

IRS2117/IRS2118(S)PbF

Features

- Floating channel designed for bootstrap operation
- Fully operational to +600 V
- Tolerant to negative transient voltage, dV/dt immune
- Gate drive supply range from 10 V to 20V
- Undervoltage lockout
- CMOS Schmitt-triggered inputs with pull-down
- Output in phase with input (IRS2117) or out of phase with input (IRS2118)
- RoHS compliant

SINGLE CHANNEL DRIVER

Product Summary

V_{OFFSET}	600 V max.
$I_{\text{O+/-}}$	200 mA / 420 mA
V_{OUT}	10 V - 20 V
$t_{\text{on/off (typ.)}}$	125 ns & 105 ns

Description

The IRS2117/IRS2118 are a high voltage, high speed power MOSFET and IGBT driver. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS outputs. The output driver features a high pulse current buffer stage designed for minimum cross-conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high-side or low-side configuration which operates up to 600 V.

Packages

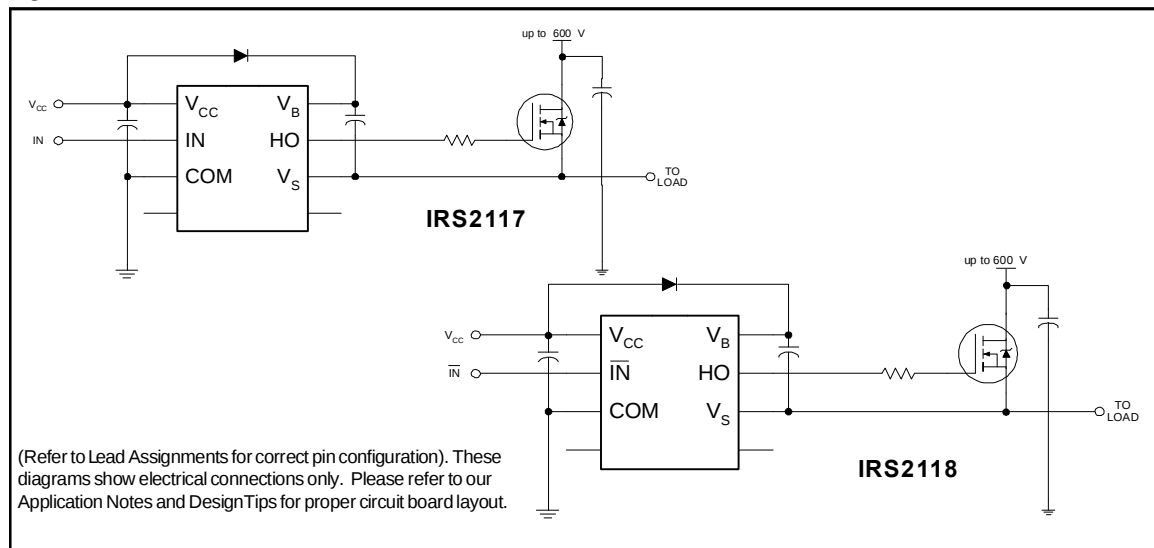


8-Lead PDIP
IRS2117/IRS2118



8-Lead SOIC
IRS2117S/IRS2118S

Typical Connection



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. Additional information is shown in Figs. 5 through 8.

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}	Logic supply voltage		-0.3	25	
V _{IN}	Logic input voltage		-0.3	V _{CC} + 0.3	
dV _S /dt	Allowable offset supply voltage transient (Fig. 2)		—	50	V/ns
P _D	Package power dissipation @ T _A ≤ +25 °C	(8 lead PDIP)	—	1.0	W
		(8 lead SOIC)	—	0.625	
R _{thJA}	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 Fig. 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 15 V 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}	Logic supply voltage	10	20	
V_{IN}	Logic input voltage	0	V_{CC}	
T_A	Ambient temperature	-40	125	$^\circ\text{C}$

Note 1: Logic operational for V_S of -5 V to +600 V. Logic state held for V_S of -5 V to $-V_{BS}$. (Please refer to the Design Tip DT97-3 for more details).

Dynamic Electrical Characteristics

V_{BIAS} (V_{CC} , V_{BS}) = 15 V, C_L = 1000 pF and T_A = 25 °C unless otherwise specified. The dynamic electrical characteristics are measured using the test circuit shown in Fig. 3.

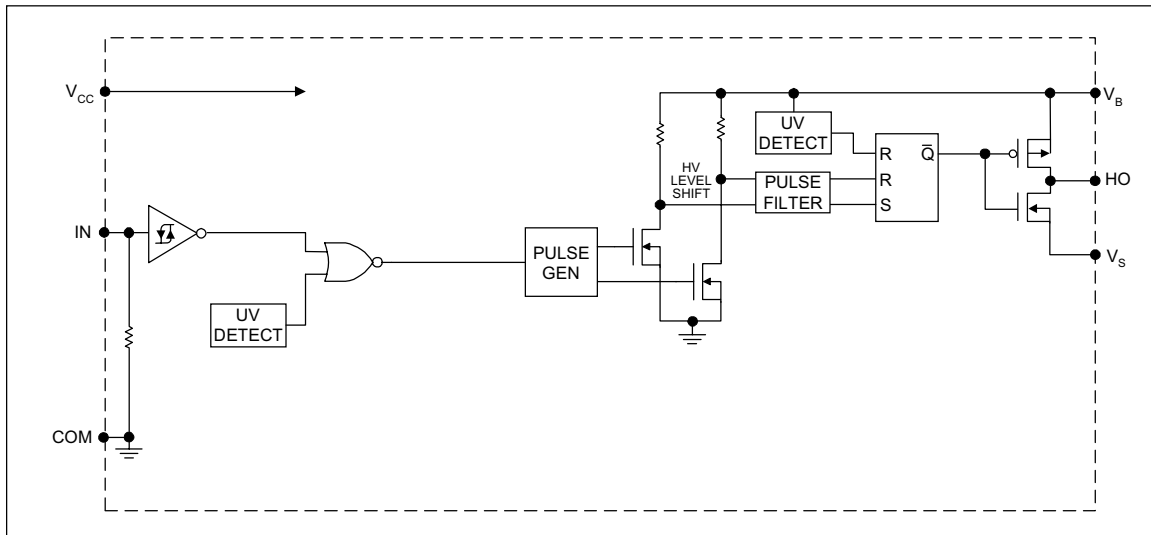
Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	—	125	200	ns	$V_S = 0$ V
t_{off}	Turn-off propagation delay	—	105	180		$V_S = 600$ V
t_r	Turn-on rise time	—	75	130		
t_f	Turn-off fall time	—	35	65		

Static Electrical Characteristics

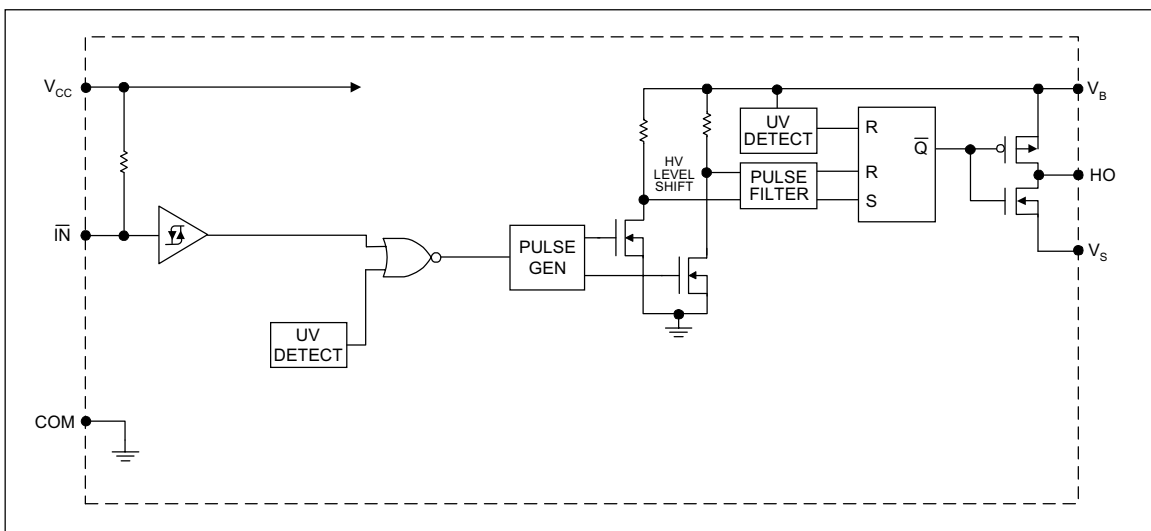
V_{BIAS} (V_{CC} , V_{BS}) = 15 V and T_A = 25 °C unless otherwise specified. The V_{IN} , V_{TH} , and I_{IN} parameters are referenced to COM. The V_O and I_O parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

Symbol	Definition		Min.	Typ.	Max.	Units	Test Conditions
V _{IH}	Input voltage - logic “1” (IRS2117) logic “0” (IRS2118)		9.5	—	—	V	
V _{IL}	Input voltage - logic “0” (IRS2117) logic “1” (IRS2118)		—	—	6.0		
V _{OH}	High level output voltage, V _{BIAS} - V _O		—	0.05	0.2		I _O = 2 mA
V _{OL}	Low level output voltage, V _O		—	0.02	0.1		
I _{LK}	Offset supply leakage current		—	—	50	μA	V _B = V _S = 600 V
I _{QBS}	Quiescent V _{BS} supply current		—	50	240		V _{IN} = 0 V or V _{CC}
I _{QCC}	Quiescent V _{CC} Supply Current		—	70	340		V _{IN} = V _{CC}
I _{IN+}	Logic “1” input bias current	(IRS2117)	—	20	40		V _{IN} = 0 V
		(IRS2118)					V _{IN} = V _{CC}
I _{IN-}	Logic “0” input bias current	(IRS2117)	—	—	5.0		V _{IN} = 0 V
		(IRS2118)					V _{IN} = V _{CC}
V _{BSUV+}	V _{BS} supply undervoltage positive going threshold		7.6	8.6	9.6	V	
V _{BSUV-}	V _{BS} supply undervoltage negative going threshold		7.2	8.2	9.2		
V _{CCUV+}	V _{CC} supply undervoltage positive going threshold		7.6	8.6	9.6		
V _{CCUV-}	V _{CC} supply undervoltage negative going threshold		7.2	8.2	9.2		
I _{O+}	Output high short circuit pulsed current		200	290	—	mA	V _O = 0V V _{IN} = Logic “1” PW ≤ 10 μs
I _{O-}	Output low short circuit pulsed current		420	600	—		V _O = 15V V _{IN} = Logic “0” PW ≤ 10 μs

Functional Block Diagram (IRS2117)



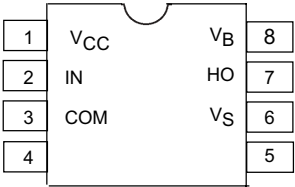
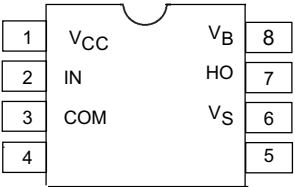
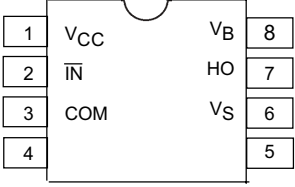
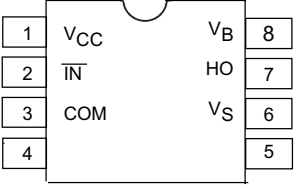
Functional Block Diagram (IRS2118)



Lead Definitions

Symbol	Description
V _{CC}	Logic and gate drive supply
IN	Logic input for gate driver output (HO), in phase with HO (IRS2117)
$\overline{\text{IN}}$	Logic input for gate driver output (HO), out of phase with HO (IRS2118)
COM	Logic ground
V _B	High-side floating supply
HO	High-side gate drive output
V _S	High-side floating supply return

Lead Assignments

 8 Lead PDIP IRS2117	 8 Lead SOIC IRS2117S
 8 Lead PDIP IRS2118	 8 Lead SOIC IRS2118S

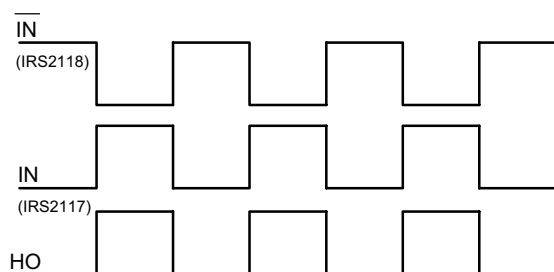


Figure 1. Input/Output Timing Diagram

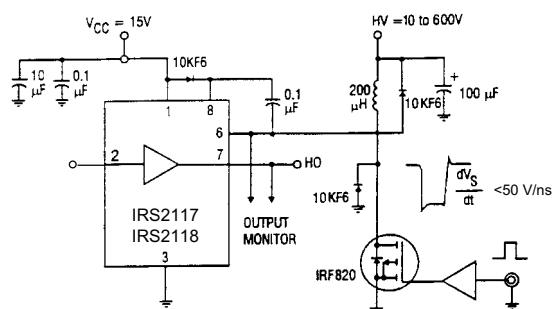


Figure 2. Floating Supply Voltage Transient Test Circuit

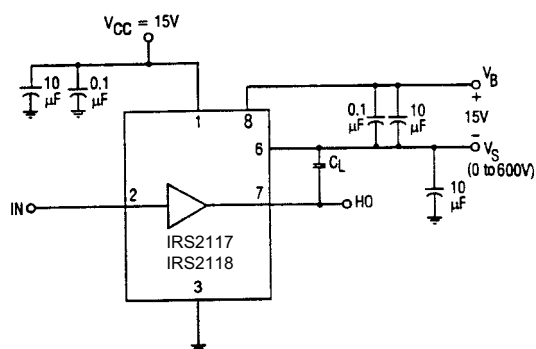


Figure 3. Switching Time Test Circuit

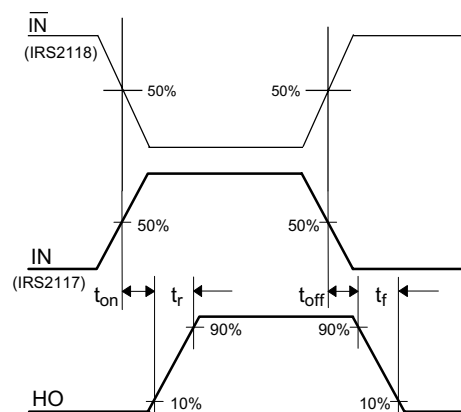
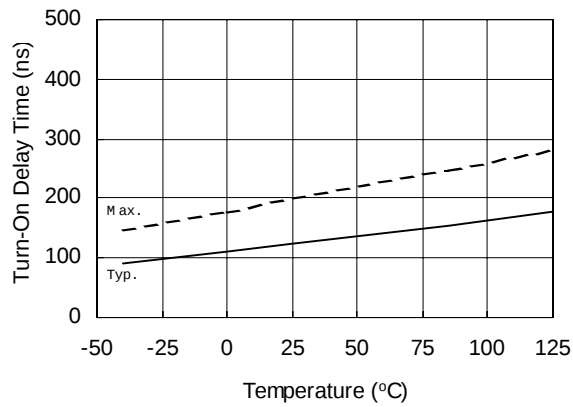
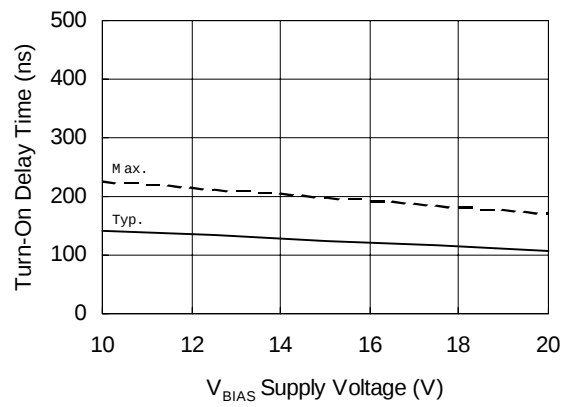


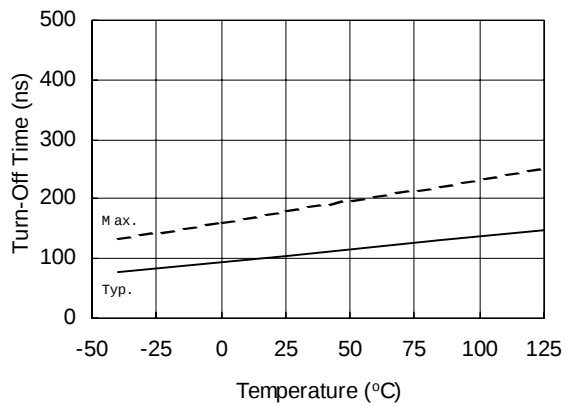
Figure 4. Switching Time Waveform Definition



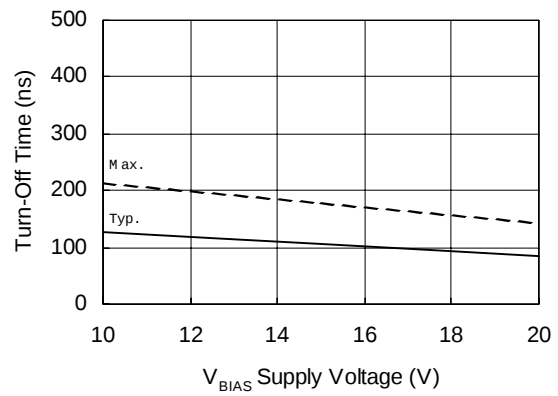
**Figure 5A. Turn-On Time
vs. Temperature**



**Figure 5B. Turn-On Time
vs. Supply Voltage**



**Figure 6A. Turn-Off Time
vs. Temperature**



**Figure 6B. Turn-Off Time
vs. Supply Voltage**

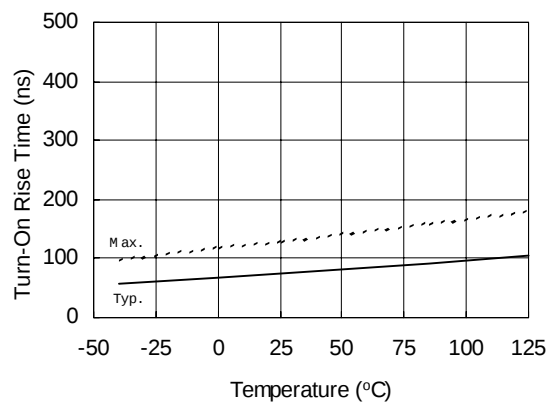


Figure 7A. Turn-On Rise Time vs. Temperature

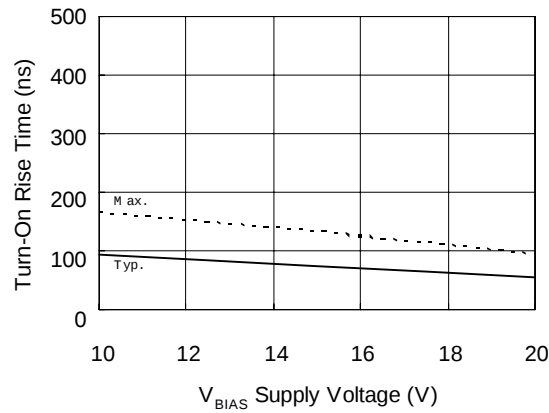


Figure 7B. Turn-On Rise Time vs. Supply Voltage

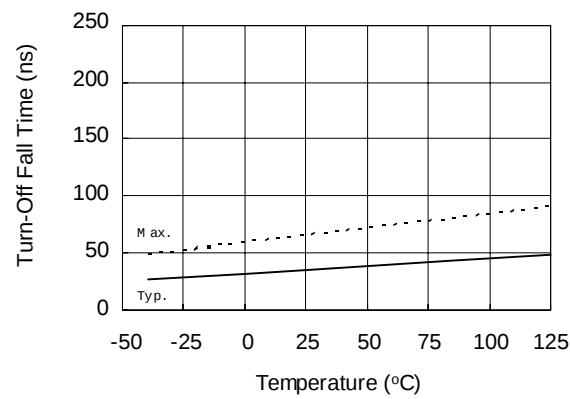


Figure 8A. Turn-Off Fall Time vs. Temperature

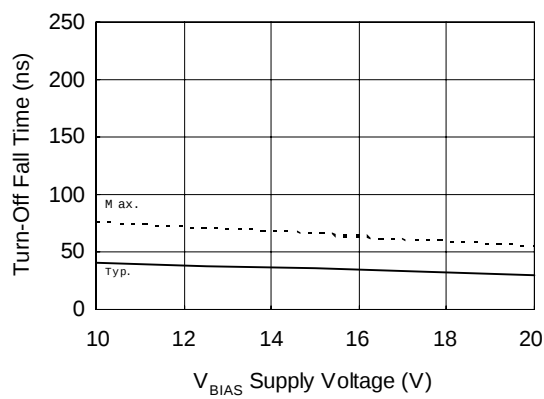


Figure 8B. Turn-Off Fall Time vs. Supply Voltage

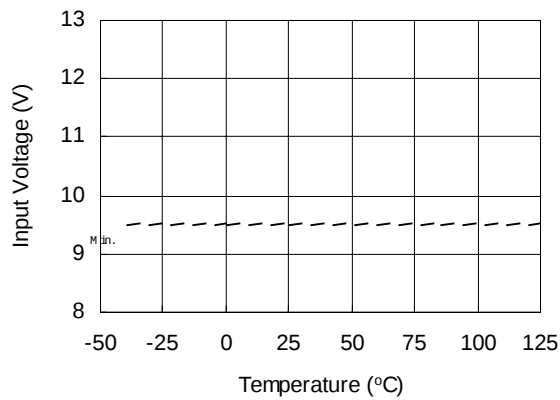


Figure 9A. Logic "1" (IRS2118 "0") Input Voltage vs. Temperature

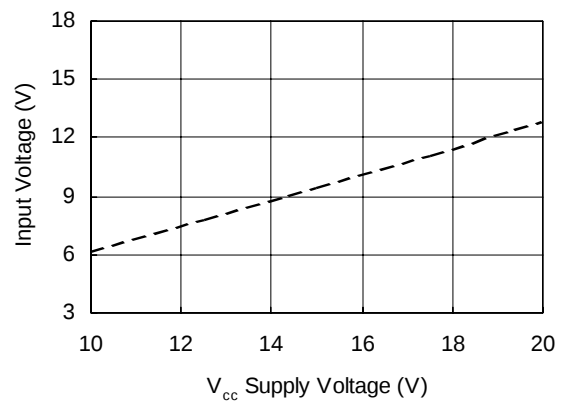


Figure 9B. Logic "1" (IRS2118 "0") Input Voltage vs. Supply Voltage

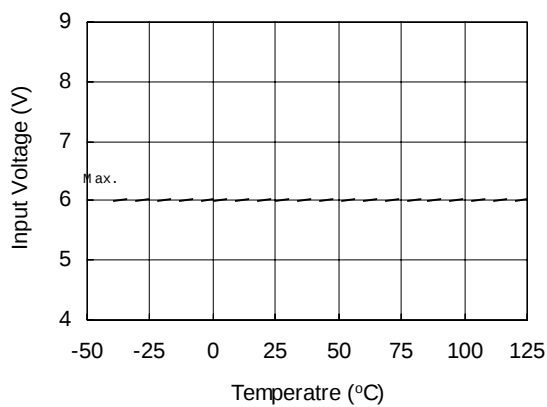


Figure 10A. Logic "0" (IRS2118 "1") Input Voltage vs. Temperature

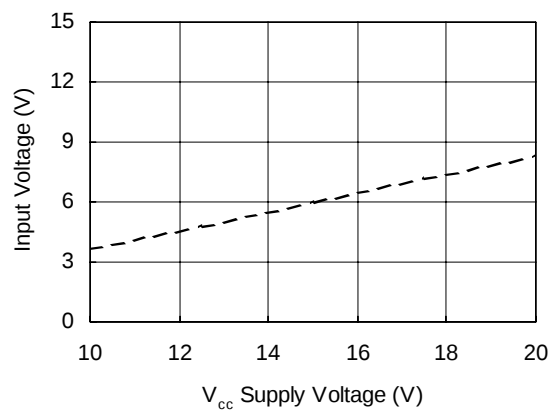


Figure 10B. Logic "0" (IRS2118 "1") Input Voltage vs. Supply Voltage

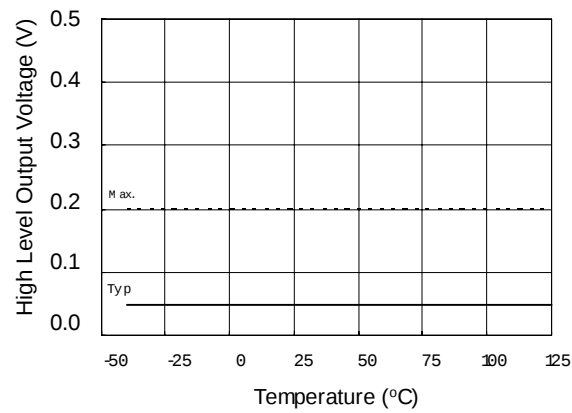


Figure 11A. High Level Output vs. Temperature ($I_O = 2\text{ mA}$)

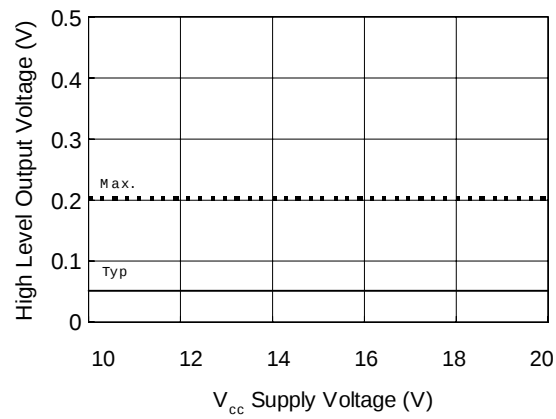


Figure 11B. High Level Output vs. Supply Voltage ($I_O = 2\text{ mA}$)

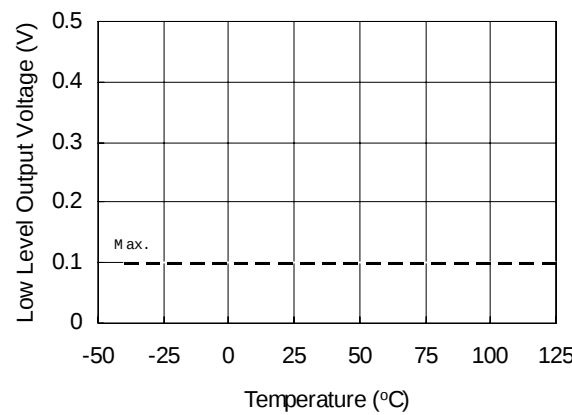


Figure 12A. Low Level Output vs. Temperature

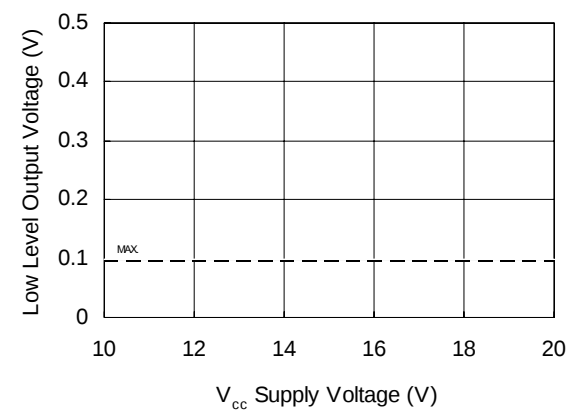


Figure 12B. Low Level Output vs. Supply Voltage

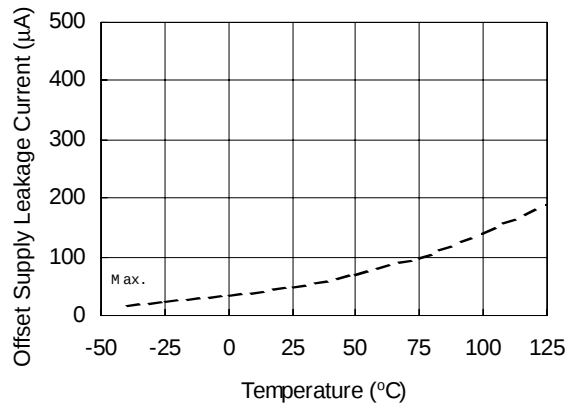


Figure 13A. Offset Supply Leakage Current vs. Temperature

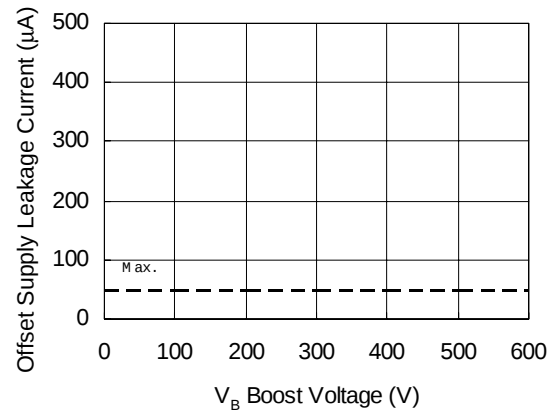


Figure 13B. Offset Supply Leakage Current vs. V_B Boost Voltage

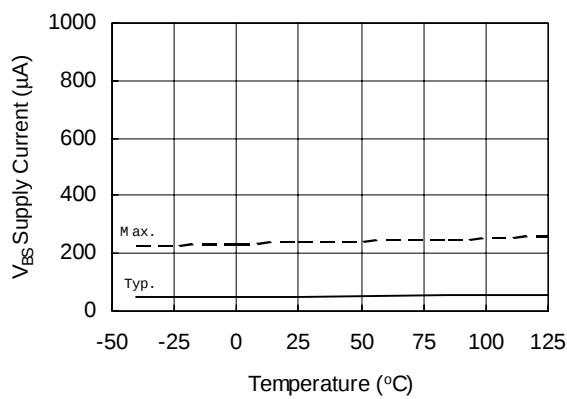


Figure 14A. V_{BS} Supply Current vs. Temperature

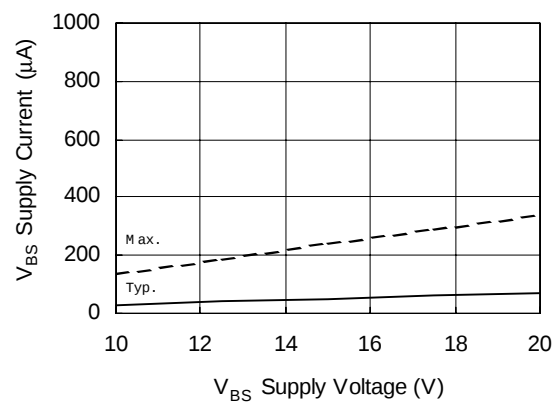


Figure 14B. V_{BS} Supply Current vs. Supply Voltage

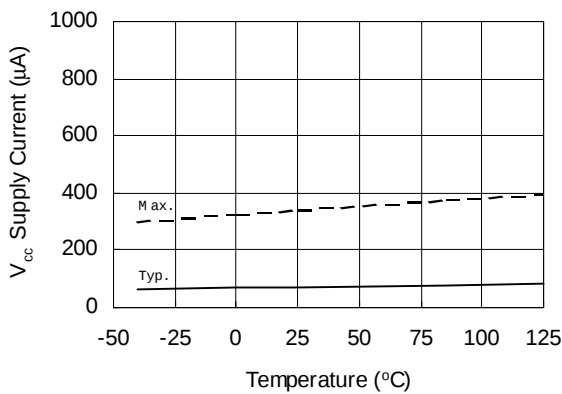


Figure 15A. V_{CC} Supply Current vs. Temperature

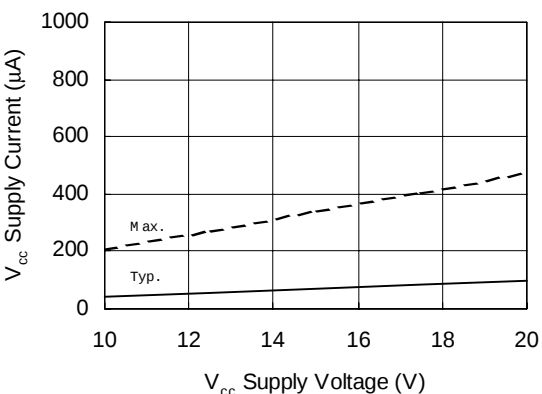


Figure 15B. V_{CC} Supply Current vs. Supply Voltage

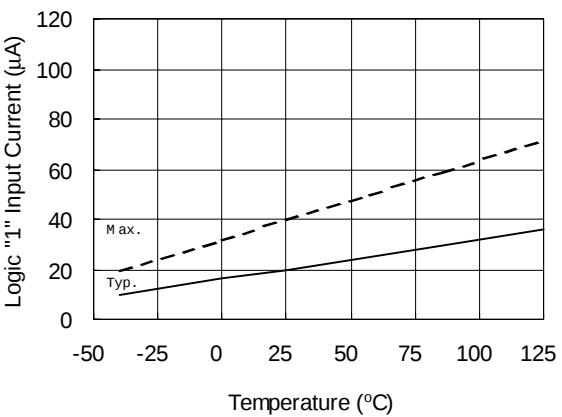


Figure 16A. Logic "1" (IRS2118 Logic "0") Input Current vs. Temperature

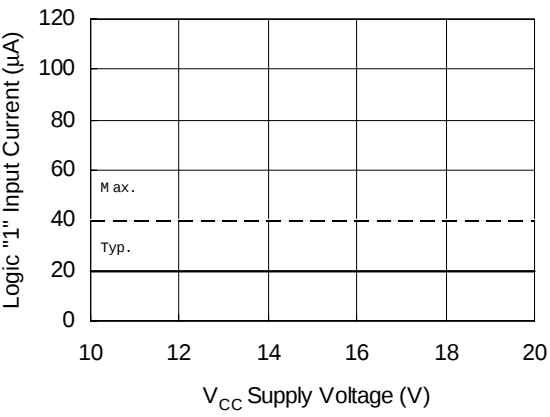


Figure 16B. Logic "1" (IRS2118 Logic "0") Input Current vs. Supply Voltage

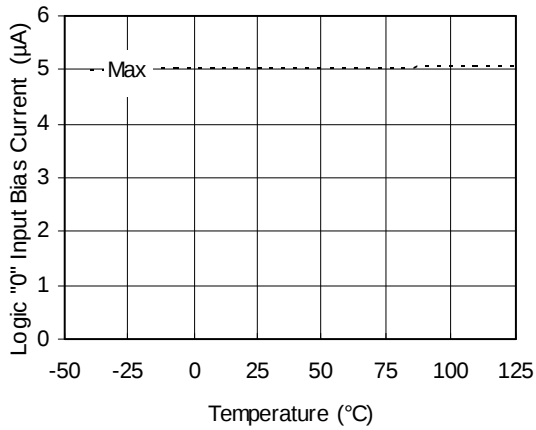


Figure 17A. Logic "0" Input Bias Current vs. Temperature

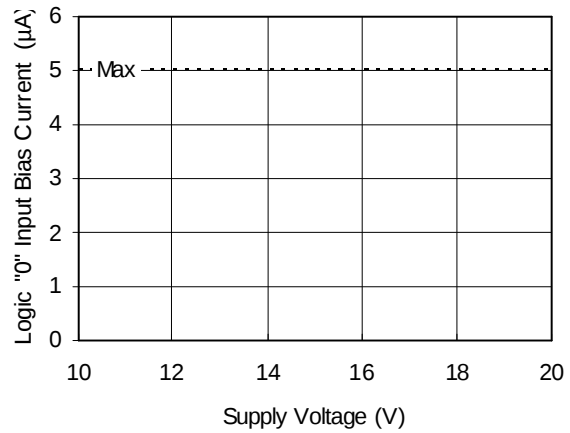


Figure 17B. Logic "0" Input Bias Current vs. Voltage

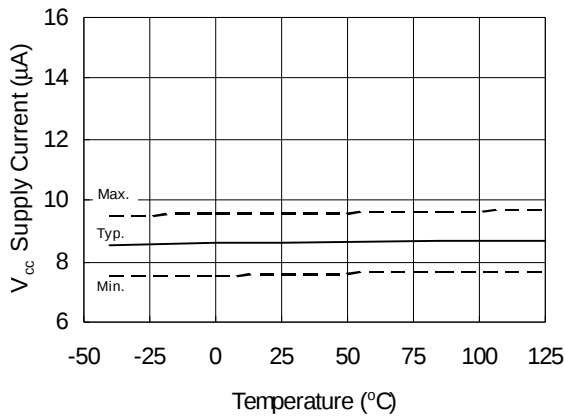


Figure 18. V_{cc} Undervoltage Threshold (+) vs. Temperature

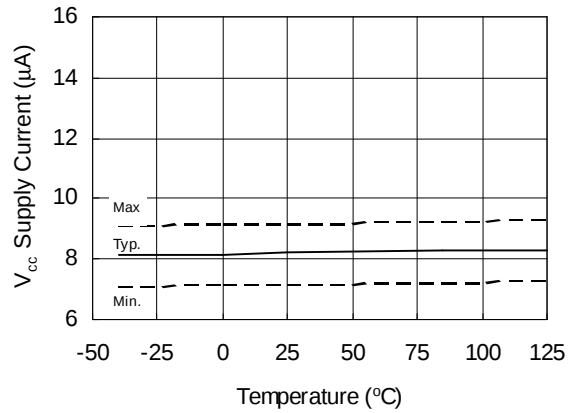


Figure 19. V_{cc} Undervoltage Threshold (-) vs. Temperature

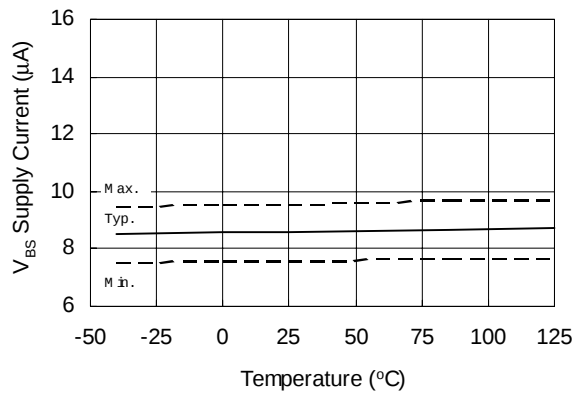


Figure 20. V_{BS} Undervoltage Threshold (+) vs. Temperature

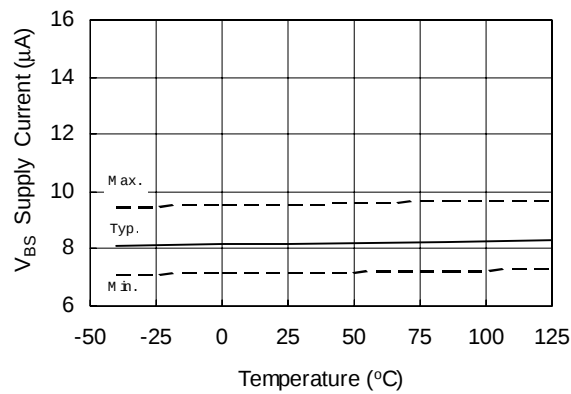


Figure 21. V_{BS} Undervoltage Threshold (-) vs. Temperature

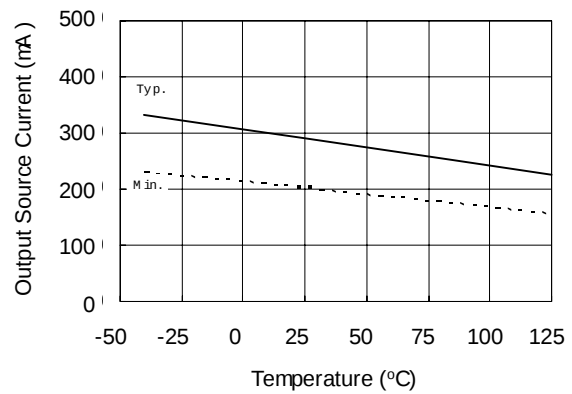


Figure 22A. Output Source Current vs. Temperature

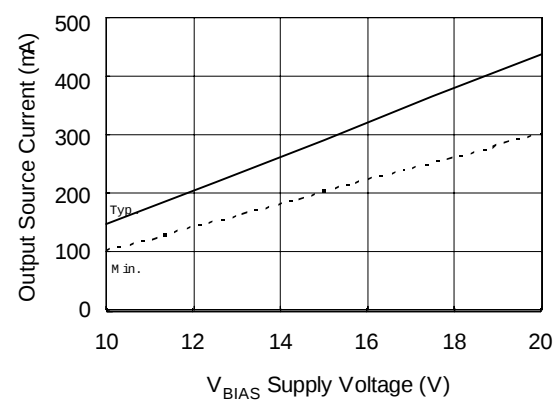


Figure 22B. Output Source Current vs. Supply Voltage

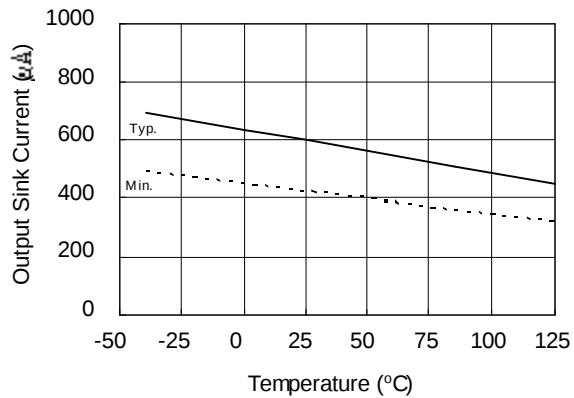


Figure 23A. Output Sink Current vs. Temperature

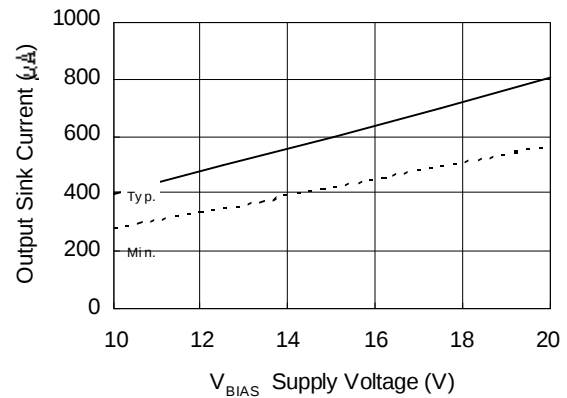


Figure 23B. Output Sink Current vs. Supply Voltage

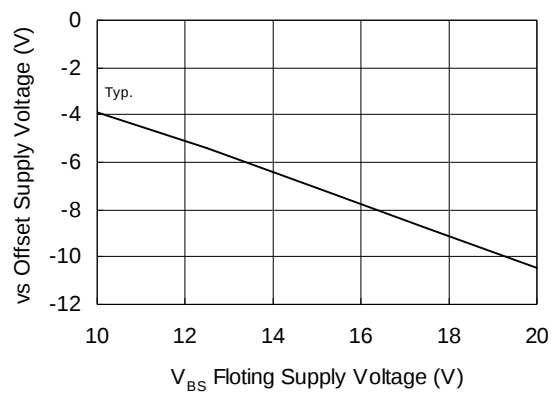


Figure 24. Maximum VS Negative Offset vs. Supply Voltage

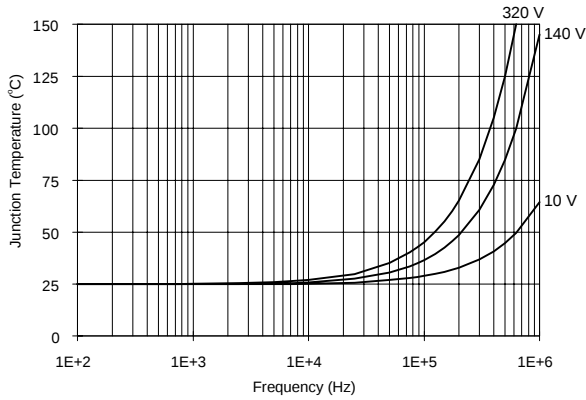


Figure 24. IRS2117/IRS2118 T_J vs. Frequency (IRFBC20)
 $R_{GATE} = 33 \Omega$, $V_{CC} = 15 V$

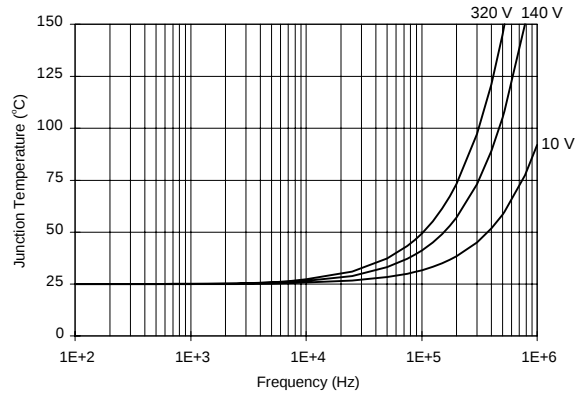


Figure 25. IRS2117/IRS2118 T_J vs. Frequency (IRFBC30)
 $R_{GATE} = 22 \Omega$, $V_{CC} = 15 V$

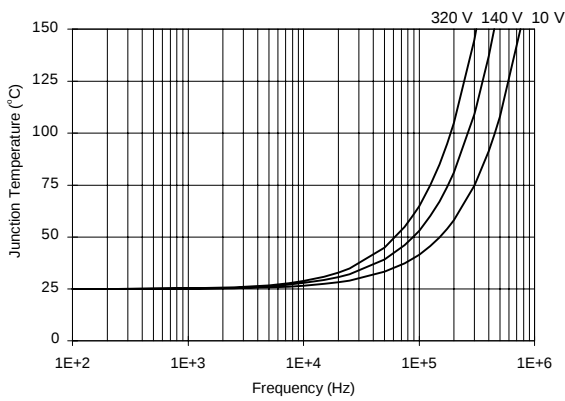


Figure 26. IRS2117/IRS2118 T_J vs. Frequency (IRFBC40)
 $R_{GATE} = 15 \Omega$, $V_{CC} = 15 V$

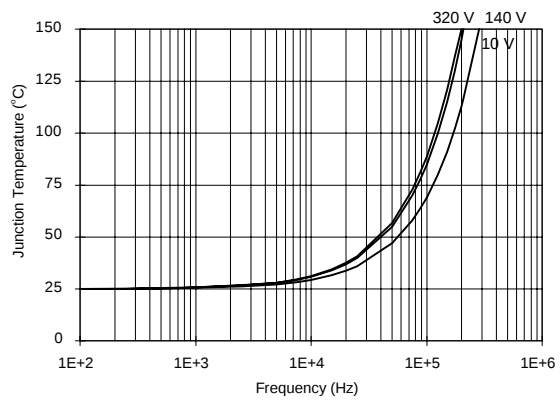
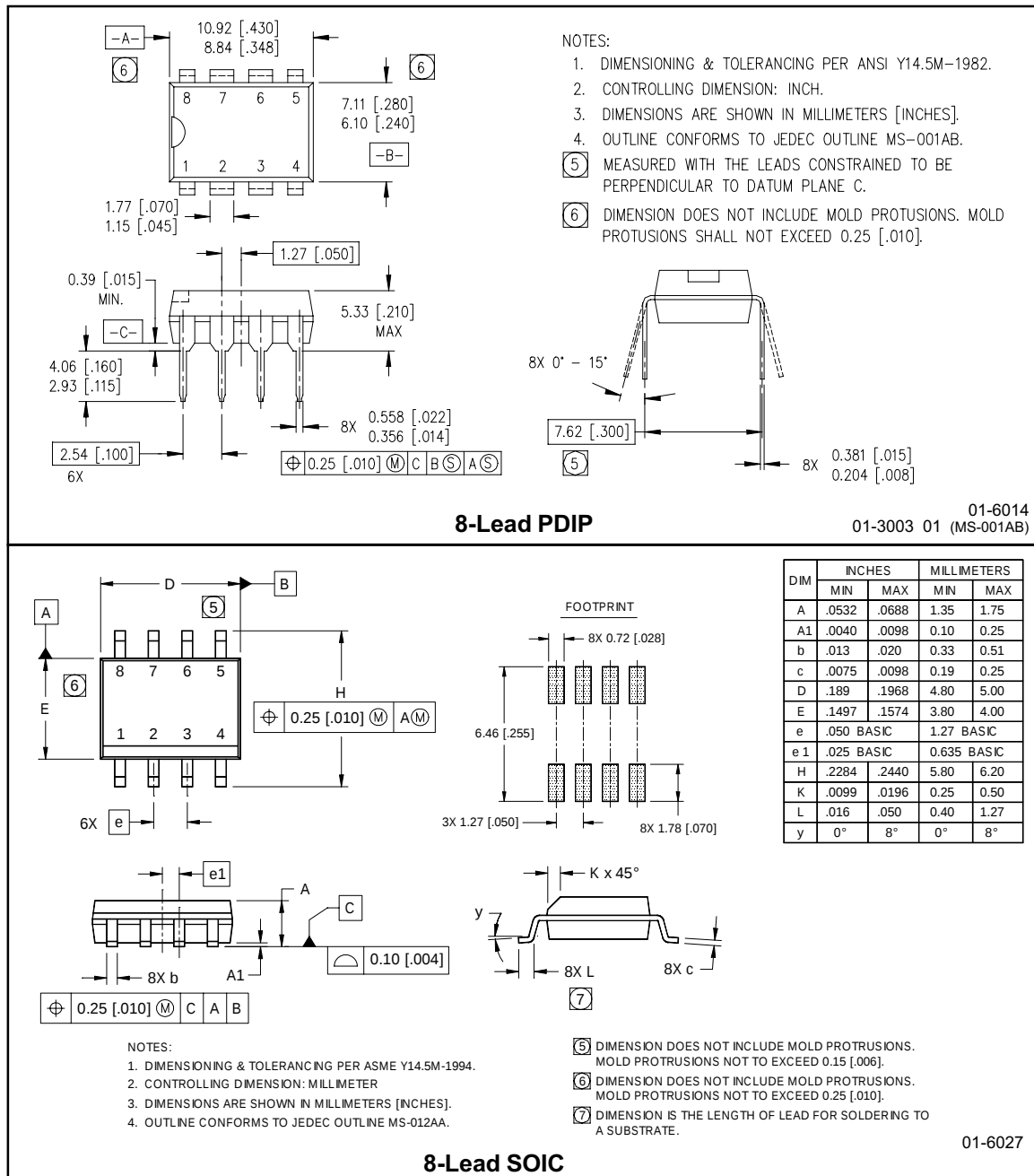
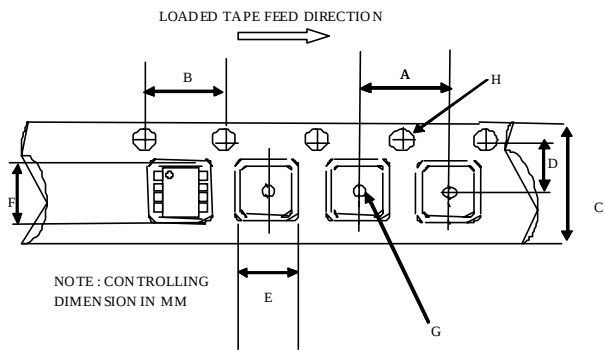


Figure 27. IRS2117/IRS2118 T_J vs. Frequency (IRFPE50)
 $R_{GATE} = 10 \Omega$, $V_{CC} = 15 V$

Case outlines

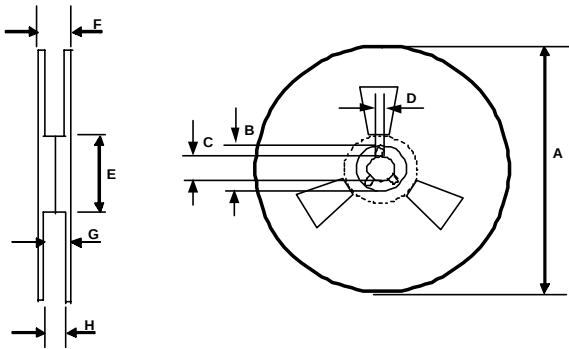


Tape & Reel
8-Lead SOIC



CARRIER TAPE DIMENSION FOR 8SOIC

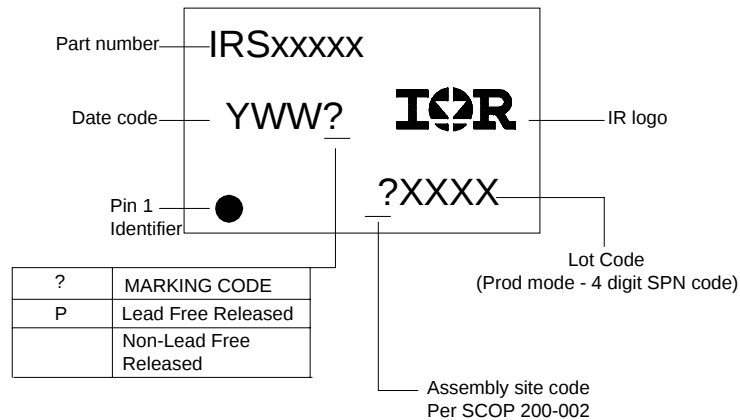
Code	Metric		Imperial	
	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	11.70	12.30	0.46	0.484
D	5.45	5.55	0.214	0.218
E	6.30	6.50	0.248	0.255
F	5.10	5.30	0.200	0.208
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062



REEL DIMENSIONS FOR 8SOIC

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

LEADFREE PART MARKING INFORMATION



ORDER INFORMATION

8-LeadPDIP IRS2117PbF
 8-LeadPDIP IRS2118PbF
 8-LeadSOIC IRS2117SPbF
 8-LeadSOIC IRS2118SPbF
 8-Lead SOIC Tape & Reel IRS2117STRPbF
 8-Lead SOIC Tape & Reel IRS2118STRPbF