

HIGH AND LOW SIDE DRIVER Product Summary

Features

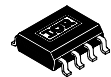
- Floating channel designed for bootstrap operation
Fully operational to +600V
Tolerant to negative transient voltage
dV/dt immune
- Gate drive supply range from 10 to 20V
- Undervoltage lockout
- 3.3V, 5V, and 15V logic input compatible
- Matched propagation delay for both channels
- Outputs in phase with inputs (IR2101) or out of phase with inputs (IR2102)

V_{OFFSET}	600V max.
$I_{\text{O}+/-}$	130 mA / 270 mA
V_{OUT}	10 - 20V
$t_{\text{on/off}}$ (typ.)	160 & 150 ns
Delay Matching	50 ns

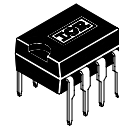
Description

The IR2101(S)/IR2102(S) are 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 3.3V 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.

Packages

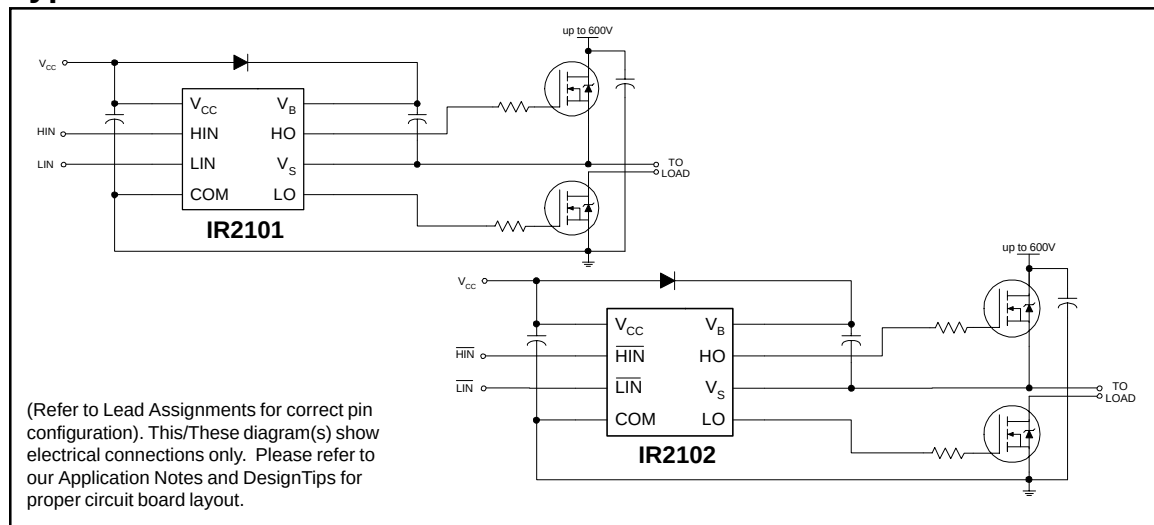


8 Lead SOIC



8 Lead PDIP

Typical Connection



IR2101/IR2102 (S)

International
IR Rectifier

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_{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 @ $T_A \leq +25^\circ\text{C}$	(8 lead PDIP)	1.0	W
		(8 lead SOIC)	0.625	
R_{thJA}	Thermal resistance, junction to ambient	(8 lead PDIP)	125	$^\circ\text{C/W}$
		(8 lead SOIC)	200	
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

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 supply 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 and logic fixed supply voltage	10	20	
V_{LO}	Low side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN & LIN) (IR2101) & ($\overline{\text{HIN}}$ & $\overline{\text{LIN}}$) (IR2102)	0	V_{CC}	
T_A	Ambient temperature	-40	125	$^\circ\text{C}$

Note 1: 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).

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	—	160	220	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	90		
MT	Delay matching, HS & LS turn-on/off	—	—	50		

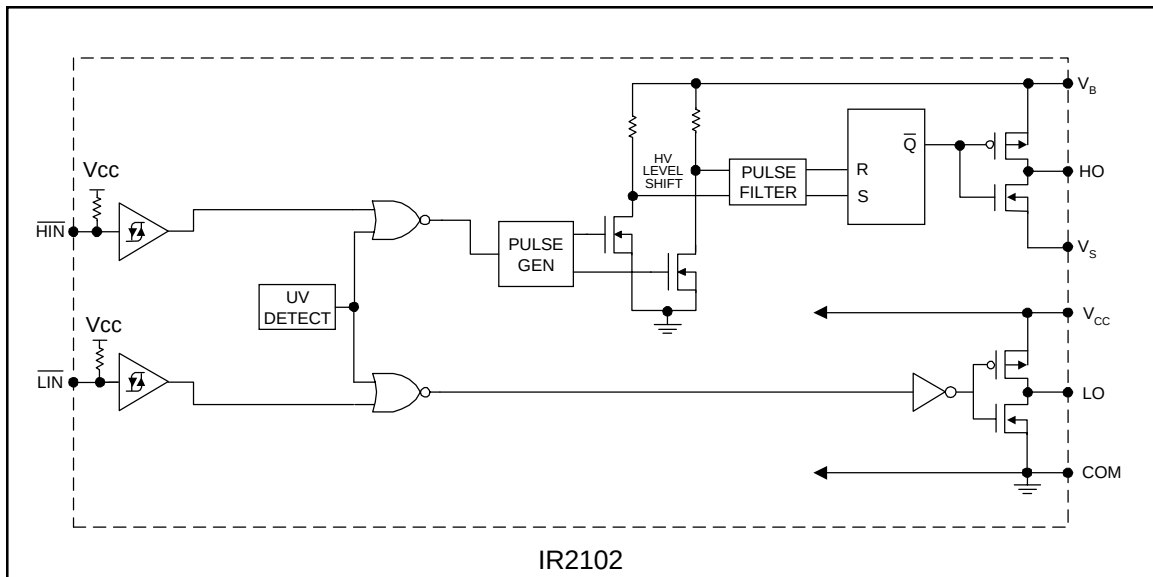
Static Electrical Characteristics

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" input voltage (IR2101) Logic "0" input voltage (IR2102)	3	—	—	V	V _{CC} = 10V to 20V
V _{IL}	Logic "0" input voltage (IR2101) Logic "1" input voltage (IR2102)	—	—	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 (IR2101) V _{IN} = 0V (IR2102)
I _{IN-}	Logic "0" input bias current	—	—	1		V _{IN} = 0V (IR2101) V _{IN} = 5V (IR2102)
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} = Logic "1" PW ≤ 10 μs
I _{O-}	Output low short circuit pulsed current	270	360	—		V _O = 15V V _{IN} = Logic "0" PW ≤ 10 μs

International
IOR Rectifier

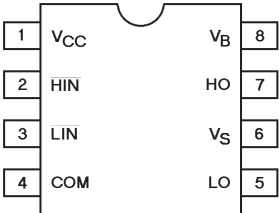
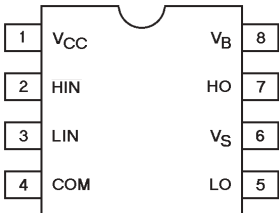
The diagram illustrates the internal circuitry of the IR2101. It features two input buffers for HIN and LIN, which feed into an AND gate and a UV DETECT block. The output of the AND gate goes to the PULSE GEN block. The UV DETECT block also feeds into the AND gate. The PULSE GEN block drives the HV LEVEL SHIFT block, which in turn drives the PULSE FILTER block. The output of the PULSE FILTER block goes to the RS flip-flop. The RS flip-flop has two outputs, Q and Q-bar, which drive the HO and LO output drivers. The output drivers are configured as push-pull stages. Power pins V_B, V_S, V_CC, and COM are also shown.

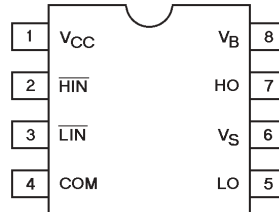
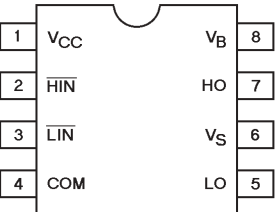


Lead Definitions

Symbol	Description
HIN	Logic input for high side gate driver output (HO), in phase (IR2101)
$\overline{\text{HIN}}$	Logic input for high side gate driver output (HO), out of phase (IR2102)
LIN	Logic input for low side gate driver output (LO), in phase (IR2101)
$\overline{\text{LIN}}$	Logic input for low side gate driver output (LO), out of phase (IR2102)
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

 8 Lead PDIP IR2101	 8 Lead SOIC IR2101S
---	---

 8 Lead PDIP IR2102	 8 Lead SOIC IR2102S
---	---

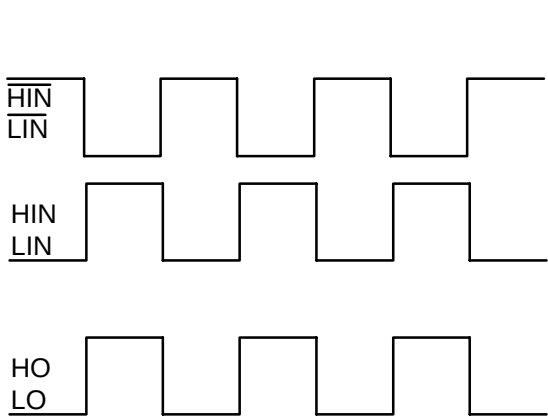


Figure 1. Input/Output Timing Diagram

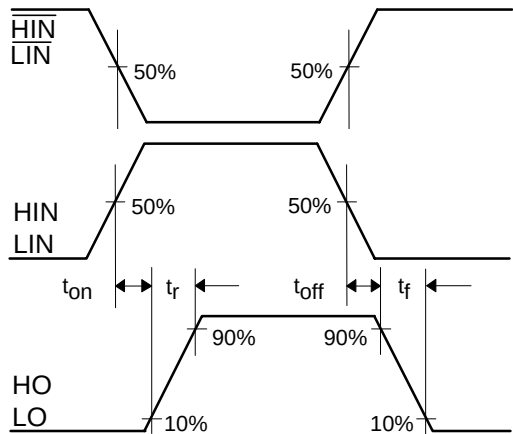


Figure 2. Switching Time Waveform Definitions

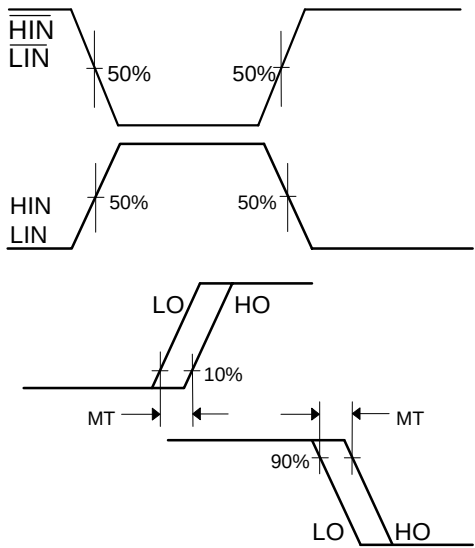


Figure 3. Delay Matching Waveform Definitions

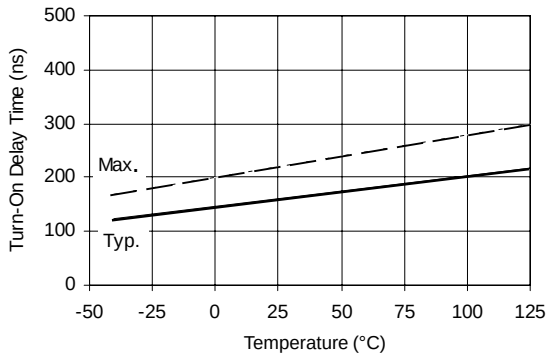


Figure 6A. Turn-On Time vs Temperature

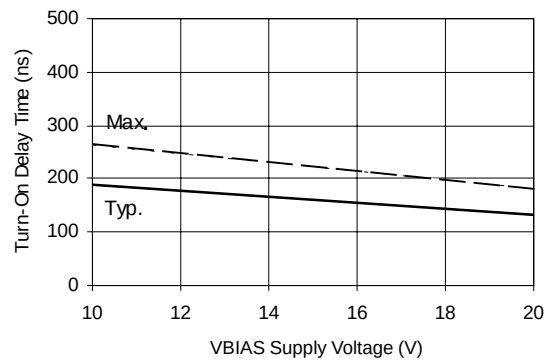


Figure 6B. Turn-On Time vs Supply Voltage

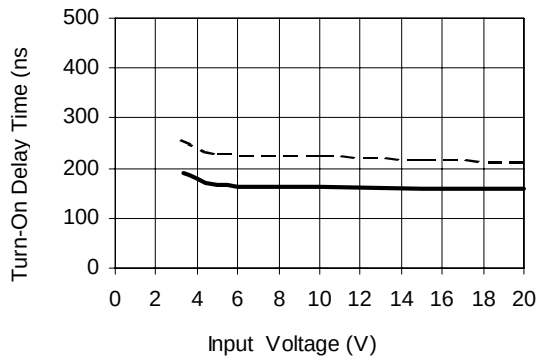


Figure 6C. Turn-On Time vs Input Voltage

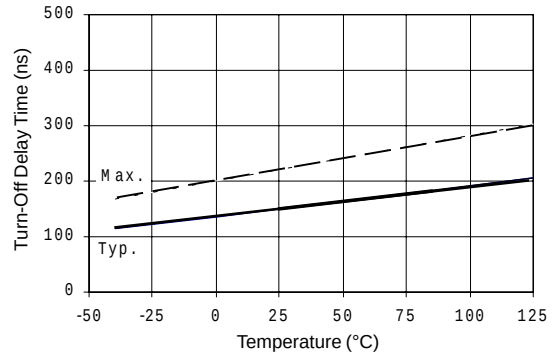


Figure 7A. Turn-Off Time vs Temperature

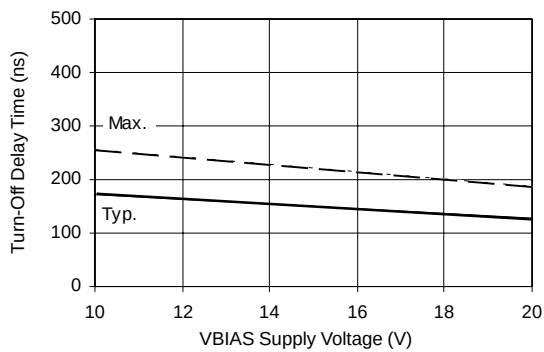


Figure 7B. Turn-Off Time vs Supply Voltage

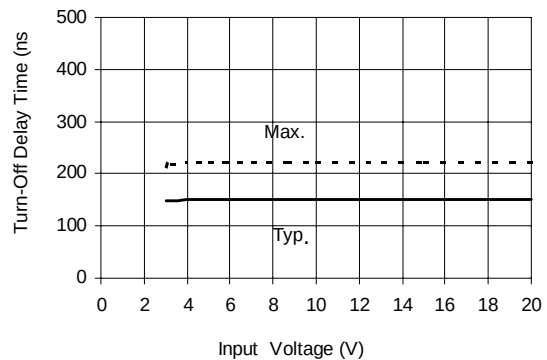


Figure 7C. Turn-Off Time vs Input Voltage

IR2101/IR2102 (S)

International
IR Rectifier

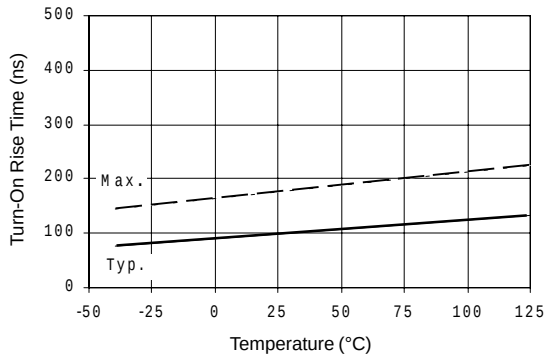


Figure 9A. Turn-On Rise Time vs Temperature

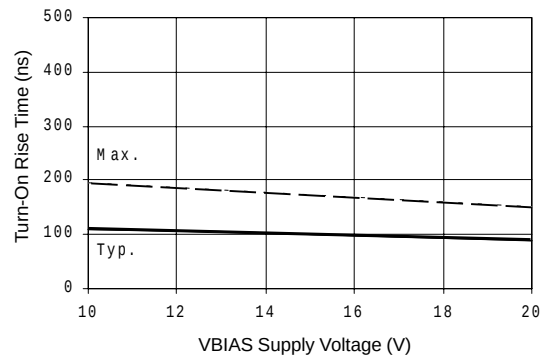


Figure 9B. Turn-On Rise Time vs Voltage

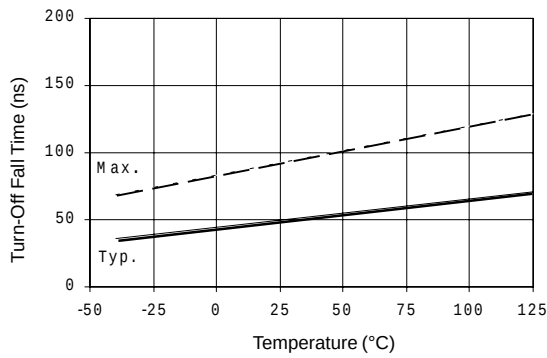


Figure 10A. Turn-Off Fall Time vs Temperature

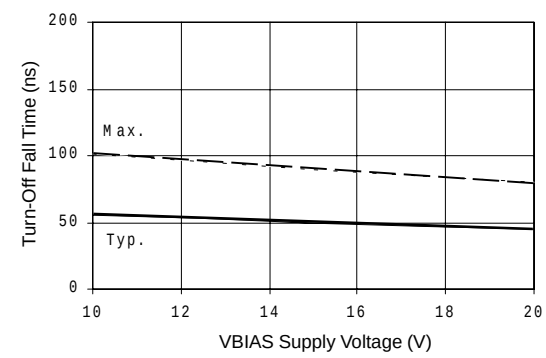
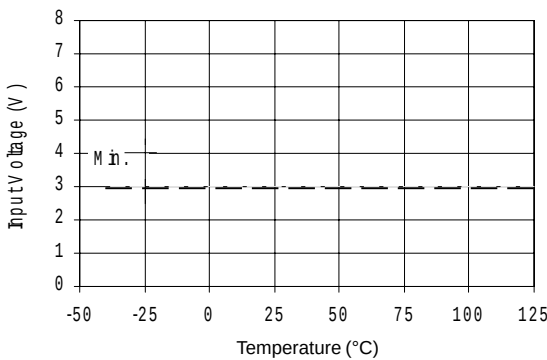
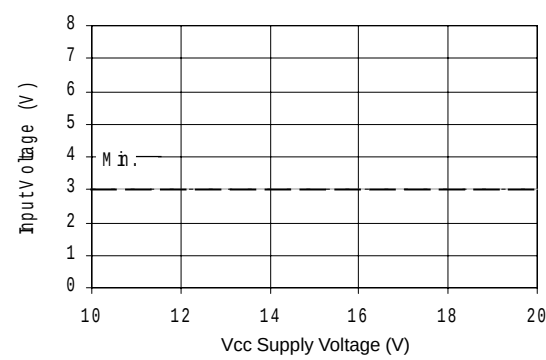


Figure 10B. Turn-Off Fall Time vs Voltage

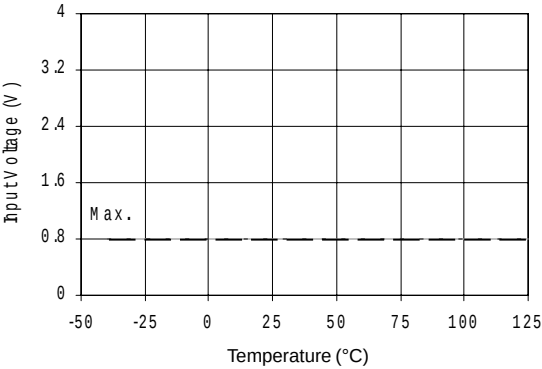


**Figure 12A. Logic "1" Input Voltage (IR2101)
Logic "0" Input Voltage (IR2102)
vs Temperature**

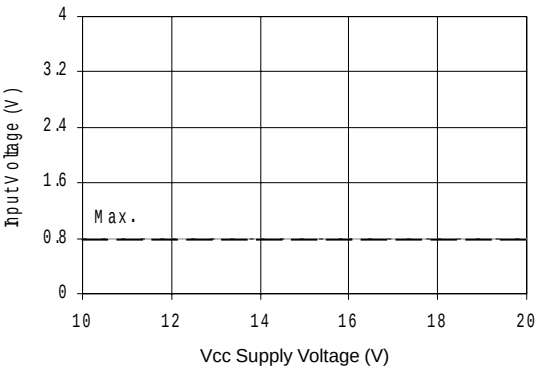


**Figure 12B. Logic "1" Input Voltage (IR2101)
Logic "0" Input Voltage (IR2102)
vs Voltage**

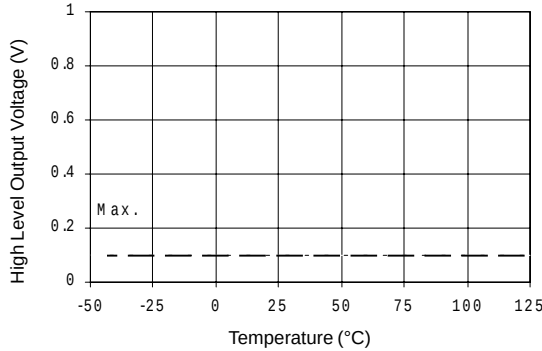
IR2101/IR2102 (S)



**Figure 13A. Logic "0" Input Voltage (IR2101)
Logic "1" Input Voltage (IR2102)
vs Temperature**



**Figure 13B. Logic "0" Input Voltage (IR2101)
Logic "1" Input Voltage (IR2102)
vs Voltage**



**Figure 14A. High Level Output
vs Temperature**

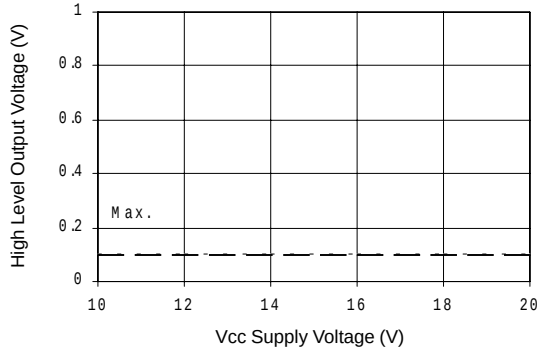
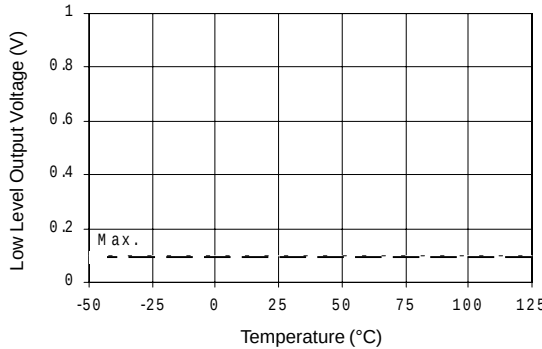


Figure 14B. High Level Output vs Voltage



**Figure 15A. Low Level Output
vs Temperature**

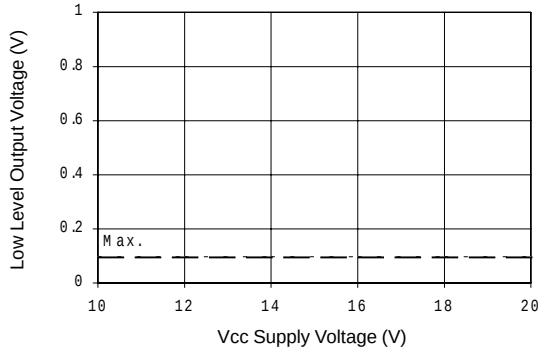


Figure 15B. Low level Output vs Voltage

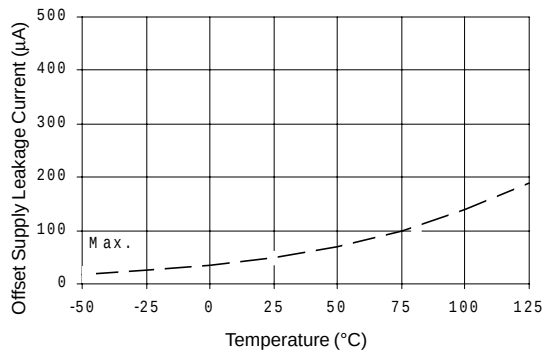


Figure 16A. Offset Supply Current vs Temperature

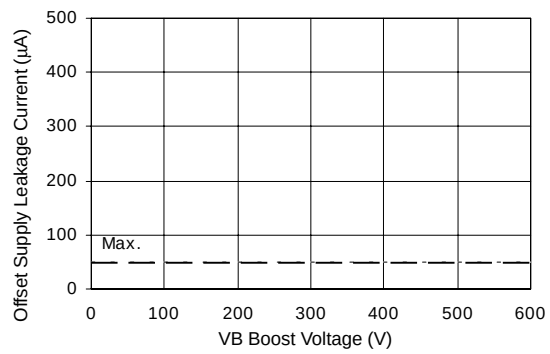


Figure 16B. Offset Supply Current vs Voltage

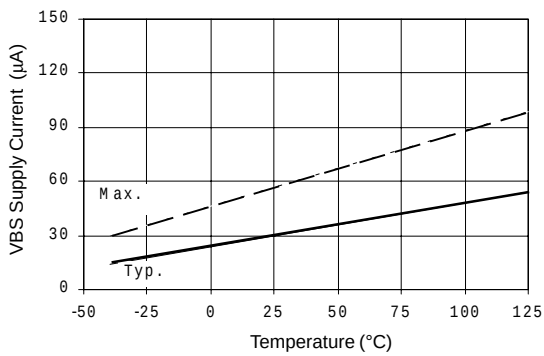


Figure 17A. V_{BS} Supply Current vs Temperature

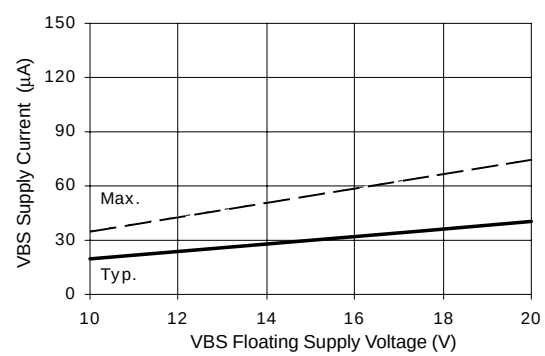


Figure 17B. V_{BS} Supply Current vs Voltage

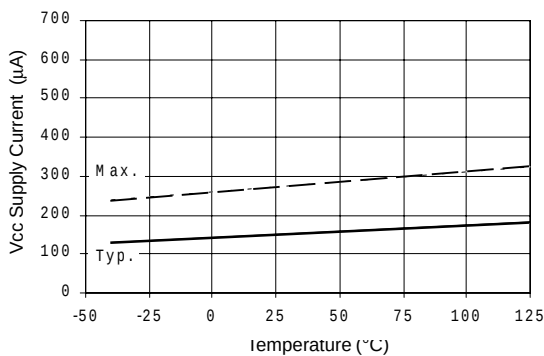


Figure 18A. V_{CC} Supply Current vs Temperature

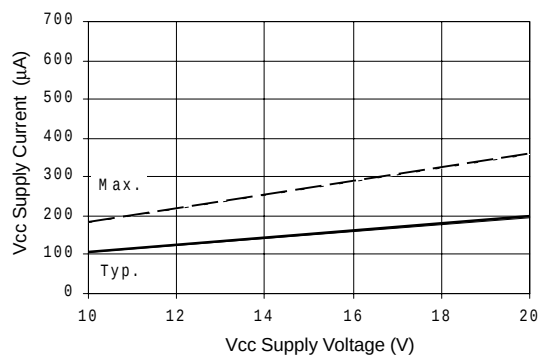


Figure 18B. V_{CC} Supply Current vs Voltage

IR2101/IR2102 (S)

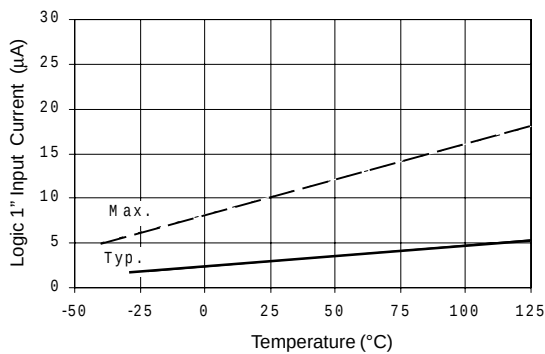


Figure 19A. Logic "1" Input Current vs Temperature

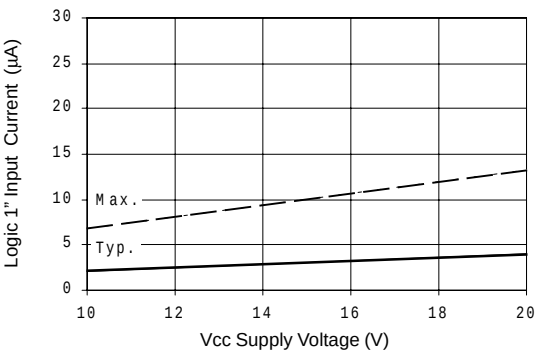


Figure 19B. Logic "1" Input Current vs Voltage

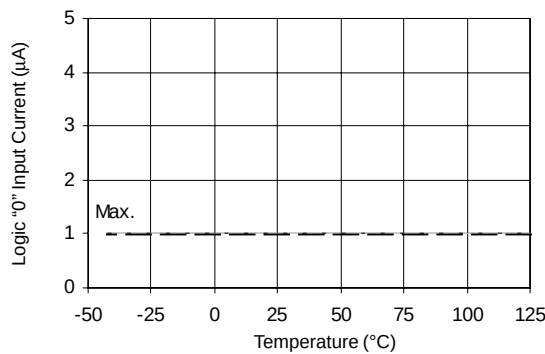


Figure 20A. Logic "0" Input Current vs Temperature

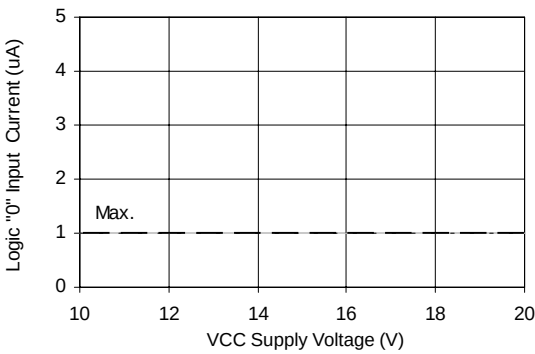


Figure 20B. Logic "0" Input Current vs Voltage

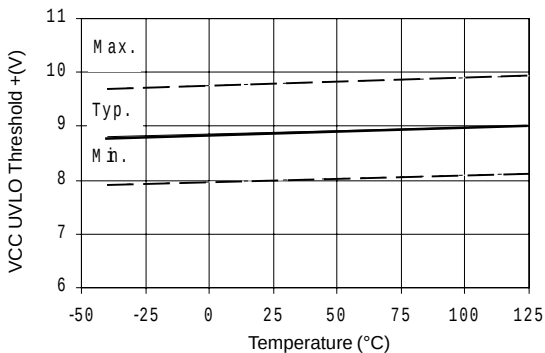


Figure 21A. Vcc Undervoltage Threshold(+) vs Temperature

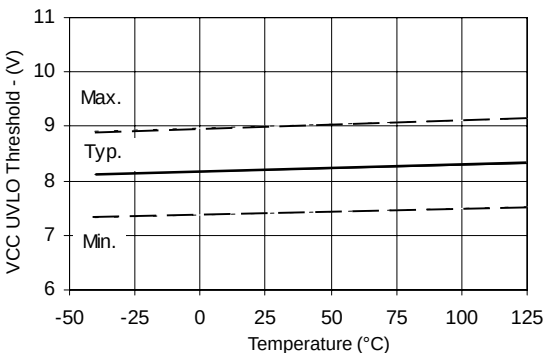


Figure 21B. Vcc Undervoltage Threshold(-) vs Temperature

IR2101/IR2102 (S)

International
IR Rectifier

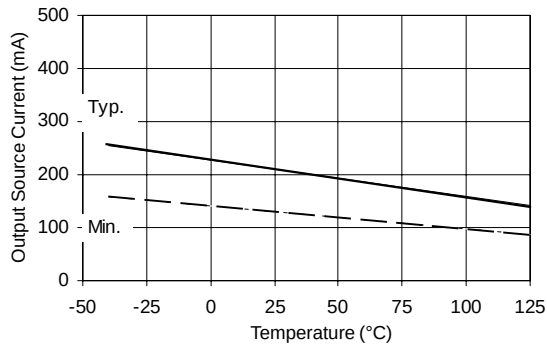


Figure 22A. Output Source Current vs Temperature

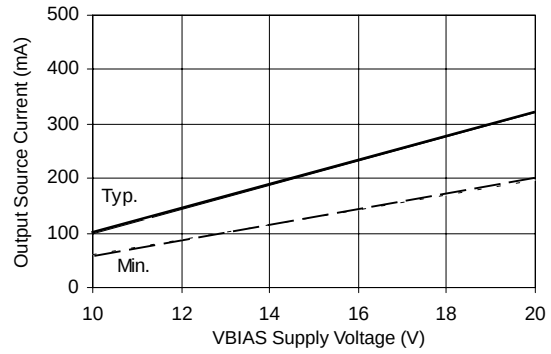


Figure 22B. Output Source Current vs Voltage

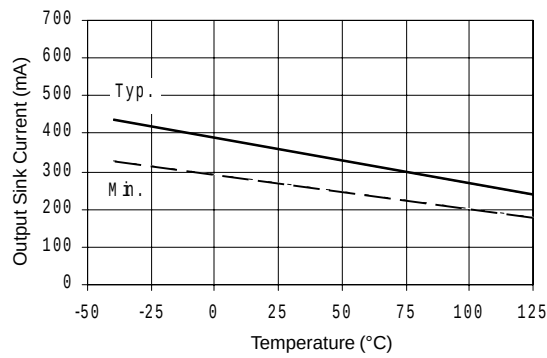


Figure 23A. Output Sink Current vs Temperature

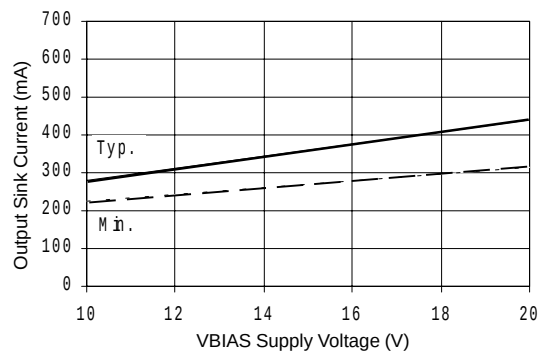
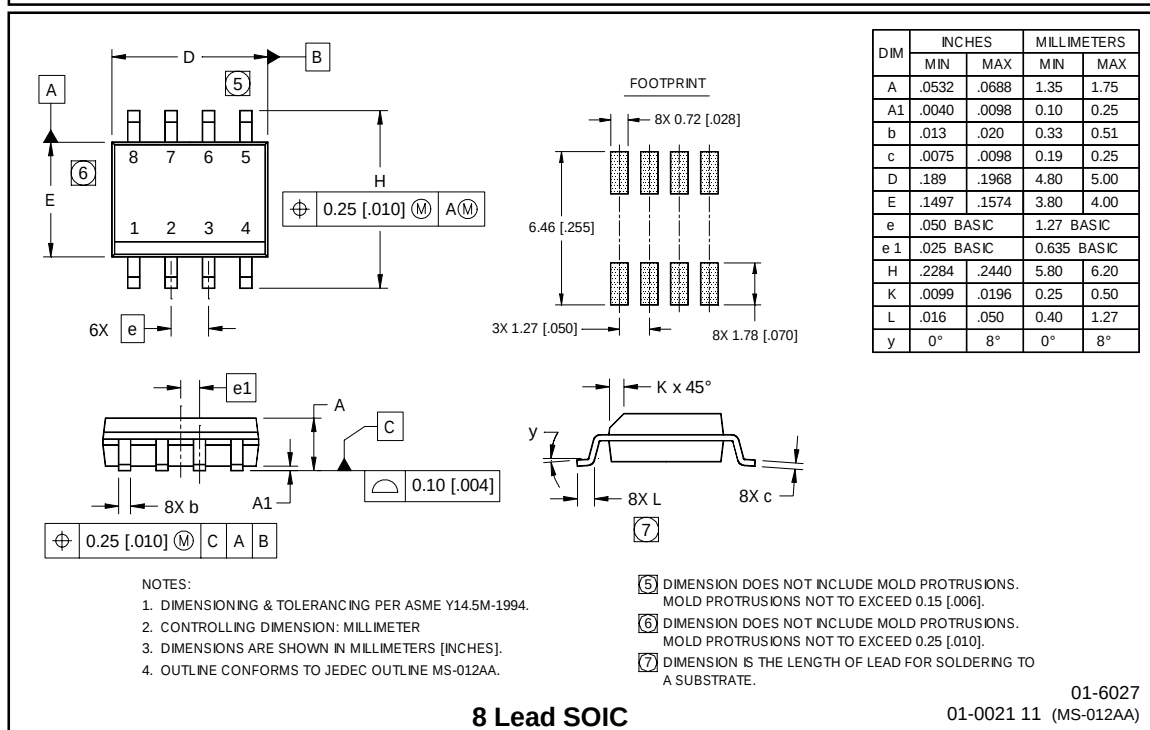
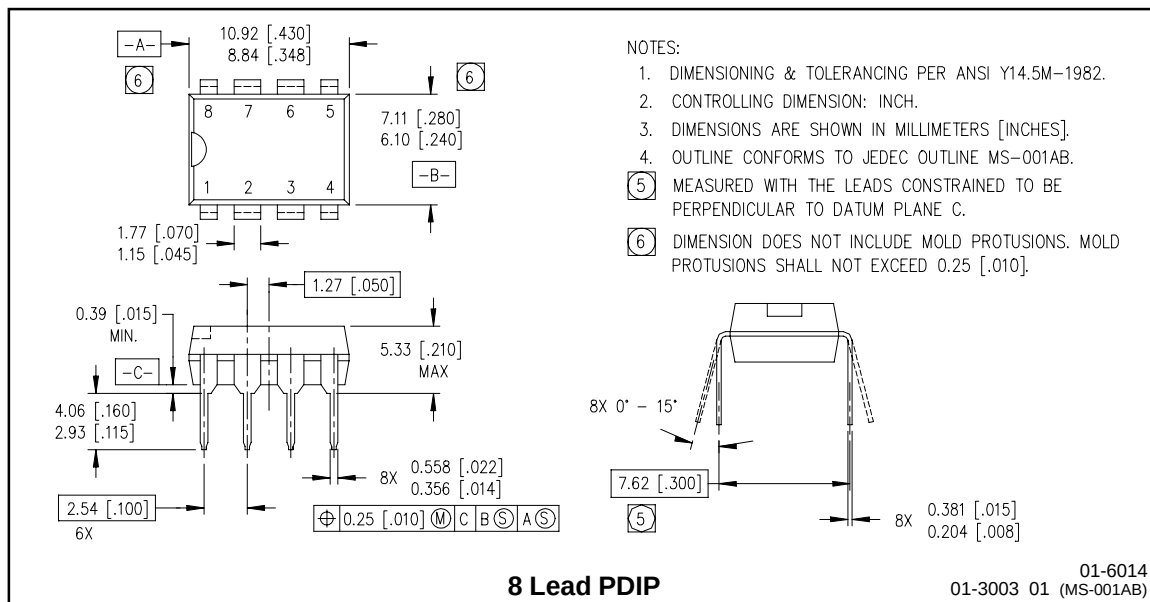


Figure 23B. Output Sink Current vs Voltage

Case outlines



IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245 Tel: (310) 252-7105
Data and specifications subject to change without notice. 4/18/2003