

High and Low Side 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 for both channels
- 3.3V logic compatible
- Separate logic supply range from 3.3V to 20V
- Logic and power ground $\pm 5V$ offset
- CMOS Schmitt-triggered inputs with pull-down
- Cycle by cycle edge-triggered shutdown logic
- Matched propagation delay for both channels
- Outputs in phase with inputs

Description

The IR25607 is a high voltage, high speed power MOSFET and IGBT driver with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. Logic inputs are 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. 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.

Product Summary

V_{OFFSET}	600V max.
$I_{\text{O+/-}}$	2A / 2A
V_{OUT}	10 – 20V
Ton/off (typ.)	120 & 94 ns
Delay Matching (typ.)	20 ns

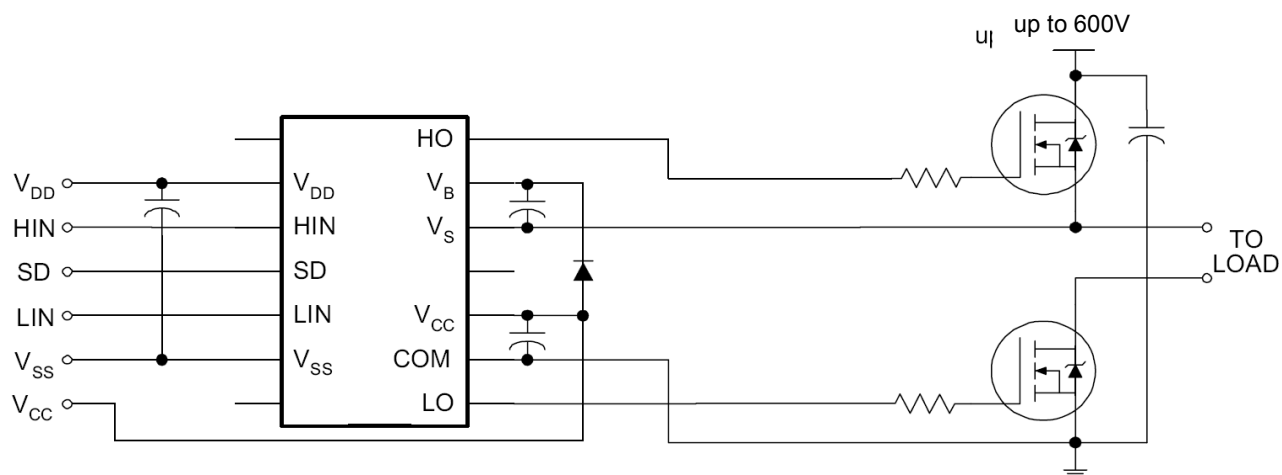
Package Options



Ordering Information

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IR25607SPBF	SO16W	Tube	45	IR25607SPBF
IR25607SPBF	SO16W	Tape and Reel	1000	IR25607STRPBF

Typical Connection Diagram



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

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	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_{DD}	Logic supply voltage	-0.3	$V_{SS} + 25$	
V_{SS}	Logic supply offset voltage	$V_{CC} - 25$	$V_{CC} + 0.3$	
V_{IN}	Logic input voltage (HIN, LIN & SD)	$V_{SS} - 0.3$	$V_{DD} + 0.3$	
dVs/dt	Allowable offset supply voltage transient	—	50	V/ns
P_D	Package power dissipation @ $T_A \leq +25^\circ\text{C}$	—	1.25	W
R_{thJA}	Thermal resistance, junction to ambient	—	100	$^\circ\text{C/W}$
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 and V_{SS} 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	†	600	
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_{DD}	Logic supply voltage	$V_{SS} + 3$	$V_{SS} + 20$	
V_{SS}	Logic supply offset voltage	-5 ††	5	
V_{IN}	Logic input voltage (HIN, LIN & SD)	V_{SS}	V_{DD}	
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).

†† When $V_{DD} < 5V$, the minimum V_{SS} offset is limited to $-V_{DD}$.

Dynamic Electrical Characteristics

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

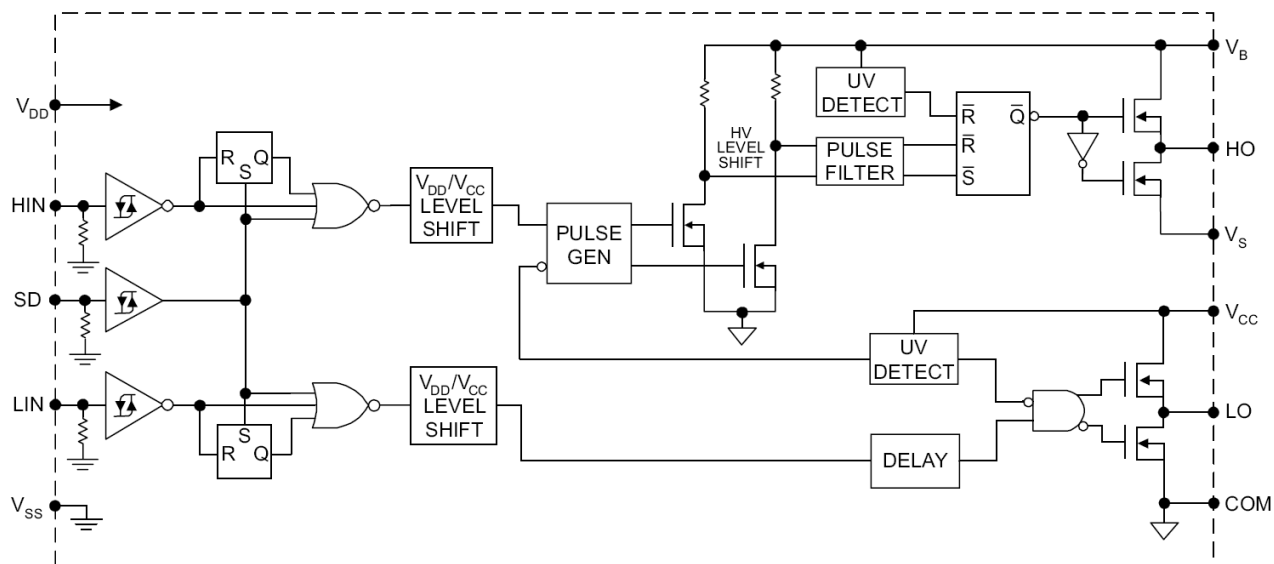
Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	—	120	150	ns	$V_S = 0V$
t_{off}	Turn-off propagation delay	—	94	125		$V_S = 600V$
t_{sd}	Shutdown propagation delay	—	110	140		$V_S = 600V$
t_r	Turn-on rise time	—	25	35		
t_f	Turn-off fall time	—	17	25		
MT	Delay matching, HS & LS turn-on/off	—	—	20		

Static Electrical Characteristics

V_{BIAS} (V_{CC} , V_{BS} , V_{DD}) = 15V, V_{SS} = COM and T_A = 25°C unless otherwise specified. The V_{IN} , V_{TH} and I_{IN} parameters are referenced to V_{SS} 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 and LO.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
V_{IH}	Logic "1" input voltage	9.5	—	—	V	
V_{IL}	Logic "0" input voltage	—	—	6.0		
V_{OH}	High level output voltage, $V_{BIAS} - V_O$	—	—	1.2		$I_O = 0A$
V_{OL}	Low level output voltage, V_O	—	—	0.1		$I_O = 0A$
I_{LK}	Offset supply leakage current	—	—	50	μA	$V_B = V_S = 600V$
I_{QBS}	Quiescent V_{BS} supply current	—	125	230		$V_{IN} = 0V$ or V_{DD}
I_{QCC}	Quiescent V_{CC} supply current	—	180	340		$V_{IN} = 0V$ or V_{DD}
I_{QDD}	Quiescent V_{CC} supply current	—	15	30		$V_{IN} = 0V$ or V_{DD}
I_{IN+}	Logic "1" input bias current	—	20	40		$V_{IN} = V_{DD}$
I_{IN-}	Logic "0" input bias current	—	—	1		$V_{IN} = 0V$
V_{BSUV+}	V_{BS} supply undervoltage positive going threshold	7.5	8.6	9.7	V	
V_{BSUV-}	V_{BS} supply undervoltage negative going threshold	7.0	8.2	9.4		
V_{CCUV+}	V_{CC} supply undervoltage positive going threshold	7.4	8.5	9.6		
V_{CCUV-}	V_{CC} supply undervoltage negative going threshold	7.0	8.2	9.4		
I_{O+}	Output high short circuit pulsed current	2	2.5	—	A	$V_O = 0V$, $V_{IN} = V_{DD}$ $PW \leq 10 \mu s$
I_{O-}	Output low short circuit pulsed current	2	2.5	—		$V_O = 15V$, $V_{IN} = V_{DD}$ $PW \leq 10 \mu s$

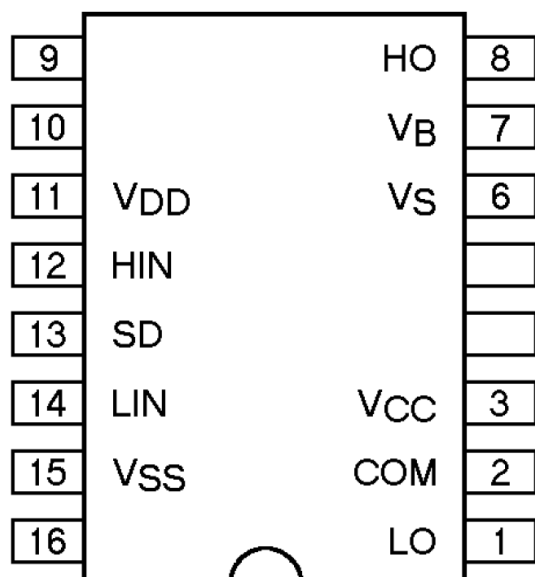
Functional Block Diagram



Lead Definitions

Symbol	Description
V _{DD}	Logic supply
HIN	Logic input for high side gate driver output (HO), in phase
SD	Logic input for shutdown
LIN	Logic input for low side gate driver output (LO), in phase
V _{SS}	Logic ground
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

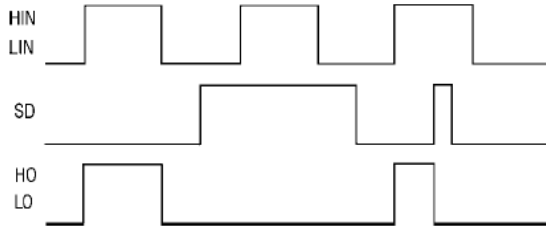


Figure 1. Input/Output Timing Diagram

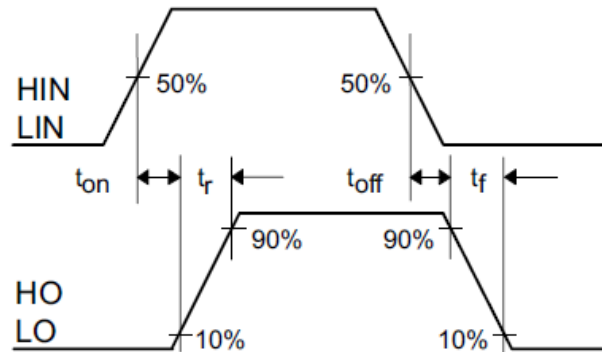


Figure 2. Switching Time Waveform Definitions

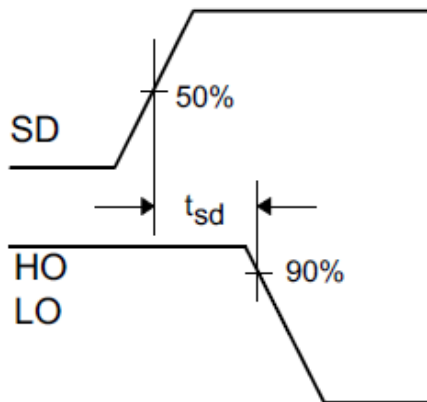


Figure 3. Shutdown Waveform Definitions

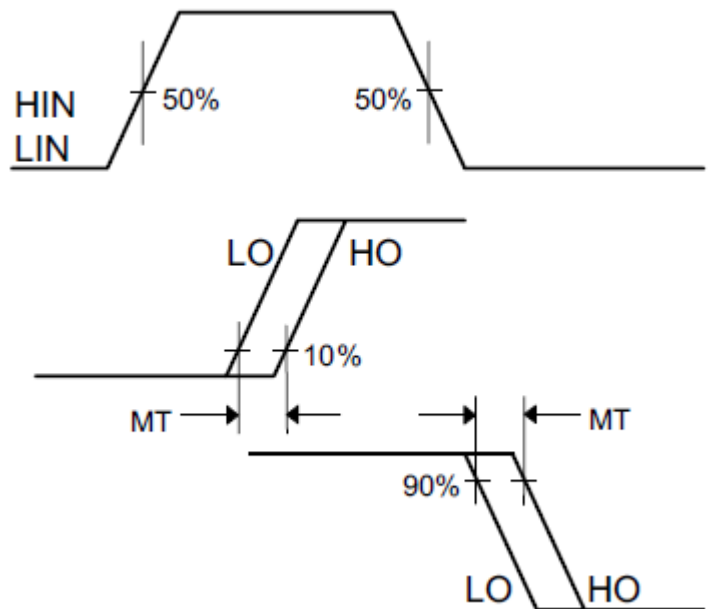
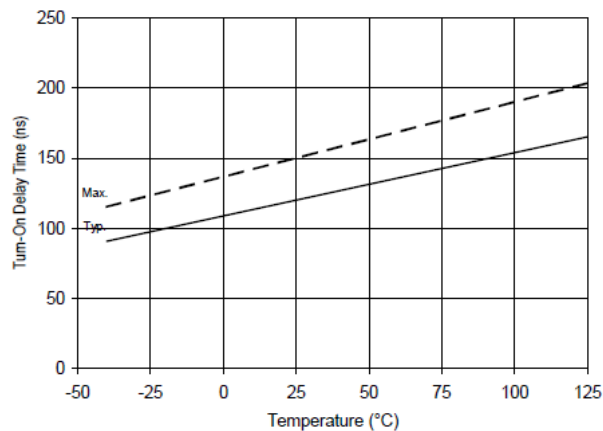
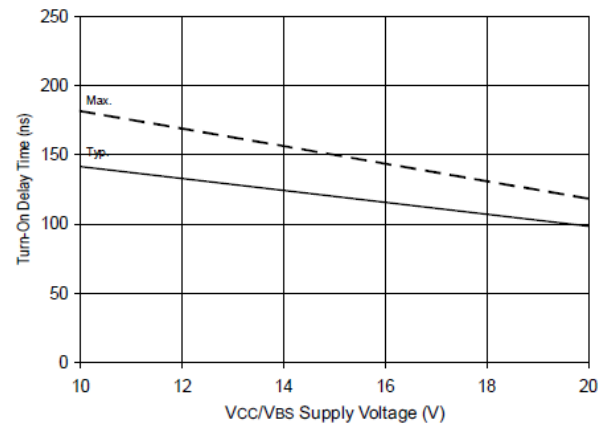
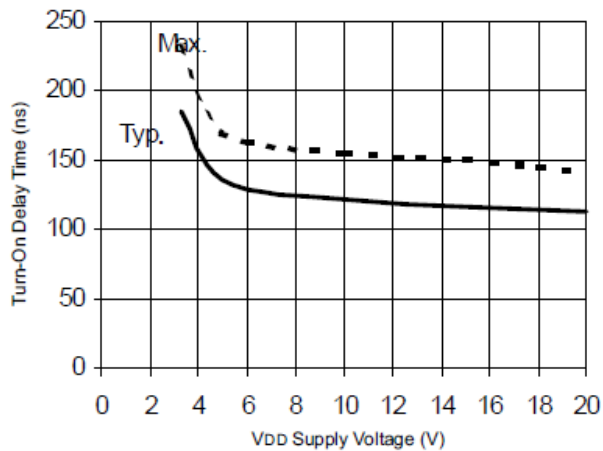
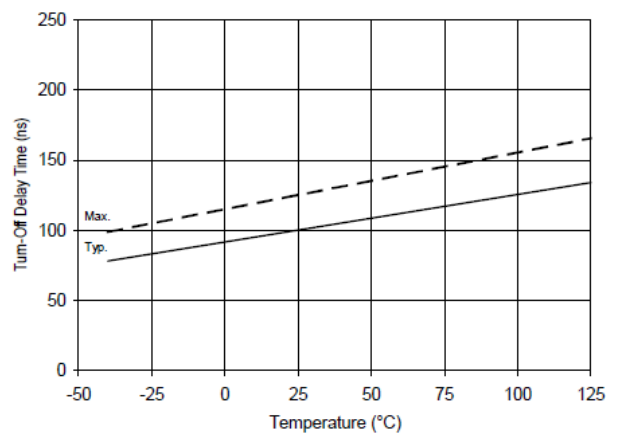
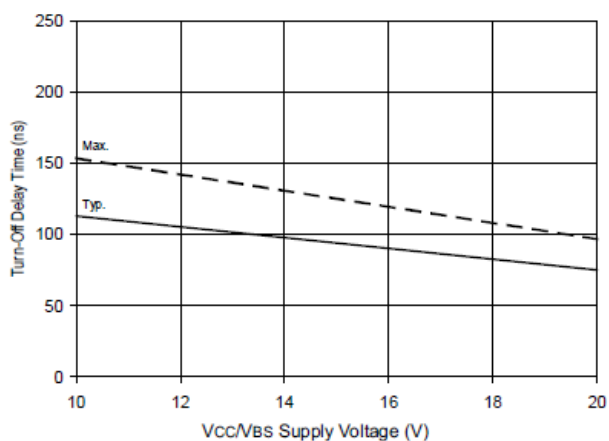
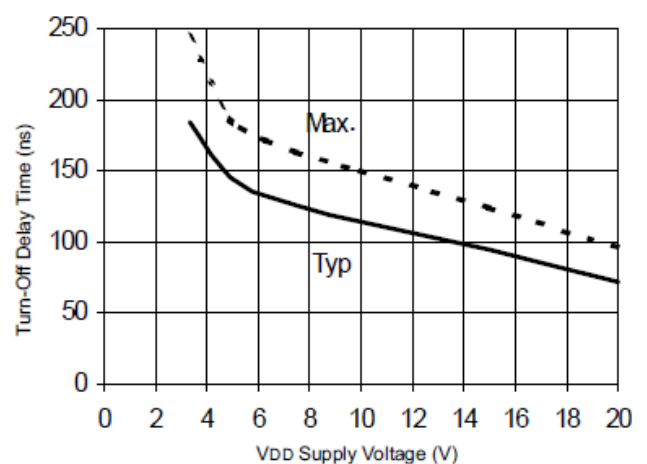
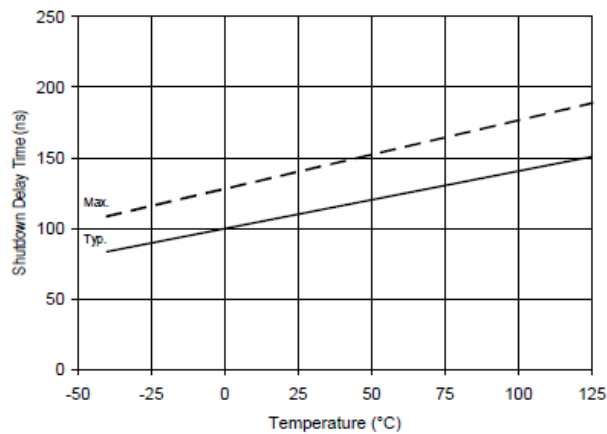
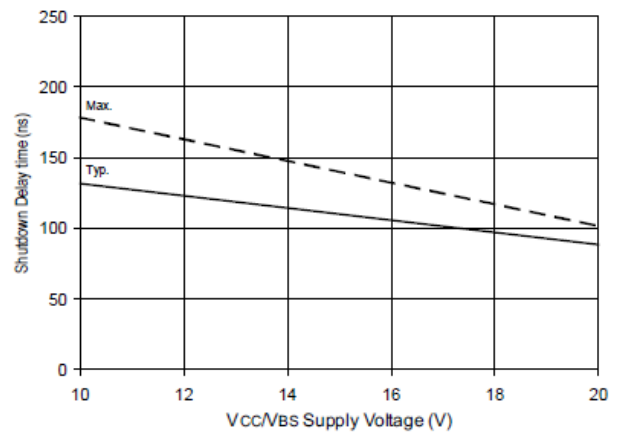
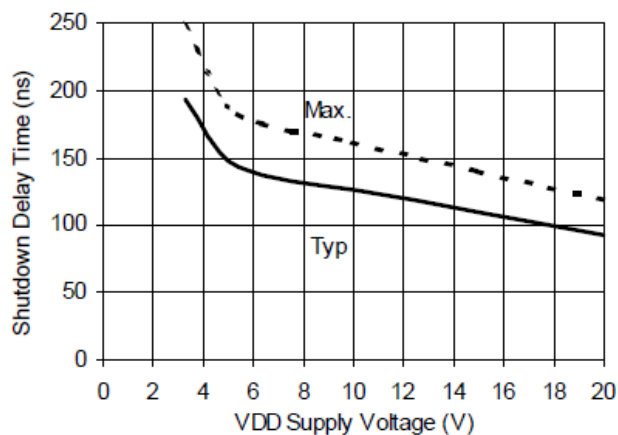
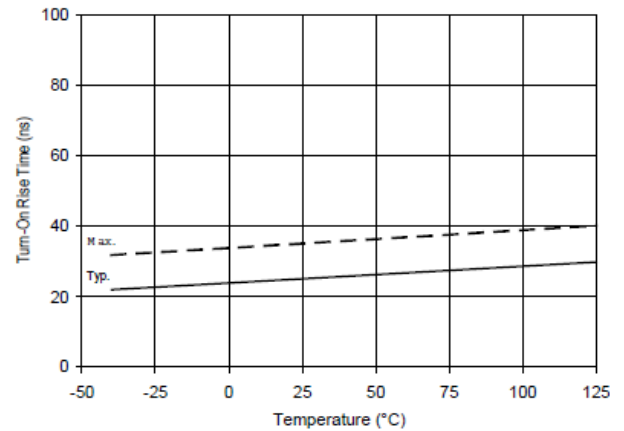
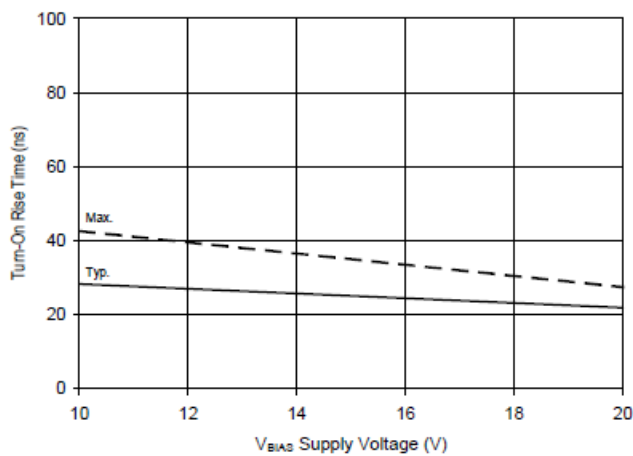
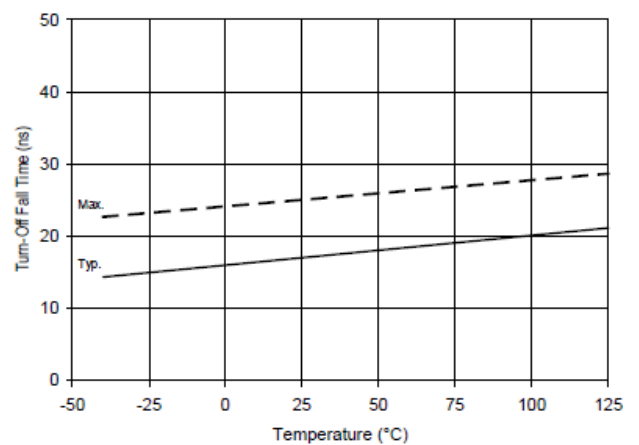
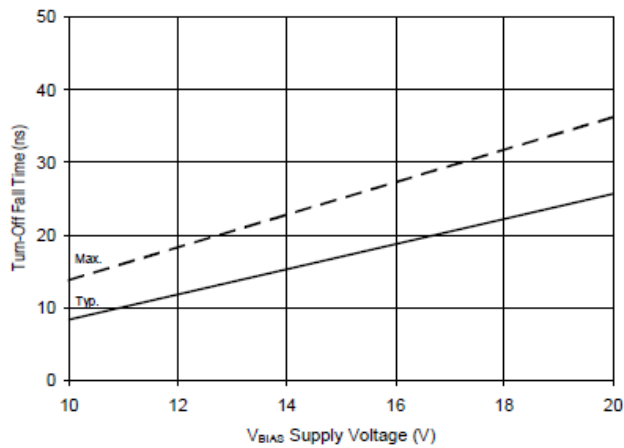
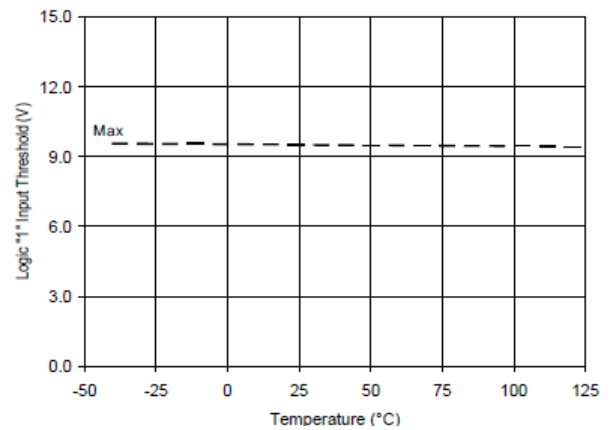
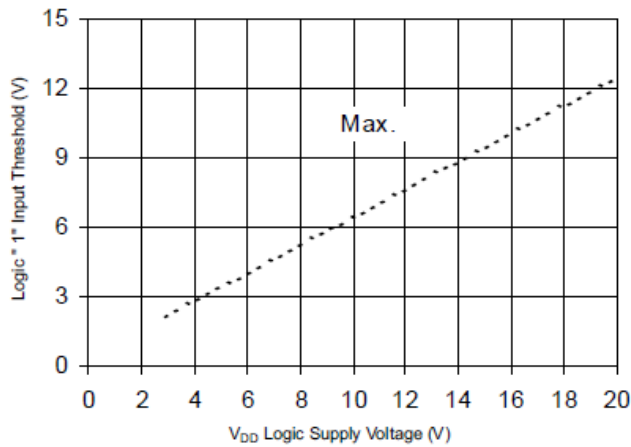
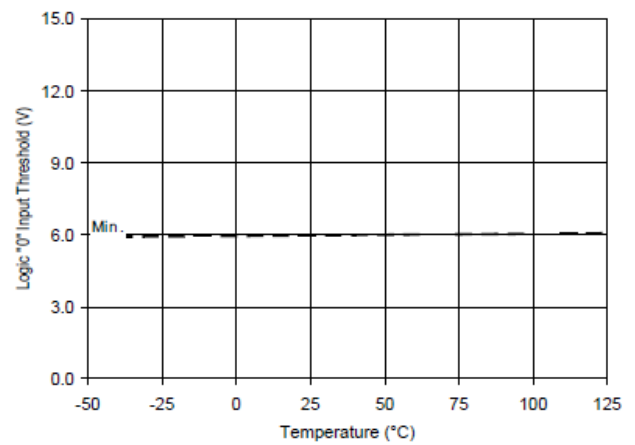
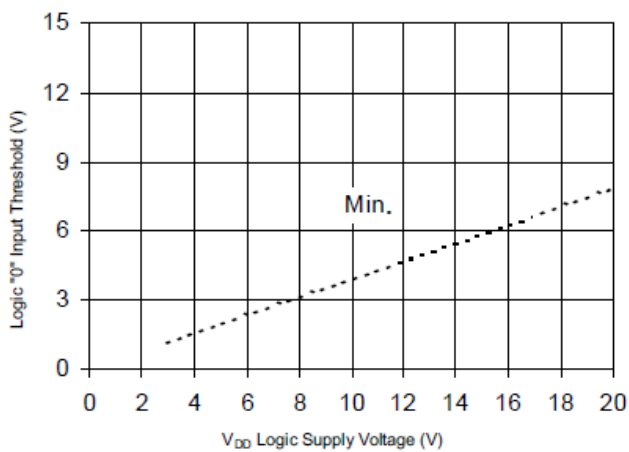
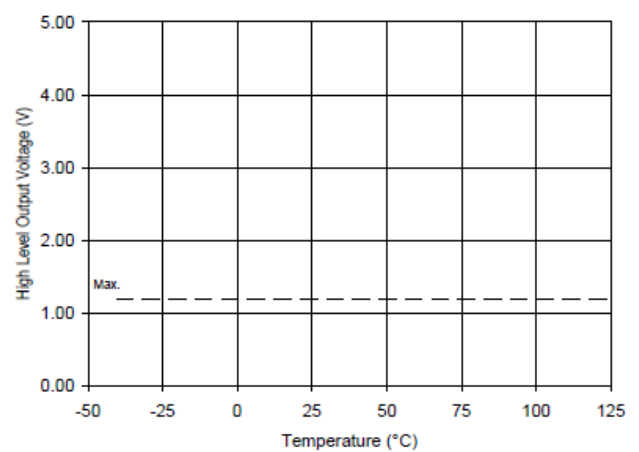
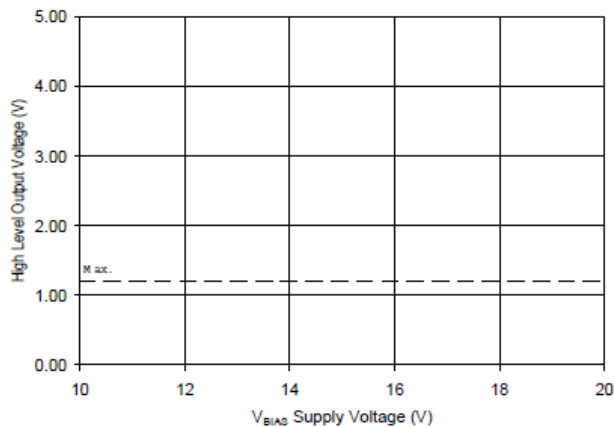
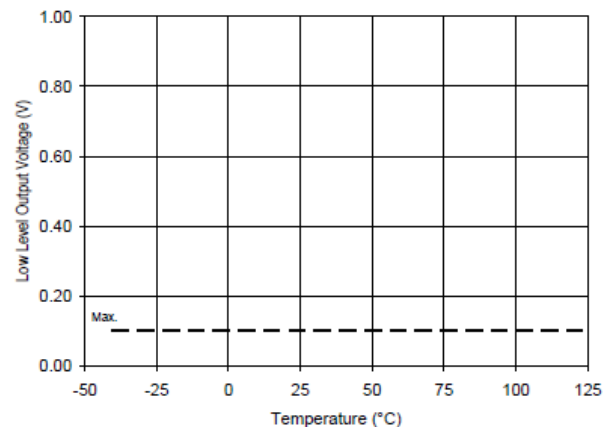
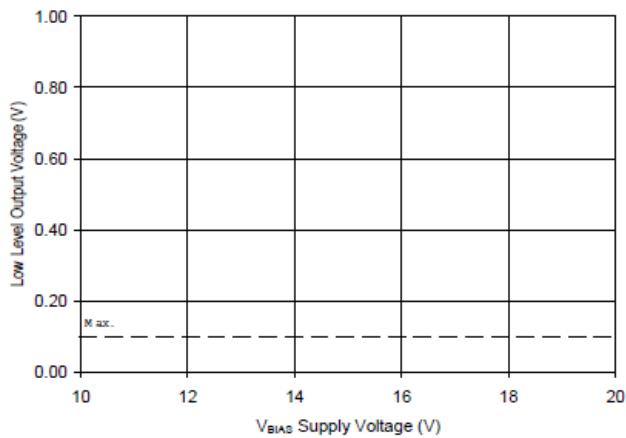
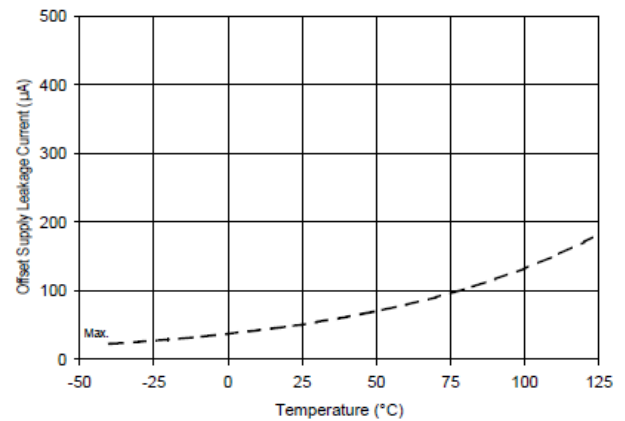
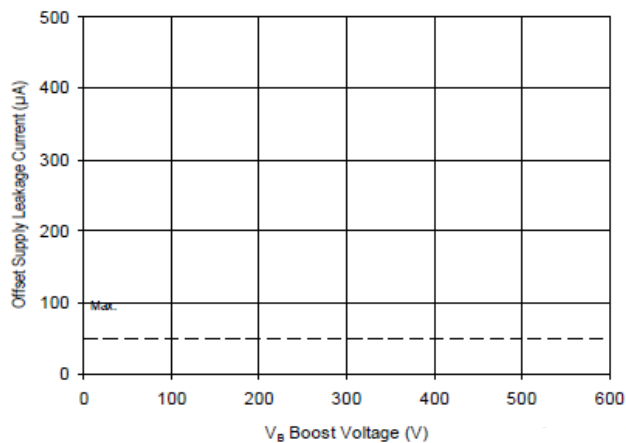
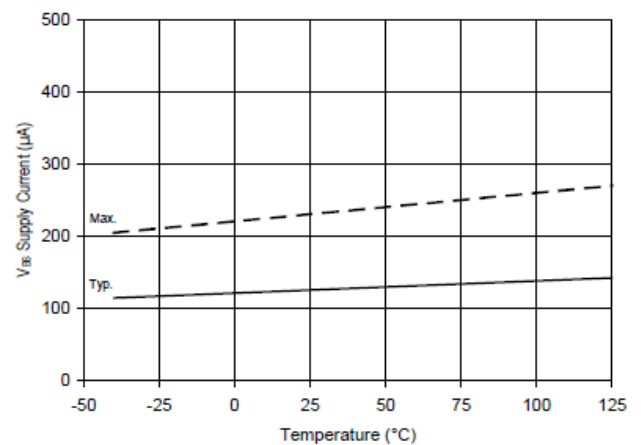


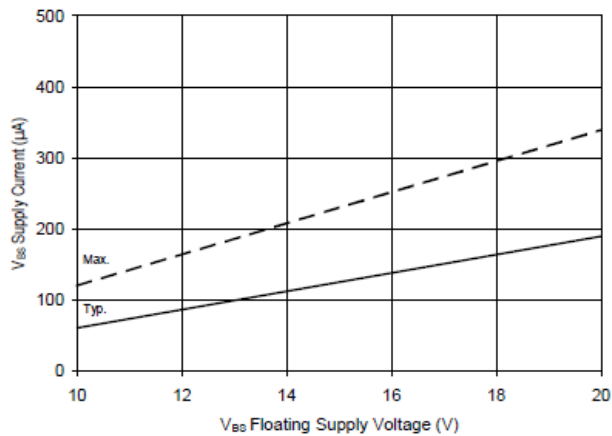
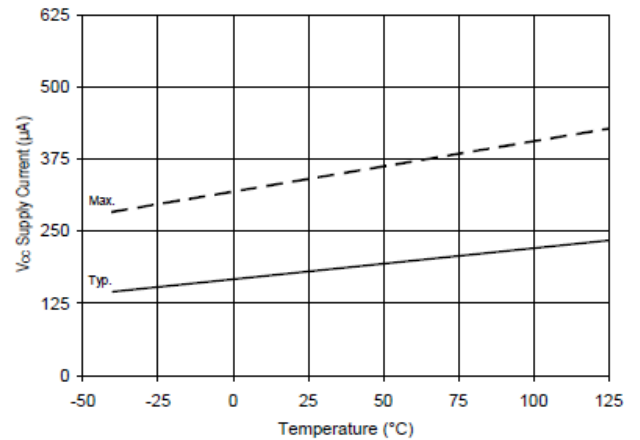
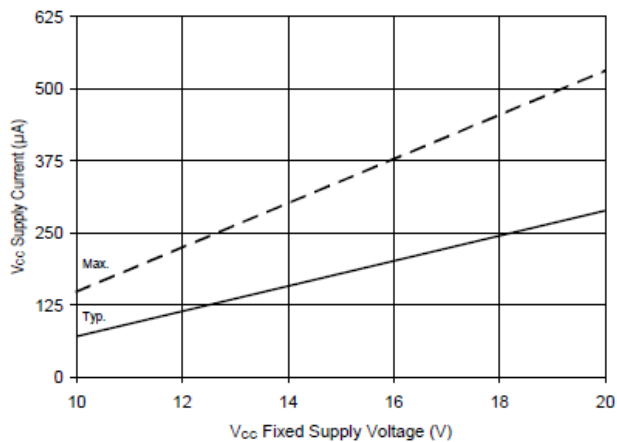
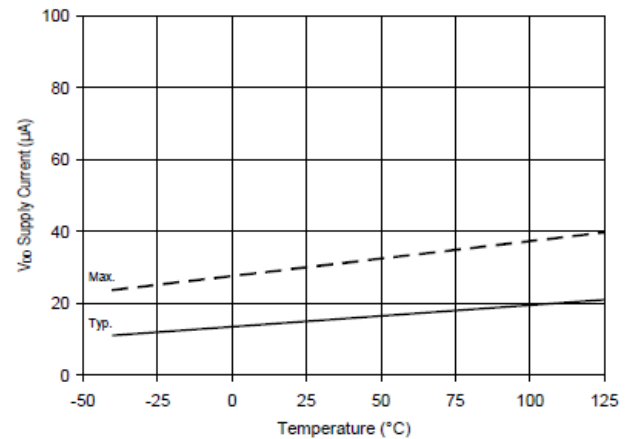
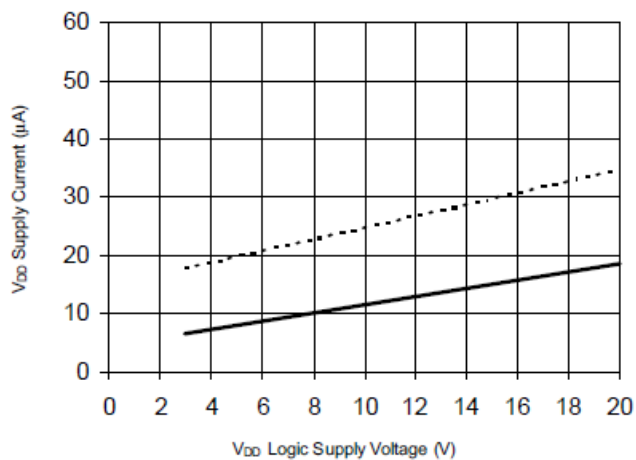
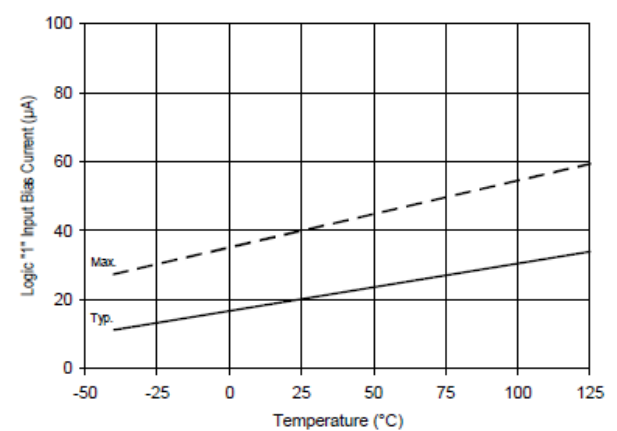
Figure 4. Delay matching Waveform Definitions

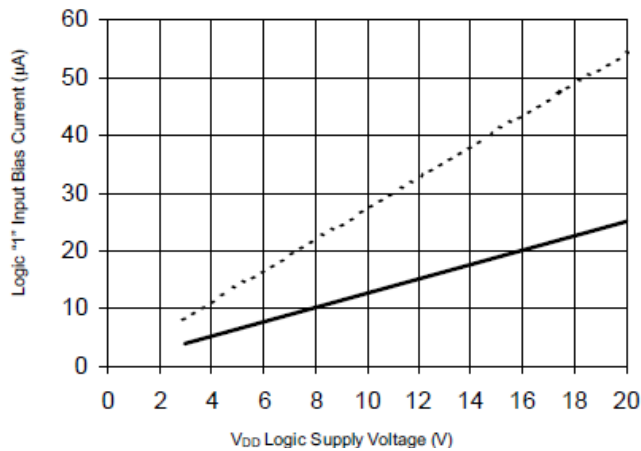
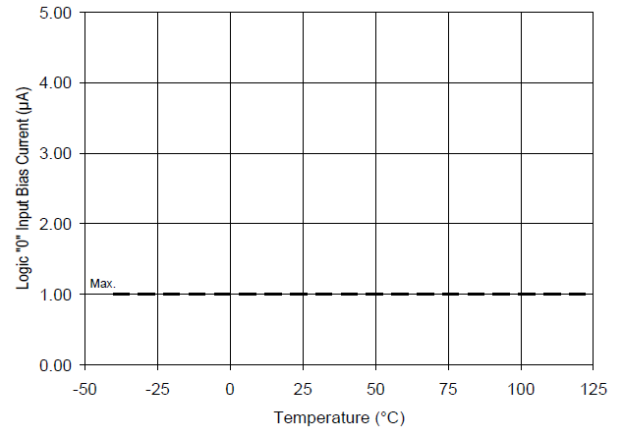
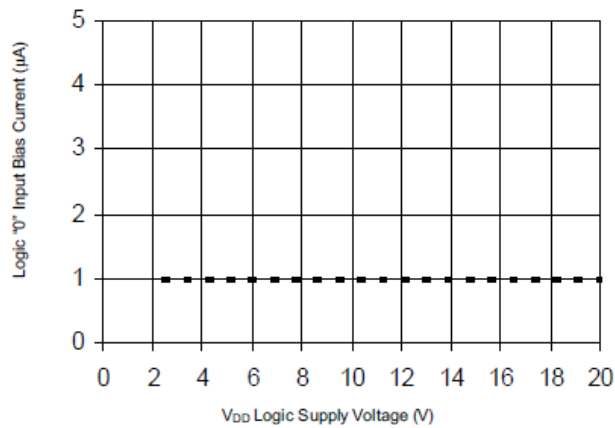
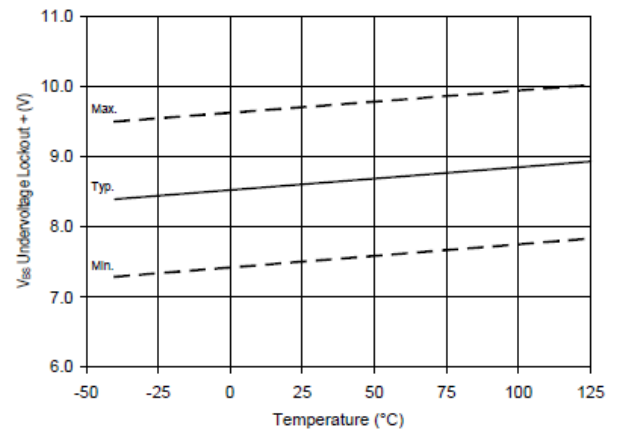
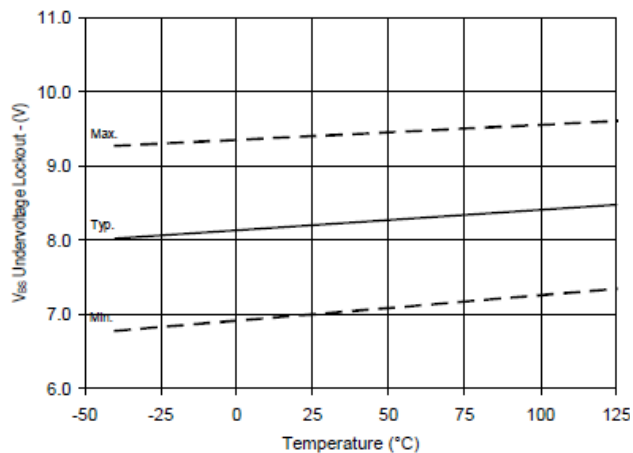
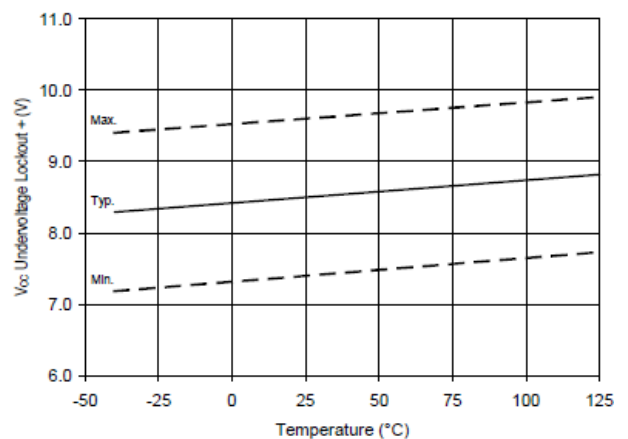

Figure 5A. Turn On Time vs. Temperature

Figure 5B. Turn On Time vs. V_{CC}/V_{BS} Supply Voltage

Figure 5C. Turn On Time vs. V_{DD} Supply Voltage

Figure 6A. Turn Off Time vs. Temperature

Figure 6B. Turn Off Time vs. V_{CC}/V_{BS} Supply Voltage

Figure 6C. Turn Off Time vs. V_{DD} Supply Voltage

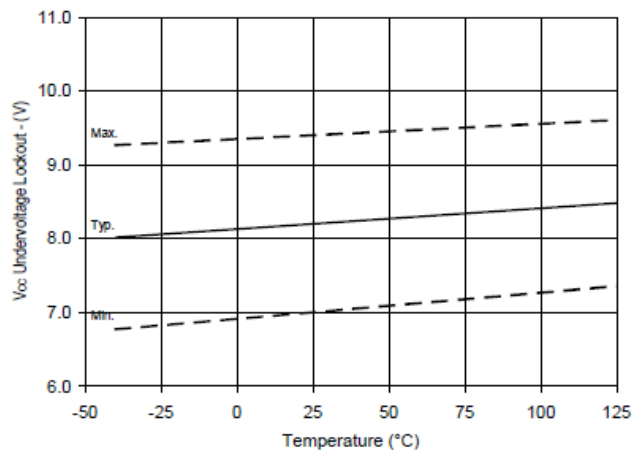
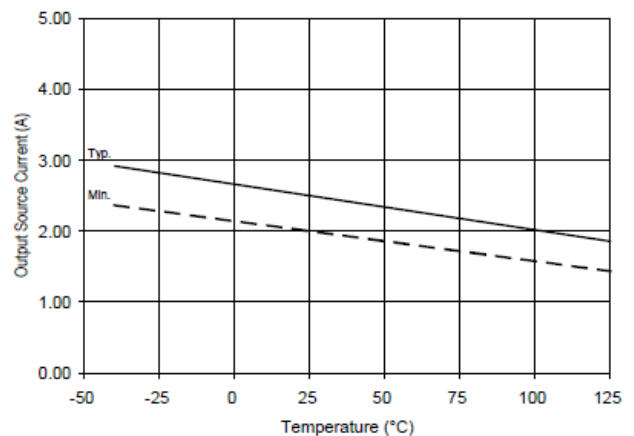
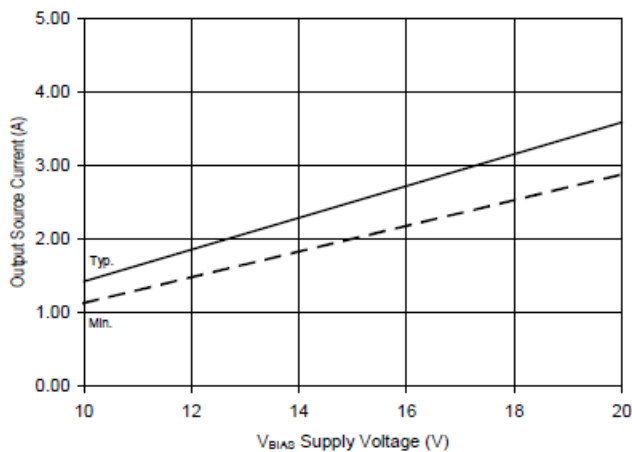
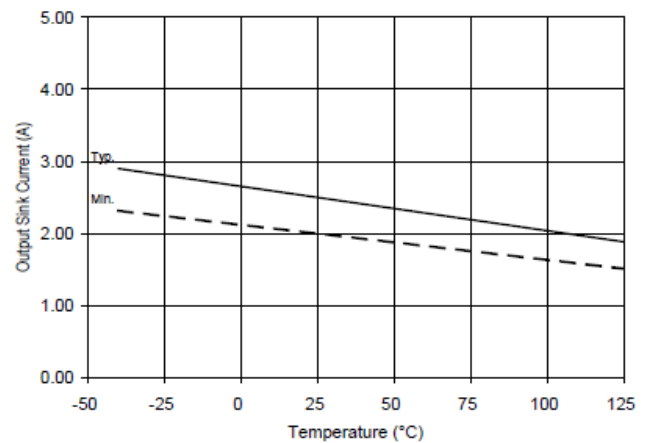
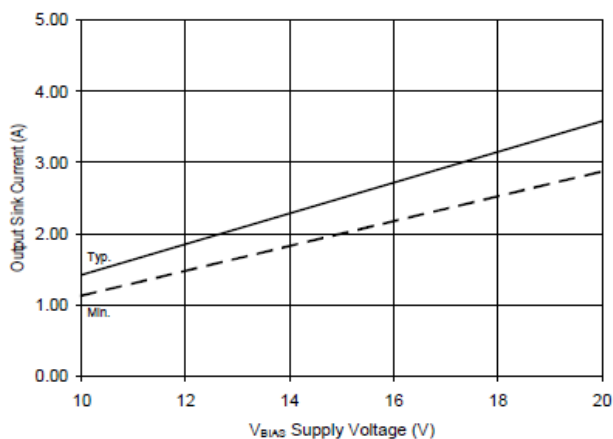
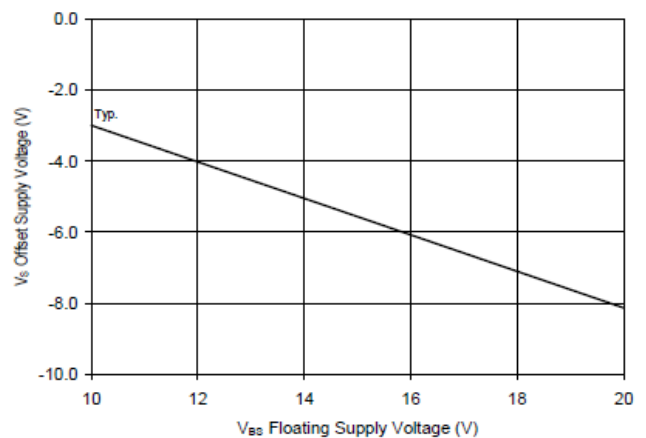

Figure 7A. Shutdown Time vs. Temperature

Figure 7B. Shutdown Time vs. V_{CC}/V_{BS} Supply Voltage

Figure 7C. Shutdown Time vs. V_{DD} Supply Voltage

Figure 8A. Turn On Rise Time vs. Temperature

Figure 8B. Turn On Rise Time vs. Voltage

Figure 9A. Turn Off Fall Time vs. Temperature


Figure 9B. Turn Off Fall Time vs. Voltage

Figure 10A. Logic '1' Input Threshold vs. Temperature

Figure 10B. Logic '1' Input Threshold vs. Voltage

Figure 11A. Logic '0' Input Threshold vs. Temperature

Figure 11B. Logic '0' Input Threshold vs. Voltage

Figure 12A. High Level Output vs. Temperature


Figure 12B. High Level Output vs. Voltage

Figure 13A. Low Level Output vs. Temperature

Figure 13B. Low Level Output vs. Voltage

Figure 14A. Offset Supply Current vs. Temperature

Figure 14B. Offset Supply Current vs. Voltage

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


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

Figure 16A. V_{CC} Supply Current vs. Temperature

Figure 16B. V_{CC} Supply Current vs. Voltage

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

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

Figure 18A. Logic '1' Input Current vs. Temperature


Figure 18B. Logic '1' Input Current vs. V_{DD} Voltage

Figure 19A. Logic '0' Input Current vs. Temperature

Figure 19B. Logic '0' Input Current vs. V_{DD} Voltage

Figure 20. V_{BS} Undervoltage (+) vs. Temperature

Figure 21 V_{BS} Undervoltage (-) vs. Temperature

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


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

Figure 24A. Output Source Current vs. Temperature

Figure 24B. Output Source Current vs. Voltage

Figure 25A. Output Sink Current vs. Temperature

Figure 25B. Output Sink Current vs. Voltage

Figure 26. Maximum V_S Negative Offset vs. V_{BS} Supply Voltage

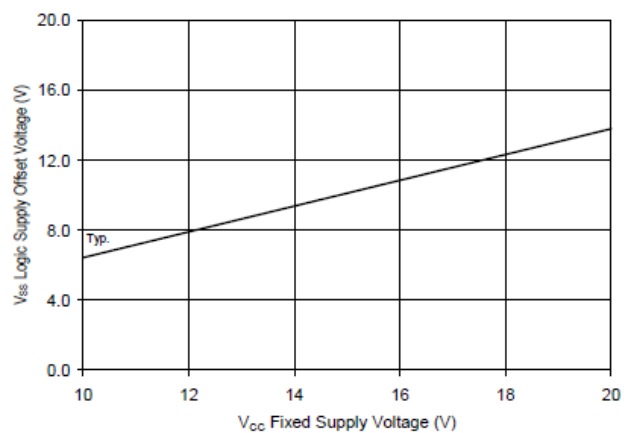
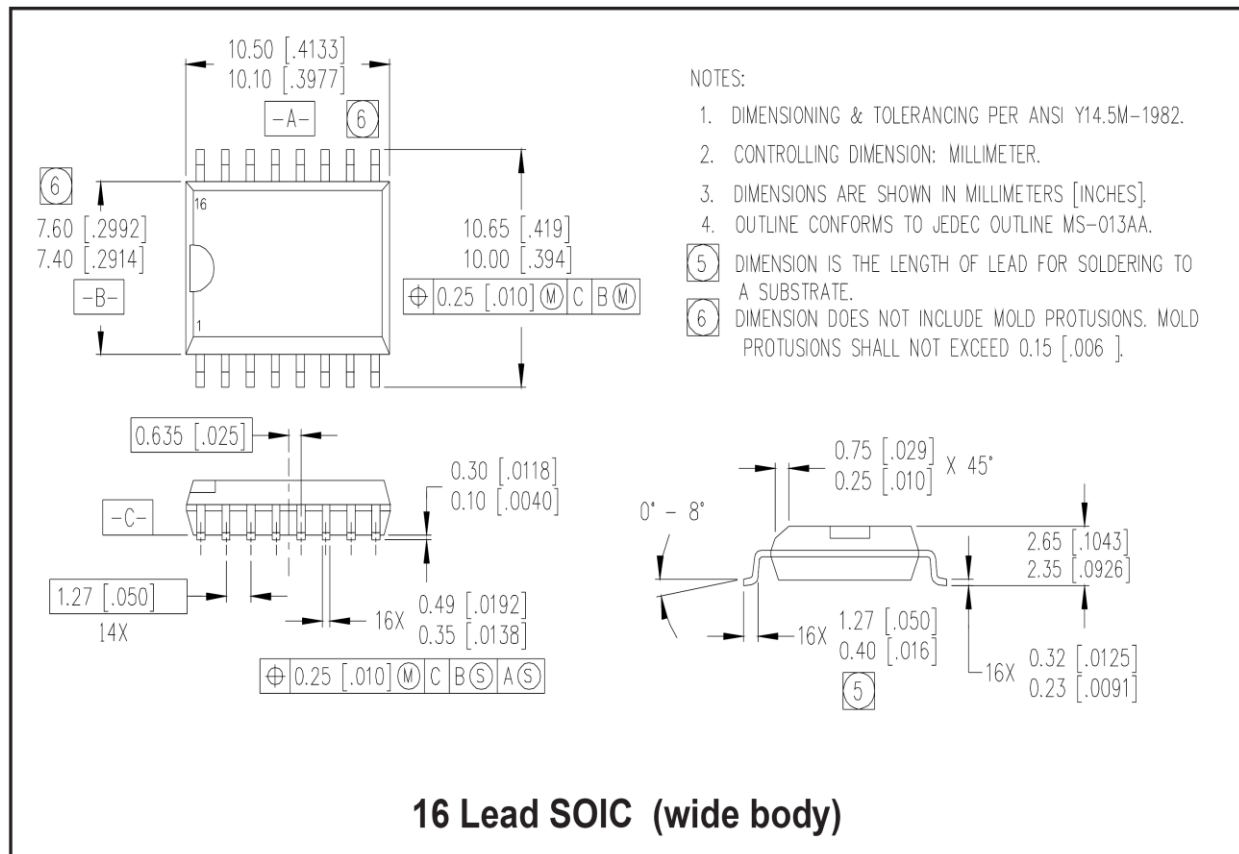
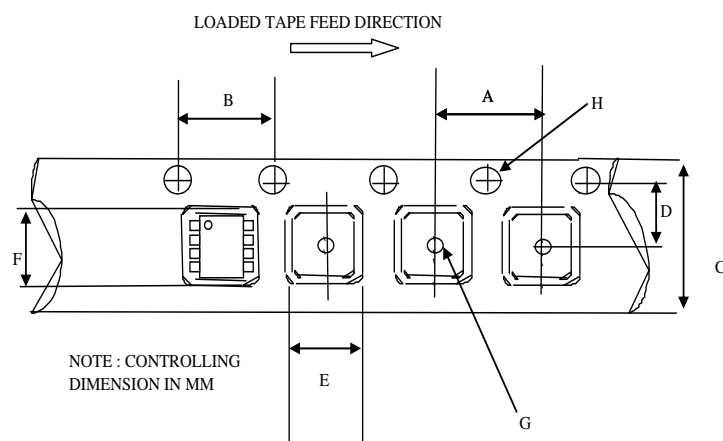


Figure 27. Maximum V_{SS} Positive Offset vs. V_{CC} Supply Voltage

Package Details

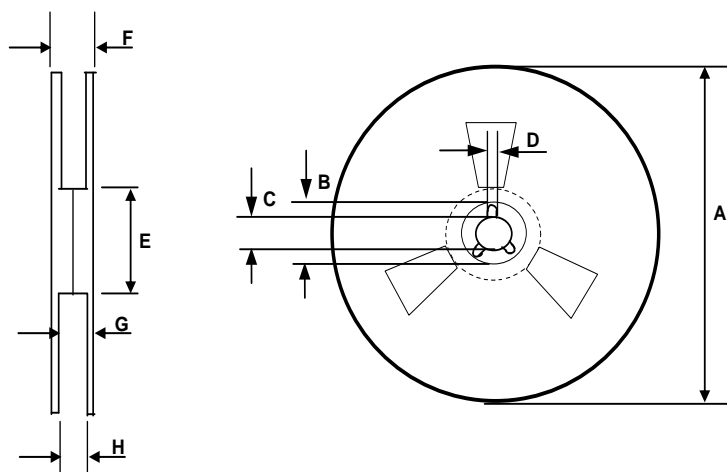


Tape and Reel Details



CARRIER TAPE DIMENSION FOR 16SOICN

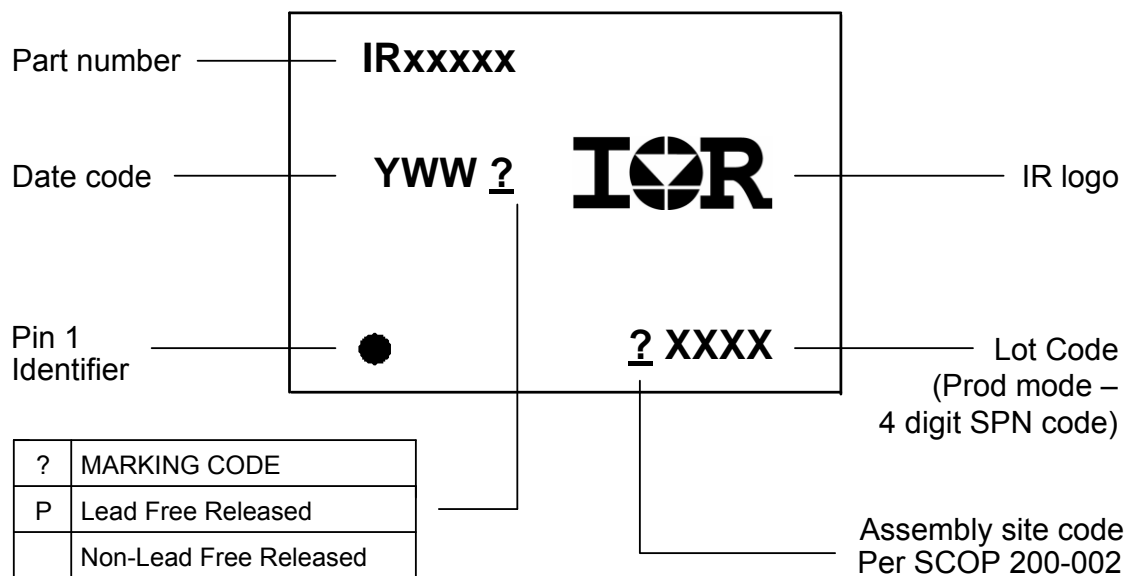
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	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	15.70	16.30	0.618	0.641
D	7.40	7.60	0.291	0.299
E	6.40	6.60	0.252	0.260
F	10.20	10.40	0.402	0.409
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062



REEL DIMENSIONS FOR 16SOICN

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	22.40	n/a	0.881
G	18.50	21.10	0.728	0.830
H	16.40	18.40	0.645	0.724

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	MSL3 ^{†††} (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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