SLM2110

600V High and Low Side Driver

PRODUCT SUMMARY

- **V_{OFFSET}** 600 V max.
- **I_O+/-** 2.5 A / 2.5 A
- **V_{OUT}** 10 V - 20 V
- **$t_{on/off}$ (typ.)** 130 ns/120 ns
- **Delay Matching (typ.)** 10 ns

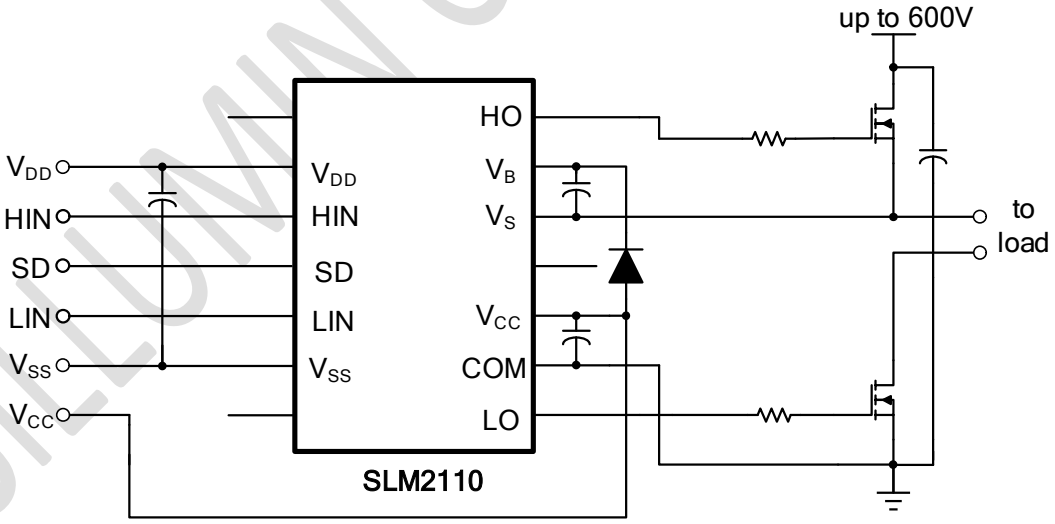
FEATURES

- Floating channel designed for bootstrap operation
- Fully operational to +600 V
- Tolerant to negative transient voltage, dV/dt immune
- Gate drive supply range from 10 V to 20 V
- Undervoltage lockout for both channels
- 3.3 V, 5 V, and 15 V logic compatible
- Logic and power ground +/- 5V offset
- Cross-conduction prevention logic
- CMOS Schemitt-triggered inputs with pull-down
- Cycle-by-cycle edge-triggered shutdown logic
- Matched propagation delay for both channels
- Outputs in phase with inputs
- RoHS compliant
- SOIC-16 (WB) package

GENERAL DESCRIPTION

The SLM2110 is a high voltage, high speed power MOSFET and IGBT drivers with independent high- and low-side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3 V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross conduction. Propagation delays are matched to simplify use in high frequency applications. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high-side configuration which operates up to 600 V.

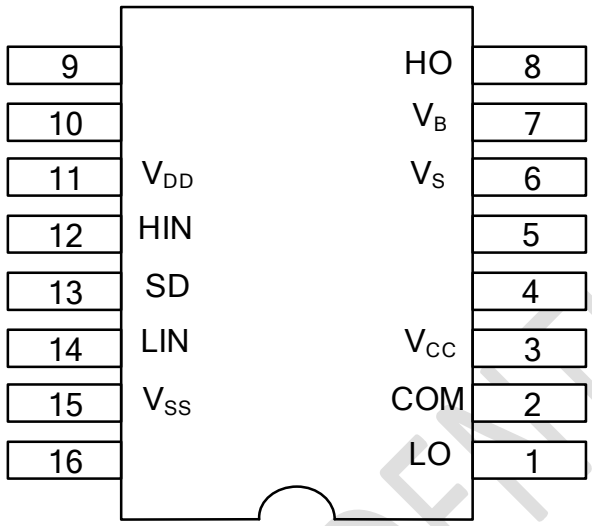
TYPICAL APPLICATION CIRCUIT



(Refer to Lead Assignments for correct configuration). This diagram shows electrical connections only. Please refer to our Application Notes and DesignTips for proper circuit board layout.

Figure 1 Typical Application Circuit

PIN CONFIGURATION

Package	Pin Configuration (Top View)
SOIC-16 (WB)	

PIN DESCRIPTION

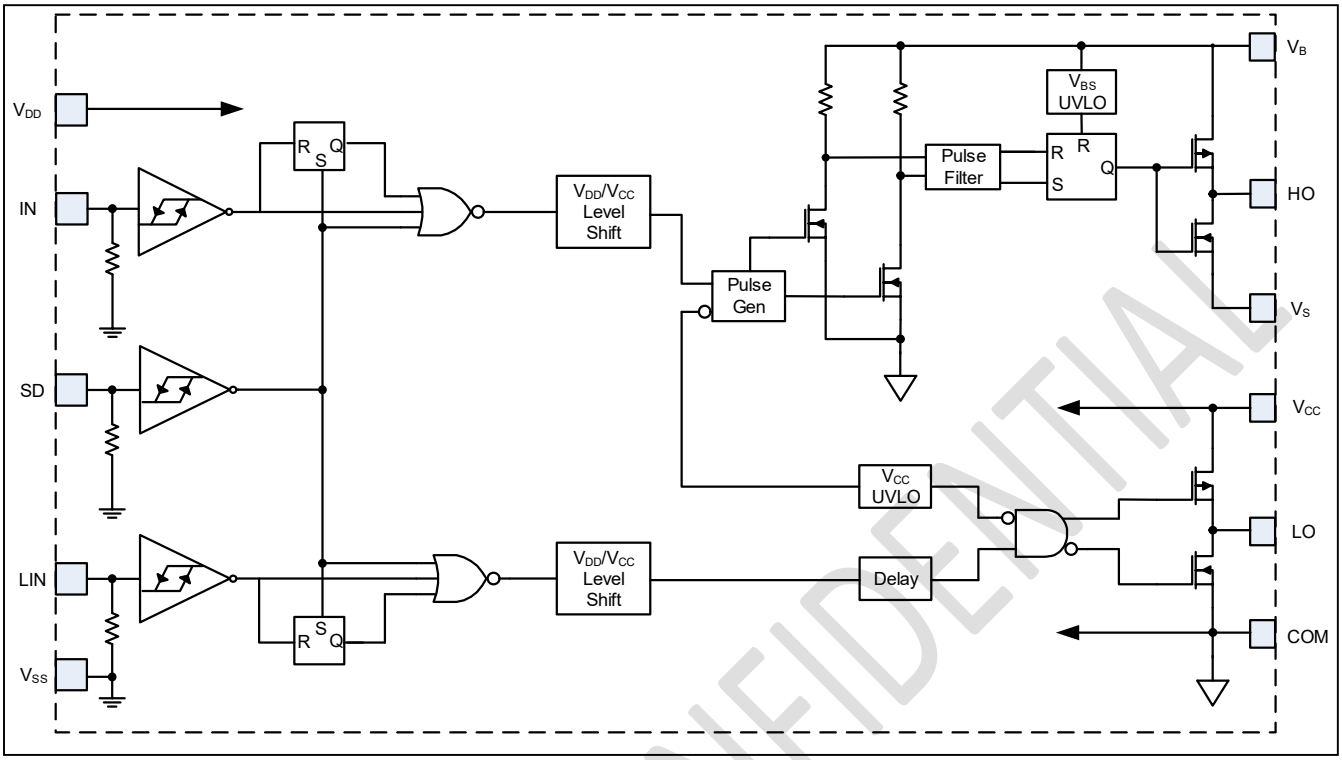
No.	Pin	Description
1	LO	Low-side gate drive output
2	COM	Low-side return
3	V_{CC}	Low-side supply
4	NC	No connection
5	NC	No connection
6	V_S	High-side floating supply return
7	V_B	High-side floating supply
8	HO	High-side gate drive output
9	NC	No connection
10	NC	No connection
11	V_{DD}	Logic supply
12	HIN	Logic input for high-side gate driver output (HO), in phase
13	SD	Logic input for shutdown
14	LIN	Logic input for low-side gate driver output (LO), in phase
15	V_{SS}	Logic ground
16	NC	No connection

ORDERING INFORMATION

Industrial Range: -40°C to +125°C

Order Part No.	Package	QTY
SLM2110CG	SOIC16 (WB), Pb-Free	1500/Reel

FUNCTIONAL BLOCK DIAGRAM



SLM2110

ABSOLUTE MAXIMUM RATINGS

Symbol	Definition		Min.	Max.	Units
V_B	High-side floating absolute voltage		-0.3	625	V
V_S	High-side floating supply offset voltage		V_B - 25	V_B + 0.3	
V_{HO}	High-side floating output voltage		V_S - 0.3	V_B + 0.3	
V_{CC}	Low-side supply voltage		-0.3	25	
V_{DD}	Logic supply voltage		-0.3	V_{SS} + 20	
V_{SS}	Logic supply offset voltage		V_{CC} - 20	V_{CC} + 0.3	
V_{LO}	Low-side output voltage		-0.3	V_{CC} + 0.3	
V_{IN}	Logic input voltage (HIN, LIN, & SD)		V_{SS} - 0.3	V_{DD} + 0.3	
dV_S/dt	Allowable offset supply voltage transient		---	50	V/ns
P_D	Package power dissipation @ $T_A \leqslant +25°C$	SOIC-16 (WB)	---	1.25	W
Rth_{JA}	Thermal resistance, junction to ambient	SOIC-16 (WB)	---	100	°C/W
T_J	Junction temperature		---	150	°C
T_S	Storage temperature		-55	150	
T_L	Lead temperature (soldering, 10 seconds)		---	300	

Note:
Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

RECOMMENDED OPERATIONG CONDITIONS

Symbol	Definition	Min.	Max.	Units
V_B	High-side floating absolute voltage	V_S + 10	V_S + 20	V
V_S	High-side floating supply offset voltage	Note 1	600	
V_{HO}	High-side floating output voltage	V_S	V_B	
V_{CC}	Low-side supply voltage	10	20	
V_{DD}	Logic supply voltage	V_{SS} + 3	V_{SS} + 20	
V_{SS}	Logic supply offset voltage	-5	5	
V_{LO}	Low-side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN, LIN, & SD)	V_{SS}	V_{DD}	
T_A	Ambient temperature	- 40	125	°C

Note:
The input/output logic timing diagram is shown in Fig. 1. For proper operation the device should be used within the recommended conditions. The V_S offset rating is tested with all supplies biased at a 15 V differential.

DYNAMIC ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}, V_{DD}) = 15 V, C_L = 1000 pF and T_A = 25°C unless otherwise specified.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
t_{on}	Turn-on propagation delay	V_S = 0 V	---	130	160	ns
t_{off}	Turn-off propagation delay	V_S = 600 V	---	120	150	
t_{sd}	Shutdown propagation delay	V_S = 600 V	---	130	160	
t_r	Turn-on rise time		---	25	35	
t_f	Turn-off fall time		---	17	25	
MT	Delay matching, HS & LS turn-on/off		---	---	10	

STATIC ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}, V_{DD}) = 15 V and T_A = 25°C unless otherwise specified. The V_{IN}, V_{TH}, and I_{IN} parameters are referenced to V_{SS} and and are applicable to all three logic input leads: HIN, LIN, and SD. The V_O and I_O parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{IH}	Logic “1” input voltage	V_{CC} = 10 V to 20V	10.2	---	---	V
V_{IL}	Logic “0” input voltage		---	---	5.0	
V_{OH}	High level output voltage, V_{BIAS} - V_O	I_O = 2 mA	---	---	1.4	
V_{OL}	Low level output voltage, V_O		---	0.02	0.15	
I_{LK}	Offset supply leakage current	V_B = V_S = 600 V	---	---	50	µA
I_{QBS}	Quiescent V_{BS} supply current	V_{IN} = 0 V or 5 V	---	65	120	
I_{QCC}	Quiescent V_{CC} supply current		---	300	550	
I_{QDD}	Quiescent V_{DD} supply current		---	15	30	
I_{IN+}	Logic “1” input bias current	V_{IN} = 5V	---	25	40	
I_{IN-}	Logic “0” input bias current	V_{IN} = 0V	---	---	5	
V_{BSUV+}	V_{BS} supply undervoltage positive going threshold		7.5	8.9	9.7	V
V_{BSUV-}	V_{BS} supply undervoltage negative going threshold		7.4	8.2	9.4	
V_{CCUV+}	V_{CC} supply undervoltage positive going threshold		7.5	8.9	9.7	V
V_{CCUV-}	V_{CC} supply undervoltage negative going threshold		7.4	8.2	9.4	
I_{O+}	Output high short circuit pulsed current	V_O = 0 V V_{IN} = Logic “1” PW ⩽ 10 µs	2.0	2.5		A
I_{O-}	Output low short circuit pulsed current	V_O = 15 V V_{IN} = Logic “0” PW ⩽ 10 µs	2.0	2.5		

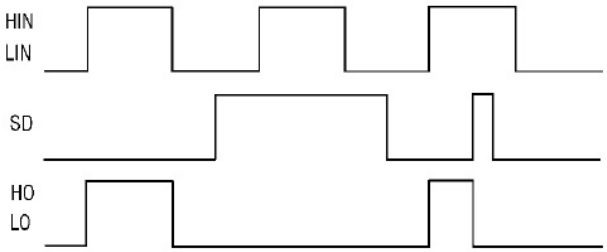


Figure 1. Input/Output Timing Diagram

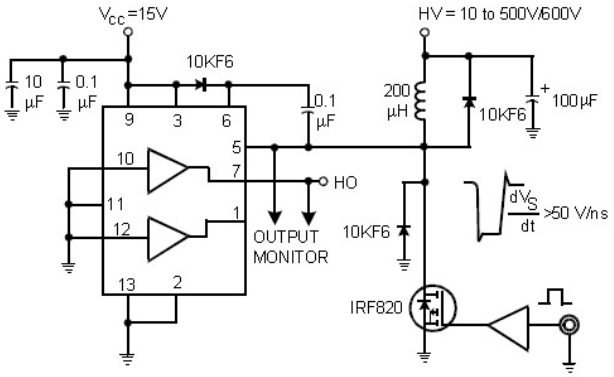


Figure 2. Floating Supply Voltage Transient Test Circuit

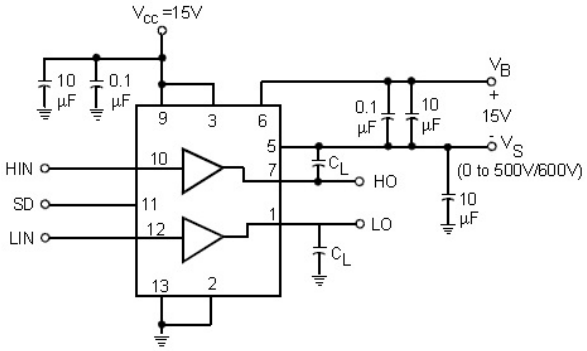


Figure 3. Switching Time Test Circuit

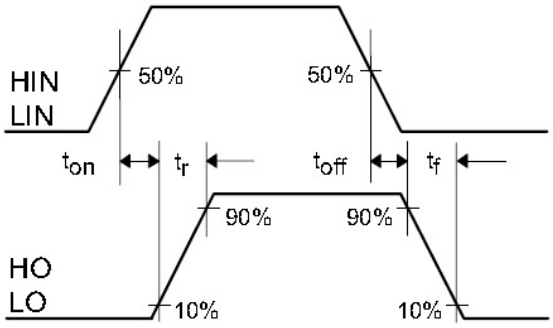


Figure 4. Switching Time Waveform Definition

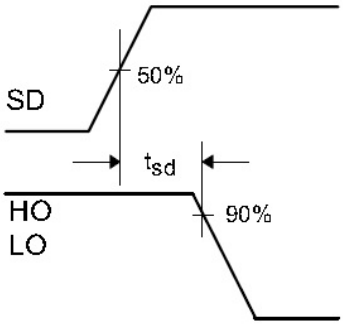


Figure 5. Shutdown Waveform Definitions

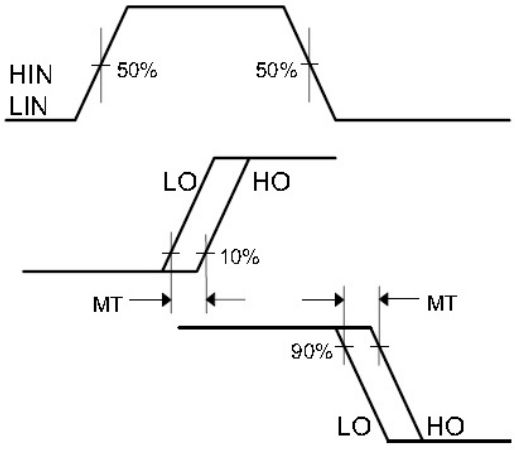


Figure 6. Delay Matching Waveform Definitions

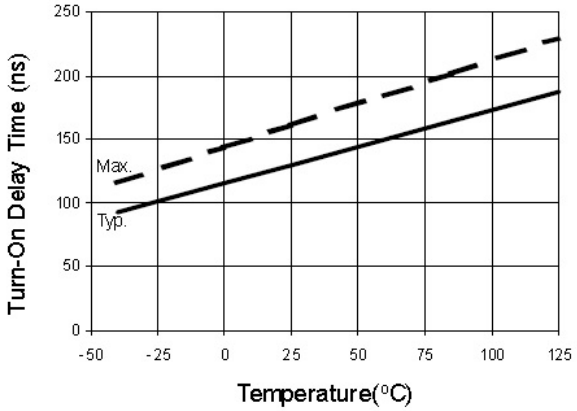


Figure 7A. Turn-On Time vs. Temperature

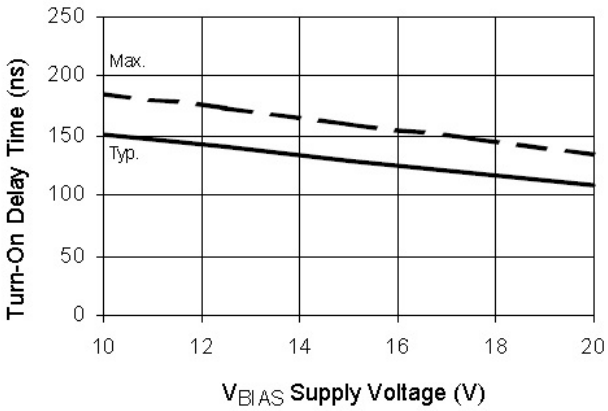


Figure 7B. Turn-On Time vs. Supply Voltage

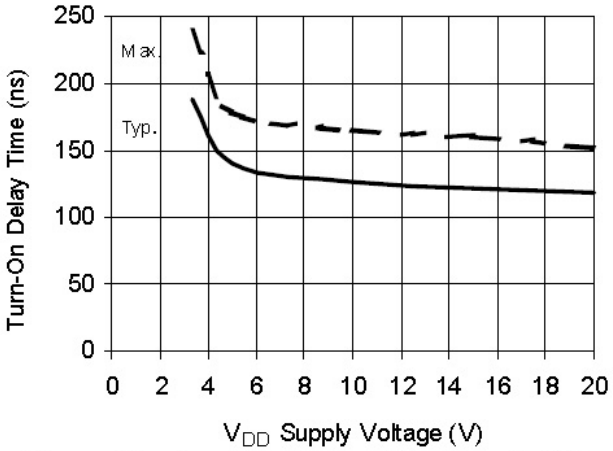


Figure 7C. Turn-On Time vs. V_{DD} Supply Voltage

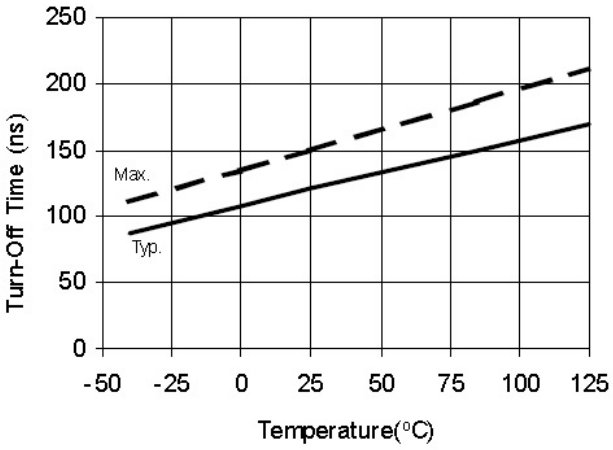


Figure 8A. Turn-Off Time vs. Temperature

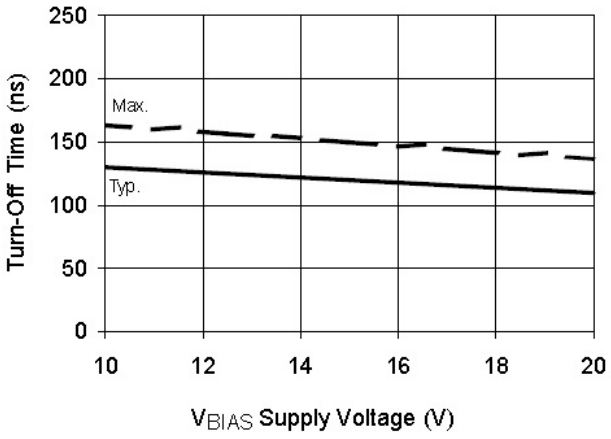


Figure 8B. Turn-Off Time vs. Supply Voltage

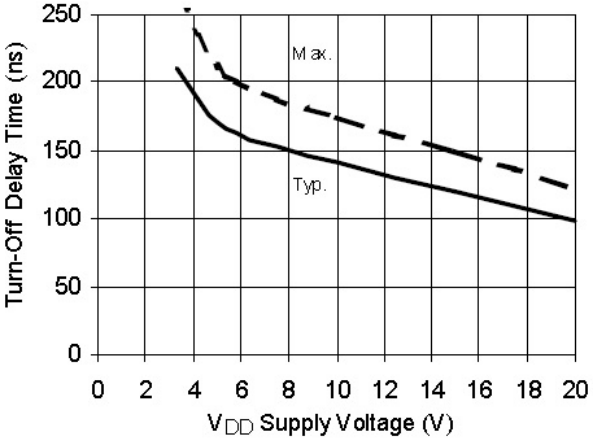


Figure 8C. Turn-Off Time vs. V_{DD} Supply Voltage

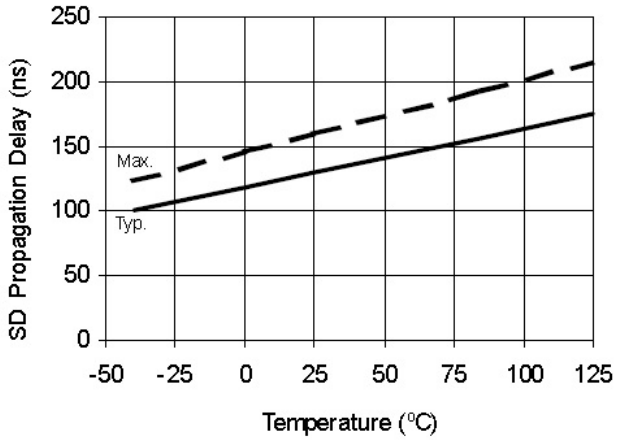


Figure 9A. Shutdown Time vs. Temperature

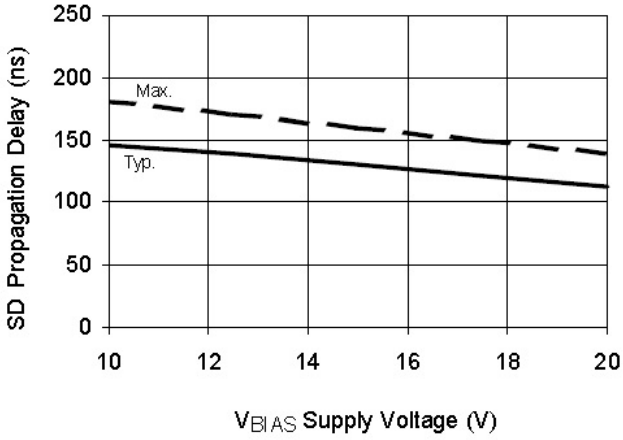


Figure 9B. Shutdown Time vs. Supply Voltage

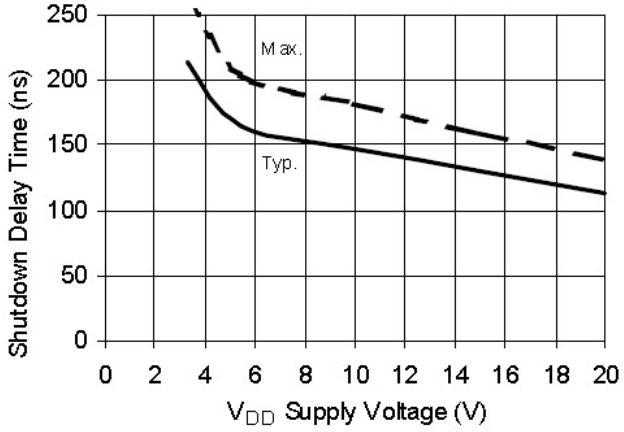


Figure 9C. Shutdown Time vs. V_{DD} Supply Voltage

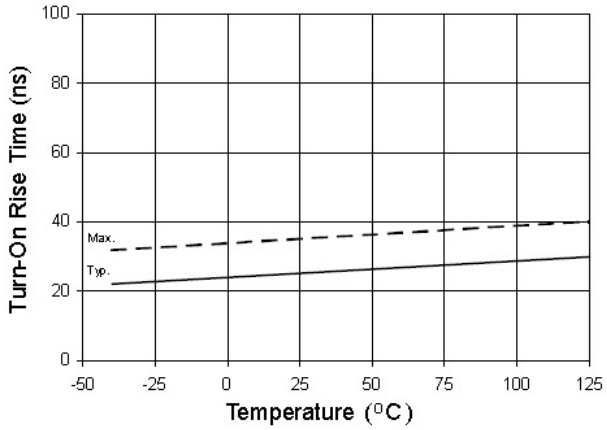


Figure 10A. Turn-On Rise Time vs. Temperature

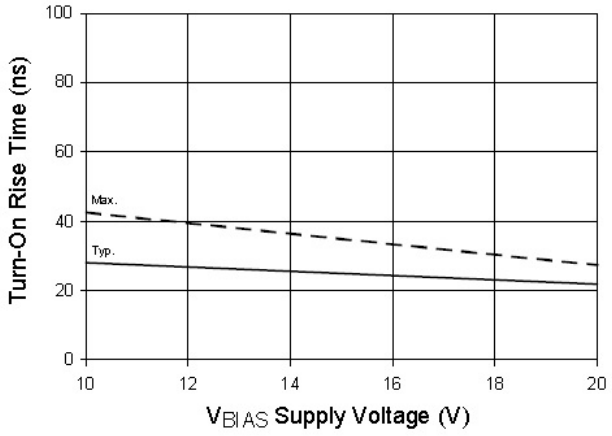


Figure 10B. Turn-On Rise Time vs. Voltage

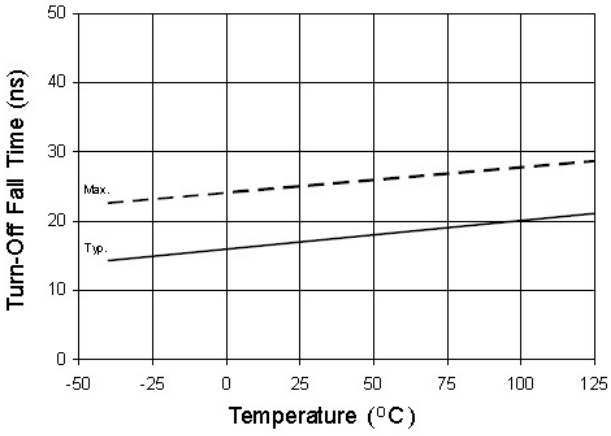


Figure 11A. Turn-Off Fall Time vs. Temperature

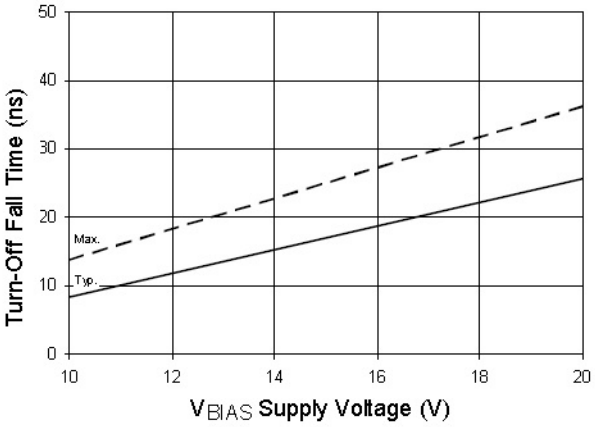


Figure 11B. Turn-Off Fall Time vs. Voltage

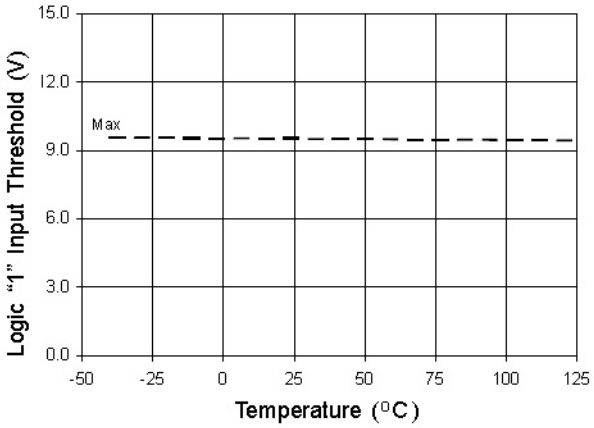


Figure 12A. Logic "1" Input Threshold vs. Temperature

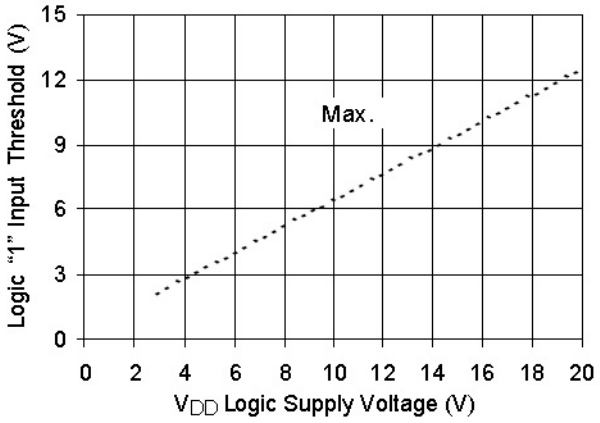


Figure 12B. Logic "1" Input Threshold vs. Voltage

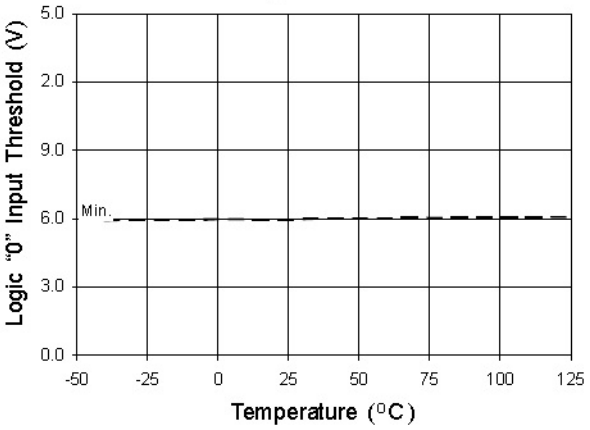


Figure 13A. Logic "0" Input Threshold vs. Temperature

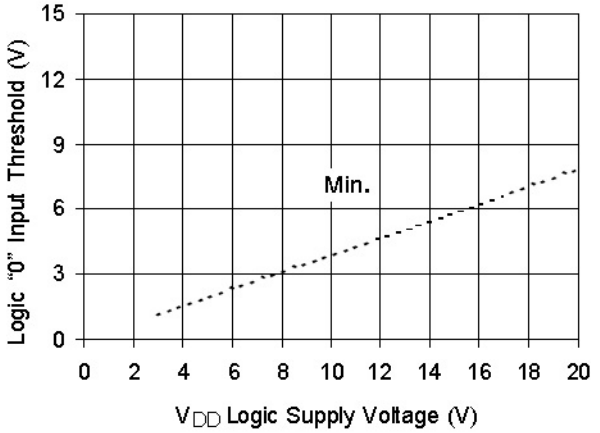


Figure 13B. Logic "0" Input Threshold vs. Voltage

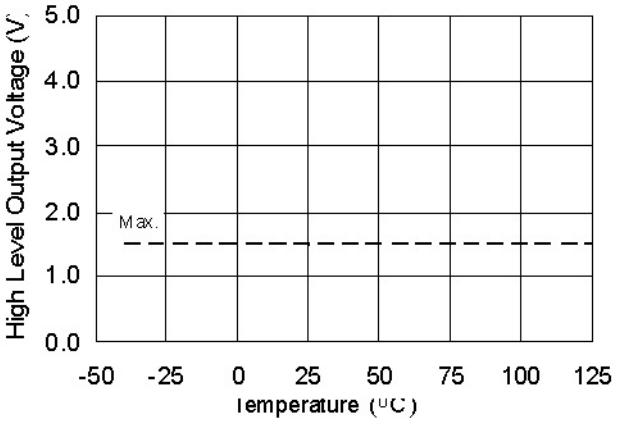


Figure 14A. High Level Output Voltage vs. Temperature (I_O = 0 mA)

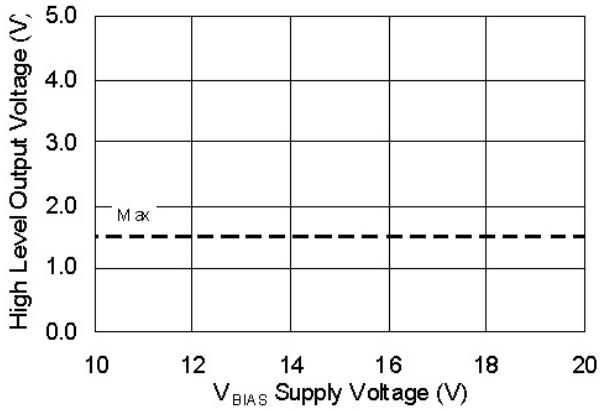


Figure 14B. High Level Output Voltage vs. Supply Voltage (I_O = 0 mA)

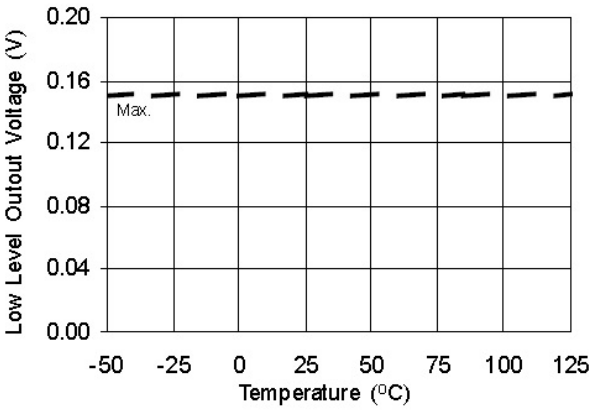


Figure 15A. Low Level Output vs. Temperature

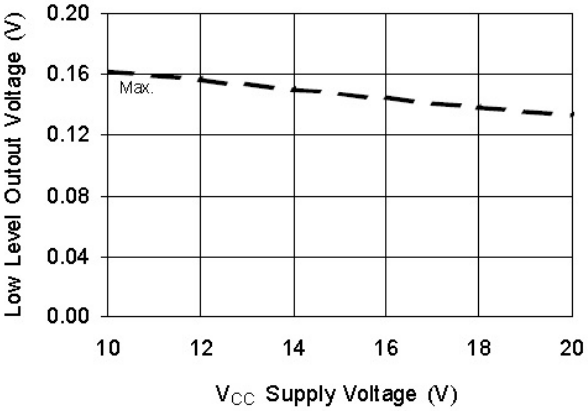


Figure 15B. Low Level Output vs. Supply Voltage

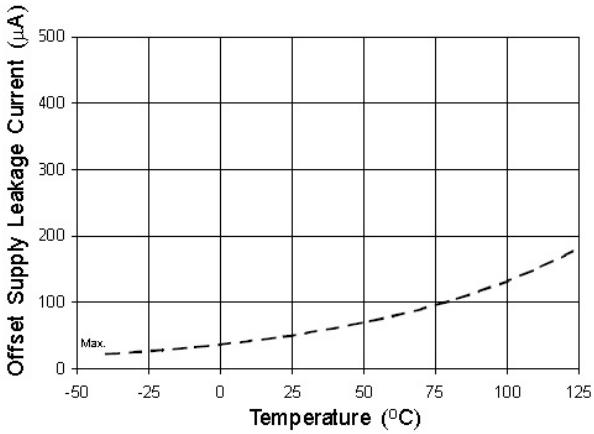


Figure 16A. Offset Supply Current vs. Temperature

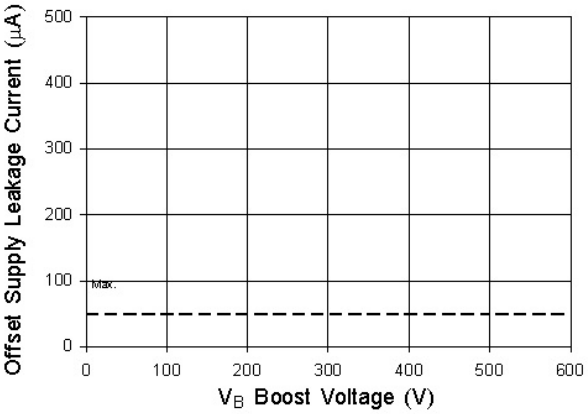


Figure 16B. Offset Supply Current vs. Voltage

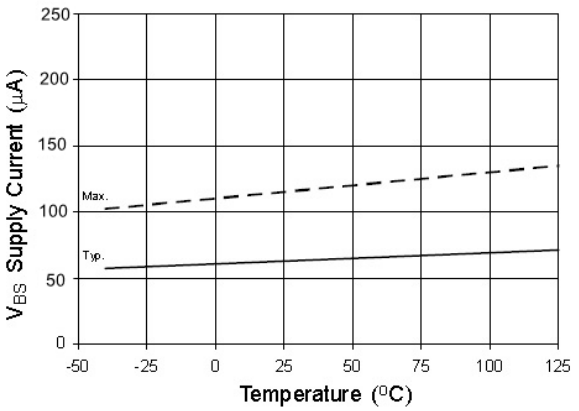


Figure 17A. V_{BS} Supply Current vs. Temperature

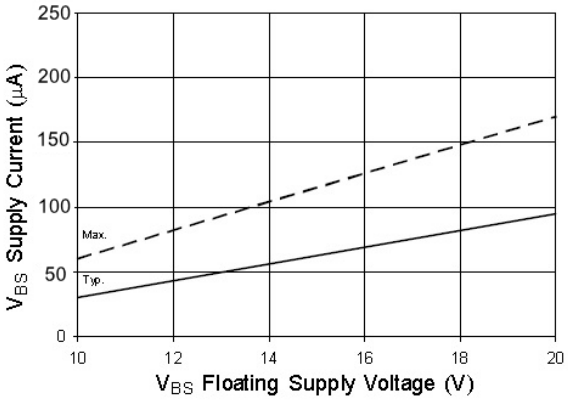


Figure 17B. V_{BS} Supply Current vs. Voltage

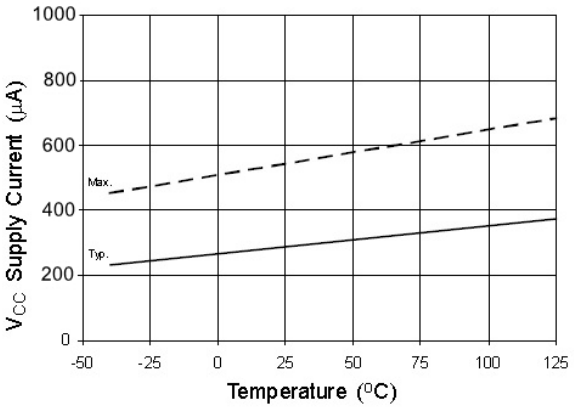


Figure 18A. V_{CC} Supply Current vs. Temperature

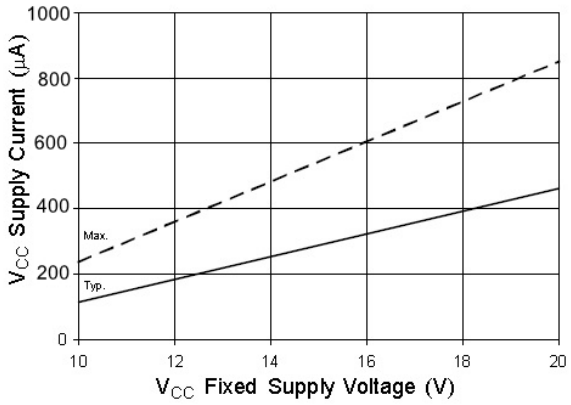


Figure 18B. V_{CC} Supply Current vs. Voltage

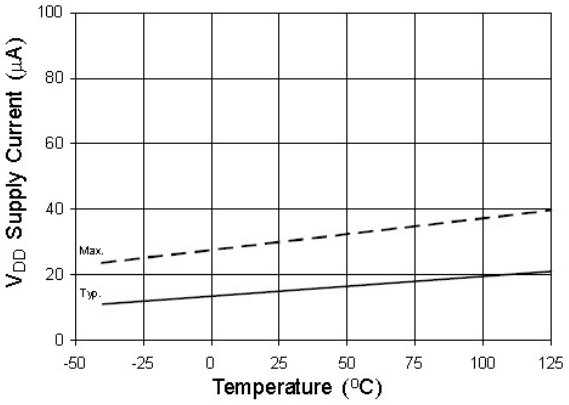


Figure 19A. V_{DD} Supply Current vs. Temperature

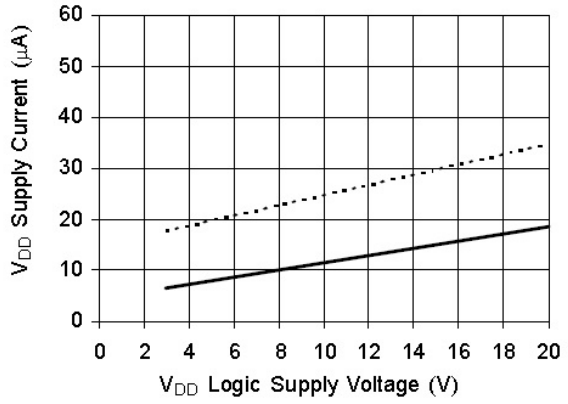


Figure 19B. V_{DD} Supply Current vs. V_{DD} Voltage

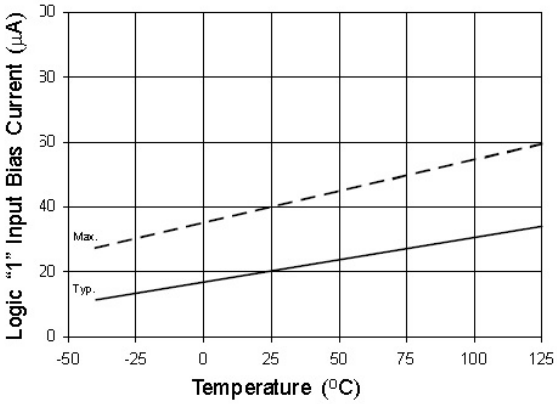


Figure 20A. Logic "1" Input Current vs. Temperature

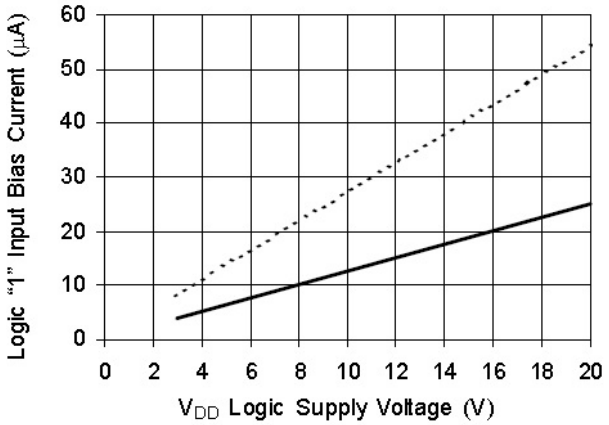


Figure 20B. Logic "1" Input Current vs. V_{DD} Voltage

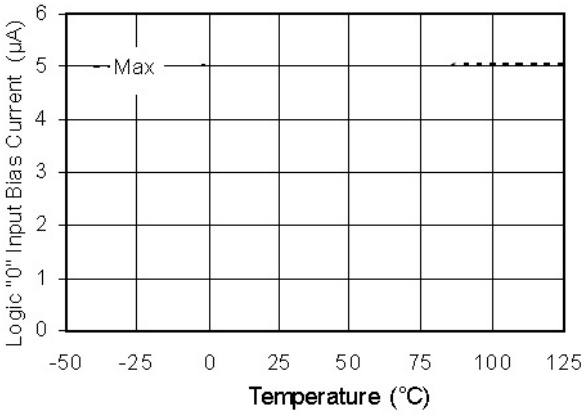


Figure 21A. Logic "0" Input Bias Current vs. Temperature

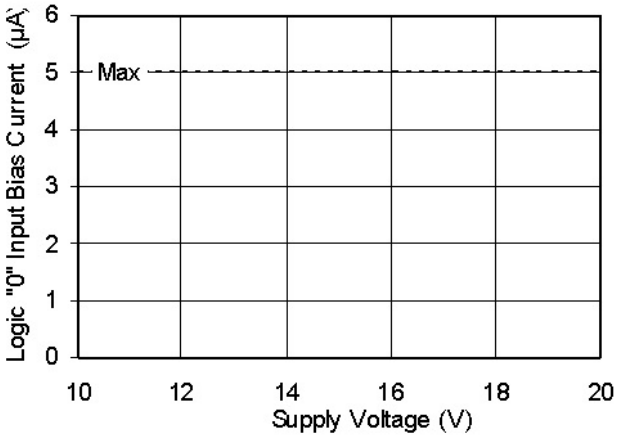


Figure 21B. Logic "0" Input Bias Current vs. Voltage

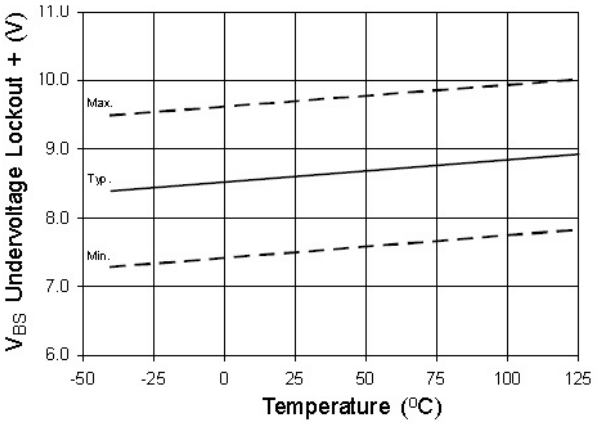


Figure 22. V_{BS} Undervoltage (+) vs. Temperature

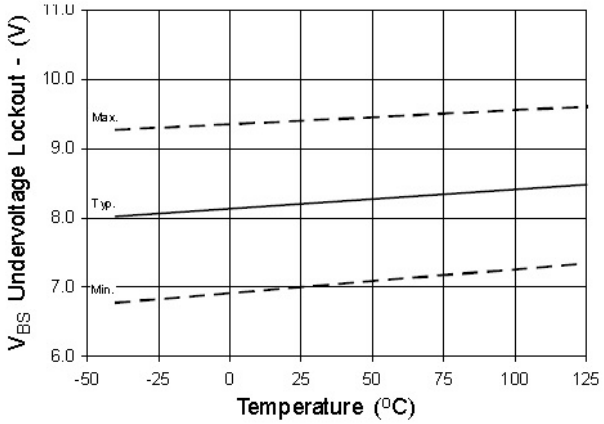


Figure 23. V_{BS} Undervoltage (-) vs. Temperature

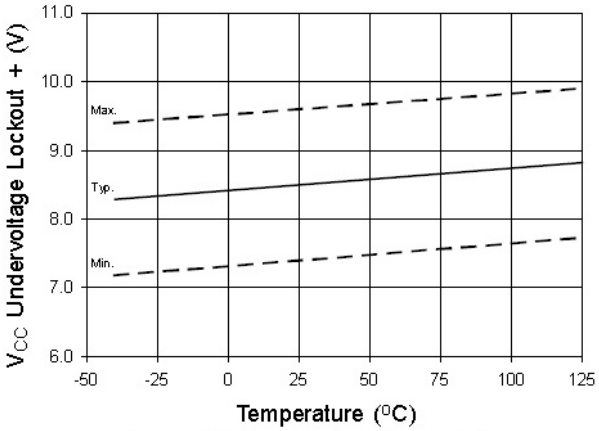


Figure 24. V_{CC} Undervoltage (+) vs. Temperature

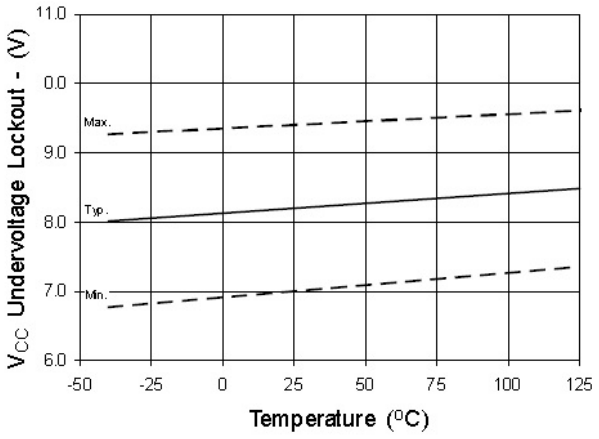


Figure 25. V_{CC} Undervoltage (-) vs. Temperature

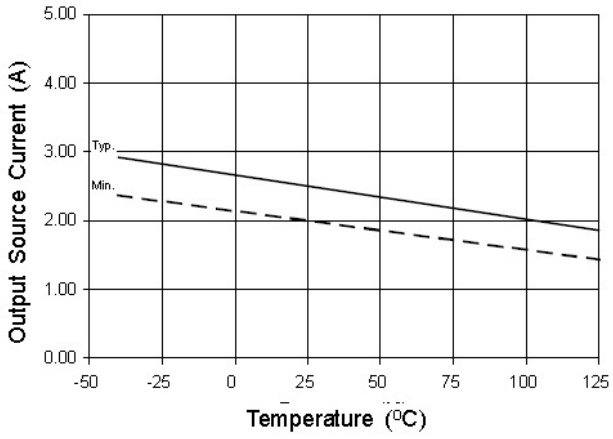


Figure 26A. Output Source Current vs. Temperature

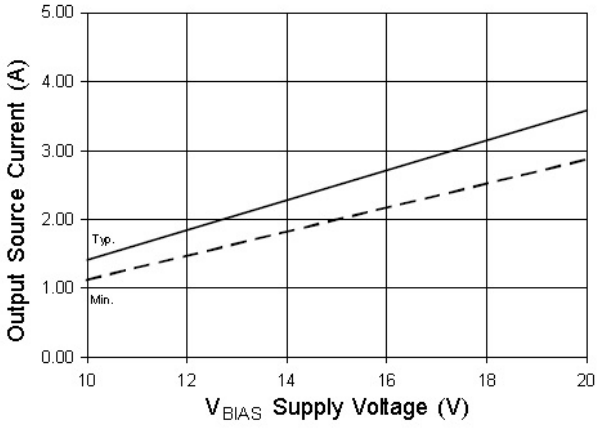


Figure 26B. Output Source Current vs. Voltage

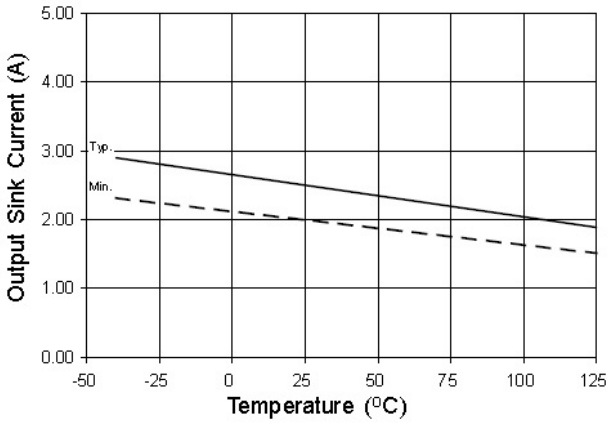


Figure 27A. Output Sink Current vs. Temperature

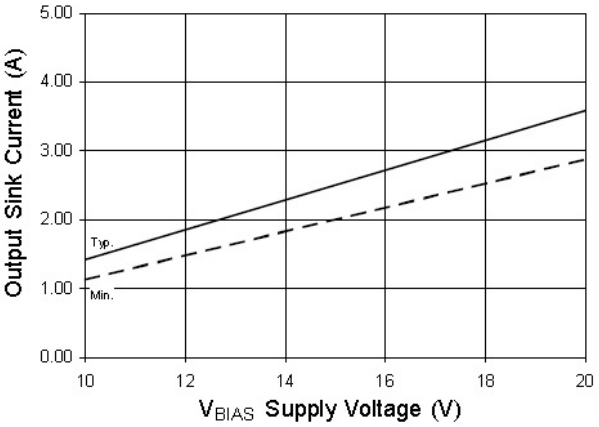
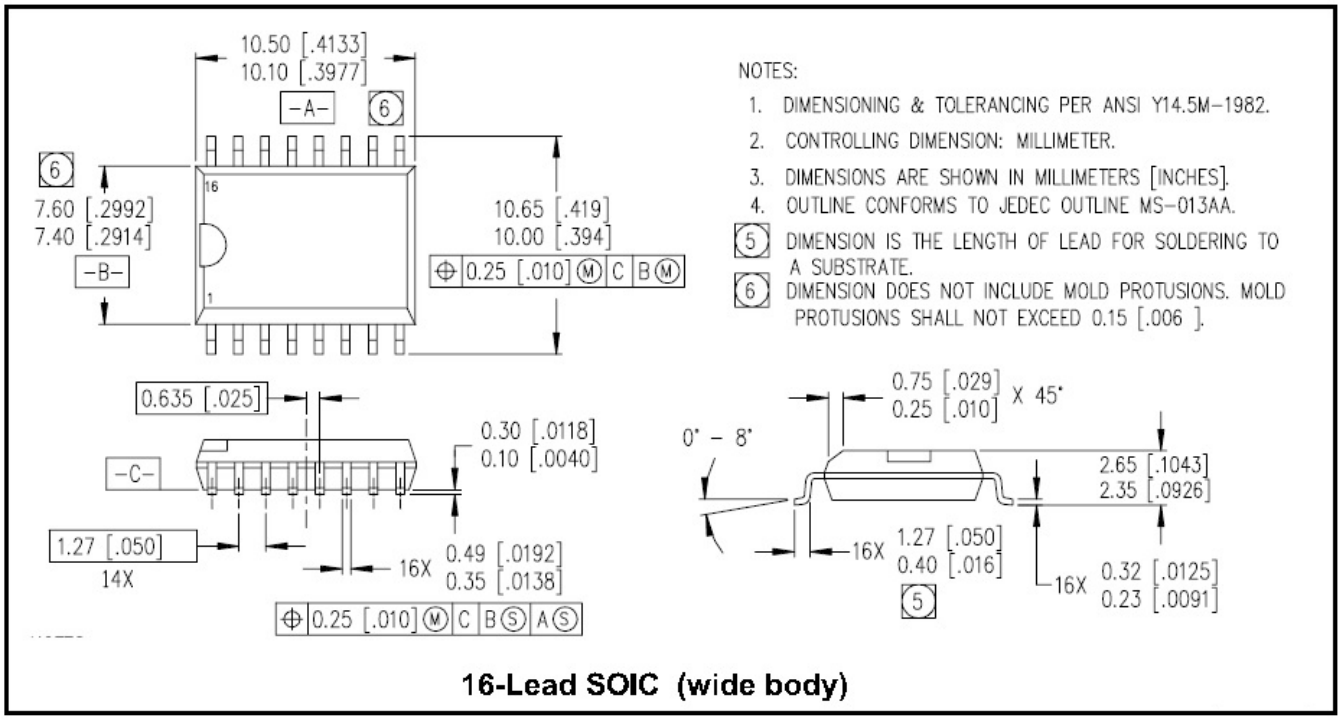


Figure 27B. Output Sink Current vs. Voltage

PACKAGE CASE OUTLINES



16-Lead SOIC (wide body)

Revision History

Note: page numbers for previous revisions may differ from page numbers in current version

Page or Item	Subjects (major changes since previous revision)
Rev 1.0 datasheet, 2019-8-27	
Whole document	New company logo released
Page 1	Remove “May 2019”

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