Half-Bridge Driver

Features

- Floating channel designed for bootstrap operation
- Fully operational to +600V
- Tolerant to negative transient voltage
- dV/dt immune
- Gate drive supply range from 10 to 20V
- Undervoltage lockout
- 3.3V, 5V and 15V logic compatible
- Cross-conduction prevention logic
- Matched propagation delay for both channels
- Internal set deadtime
- High side output in phase with HIN input
- Low side output out of phase with LIN input

Product Summary

V_{OFFSET} (max)	600V
$I_{O+/-}$	130mA / 270mA
V_{OUT}	10V – 20V
ton/off (typ.)	680 & 150 ns
Deadtime (typ.)	520 ns

Description

The IR2103(S) are high voltage, high speed power MOSFET and IGBT drivers with dependent 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 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. 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 volts.

Package Options



8 Lead SOIC



8 Lead PDIP

Ordering Information

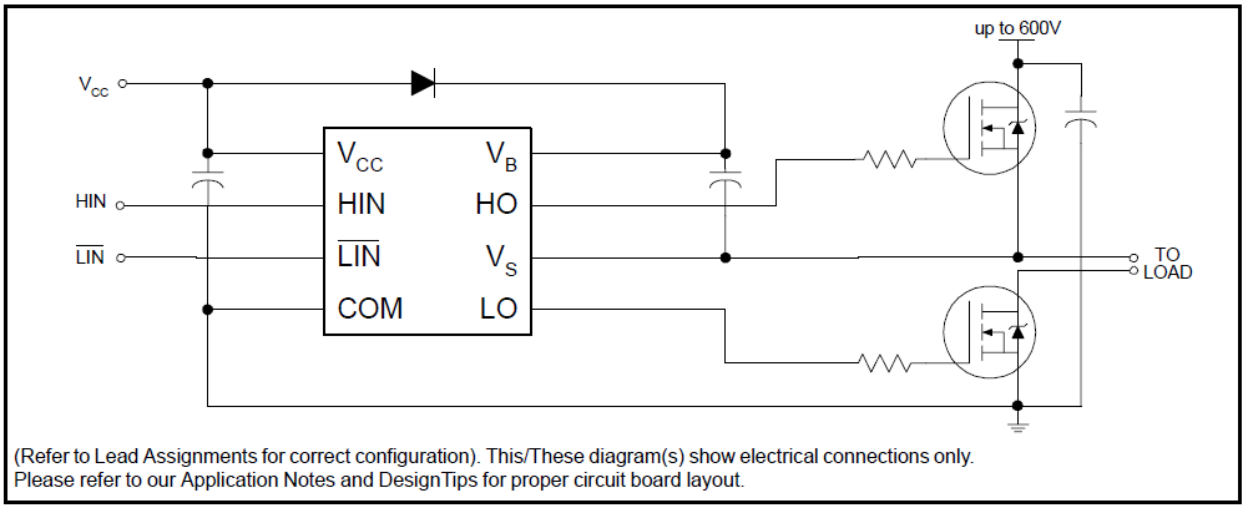
Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IR2103SPBF	SO8N	Tube	95	IR2103SPBF
IR2103SPBF	SO8N	Tape and Reel	2500	IR2103STRPBF
IR2103PBF	PDIP8	Tube	50	IR2103PBF

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Table of Contents	Page
Description	1
Ordering Information	1
Typical Connection Diagram	3
Absolute Maximum Ratings	4
Recommended Operating Conditions	4
Dynamic Electrical Characteristics	5
Static Electrical Characteristics	5
Functional Block Diagrams	6
Lead Definitions	7
Lead Assignments	7
Application Information and Additional Details	8
Package Details: PDIP8, SO8N	15
Tape and Reel Details: SO8N	16
Part Marking Information	17
Qualification Information	18

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Typical Connection Diagram



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

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Absolute Maximum Ratings

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.

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 and logic fixed supply voltage		-0.3	25	
V_{LO}	Low side output voltage		-0.3	V_{CC} + 0.3	
V_{IN}	Logic input voltage (HIN & $\overline{LIN}$)		-0.3	V_{CC} + 0.3	
dV_S/dt	Allowable offset supply voltage transient		—	50	V/ns
P_D	Package power dissipation @ $T_A \leq +25°C$	8 lead PDIP	—	1	W
		8 lead SOIC	—	0.625	
Rth_{JA}	Thermal resistance, junction to ambient	8 lead PDIP	—	125	°C/W
		8 lead SOIC	—	200	
T_J	Junction temperature		—	150	°C
T_S	Storage temperature		-55	150	
T_L	Lead temperature (soldering, 10 seconds)		—	300	

Recommended Operating Conditions

The input/output logic timing diagram is shown in figure 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 15V differential.

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	†	600	
V_{HO}	High side floating output voltage	V_S	V_B	
V_{CC}	Low side and logic fixed supply voltage	10	20	
V_{LO}	Low side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN & $\overline{LIN}$)	0	V_{CC}	
T_A	Ambient temperature	-40	125	°C

† Logic operational for V_S of -5 to +600V. Logic state held for V_S of -5V to $-V_{BS}$. (Please refer to the Design Tip DT97-3 for more details).

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Dynamic Electrical Characteristics

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

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	—	680	820	ns	V_S = 0V
t_{off}	Turn-off propagation delay	—	150	220		V_S = 600V
t_r	Turn-on rise time	—	100	170		
t_f	Turn-off fall time	—	50	60		
DT	Deadtime, LS turn-off to HS turn-on & HS turn-on to LS turn-off	400	520	650		
MT	Delay matching, HS & LS turn on/off	—	—	60		

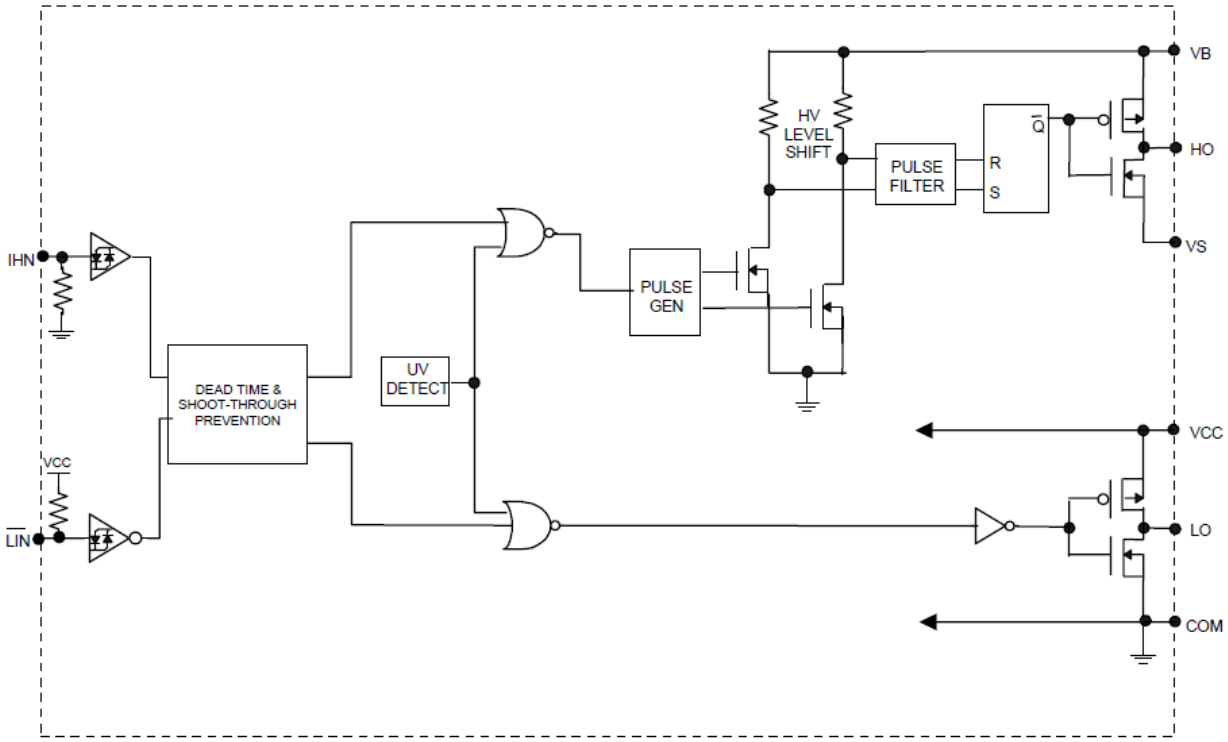
Static Electrical Characteristics

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

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
V_{IH}	Logic “1” (HIN) & Logic “0” ($\overline{\text{LIN}}$) input voltage	3	—	—	V	V_{CC} = 10V to 20V
V_{IL}	Logic “0” (HIN) & Logic “1” ($\overline{\text{LIN}}$) input voltage	—	—	0.8		V_{CC} = 10V to 20V
V_{OH}	High level output voltage V_{BIAS} - V_O	—	—	100	mV	I_O = 0A
V_{OL}	Low level output voltage, V_O	—	—	100		I_O = 0A
I_{LK}	Offset supply leakage current	—	—	50	µA	V_B = V_S = 600V
I_{QBS}	Quiescent V_{BS} supply current	—	30	55		V_{IN} = 0V or 5V
I_{QCC}	Quiescent V_{CC} supply current		150	270		V_{IN} = 0V or 5V
I_{IN+}	Logic “1” input bias current	—	3	10		H_{IN} = 5V, $\overline{\text{LIN}}$ =0V
I_{IN-}	Logic “0” input bias current	—	—	1		H_{IN} = 0V, $\overline{\text{LIN}}$ =5V
V_{CCUV+}	V_{CC} supply undervoltage positive going threshold	8	8.9	9.8	V	
V_{CCUV-}	V_{CC} supply undervoltage negative going threshold	7.4	8.2	9		
I_{O+}	Output high short circuit pulsed current	130	210	—	mA	V_O = 0V, V_{IN} = V_{IH} PW ≤ 10 µs
I_{O-}	Output low short circuit pulsed current	270	360	—		V_O = 15V , V_{IN} = V_{IL} PW ≤ 10 µs

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Functional Block Diagram

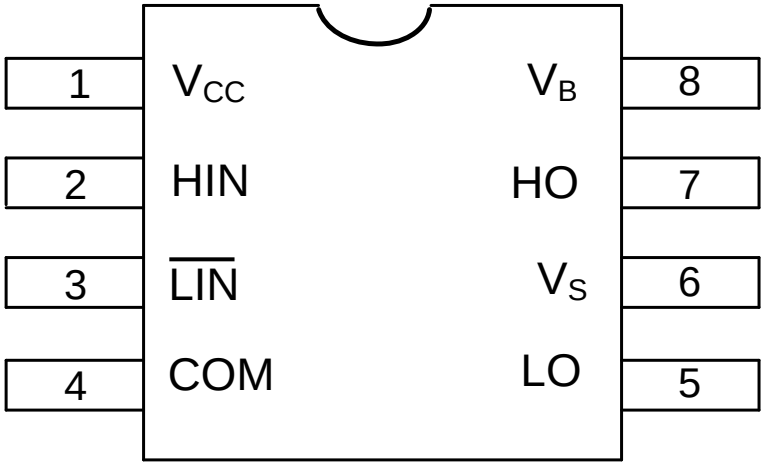


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Lead Definitions

Symbol	Description
HIN	Logic input for high side gate driver output (HO), in phase
$\overline{\text{LIN}}$	Logic input for low side gate driver output (LO), out of phase
V_B	High side floating supply
HO	High side gate drive output
V_S	High side floating supply return
V_{CC}	Low side and logic fixed supply
LO	Low side gate drive output
COM	Low side return

Lead Assignments



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Application Information and Additional Details

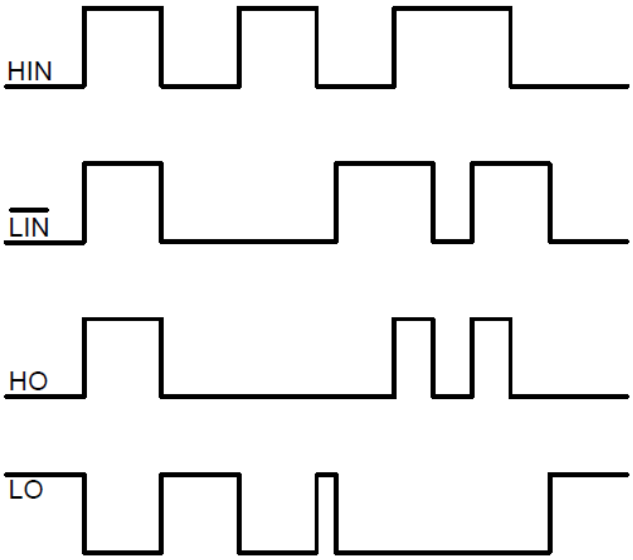
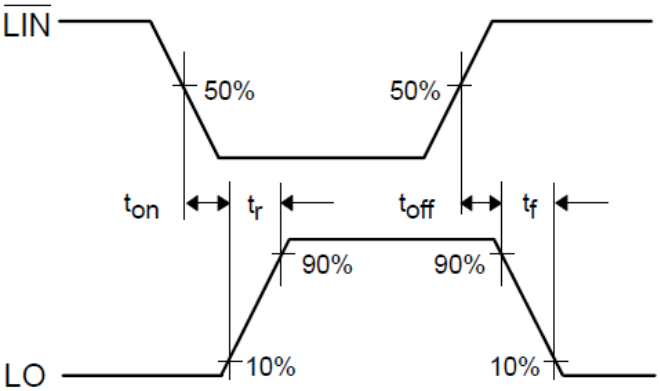


Figure 1. Input/Output Timing Diagram



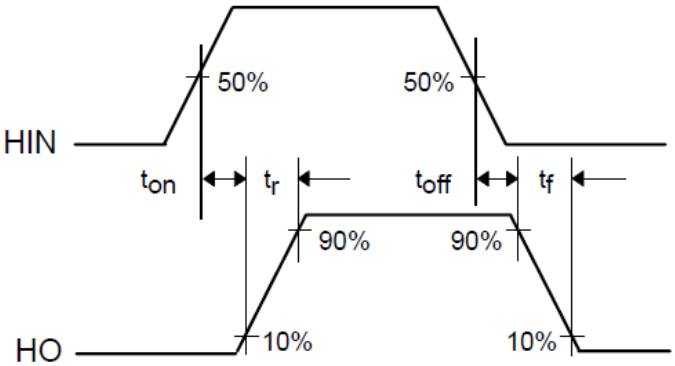


Figure 2. Switching Time Waveform Definitions

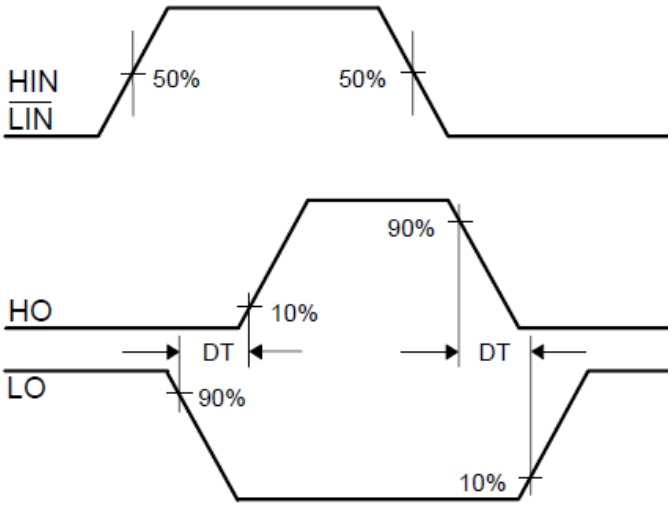


Figure 3. Deadtime Waveform Definitions

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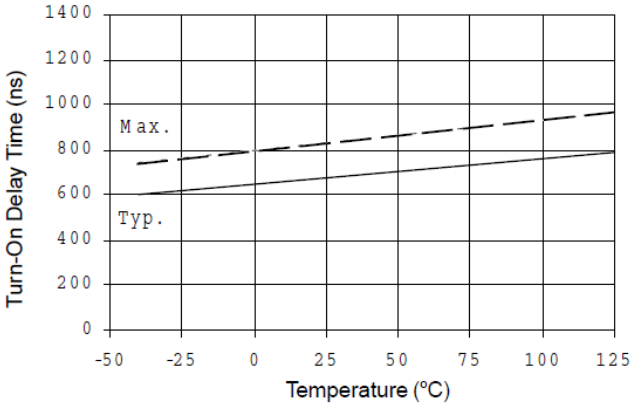


Figure 4A. Turn-On Time vs. Temperature

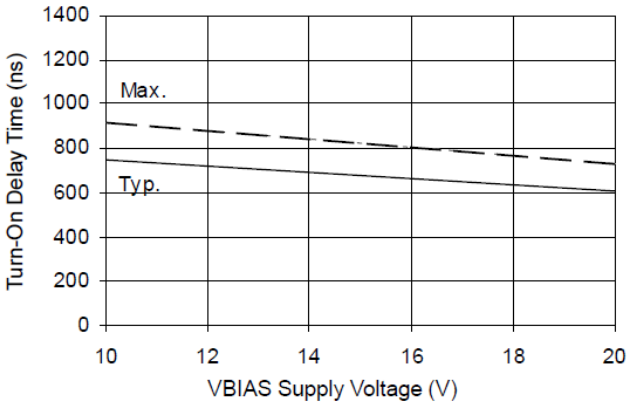


Figure 4B. Turn-On Time vs. Supply Voltage

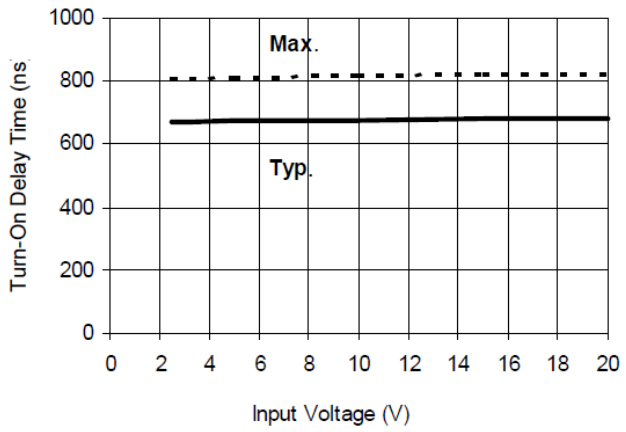


Figure 4C. Turn-On Time vs. Input Voltage

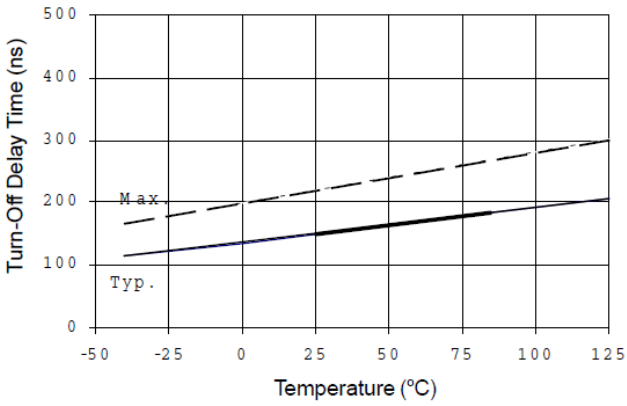


Figure 5A. Turn-Off Time vs. Temperature

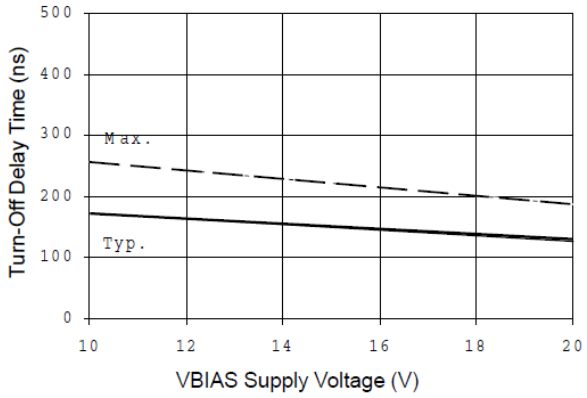


Figure 5B. Turn-Off Time vs. Supply Voltage

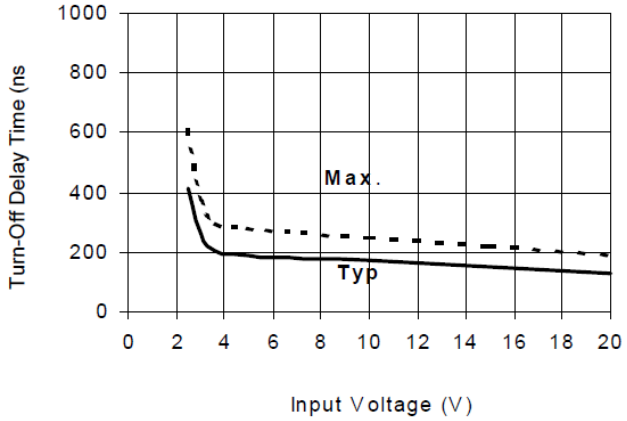


Figure 5C. Turn-Off Time vs. Input Voltage

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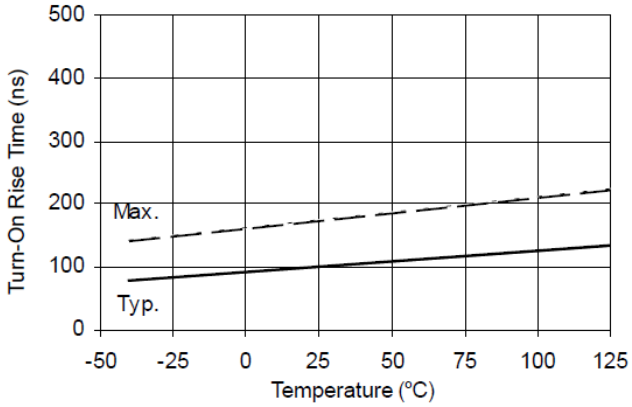


Figure 6A. Turn-On Rise Time vs. Temperature

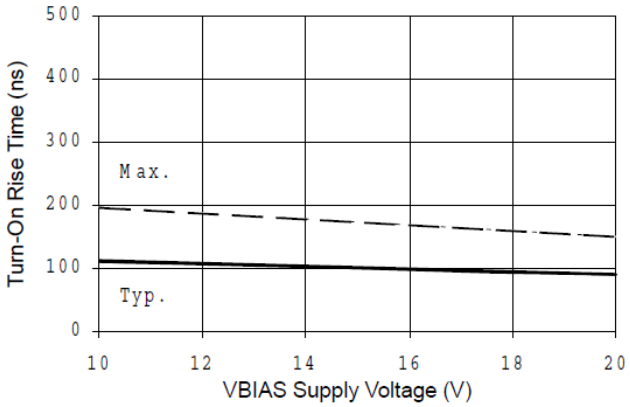


Figure 6B. Turn-On Rise Time vs. Voltage

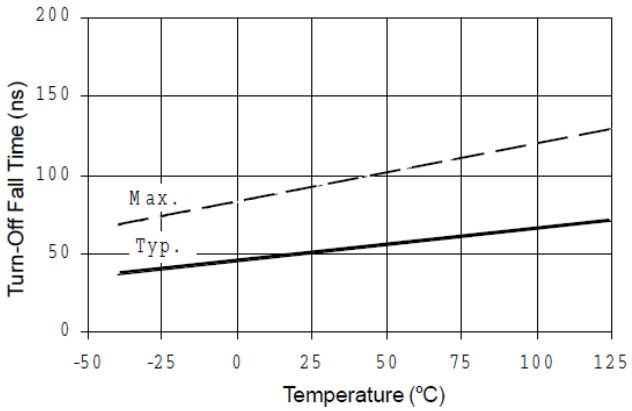


Figure 7A. Turn Off Fall Time vs. Temperature

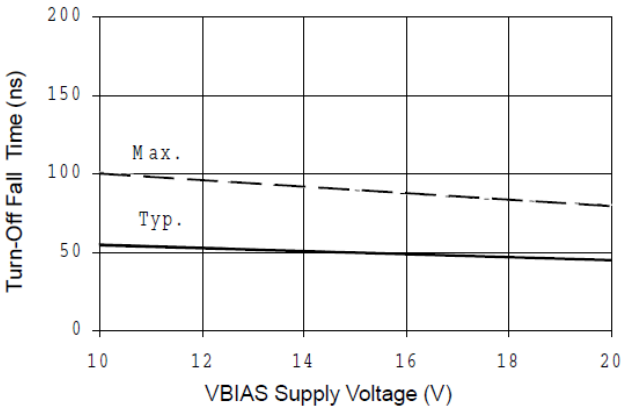


Figure 7B. Turn Off Fall Time vs. Voltage

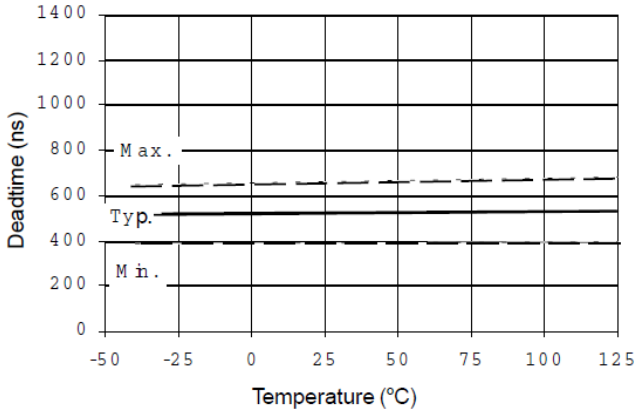


Figure 8A. Deadtime vs. Temperature

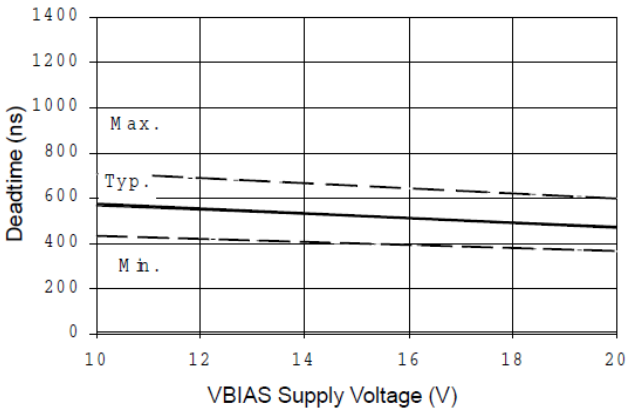


Figure 8B. Deadtime vs. Voltage

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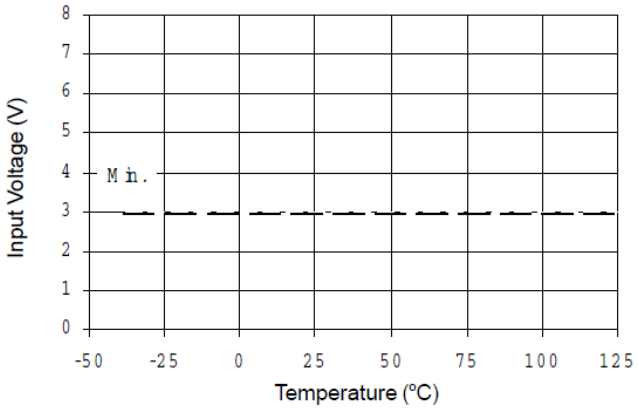


Figure 9A. Logic "1" ($\overline{HIN}$) & Logic "0" ($\overline{LIN}$) Input Voltage vs. Temperature

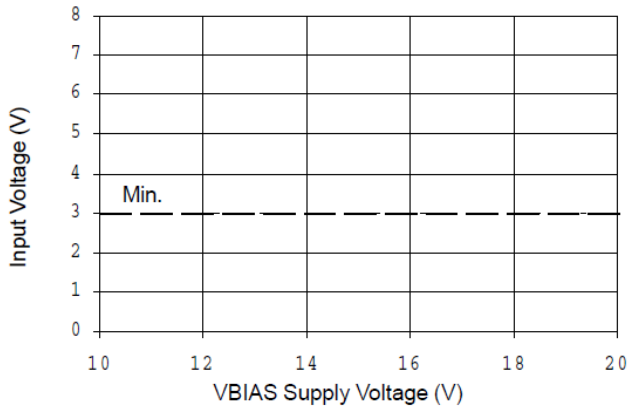


Figure 9B. Logic "1" ($\overline{HIN}$) & Logic "0" ($\overline{LIN}$) Input Voltage vs. Voltage

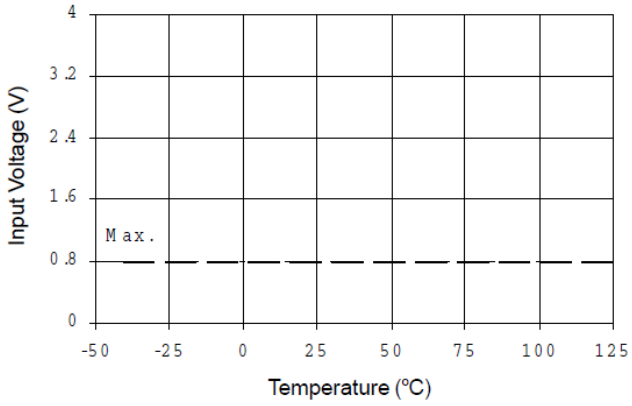


Figure 10A. Logic "0" ($\overline{HIN}$)) & Logic "1" ($\overline{LIN}$) Input Voltage vs. Temperature

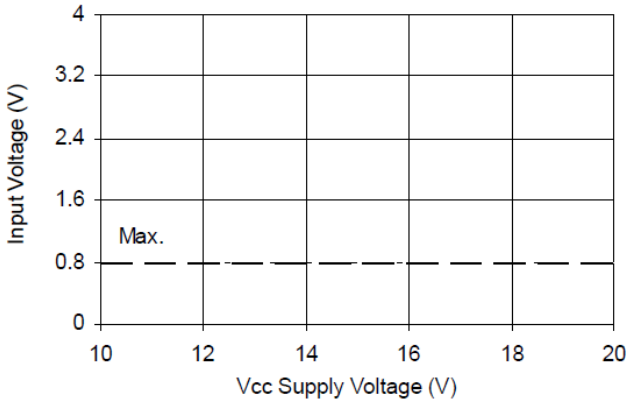


Figure 10B. Logic "0" (HIN) & Logic "1" (LIN) Input Voltage vs. Voltage

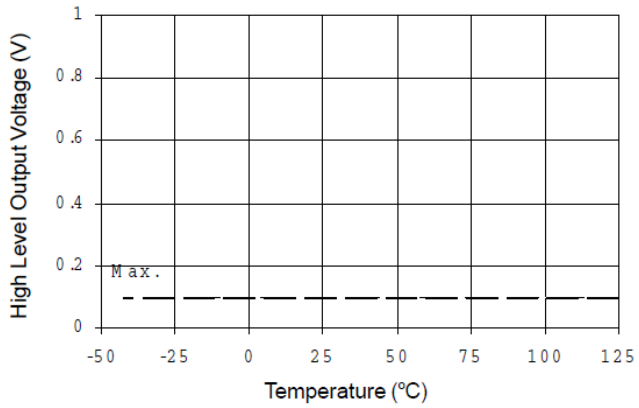


Figure 11A. High Level Output vs. Temperature

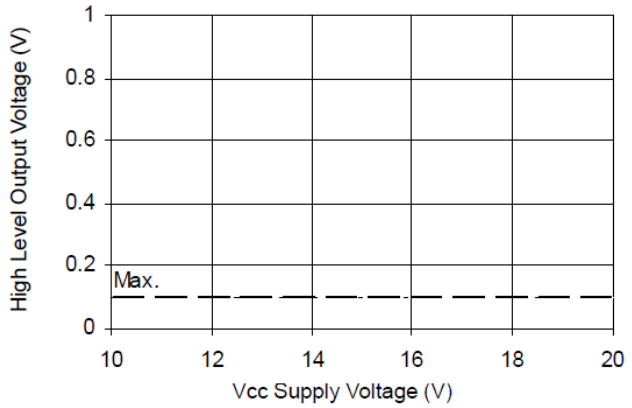


Figure 11B. High Level Output vs. Voltage

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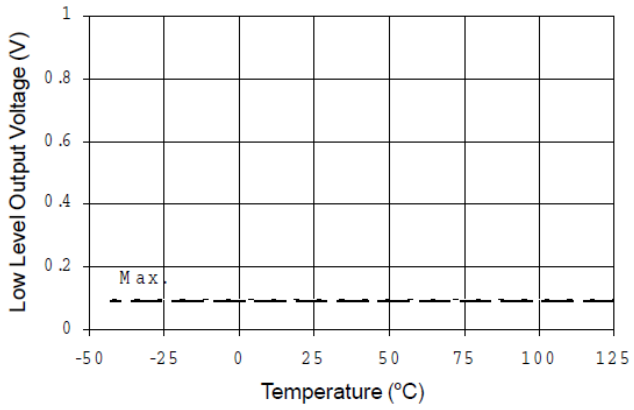


Figure 12A. Low Level Output vs. Temperature

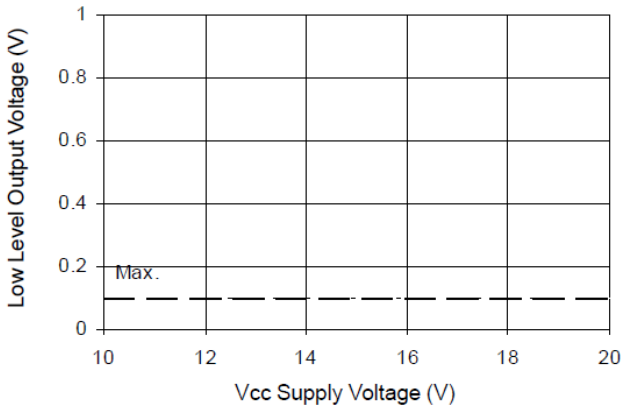


Figure 12B. Low Level Output vs. Voltage

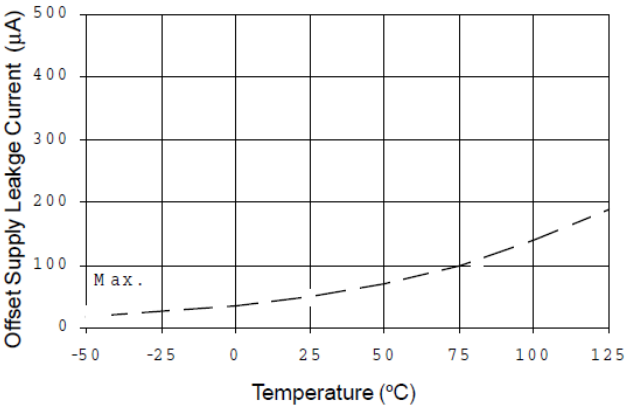


Figure 13A. Offset Supply Current vs. Temperature

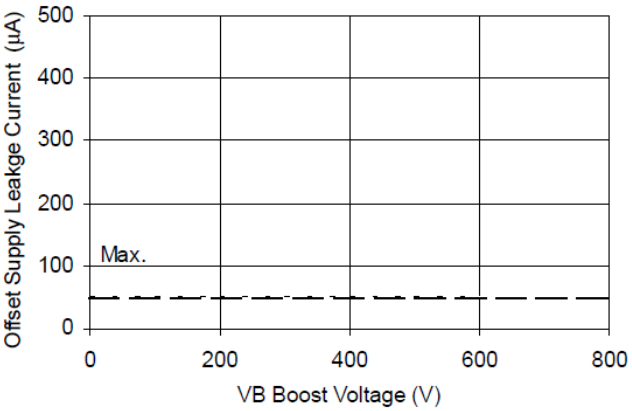


Figure 13B. Offset Supply Current vs. Voltage

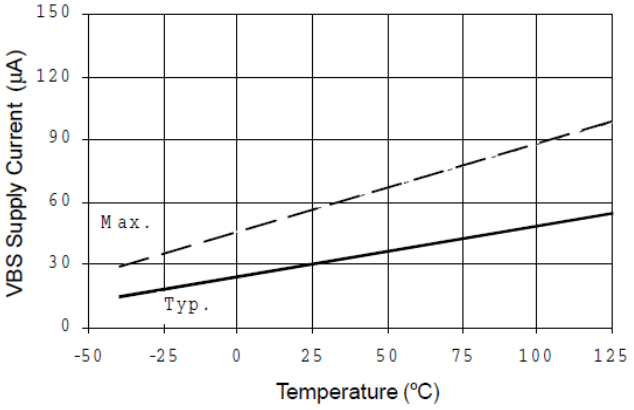


Figure 14A. V_{BS} Supply Current vs. Temperature

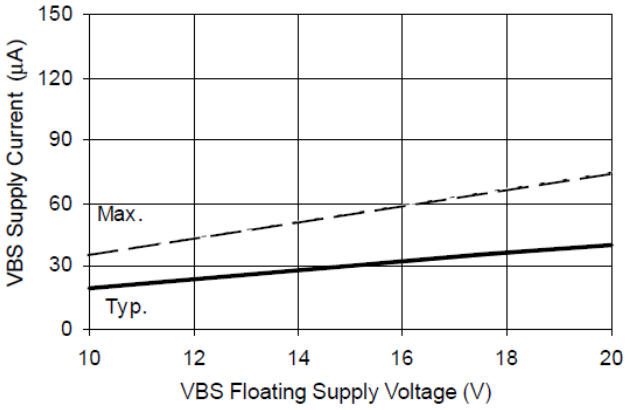


Figure 14B. V_{BS} Supply Current vs. Voltage

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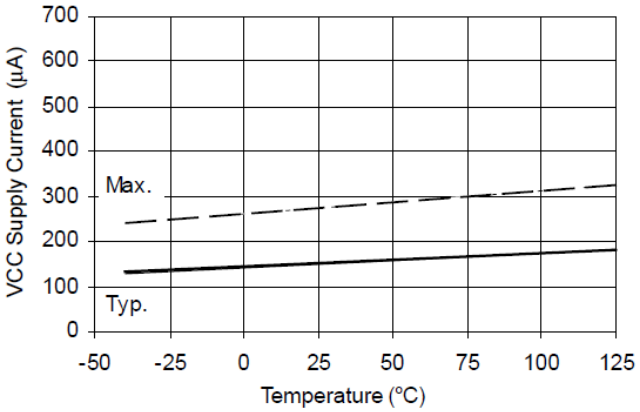


Figure 15A. V_{CC} Supply Current vs. Temperature

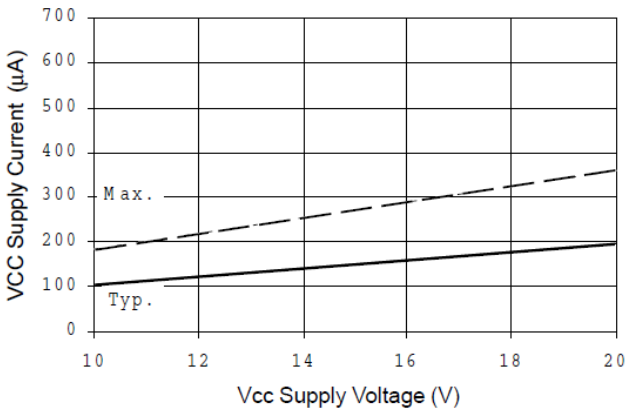


Figure 15B. V_{CC} Supply Current vs. Voltage

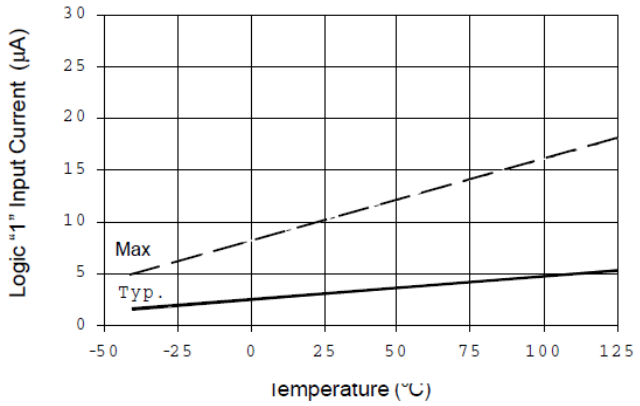


Figure 16A. Logic "1" Input Current vs. Temperature

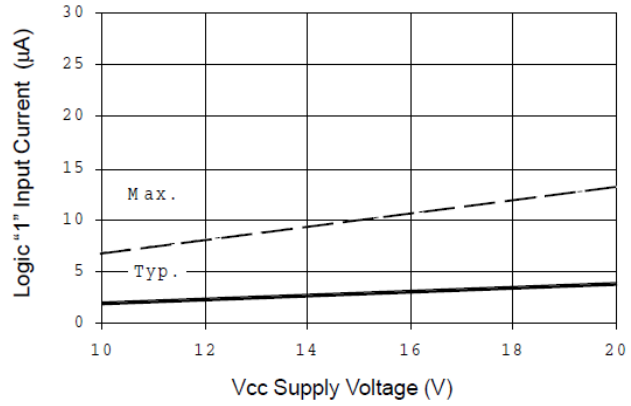


Figure 16B. Logic "1" Input Current vs. Voltage

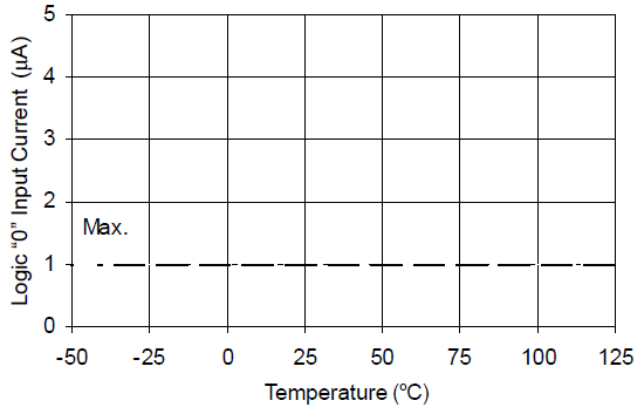


Figure 17A. Logic "0" Input Current vs. Temperature

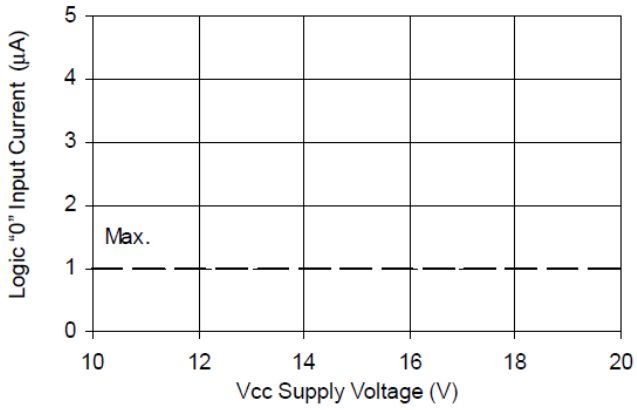


Figure 17B. Logic "0" Input Current vs. Voltage

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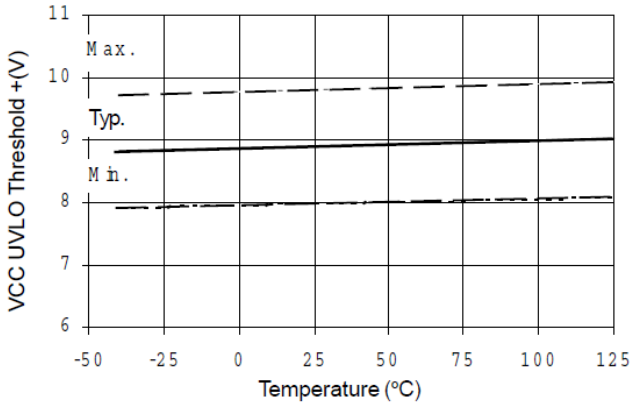


Figure 18A. V_{CC} Undervoltage Threshold (+) vs. Temperature

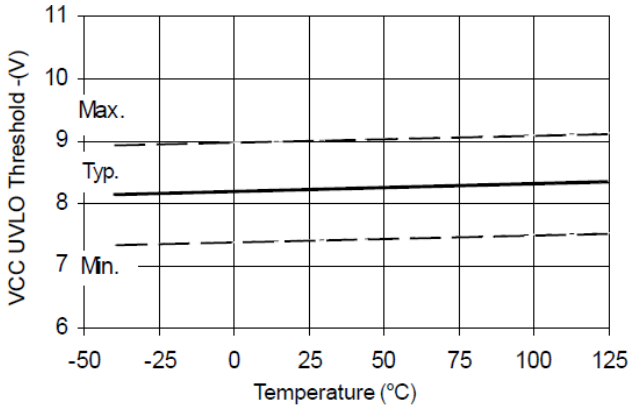


Figure 18B. V_{CC} Undervoltage Threshold (-) vs. Temperature

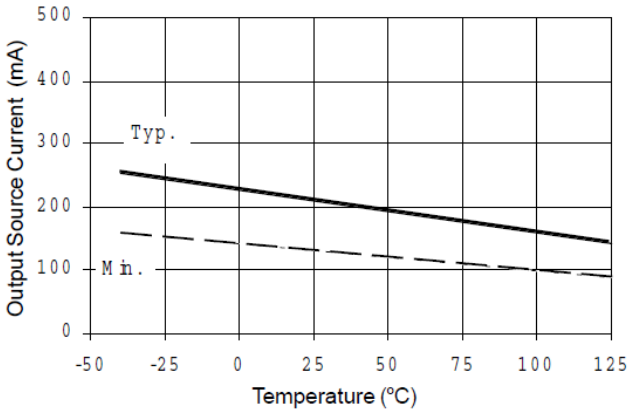


Figure 19A. Output Source Current vs. Temperature

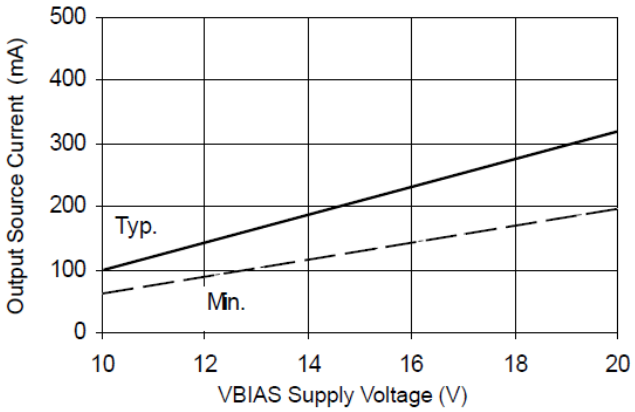


Figure 19B. Output Source Current vs. Voltage

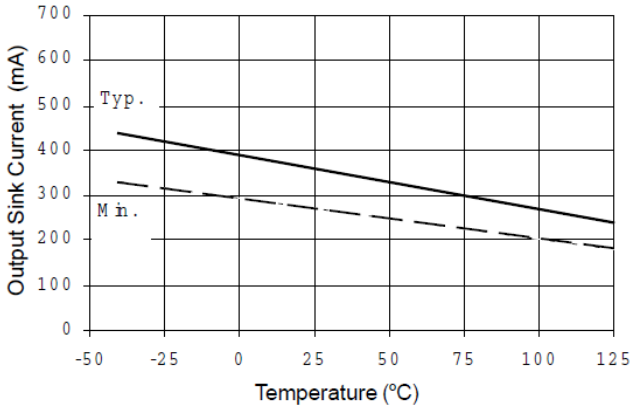


Figure 20A. Output Sink Current vs. Temperature

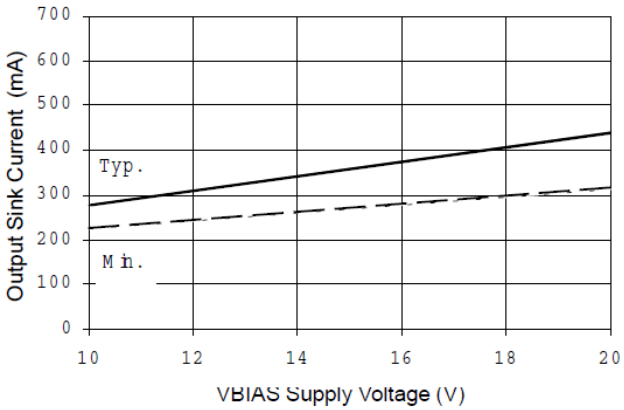
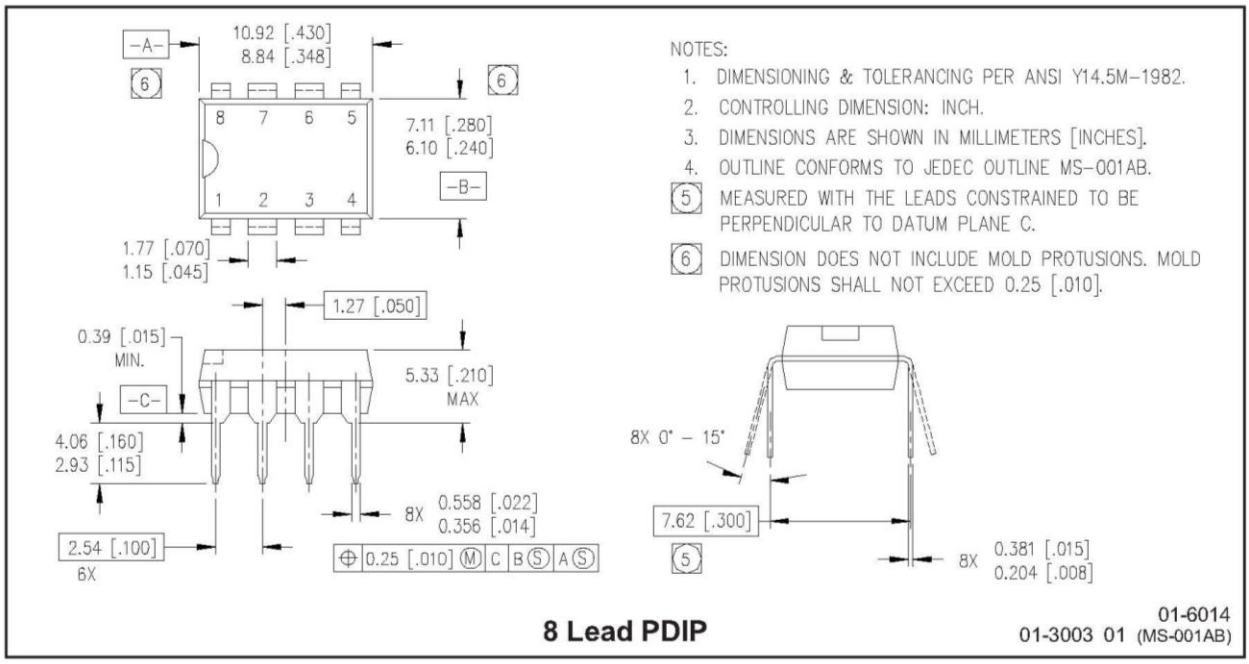
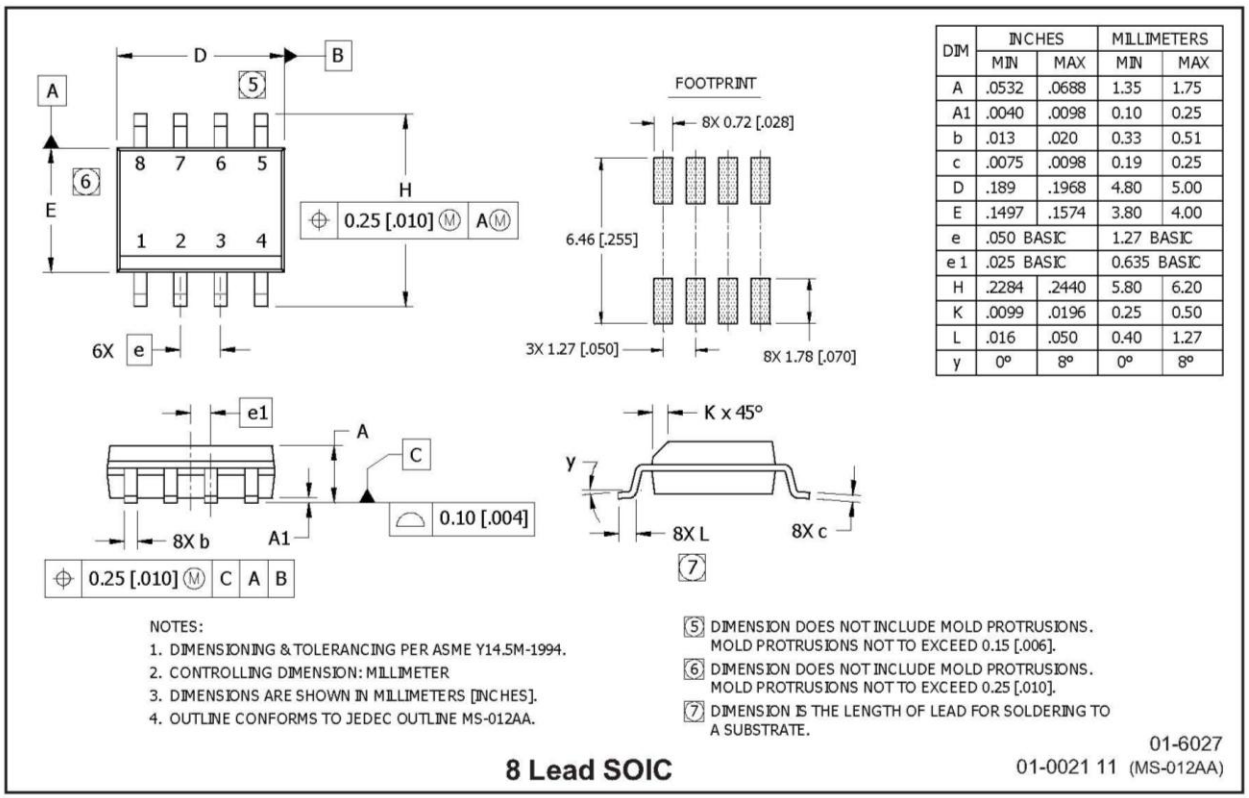


Figure 20A. Output Sink Current vs. Voltage

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Package Details: PDIP8, SO8N

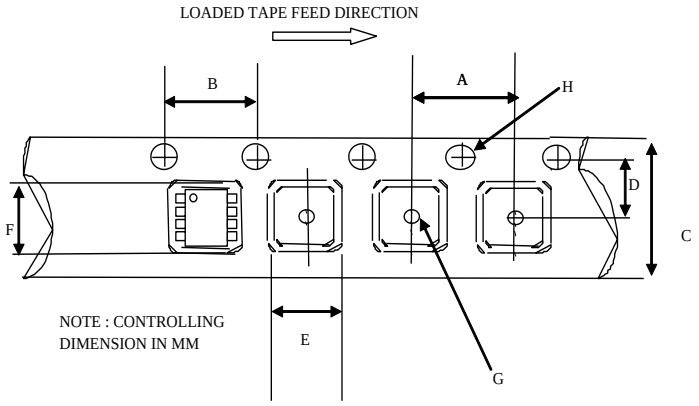




DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e 1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°

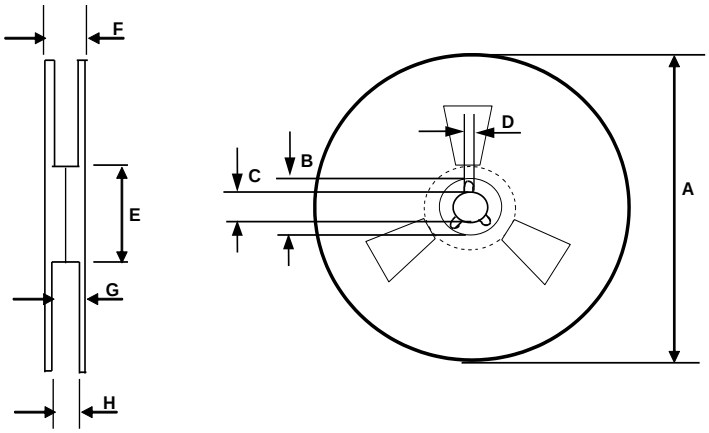
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Tape and Reel Details: SO8N



CARRIER TAPE DIMENSION FOR 8SOICN

Code	Metric		Imperial	
	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	11.70	12.30	0.46	0.484
D	5.45	5.55	0.214	0.218
E	6.30	6.50	0.248	0.255
F	5.10	5.30	0.200	0.208
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062

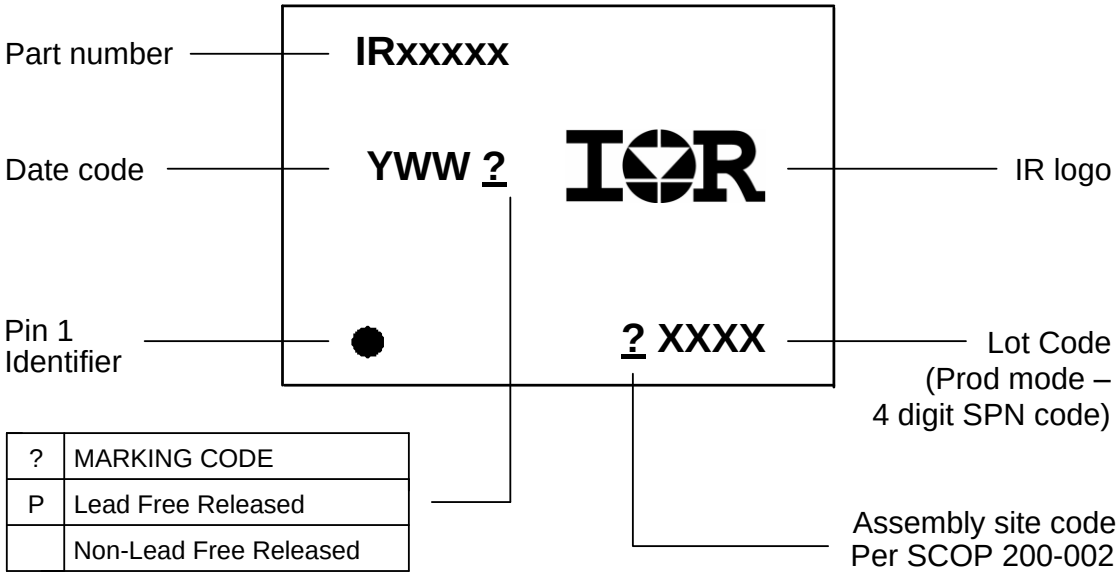


REEL DIMENSIONS FOR 8SOICN

Code	Metric		Imperial	
	Min	Max	Min	Max
A	329.60	330.25	12.976	13.001
B	20.95	21.45	0.824	0.844
C	12.80	13.20	0.503	0.519
D	1.95	2.45	0.767	0.096
E	98.00	102.00	3.858	4.015
F	n/a	18.40	n/a	0.724
G	14.50	17.10	0.570	0.673
H	12.40	14.40	0.488	0.566

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Part Marking Information



?	MARKING CODE
P	Lead Free Released
	Non-Lead Free Released

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Qualification Information†

Qualification Level	Industrial†† (per JEDEC JESD 47)	
	Comments: This family of ICs has passed JEDEC's Industrial qualification. IR's Consumer qualification level is granted by extension of the higher Industrial level.	
Moisture Sensitivity Level	SOIC8N	MSL2††† (per IPC/JEDEC J-STD 020)
	PDIP8	Not applicable (non-surface mount package style)
RoHS Compliant	Yes	

† Qualification standards can be found at International Rectifier's web site http://www.irf.com/

†† Higher qualification ratings may be available should the user have such requirements. Please contact your International Rectifier sales representative for further information.

††† Higher MSL ratings may be available for the specific package types listed here. Please contact your International Rectifier sales representative for further information.

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