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International
IOR Rectifier

IR2011(S)PBF

High and Low Side Driver

Features

- Floating channel designed for bootstrap operation
- Fully operational to 200V
- Tolerant to negative transient voltage, dV/dt immune
- Gate drive supply range from 10 to 20V
- Independent low and high side channels
- Input logic HIN/LIN active high
- Undervoltage lockout for both channels
- 3.3V and 5V logic compatible
- CMOS Schmitt-triggered inputs with pull-down
- Matched propagation delay for both channels

Product Summary

V_{OFFSET} (max)	200V
$I_{O+/-}$ (typ)	1.0A / 1.0A
V_{OUT}	10 – 20V
$t_{on/off}$ (typ)	80ns & 60ns
Delay Matching (max)	20ns

Description

The IR2011 is a high power, high speed power MOSFET driver with independent high and low side referenced output channels. Logic inputs are compatible with standard CMOS or LSTTL output, down to 3.0V 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 in the high side configuration which operates up to 200 volts. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction.

Package Options



8-Lead PDIP



8-Lead SOIC

Applications

- Converters
- DC motor drive

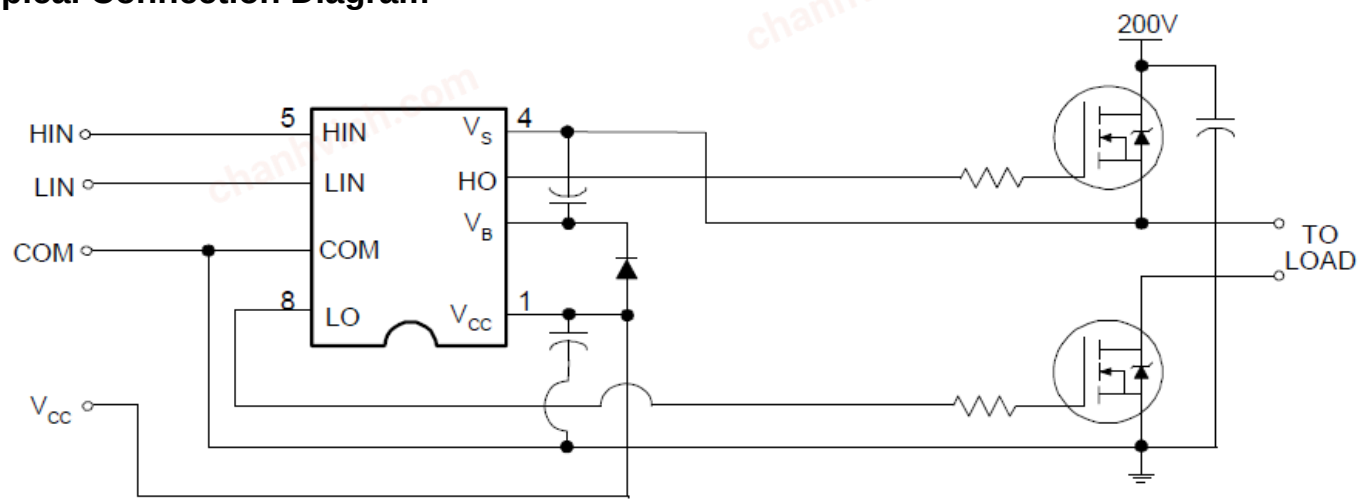
Ordering Information

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IR2011PBF	PDIP8	Tube	50	IR2011PBF
IR2011SPBF	SO8N	Tube	95	IR2011SPBF
IR2011SPBF	SO8N	Tape and Reel	2500	IR2011STRPBF

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Typical Connection Diagram



(Refer to Lead Assignments for correct configuration.) This diagram shows electrical connections only. Please refer to our Application Notes and Design Tips 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 supply voltage		-0.3	225	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 fixed supply voltage		-0.3	25	
V_{LO}	Low side output voltage		-0.3	V_{CC} + 0.3	
V_{IN}	Logic input voltage (HIN, 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	—	1.0	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

For proper operation the device should be used within the recommended conditions. The V_S and COM offset ratings are tested with all supplies biased at 15V differential.

Symbol	Definition	Min.	Max.	Units
V_B	High side floating supply absolute voltage	V_S + 10	V_S + 20	V
V_S	High side floating supply offset voltage	†	200	
V_{HO}	High side floating output voltage	V_S	V_B	
V_{CC}	Low side fixed supply voltage	10	20	
V_{LO}	Low side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN, LIN)	COM	5.5	
T_A	Ambient temperature	-40	125	°C

† Logic operational for V_S of -4 to +200V. Logic state held for V_S of -4V to $-V_{BS}$.

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Dynamic Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS}) = 15V, C_L = 1000pF and T_A = 25°C unless otherwise specified. Figure 1 shows the timing definitions.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	—	80	—	ns	V_S = 0V
t_{off}	Turn-off propagation delay	—	75	—		V_S = 200V
t_r	Turn-on rise time	—	35	50		
t_f	Turn-off fall time	—	20	35		
DM1	Turn-on delay matching | t_{on} (H) - t_{on} (L) |	—	—	20		
DM2	Turn-off delay matching | t_{off} (H) - t_{off} (L) |	—	—	20		

Static Electrical Characteristics

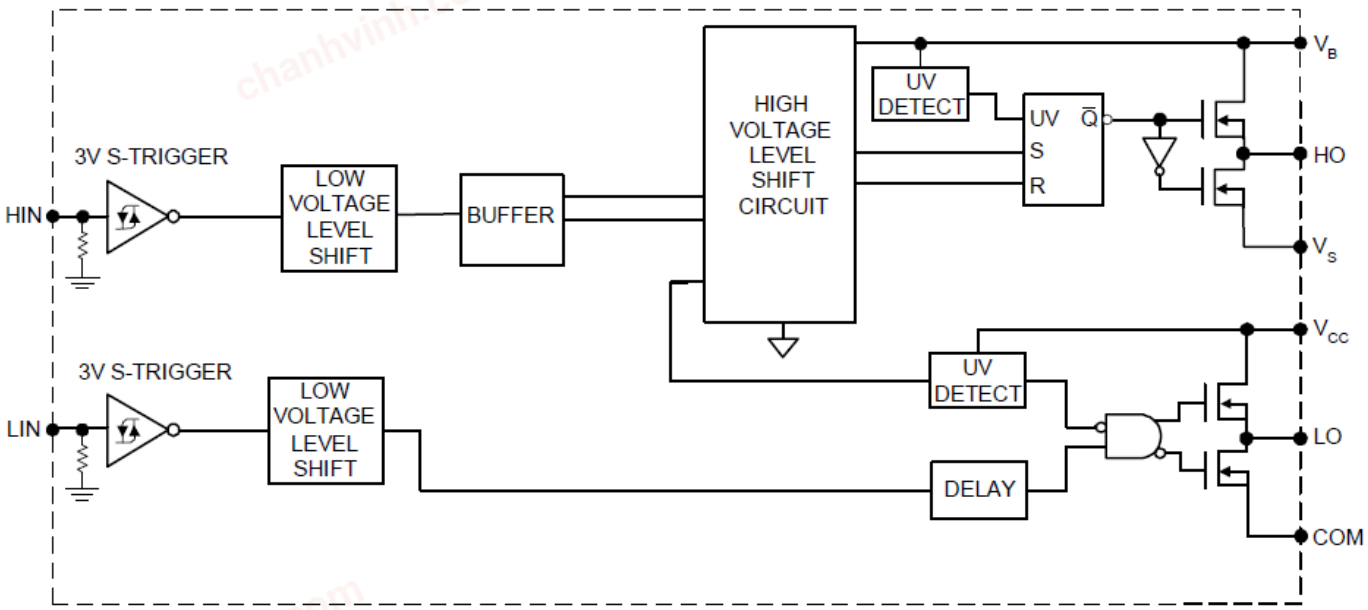
V_{BIAS} (V_{CC}, V_{BS}) = 15V and T_A = 25°C unless otherwise specified. The V_{IN}, V_{TH} and I_{IN} parameters are referenced to COM and are applicable to all logic input leads: HIN and LIN. The V_O and I_O parameters are referenced to COM and are applicable to the respective output leads: HO or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

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
V_{IH}	Logic “1” input voltage	2.2	—	—	V	V_{CC} = 10V – 20V
V_{IL}	Logic “0” input voltage	—	—	0.7		
V_{OH}	High level output voltage, V_{BIAS} - V_O	—	—	2.0		I_O = 0A
V_{OL}	Low level output voltage, V_O	—	—	0.2		I_O = 20mA
I_{LK}	Offset supply leakage current	—	—	50	µA	V_B = V_S = 200V
I_{QBS}	Quiescent V_{BS} supply current	—	90	210		V_{IN} = 0V or 3.3V
I_{QCC}	Quiescent V_{CC} supply current	—	140	230		
I_{IN+}	Logic “1” input bias current	—	7.0	20		V_{IN} = 3.3V
I_{IN-}	Logic “0” input bias current	—	—	1.0		V_{IN} = 0V
V_{BSUV+}	V_{BS} supply undervoltage positive going threshold	8.2	9.0	9.8	V	
V_{BSUV-}	V_{BS} supply undervoltage negative going threshold	7.4	8.2	9.0		
V_{CCUV+}	V_{CC} supply undervoltage positive going threshold	8.2	9.0	9.8		
V_{CCUV-}	V_{CC} supply undervoltage negative going threshold	7.4	8.2	9.0		
I_{O+}	Output high short circuit pulsed current	—	1.0	—	A	V_O = 0V, PW ≤ 10 µs
I_{O-}	Output low short circuit pulsed current	—	1.0	—		V_O = 15V PW ≤ 10 µs

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Functional Block Diagram



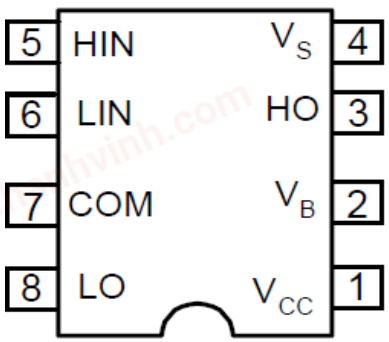
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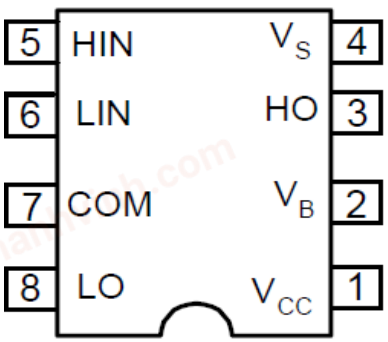
Lead Definitions

Symbol	Description
HIN	Logic input for high side gate driver outputs (HO), in phase
LIN	Logic input for low side gate driver outputs (LO), in phase
V_B	High side floating supply
HO	High side gate drive output
V_S	High side floating supply return
V_{CC}	Low side supply
LO	Low side gate drive output
COM	Low side return

Lead Assignments



8-Lead PDIP



8-Lead SOIC

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Application Information and Additional Details

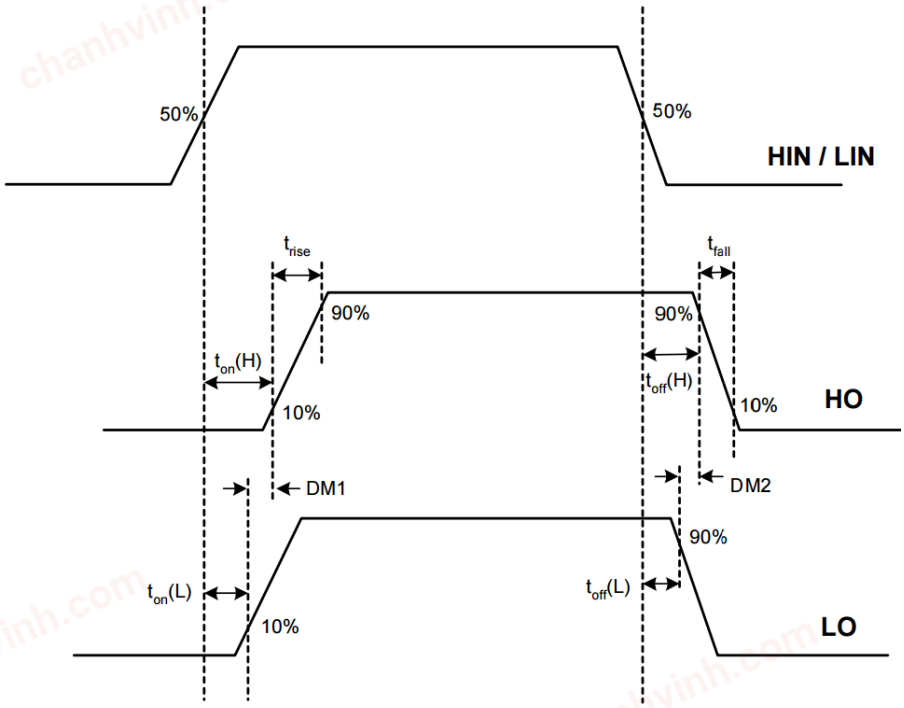


Figure 1. Timing Diagram

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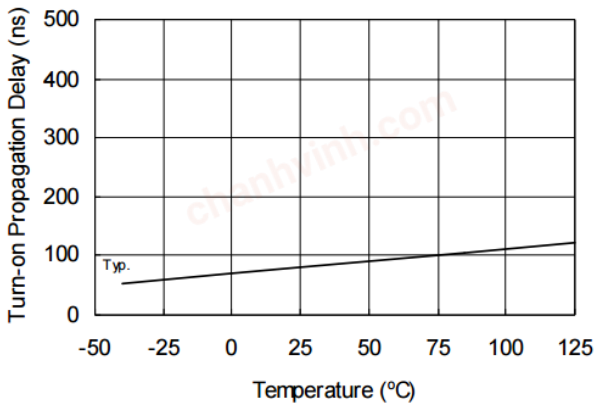


Figure 2A. Turn-on Propagation Delay vs. Temperature

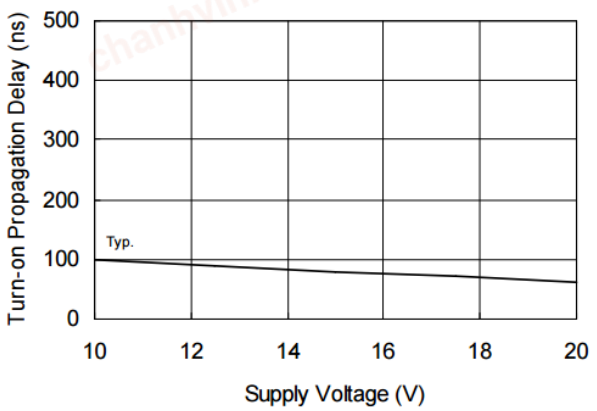


Figure 2B. Turn-on Propagation Delay vs. Supply Voltage

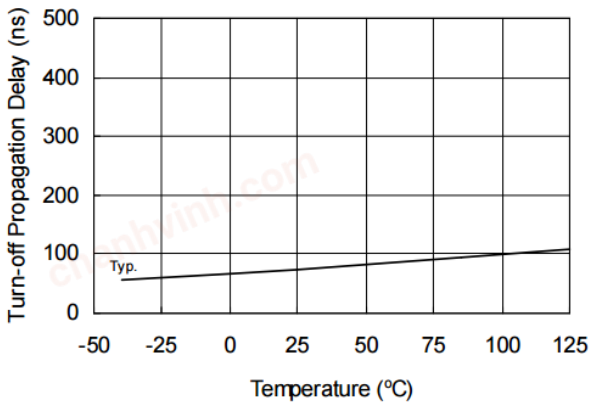


Figure 3A. Turn-off Propagation Delay vs. Temperature

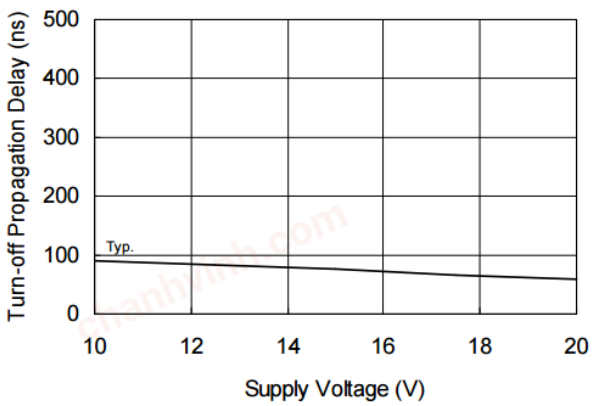


Figure 3B. Turn-off Propagation Delay vs. Supply Voltage

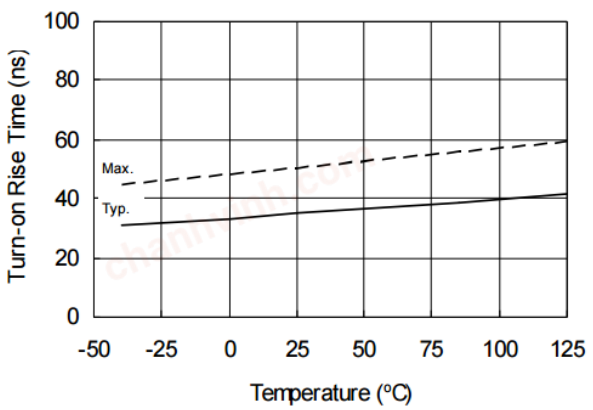


Figure 4A. Turn-on Rise Time vs. Temperature

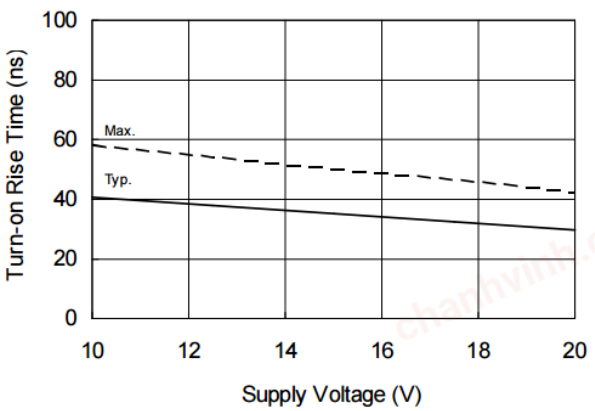


Figure 4B. Turn-on Rise Time vs. Supply Voltage

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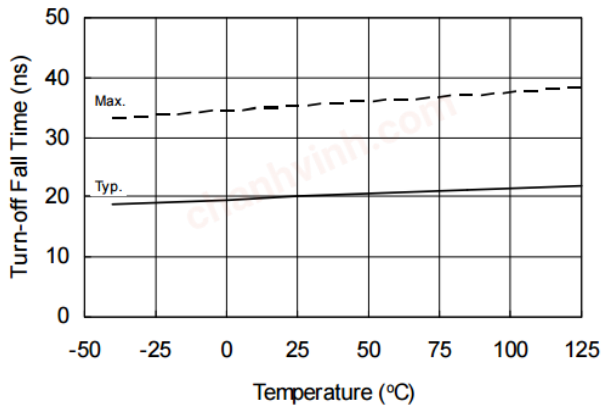


Figure 5A. Turn-off Fall Time vs. Temperature

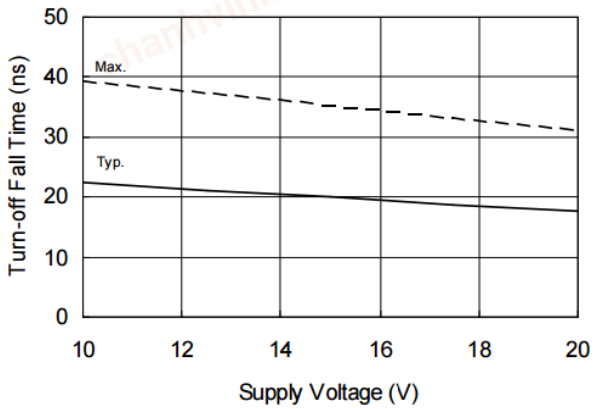


Figure 5B. Turn-off Fall Time vs. Supply Voltage

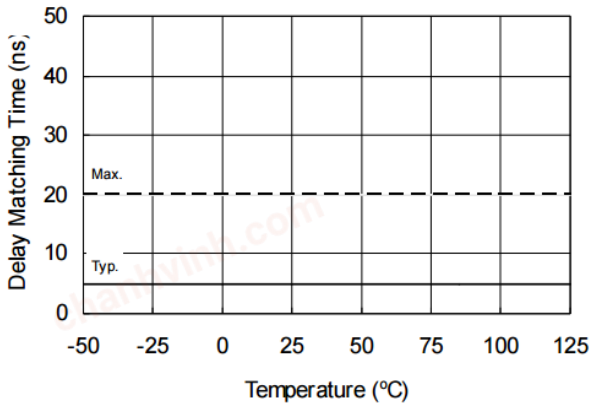


Figure 6A. Turn-on Delay Matching vs. Temperature

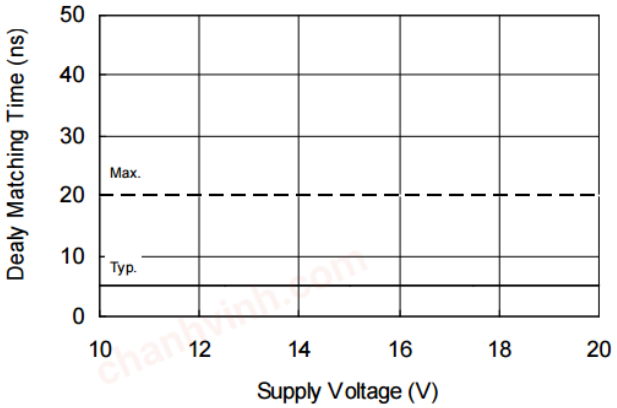


Figure 6B. Turn-on Delay Matching Time vs. Supply Voltage

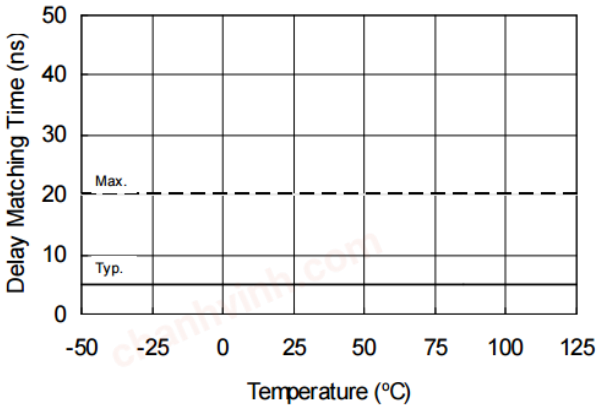


Figure 7A. Turn-off Delay Matching Time vs. Temperature

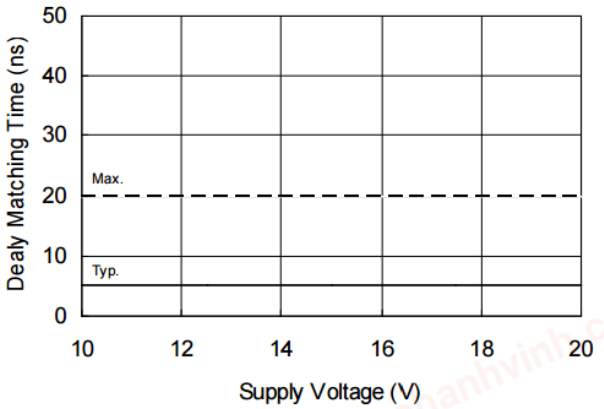


Figure 7B. Turn-off Delay Matching Time vs. Supply Voltage

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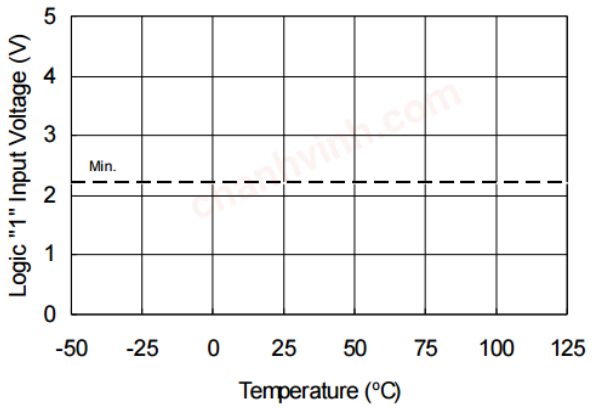


Figure 8A. Logic “1” Input Voltage vs. Temperature

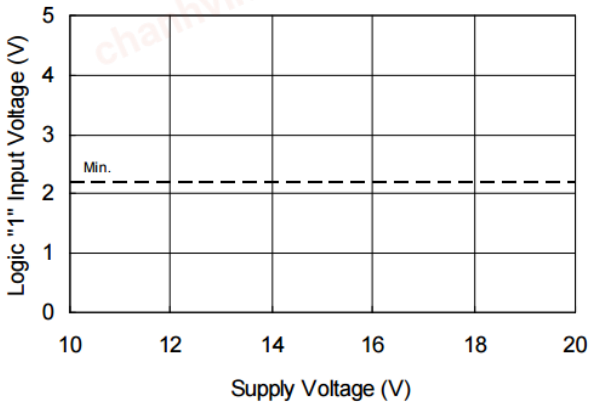


Figure 8B. Logic “1” Input Voltage vs. Supply Voltage

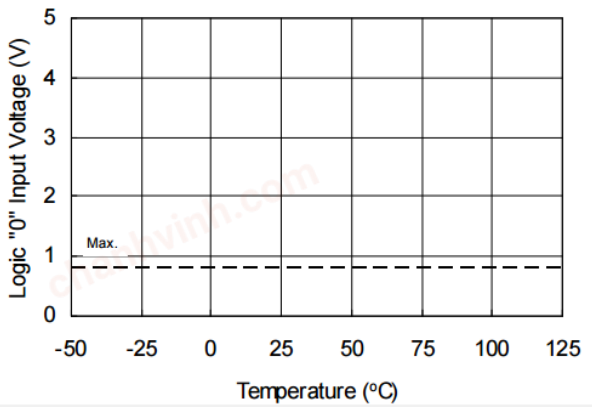


Figure 9A. Logic “0” Input Voltage vs. Temperature

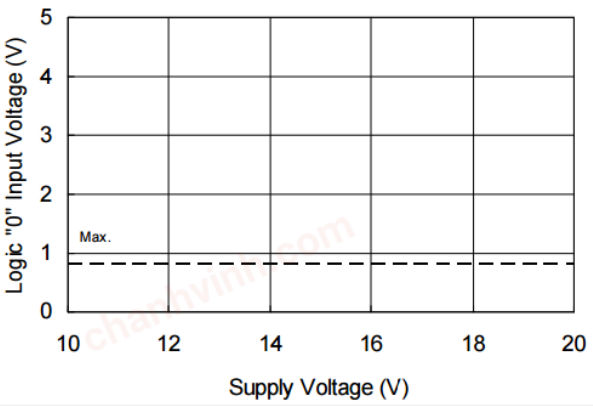


Figure 9B. Logic “0” Input Voltage vs. Supply Voltage

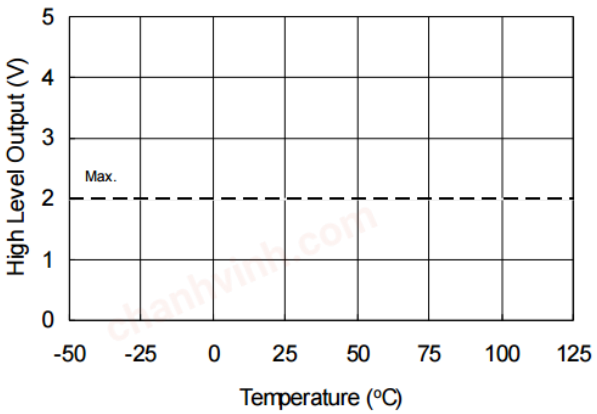


Figure 10A. High Level Output vs. Temperature

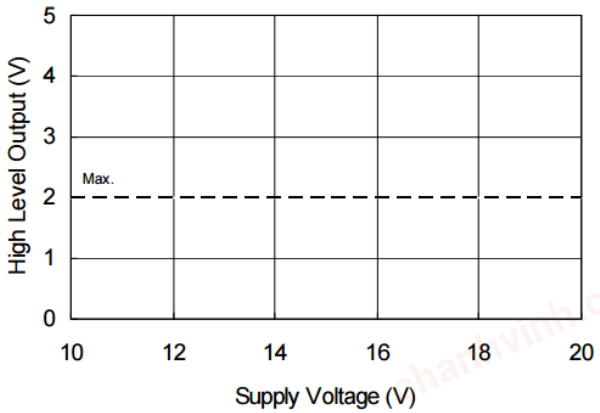


Figure 10B. High Level Output vs. Supply Voltage

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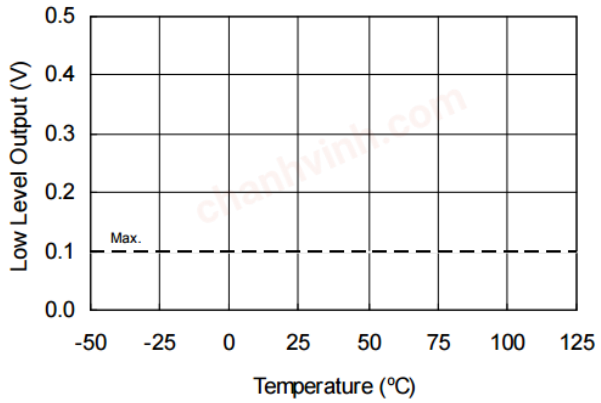


Figure 11A. Low Level Output vs. Temperature

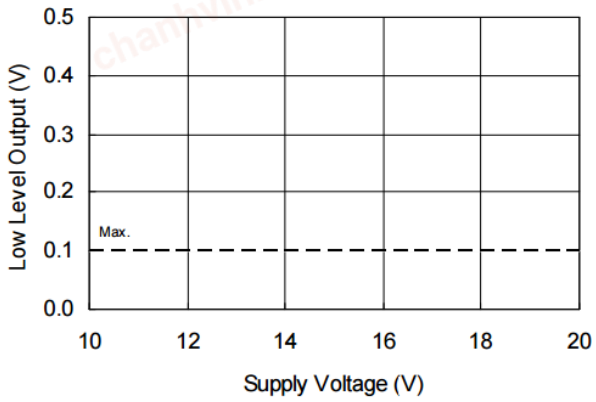


Figure 11B. Low Level Output vs. Supply Voltage

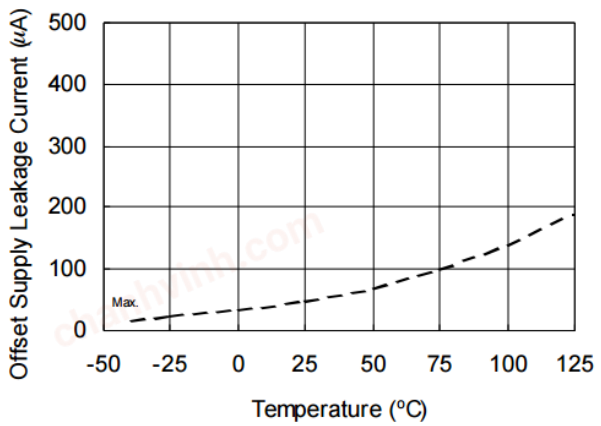


Figure 12A. Offset Supply Leakage Current vs. Temperature

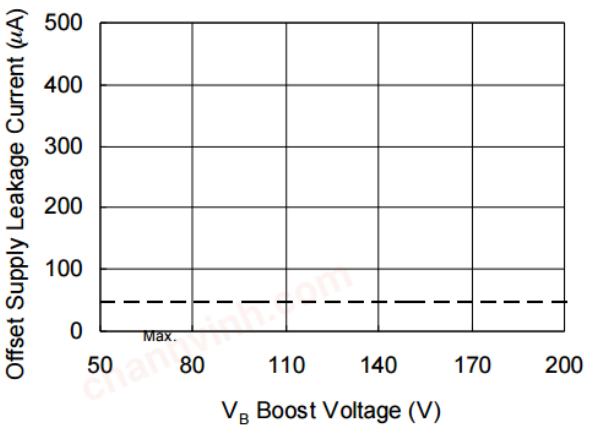


Figure 12B. Offset Supply Leakage Current vs. Supply Voltage

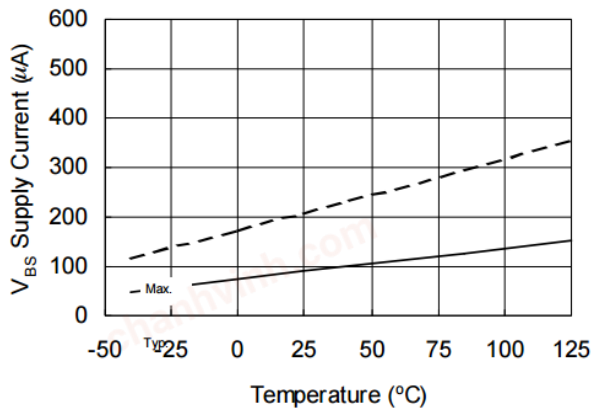


Figure 13A. V_{BS} Supply Current vs. Temperature

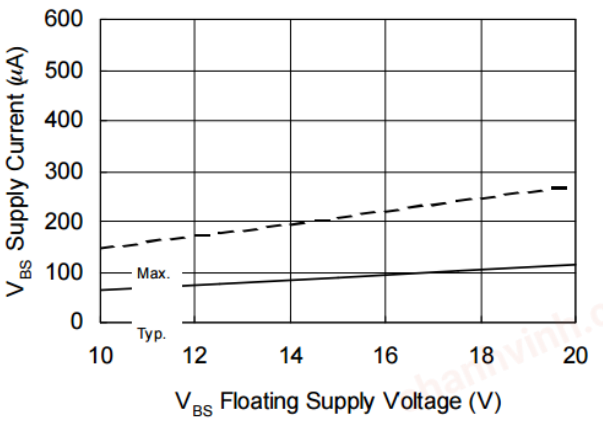


Figure 13B. V_{BS} Supply Current vs. Supply Voltage

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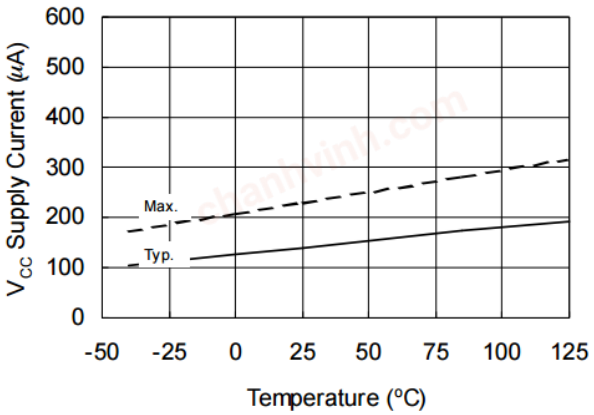


Figure 14A. V_{CC} Supply Current vs. Temperature

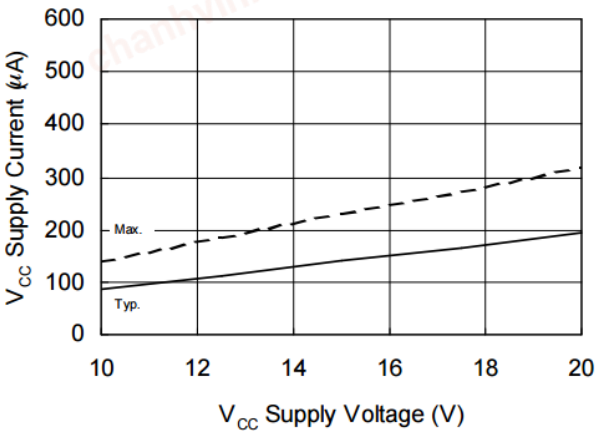


Figure 14B. V_{CC} Supply Current vs. V_{CC} Supply Voltage

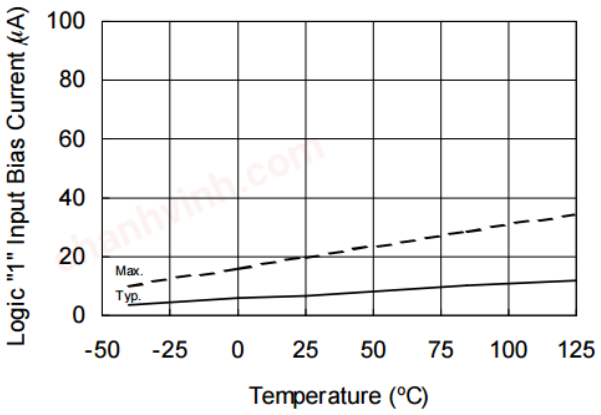


Figure 15A. Logic “1” Input Bias Current vs. Temperature

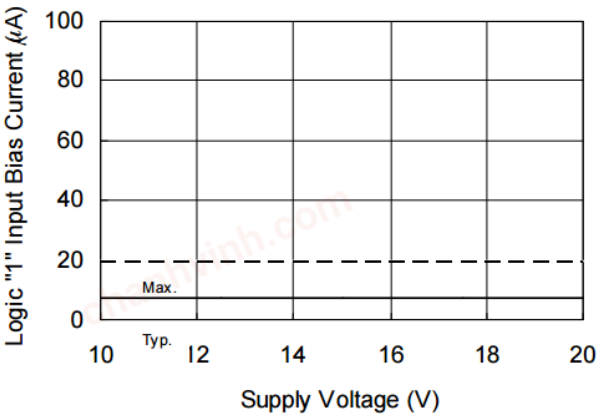


Figure 15 B. Logic “1” Input Bias Current vs. Supply Voltage

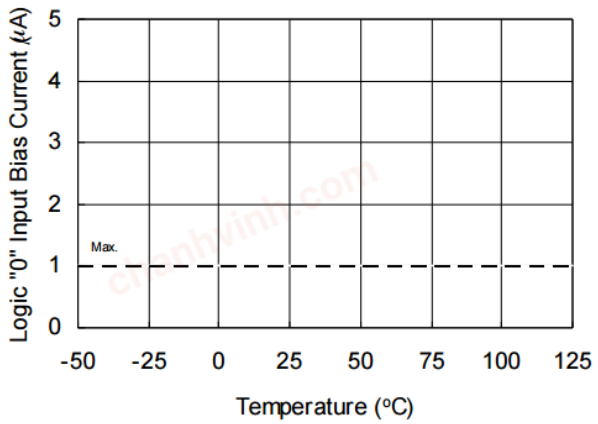


Figure 16A. Logic “0” Input Bias Current vs. Temperature

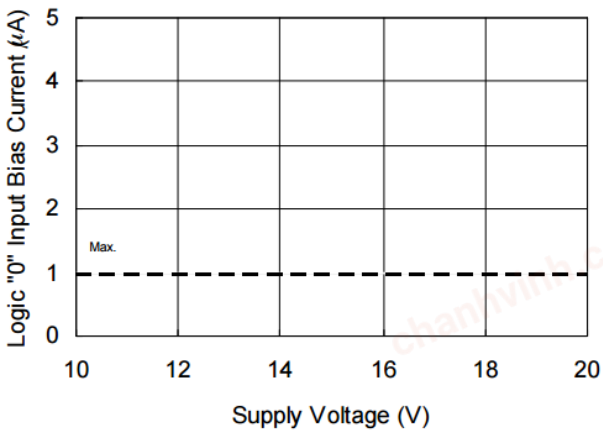


Figure 16B. Logic “0” Input Bias Current vs. Supply Voltage

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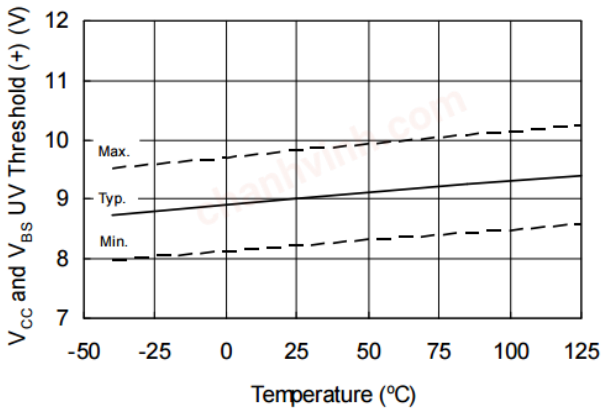


Figure 17. V_{CC} and V_{BS} Undervoltage Threshold (+) vs. Temperature

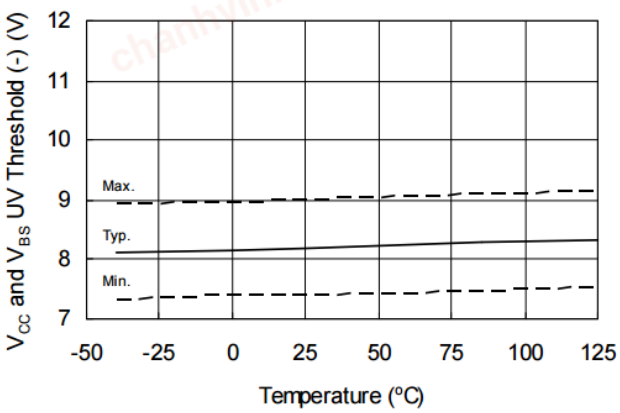


Figure 18. V_{CC} and V_{BS} Undervoltage Threshold (-) vs. Temperature

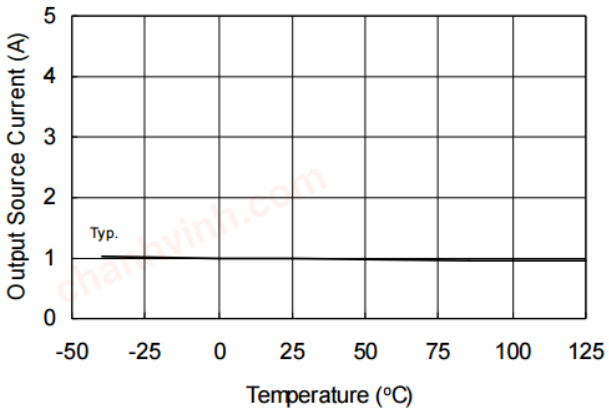


Figure 19A. Output Source Current vs. Temperature

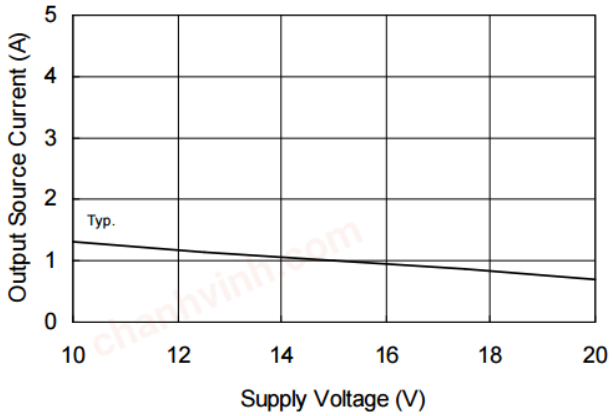


Figure 19B. Output Source Current vs. Supply Voltage

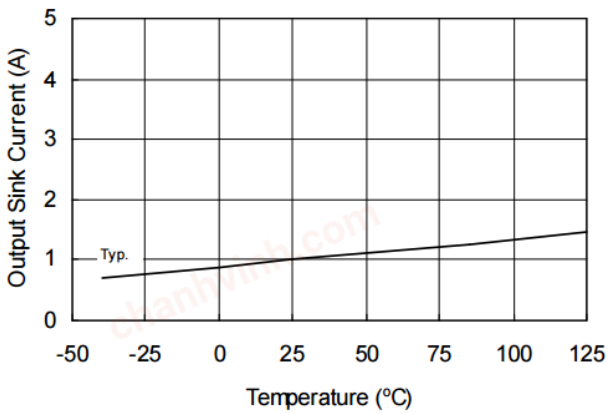


Figure 20A. Output Sink Current vs. Temperature

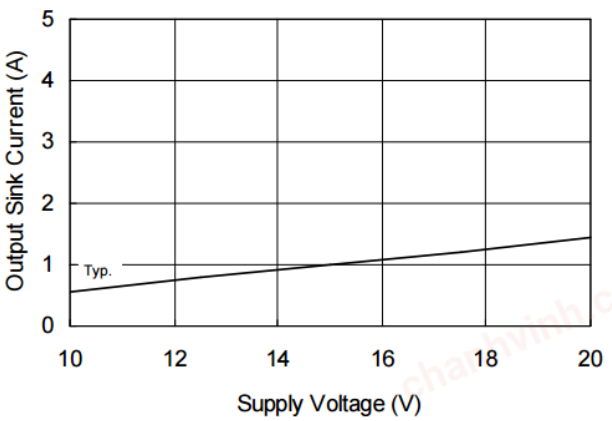


Figure 20B. Output Sink Currnt vs. Supply Voltage

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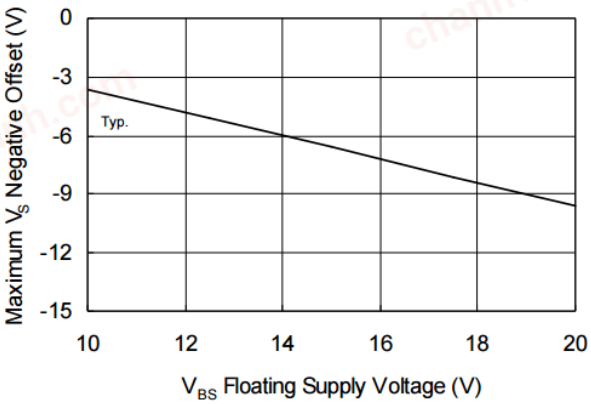
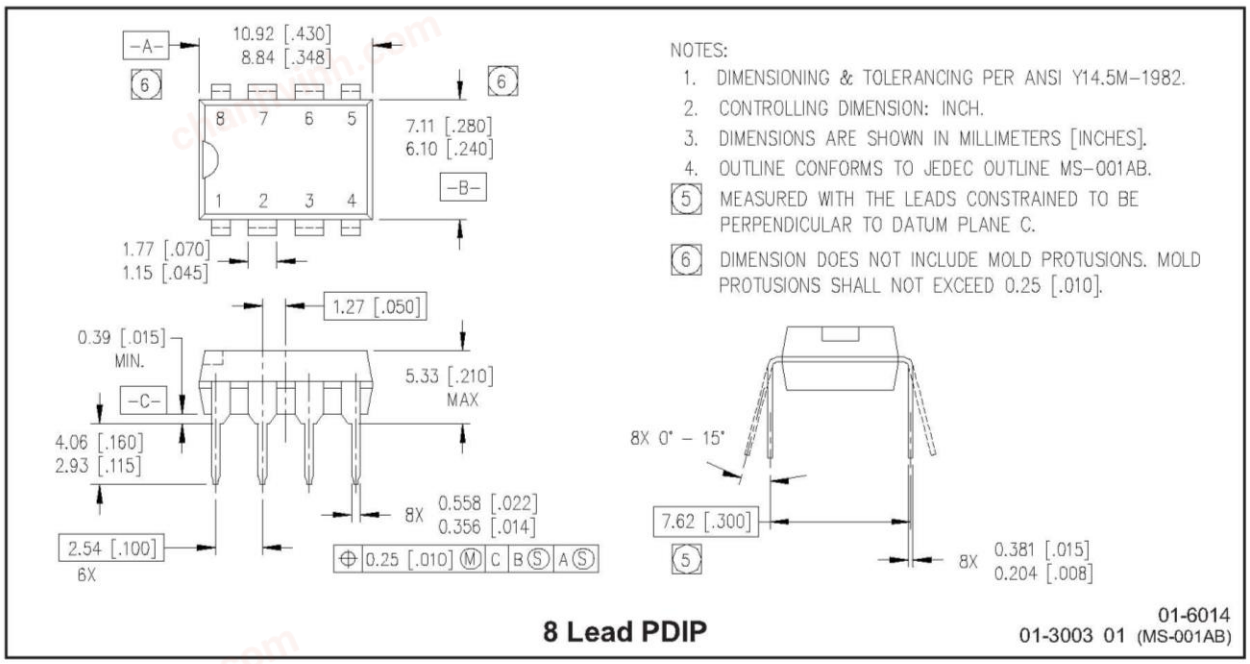


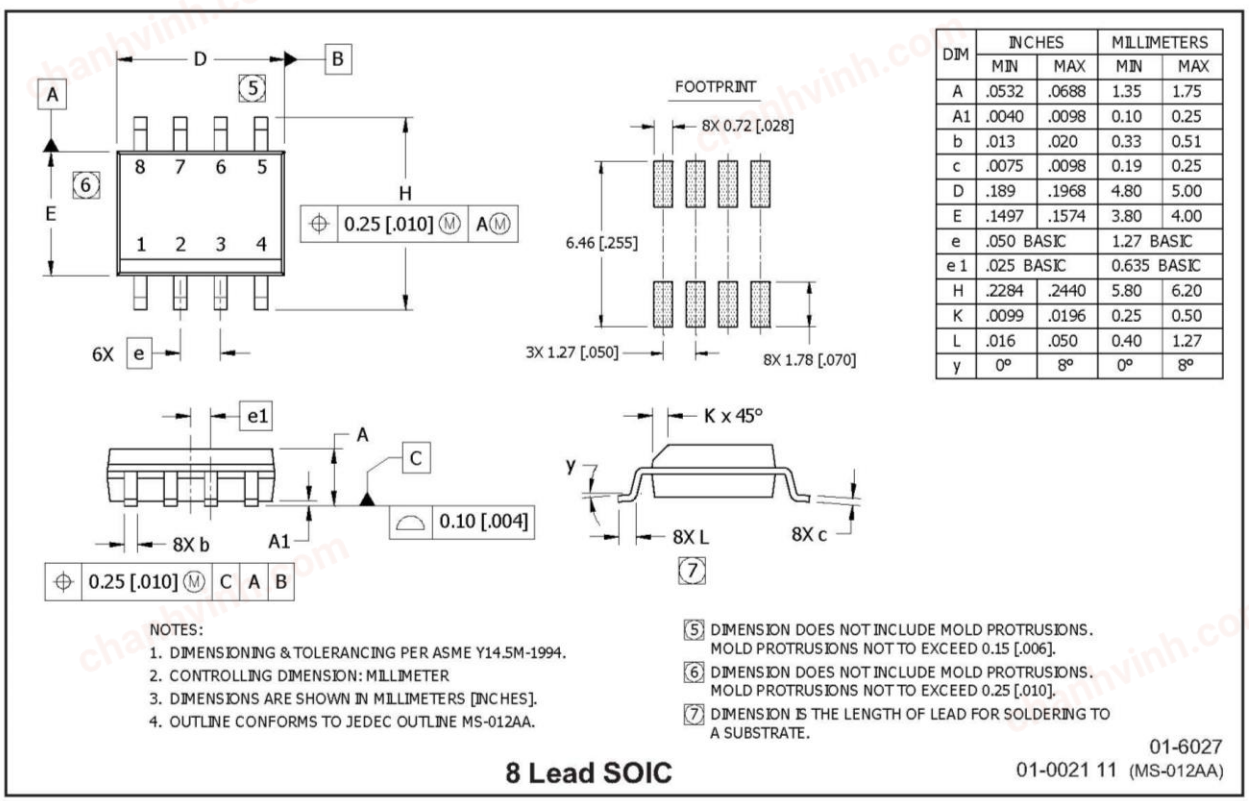
Figure 21. Maximum V_S Negative Offset vs. V_{BS} Floating Supply Voltage

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Package Details



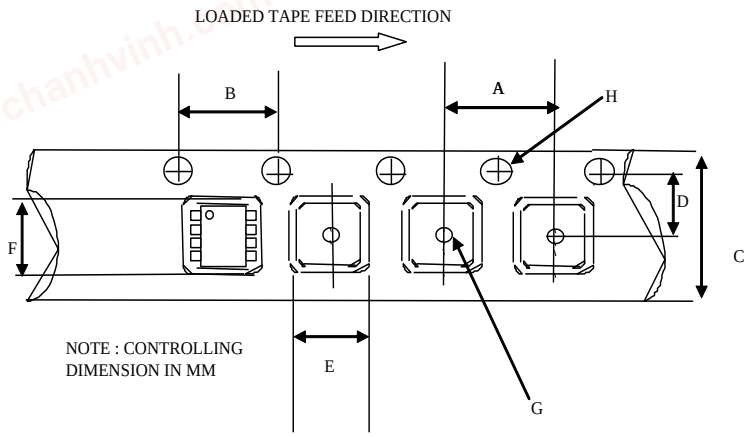


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e 1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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

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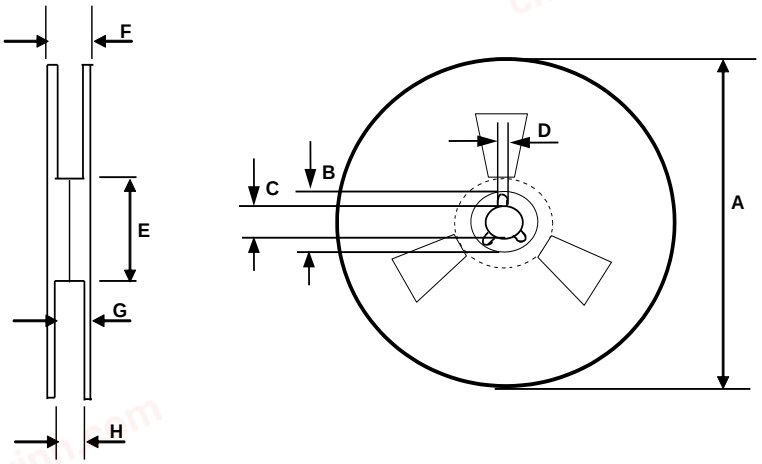
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Tape and Reel Details



CARRIER TAPE DIMENSION FOR 8SOICN

	Metric		Imperial	
Code	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



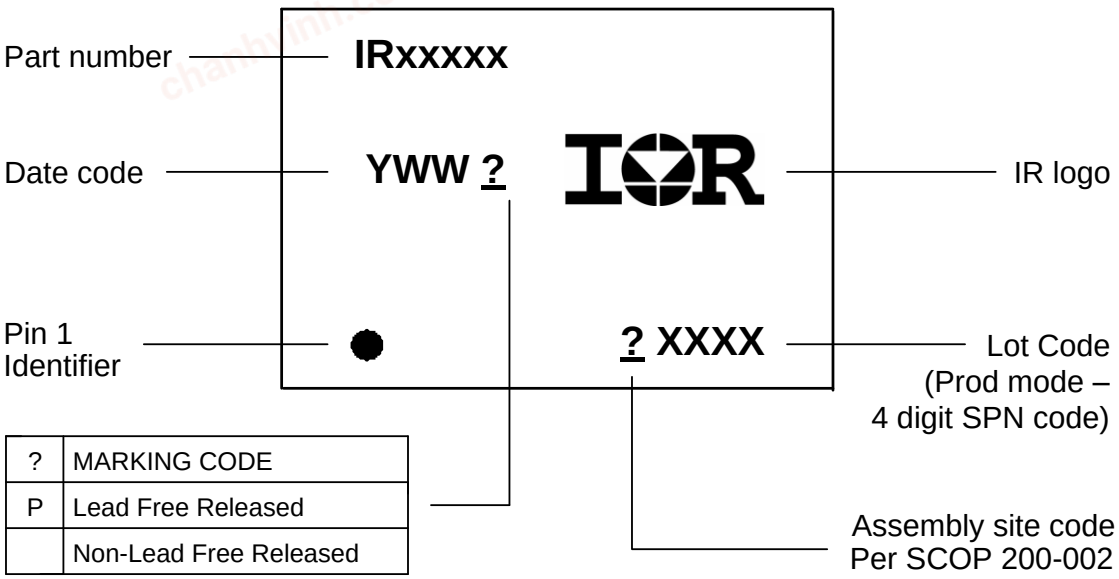
REEL DIMENSIONS FOR 8SOICN

	Metric		Imperial	
Code	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	8-Lead SOIC	MSL2††† (per IPC/JEDEC J-STD-020)
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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