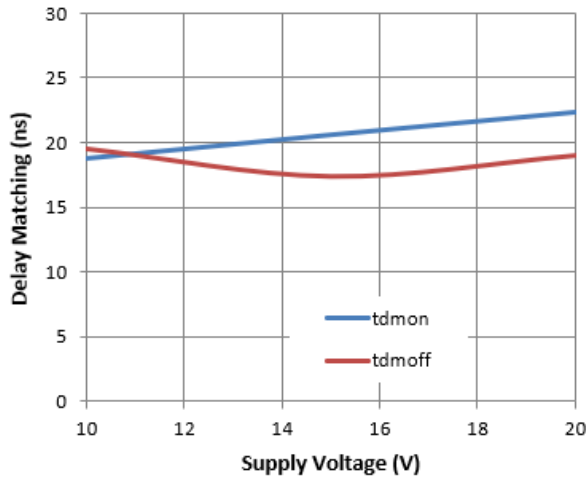


Figure 16. Delay Matching vs. Supply Voltage

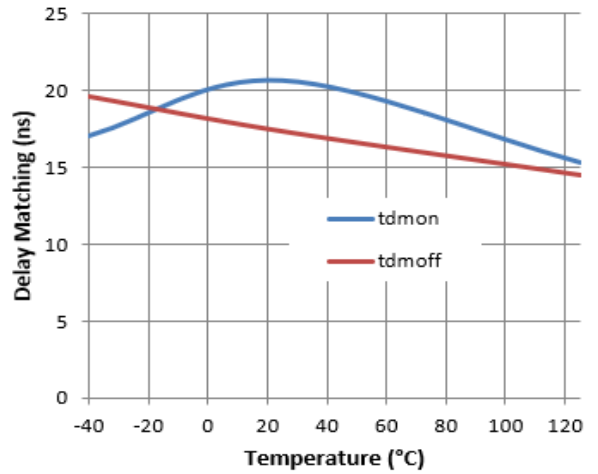


Figure 17. Delay Matching vs. Temperature

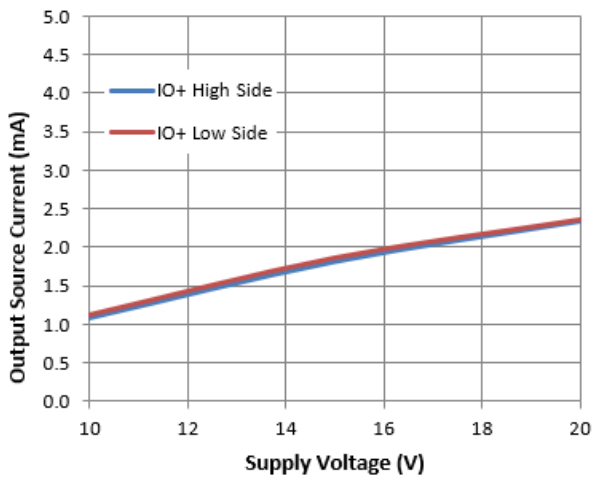


Figure 18. Output Source Current vs. Supply Voltage

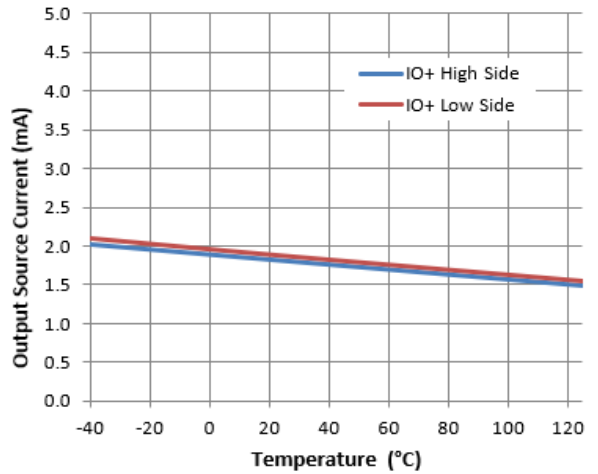


Figure 19. Output Source Current vs. Temperature

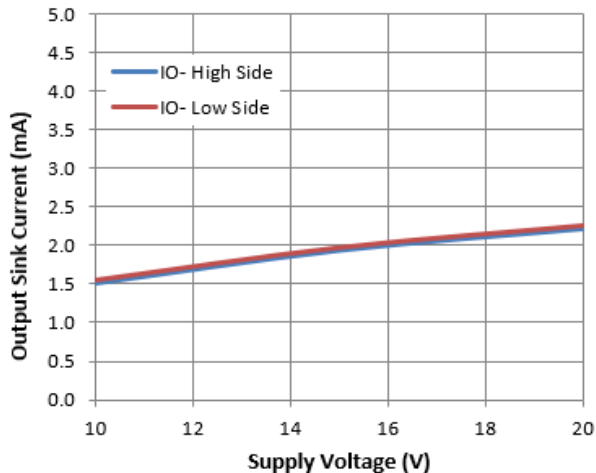


Figure 20. Output Sink Current vs. Supply Voltage

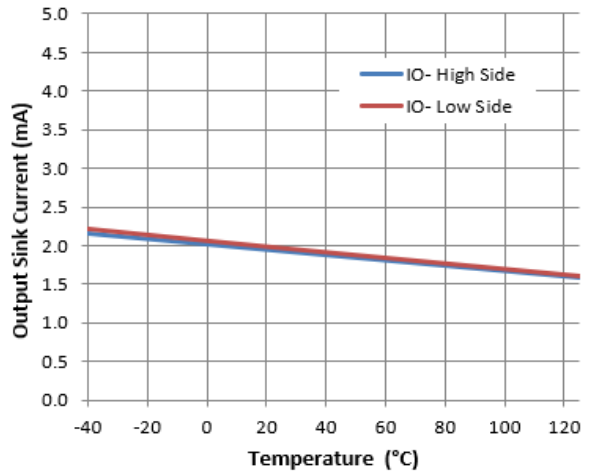


Figure 21. Output Sink Current vs. Temperature

Typical Performance Characteristics (continued)

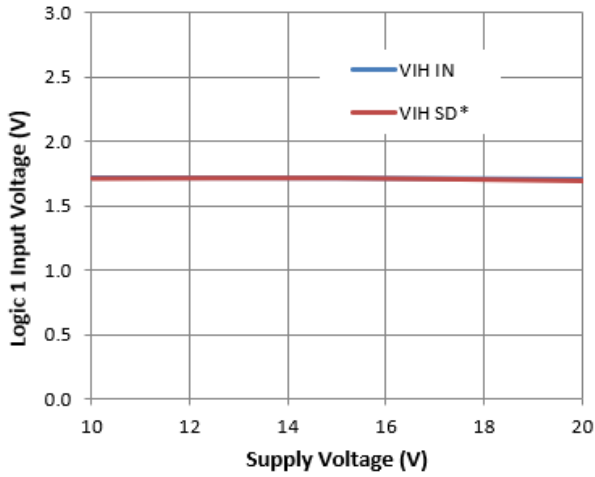


Figure 22. Logic 1 Input Voltage vs. Supply Voltage

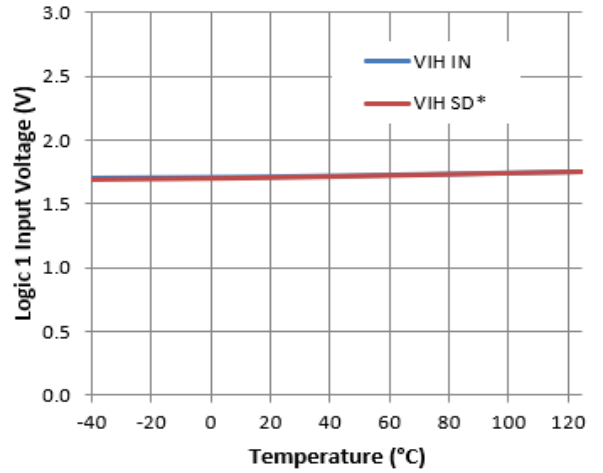


Figure 23. Logic 1 Input Voltage vs. Temperature

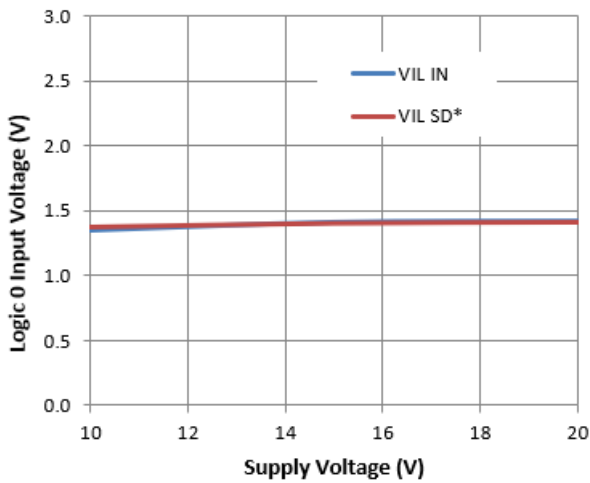


Figure 24. Logic 0 Input Voltage vs. Supply Voltage

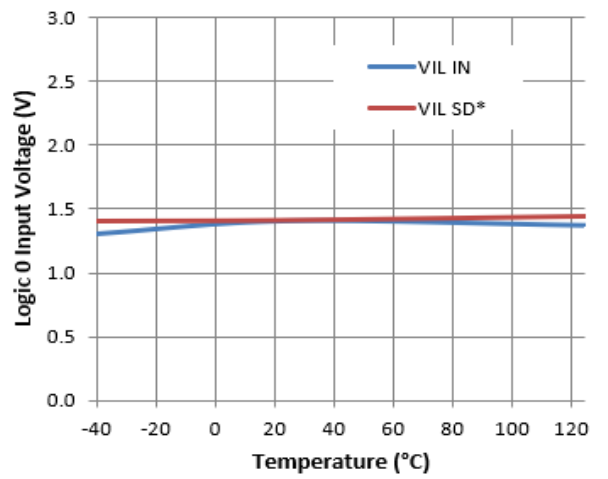


Figure 25. Logic 0 Input Voltage vs. Temperature

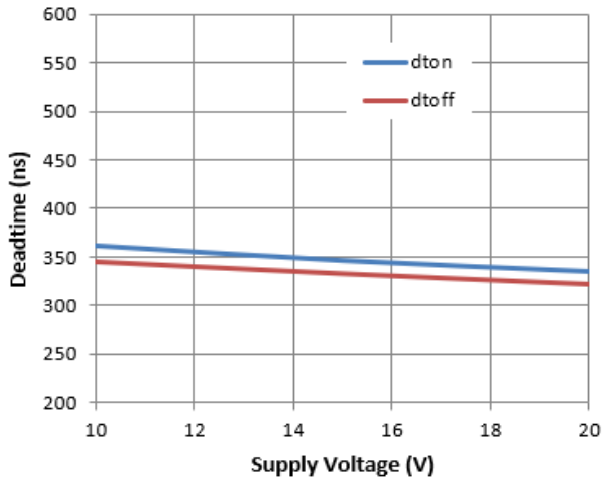


Figure 26. Deadtime vs. Supply Voltage

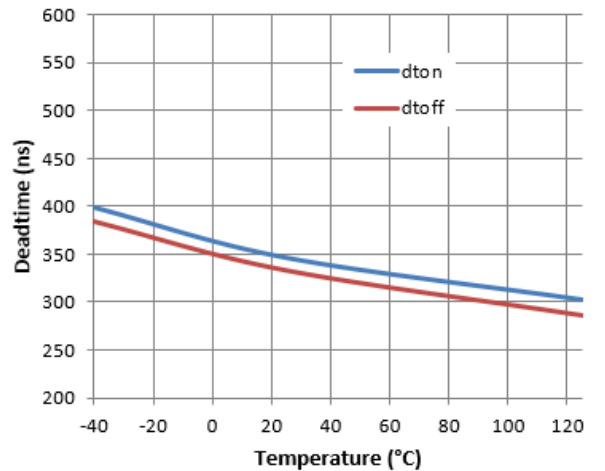


Figure 27. Deadtime vs. Temperature

Typical Performance Characteristics (continued)

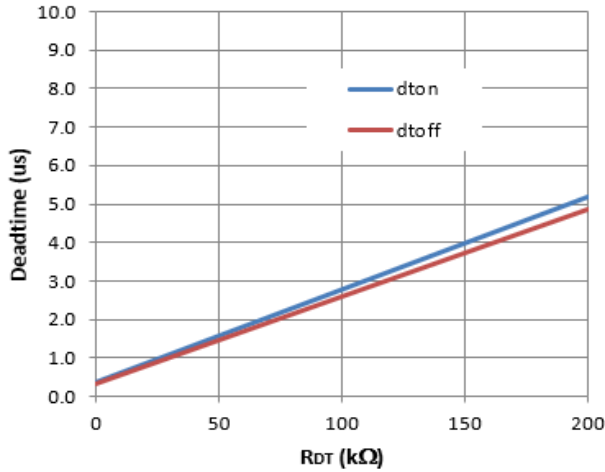


Figure 28. Deadtime vs. RDT

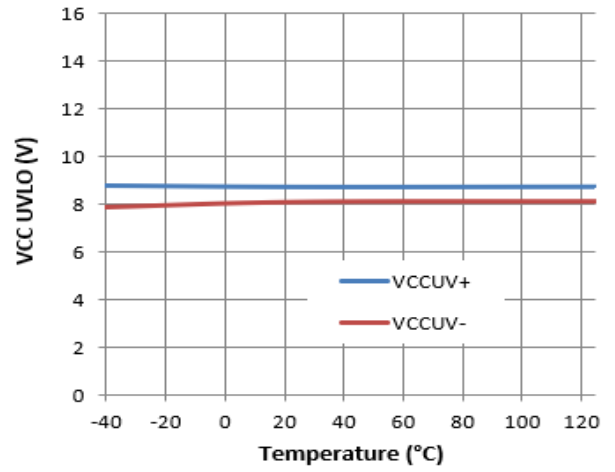


Figure 29. VCC UVLO vs. Temperature

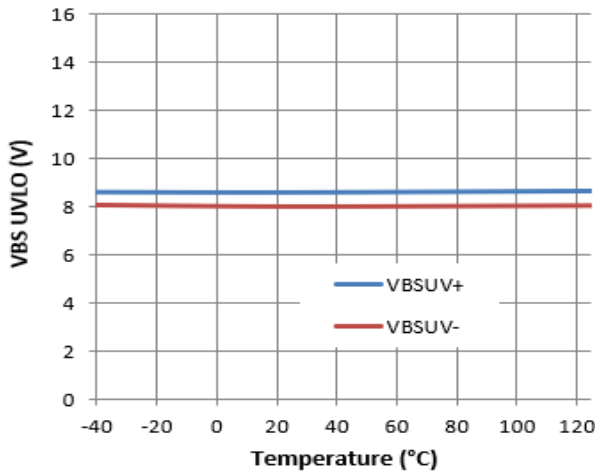


Figure 30. VBS UVLO vs. Temperature

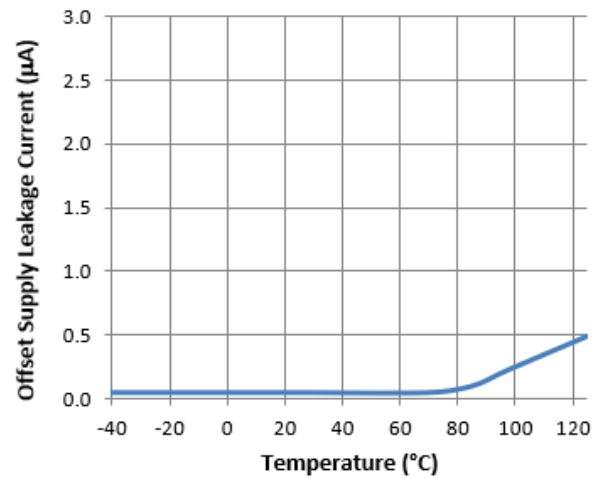
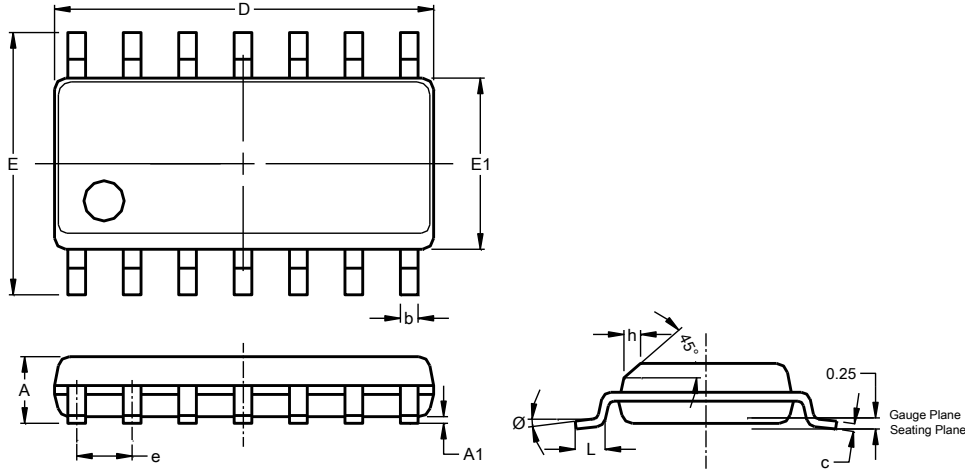


Figure 31. Offset Supply Leakage Current vs. Temperature

Package Outline Dimensions

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

SO-14 (Type TH)

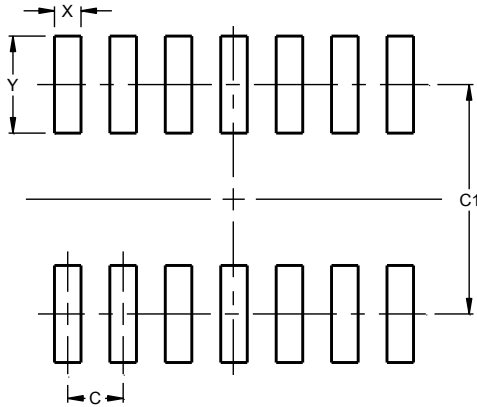


SO-14 (Type TH)			
Dim	Min	Max	Typ
A	1.55	1.73	--
A1	0.10	0.25	--
b	0.35	0.51	--
c	0.190	0.248	--
D	8.56	8.74	8.61
E	5.84	6.20	6.00
E1	3.81	3.99	3.94
e	--	--	1.27
h	--	--	0.33
L	0.41	0.89	--
Ø	0°	8°	--
All Dimensions in mm			

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

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