

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 input logic compatible
- Cross-conduction prevention logic
- Internally set dead-time
- High side output in phase with input
- Shut down input turns off both channels
- Matched propagation delay for both channels

Description

The IR25602 is a high voltage, high speed power MOSFET and IGBT driver 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 from 10 to 600 V.

Product Summary

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

Package Options



Ordering Information

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IR25602SPBF	SO8N	Tube	95	IR25602SPBF
IR25602SPBF	SO8N	Tape and Reel	2500	IR25602STRPBF

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 (IN & $\overline{SD}$)	-0.3	$V_{CC} + 0.3$	
dV_S/dt	Allowable offset supply voltage transient	—	50	V/ns
P_D	Package power dissipation @ $T_A \leq +25^\circ\text{C}$	—	0.625	W
R_{thJA}	Thermal resistance, junction to ambient	—	200	$^\circ\text{C/W}$
T_J	Junction temperature	—	150	$^\circ\text{C}$
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 offset rating is 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	†	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 (IN & $\overline{SD}$)	0	V_{CC}	
T_A	Ambient temperature	-40	125	$^\circ\text{C}$

†Logic operational for V_S of -5 to +600V. Logic state held for V_S of -5V to -VBS. (Please refer to Design Tip DT97-3 for more details).

Dynamic Electrical Characteristics

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

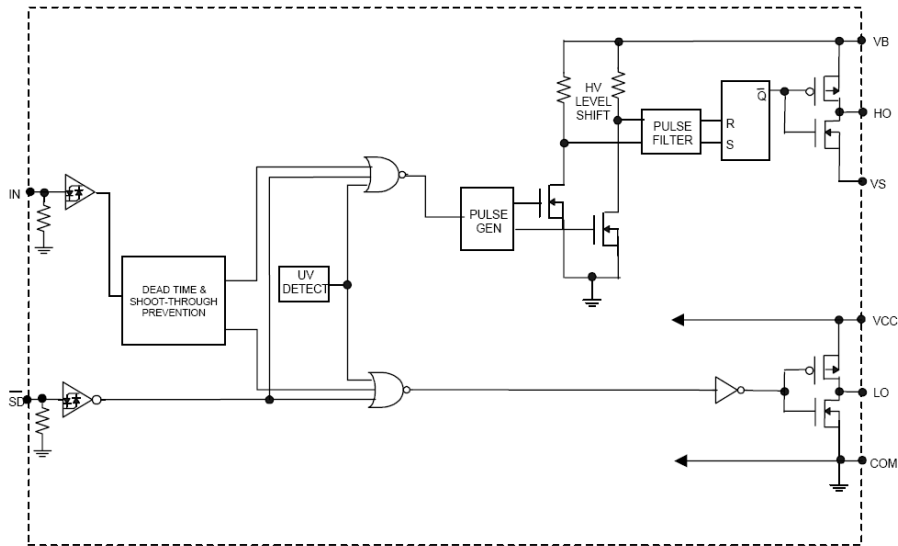
Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	—	680	820	ns	$V_S = 0V$
t_{off}	Turn-off propagation delay	—	150	220		$V_S = 600V$
t_{sd}	Shutdown propagation delay	—	160	220		
t_r	Turn-on rise time	—	100	170		
t_f	Turn-off fall time	—	50	90		
DT	Dead time, LS 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 and LO.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
V_{IH}	Logic "1" (HO) & Logic "0" (LO) input voltage	3	—	—	V	$V_{CC} = 10V$ to 20V
V_{IL}	Logic "0" (HO) & Logic "1" (LO) input voltage	—	—	0.8		$V_{CC} = 10V$ to 20V
$V_{SD,TH+}$	SD input positive going threshold	3	—	—		$V_{CC} = 10V$ to 20V
$V_{SD,TH-}$	SD input negative going threshold	—	—	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		$V_{IN} = 5V$
I_{IN-}	Logic "0" input bias current	—	—	1		$V_{IN} = 0V$
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	$V_O = 0V$ $PW \leq 10 \mu s$
I_{O-}	Output low short circuit pulsed current	270	360	—		$V_O = 15V$ $PW \leq 10 \mu s$

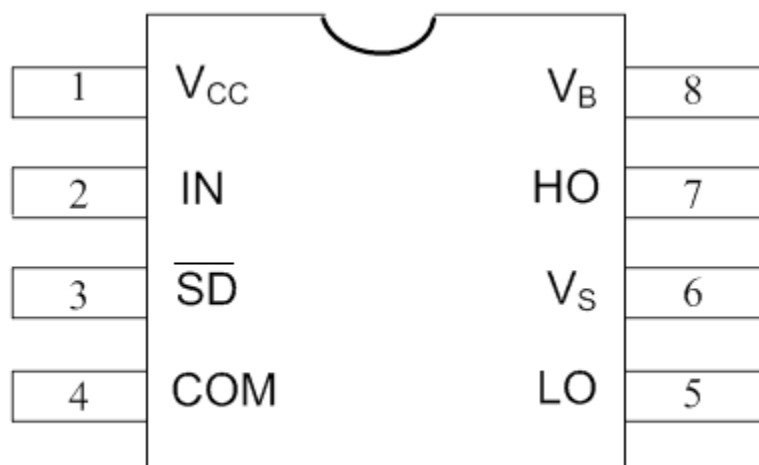
Functional Block Diagram



Lead Definitions

Symbol	Description
IN	Logic input for high and low side gate driver outputs (HO and LO), in phase with HO
$\overline{\text{SD}}$	Logic input for shutdown
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



Application Information and Additional Details

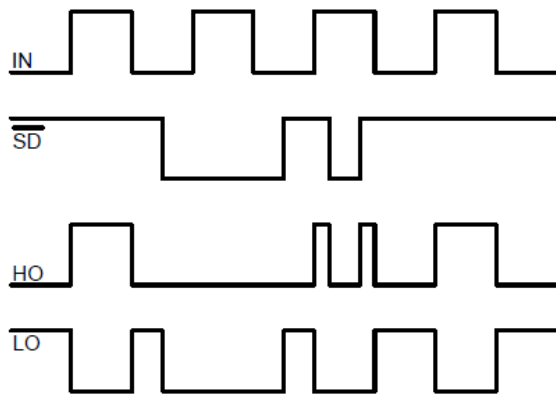


Figure 1. Input/Output Timing Diagram

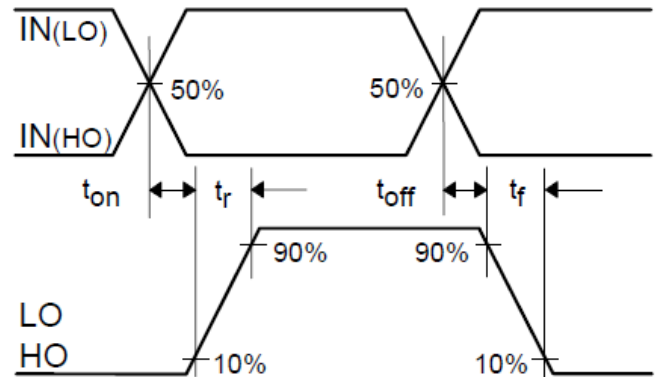


Figure 2. Switching Time Waveform Definitions

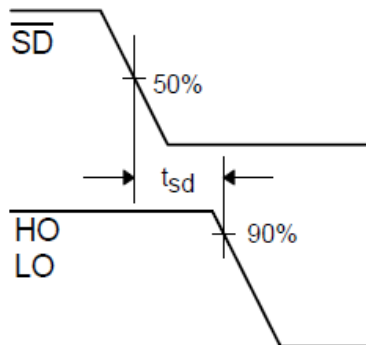


Figure 3. Shutdown Waveform Definitions

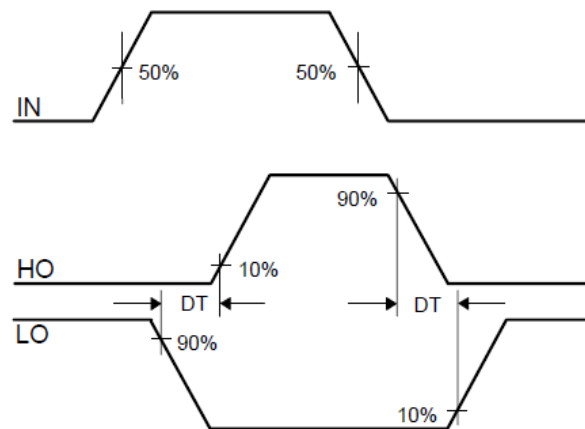


Figure 4. Deadtime Waveform Definitions

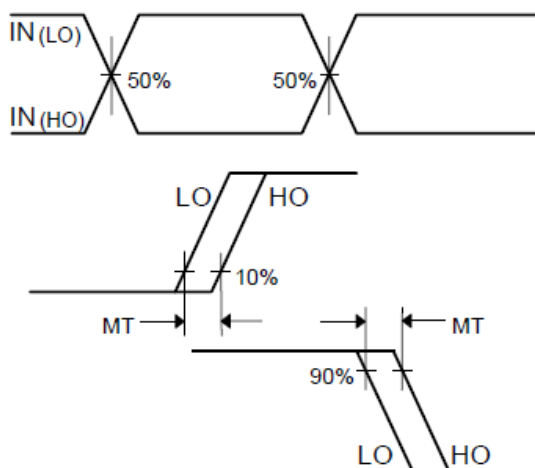


Figure 5. Delay Matching Waveform Definitions

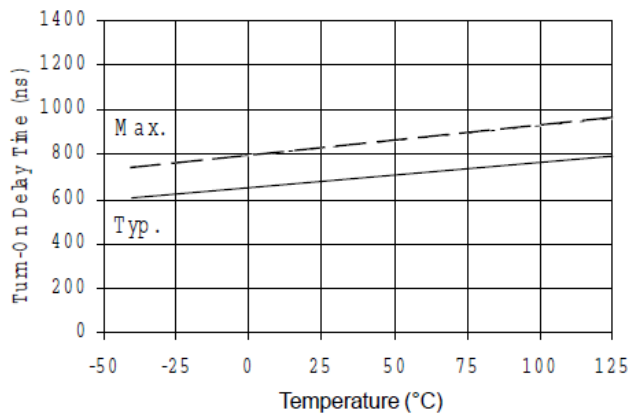


Figure 6A. Turn-On Time vs Temperature

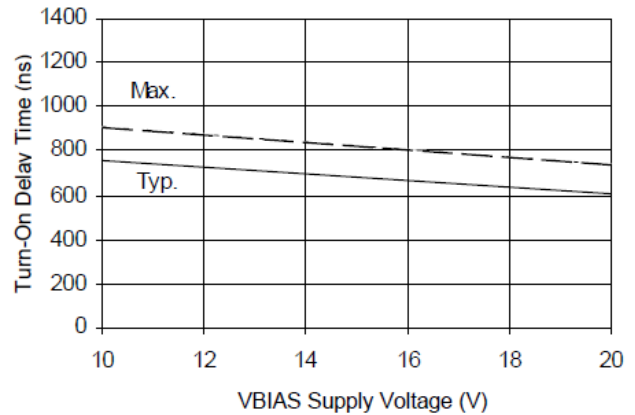


Figure 6B. Turn-On Time vs Supply Voltage

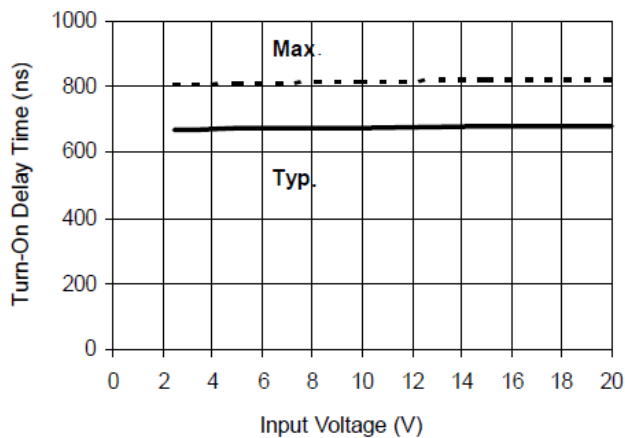


Figure 6C. Turn-On Time vs Input Voltage

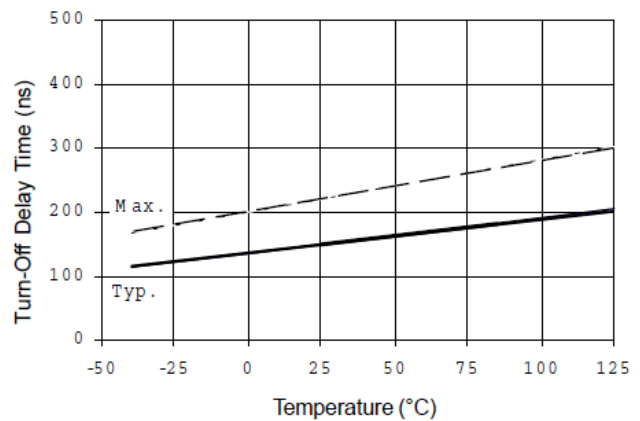


Figure 7A. Turn-Off Time vs Temperature

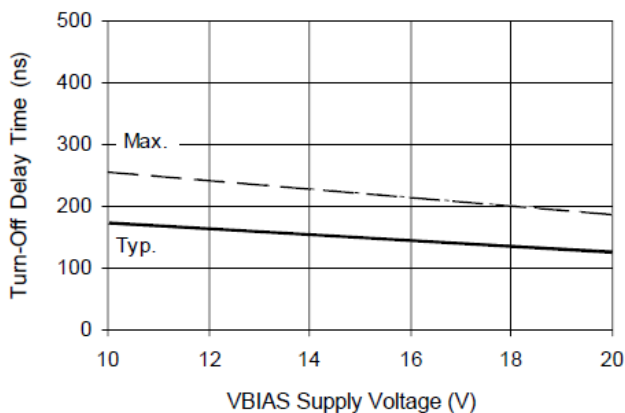


Figure 7B. Turn-Off Time vs Supply Voltage

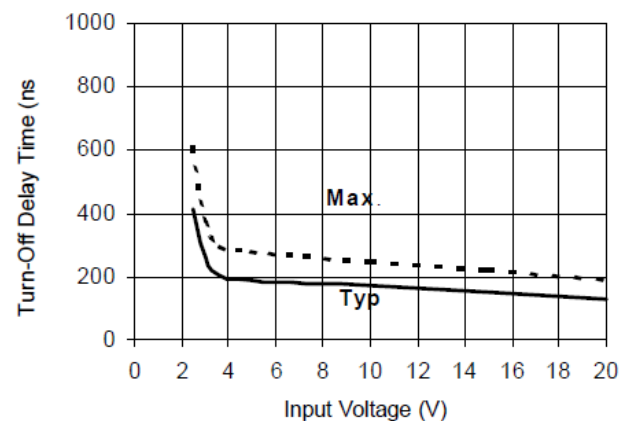
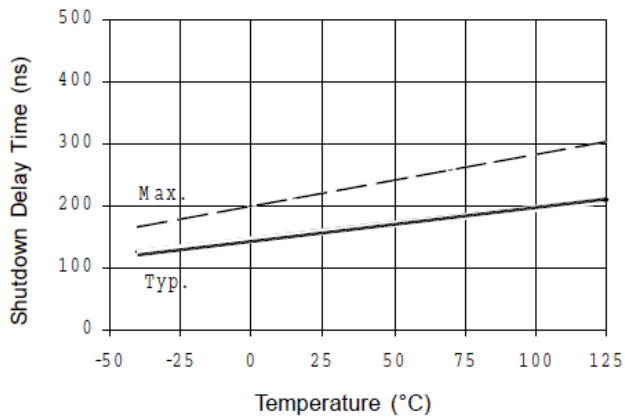
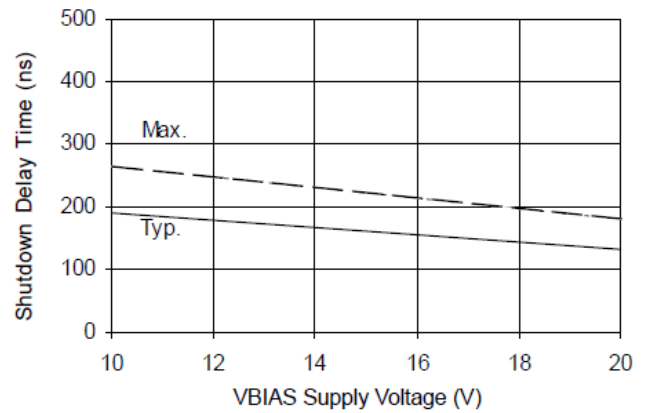
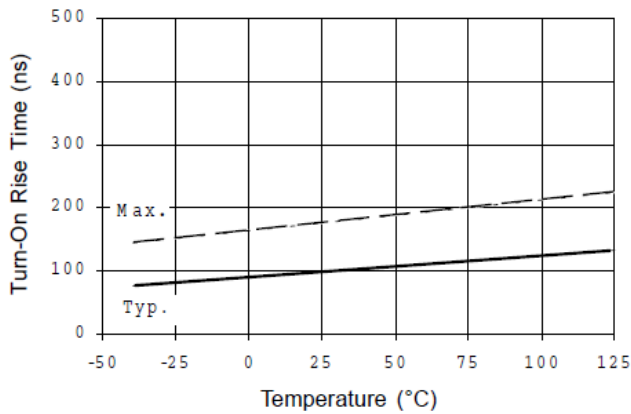
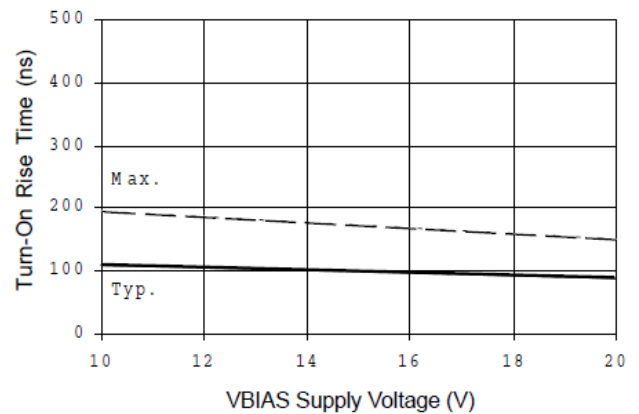
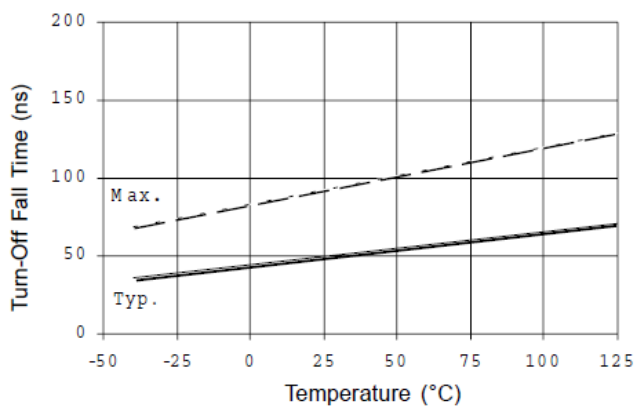
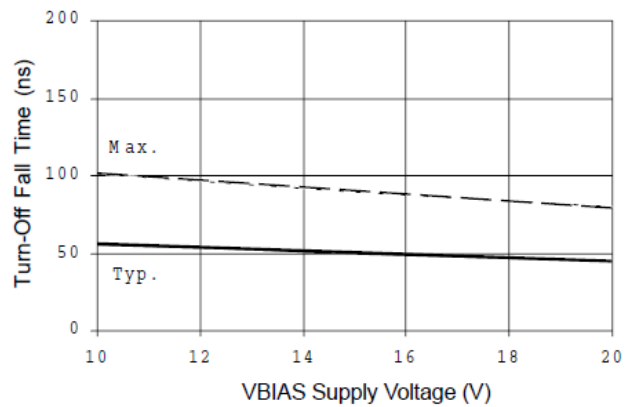
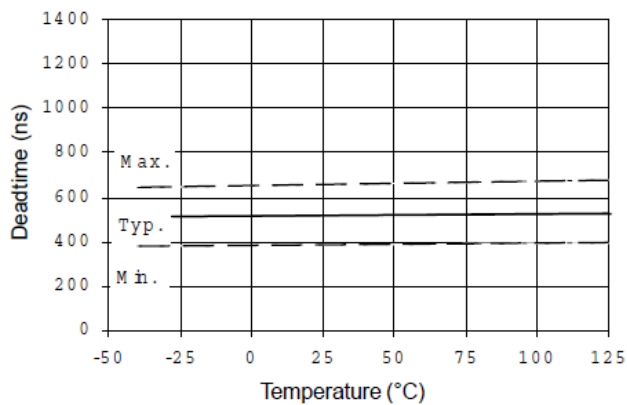
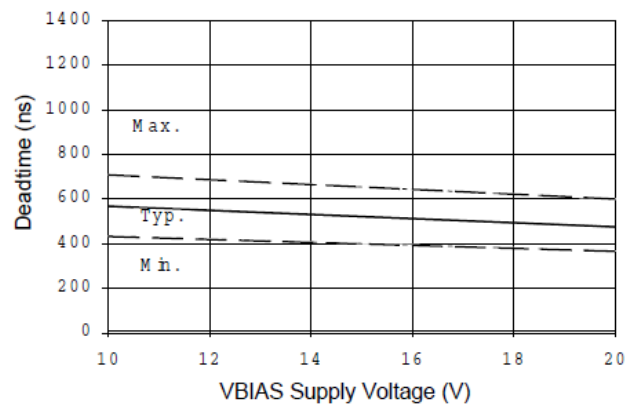
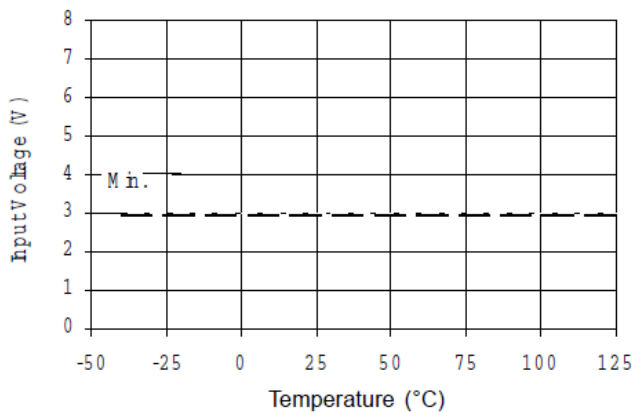
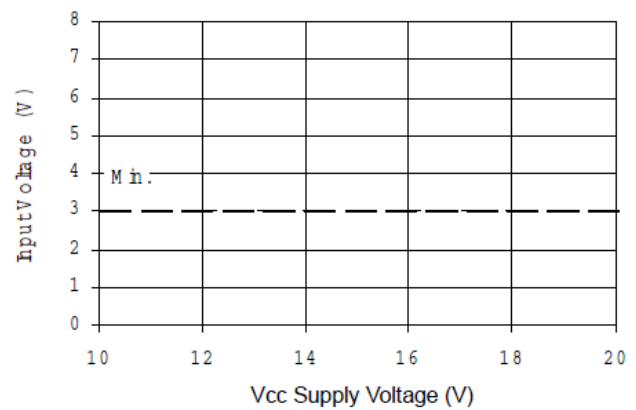
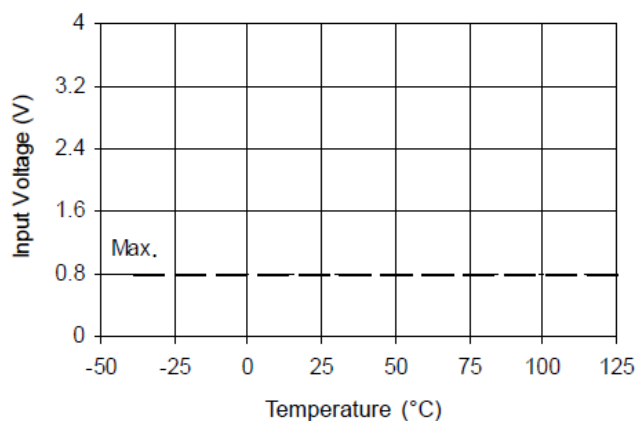
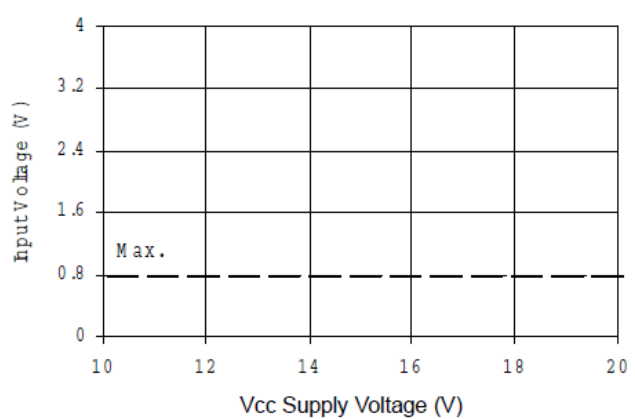


Figure 7C. Turn-Off Time vs Input Voltage


Figure 8A. Shutdown Time vs Temperature

Figure 8B. Shutdown Time vs Voltage

Figure 9A. Turn-On Rise Time vs Temperature

Figure 9B. Turn-On Rise Time vs Voltage

Figure 10A. Turn-Off Fall Time vs Temperature

Figure 10B. Turn-Off Fall Time vs Voltage


Figure 11A. Deadtime vs Temperature

Figure 11B. Deadtime vs Voltage

Figure 12A. Logic "1" (HO) & Logic "0" (LO) & Inactive SD Input Voltage vs Temperature

Figure 12B. Logic "1" (HO) & Logic "0" (LO) & Inactive SD Input Voltage vs Voltage

Figure 13A. Logic "0" (HO) & Logic "1" (LO) & Active SD Input Voltage vs Temperature

Figure 13B. Logic "0" (HO) & Logic "1" (LO) & Active SD Input Voltage vs Voltage

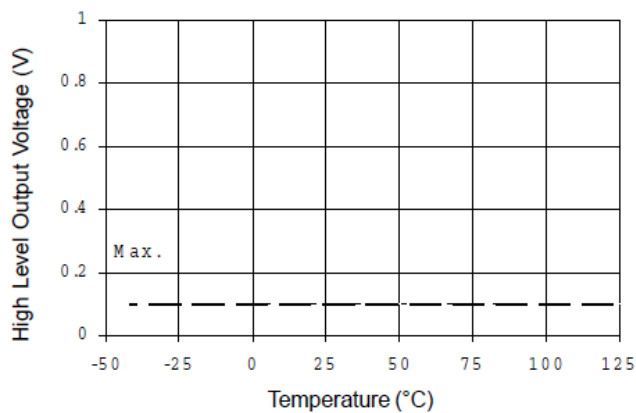


Figure 14A. High Level Output vs Temperature

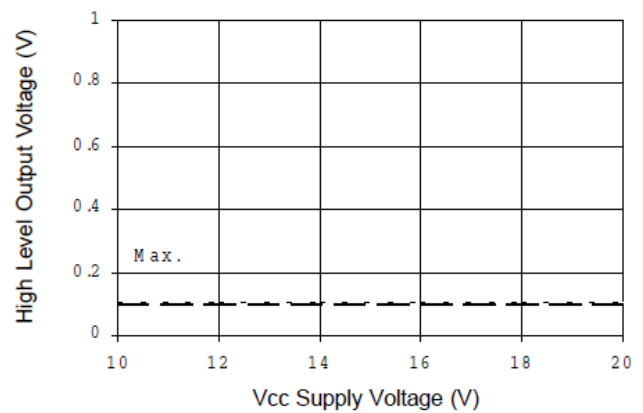


Figure 14B. High Level Output vs Voltage

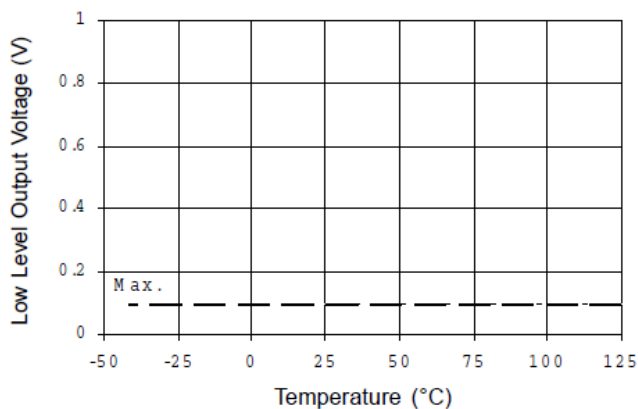


Figure 15A. Low Level Output vs Temperature

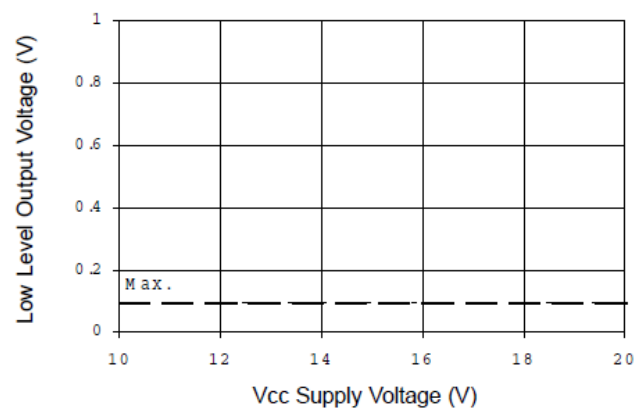


Figure 15B. Low level Output vs Voltage

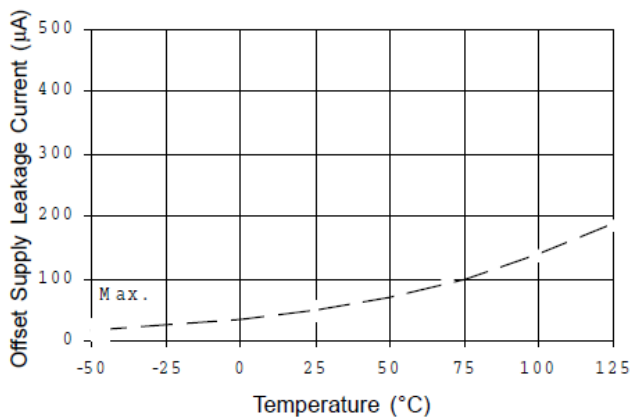


Figure 16A. Offset Supply Current vs Temperature

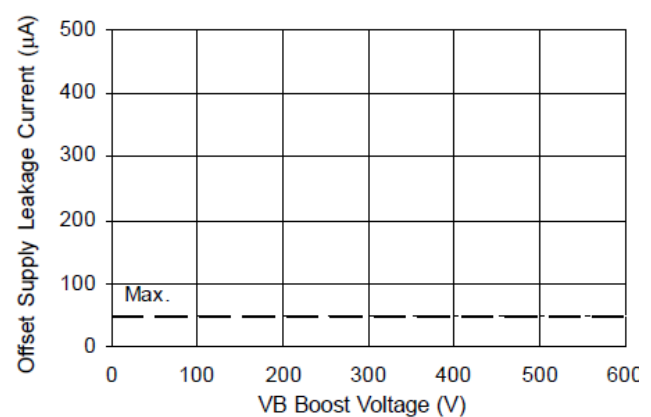


Figure 16B. Offset Supply Current vs Voltage

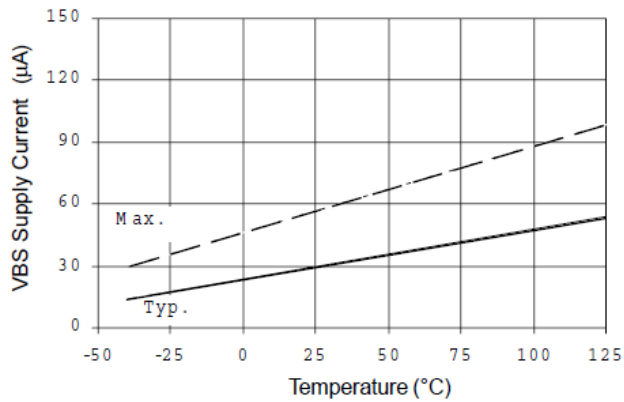


Figure 17A. V_{BS} Supply Current vs Temperature

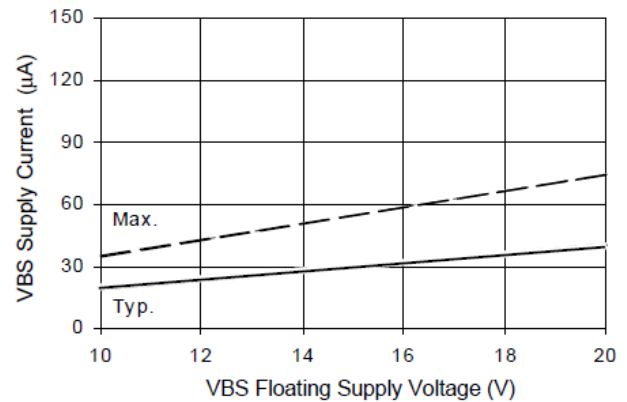


Figure 17B. V_{BS} Supply Current vs Voltage

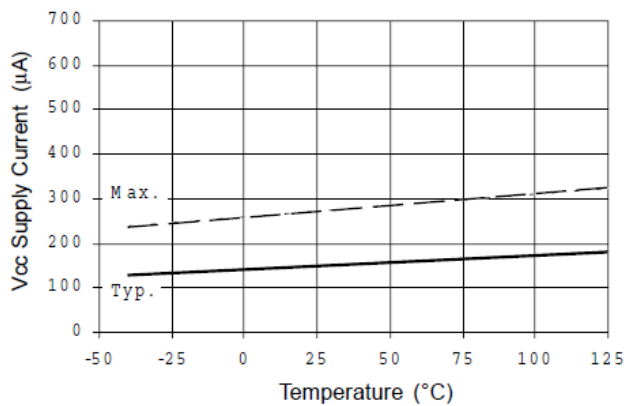


Figure 18A. V_{CC} Supply Current vs Temperature

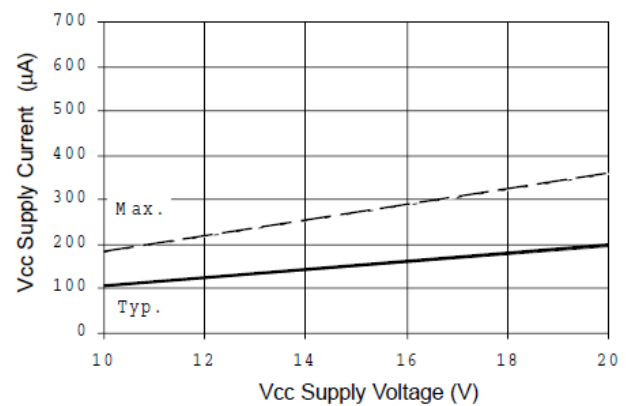


Figure 18B. V_{CC} Supply Current vs Voltage

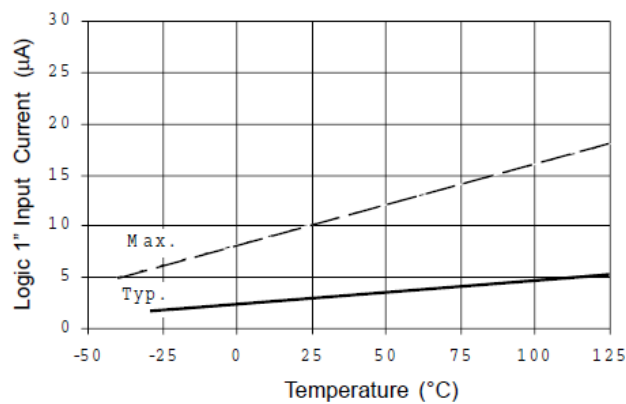


Figure 19A. Logic "1" Input Current vs Temperature

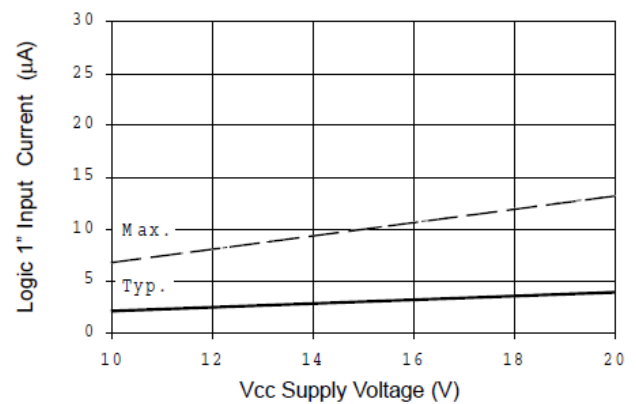


Figure 19B. Logic "1" Input Current vs Voltage

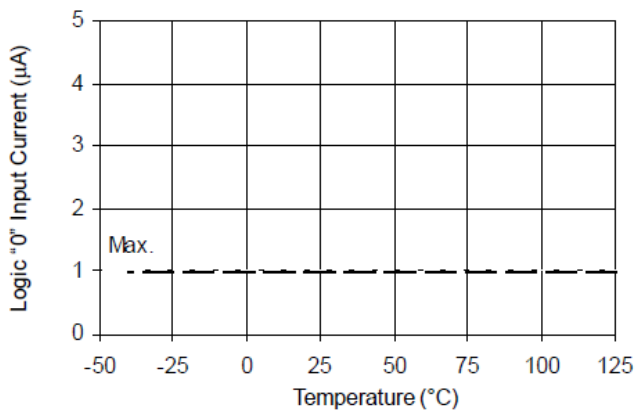


Figure 20A. Logic "0" Input Current vs Temperature

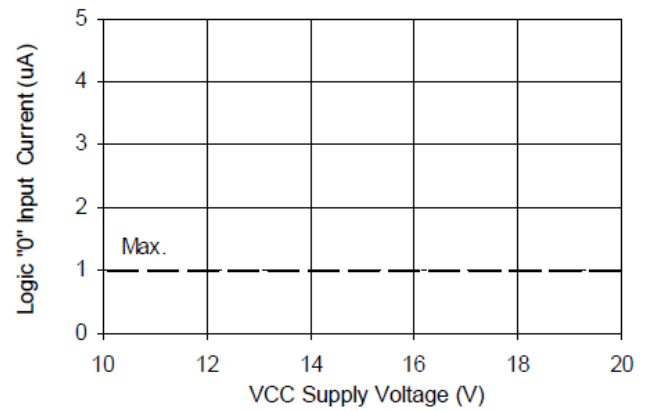


Figure 20B. Logic "0" Input Current vs Voltage

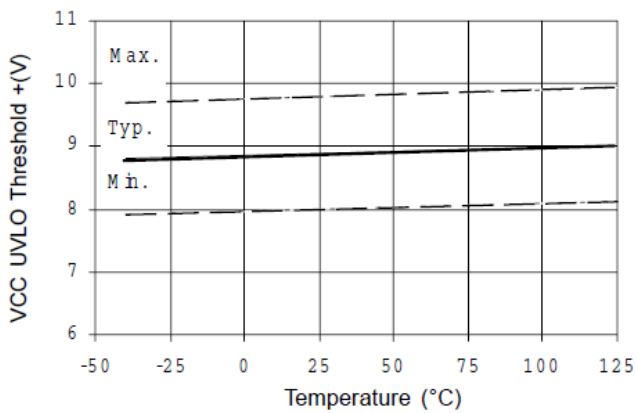


Figure 21A. Vcc Undervoltage Threshold(+) vs Temperature

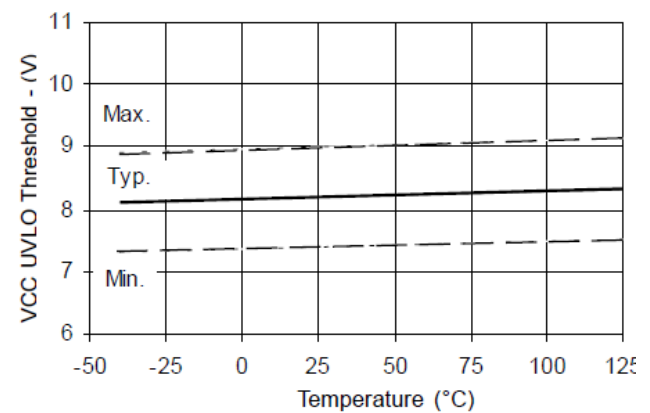


Figure 21B. Vcc Undervoltage Threshold(-) vs Temperature

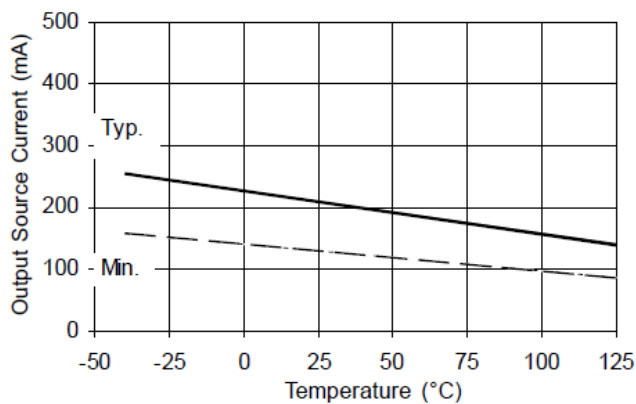


Figure 22A. Output Source Current vs Temperature

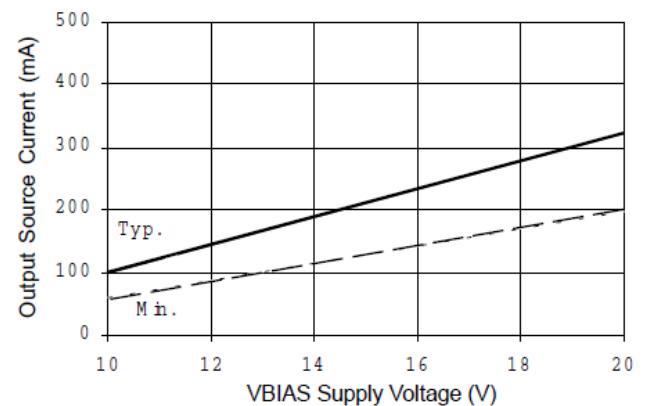


Figure 22B. Output Source Current vs Voltage

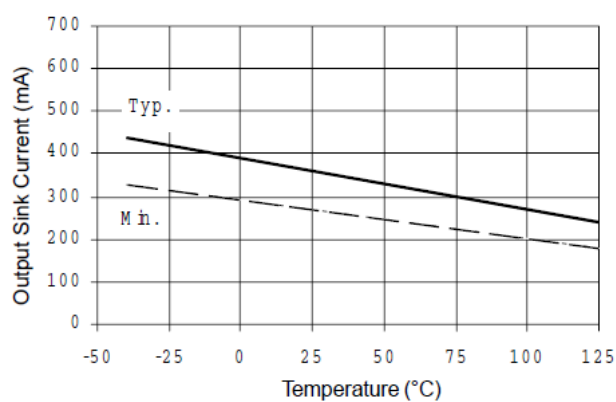


Figure 23A. Output Sink Current vs Temperature

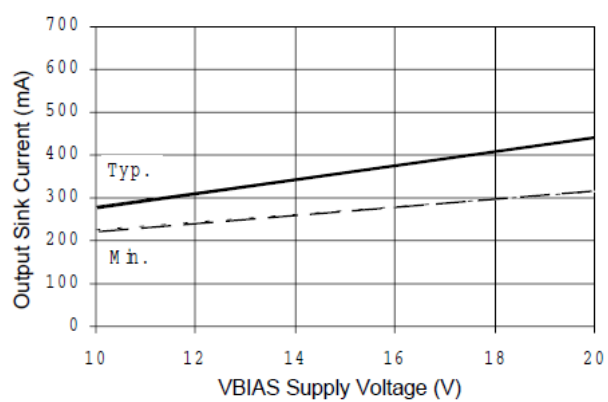
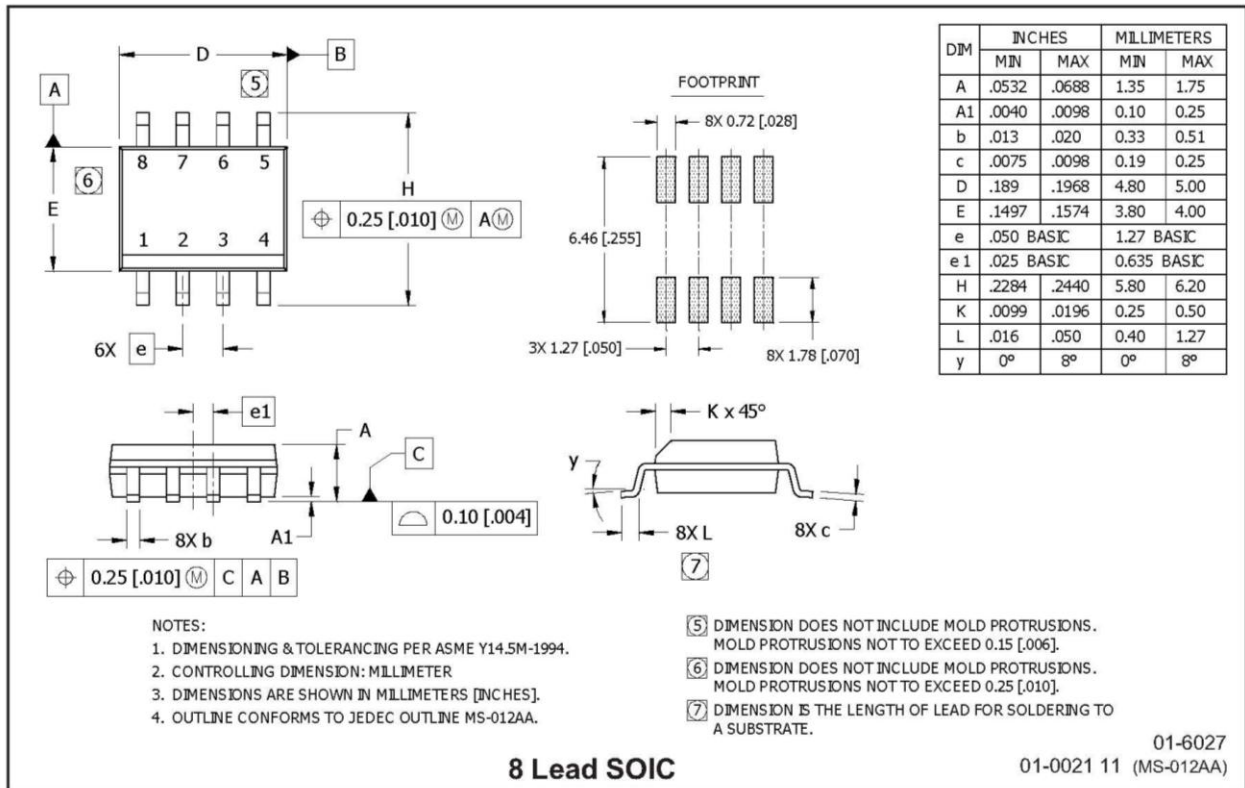
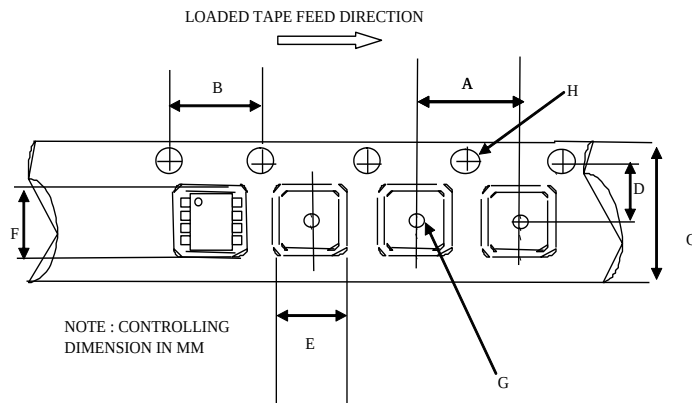


Figure 23B. Output Sink Current vs Voltage

Package Details

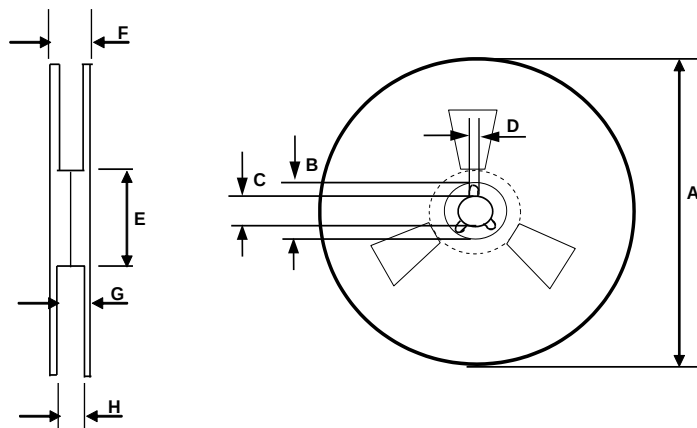


Tape and Reel Details



CARRIER TAPE DIMENSION FOR 8SOICN

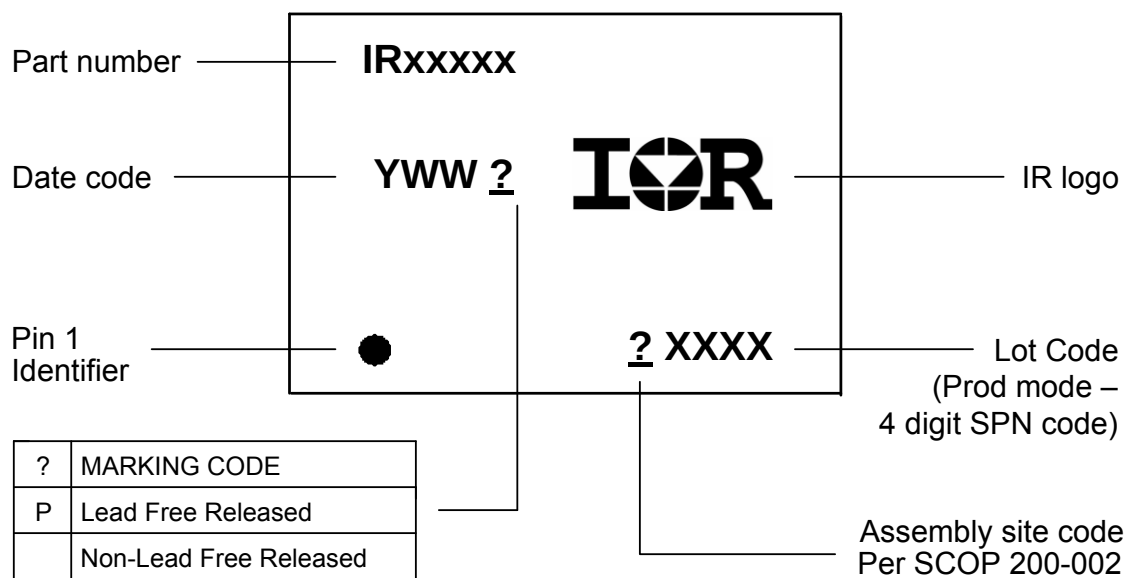
Code	Metric		Imperial	
	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	11.70	12.30	0.46	0.484
D	5.45	5.55	0.214	0.218
E	6.30	6.50	0.248	0.255
F	5.10	5.30	0.200	0.208
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062



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

Part Marking Information



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	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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