International
IOR Rectifier

May 20th, 2010

Automotive Grade AUIRS4428S

DUAL LOW SIDE DRIVER

Features

- Gate drive supply range from 6 V to 20 V
- CMOS Schmitt-triggered inputs
- Matched propagation delay for both channels
- OutputA out of phase with InputA and OutputB in phase with inputB
- Automotive Qualified†
- Leadfree, RoHS compliant

Product Summary

Topology	Dual Low Side Driver
V_{OUT}	6 V – 20 V
I_{o+} & I_{o-} (typical)	2.3 A & 3.3 A
t_{ON} & t_{OFF} (typical)	70 ns & 65 ns

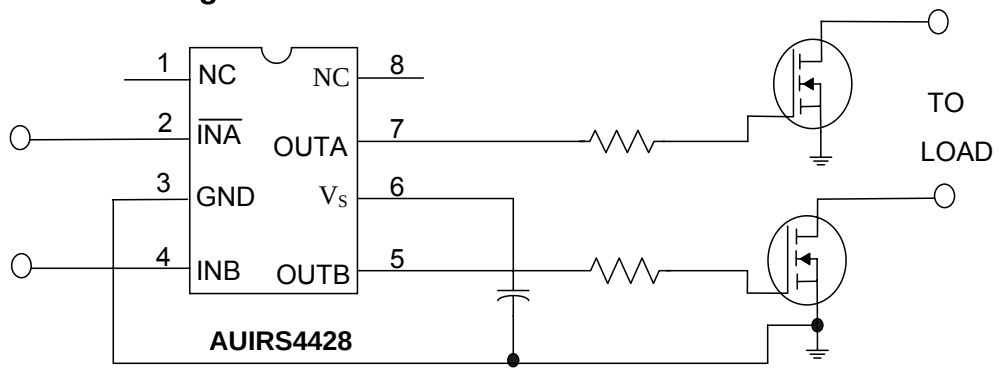
Typical Applications

- Automotive General Purpose Dual Low Side Driver
- Automotive DC-DC converters
- Hybrid Power Train Drives
- Direct Fuel Injection

Package

8-Lead SOIC

Typical Connection Diagram



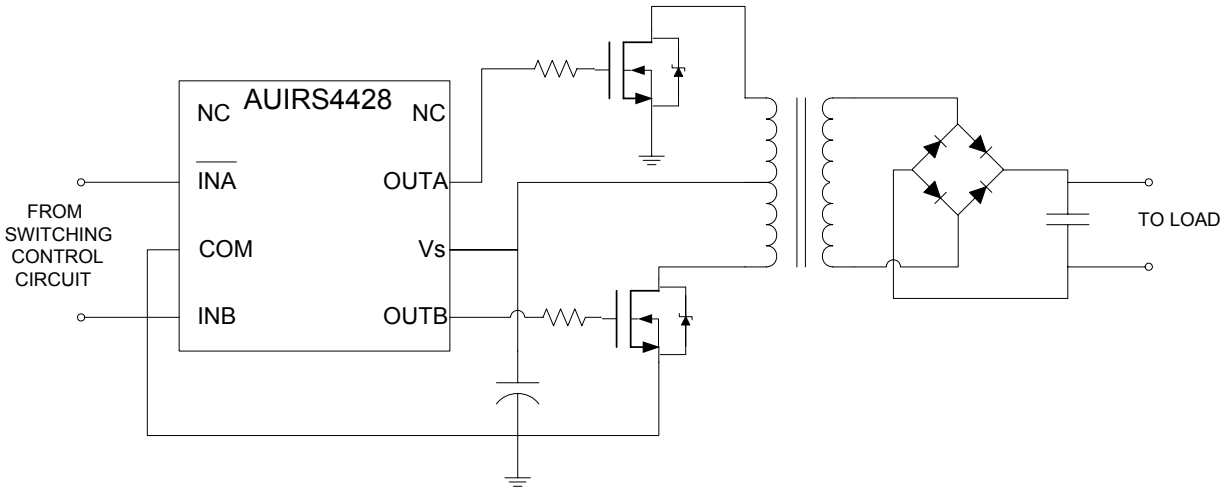
(Please refer to our Application Notes and Design Tips for proper circuit board layout)

* Qualification standards can be found on IR's web site www.irf.com

Description

The AUIRS4426 is a low voltage, high speed power MOSFET and IGBT driver. Proprietary latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays between two channels are matched.

Diagram for push-pull forward DC-DC converter application



Qualification Information†

Qualification Level		Automotive (per AEC-Q100††)	
		Comments: This family of ICs has passed an Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		SOIC8N	MSL3††† 260°C (per IPC/JEDEC J-STD-020)
ESD	Machine Model	Class M3 (per AEC-Q100-003)	
	Human Body Model	Class H3A (per AEC-Q100-002)	
	Charged Device Model	Class C5 (per AEC-Q100-011)	
RoHS Compliant		Yes	

† Qualification standards can be found at International Rectifier's web site http://www.irf.com/
†† Exceptions to AEC-Q100 requirements are noted in the qualification report.
††† Higher MSL ratings may be available for the specific package types listed here. Please contact your International Rectifier sales representative for further information.

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 GND lead. Stresses beyond those listed under " Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the “Recommended Operating Conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (T_A) is 25°C, unless otherwise specified.

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Symbol	Definition	Min.	Max.	Units
V_S	Fixed supply voltage	-0.3	25	V
V_O	Output voltage	-0.3	V_S + 0.3	
V_{IN}	Logic input voltage	- 0.3	V_S + 0.3	
P_D	Package power dissipation @ TA ≤ 25°C	—	0.625	W
Rth_{JA}	Thermal resistance, junction to ambient	—	200	°C/W
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 Figure 1. For proper operation the device should be used within the recommended conditions. All voltage parameters are absolute voltage referenced to GND.

Symbol	Definition	Min.	Max.	Units
V_S	Fixed supply voltage	6	20	V
V_O	Output voltage	0	V_S	
V_{IN}	Logic input voltage	0	V_S	
T_A	Ambient temperature	-40	125	°C

Static Electrical Characteristics

Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C ≤ Tj ≤ 125°C with bias conditions of V_{BIAS} (V_S) = 15 V, T_A = 25°C. The V_{IN} and I_{IN} parameters are referenced to GND and are applicable to input leads: INA and INB. The V_O and I_O parameters are referenced to GND and are applicable to the output leads: OUTA and OUTB.

Symbol	Definition	Min	Typ	Max	Units	Test Conditions
V_{IH}	Logic "0" input voltage (OUTA=LO), Logic "1" input voltage (OUTB=HI)	2.7	—	—	V	
V_{IL}	Logic "1" input voltage (OUTA=HI) Logic "0" input voltage (OUTB=LO)	—	—	0.8		
V_{OH}	High level output voltage, V_{BIAS} -V_O	—	—	1.4		I_O = 0 mA
V_{OL}	Low level output voltage, V_O	—	—	0.1		
I_{IN+}	Logic "1" input bias current (OUT = HI)	—	5	15	µA	V_{INA} = 0 V, V_{INB} = V_S
I_{IN-}	Logic "0" input bias current (OUT = LO)	-30	-10	—		V_{INA} = V_S, V_{INB} = 0 V
I_{QBS}	Quiescent V_S supply current	—	120	200		V_{IN} = 0 V or V_S
I_{O+}	Output high short circuit pulsed current(†)	1.5	2.3	—	A	V_O = 0 V, V_{INA} = 0 V; V_O = 0 V, V_{INB} = V_S PW ≤ 10 µs
I_{O-}	Output high short circuit pulsed current(†)	1.5	3.3	—		V_O = 15 V, V_{INA} = V_S; V_O = 15 V, V_{INB} = 0 V PW ≤ 10 µs

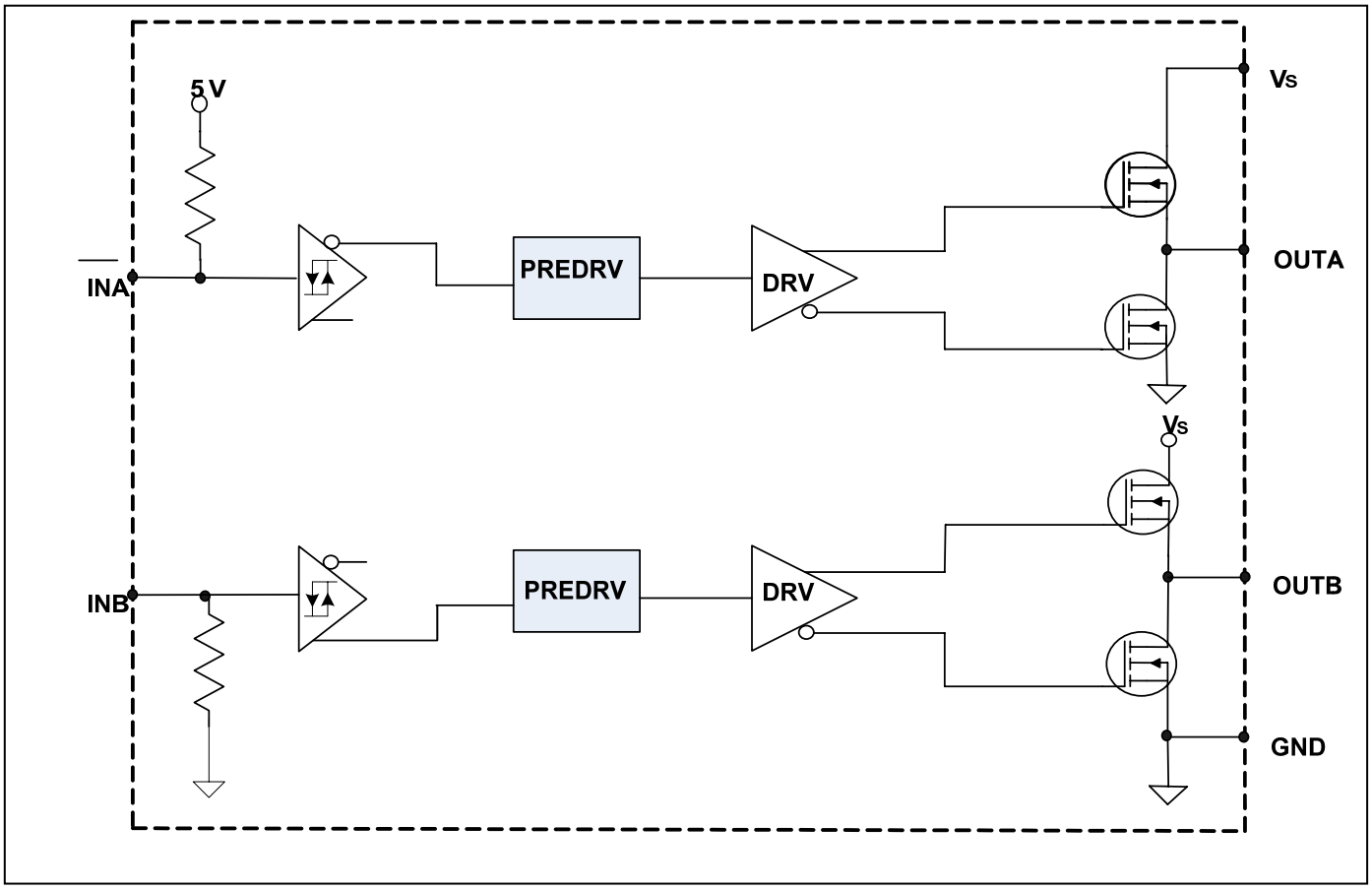
(†) Guaranteed by design

Dynamic Electrical Characteristics

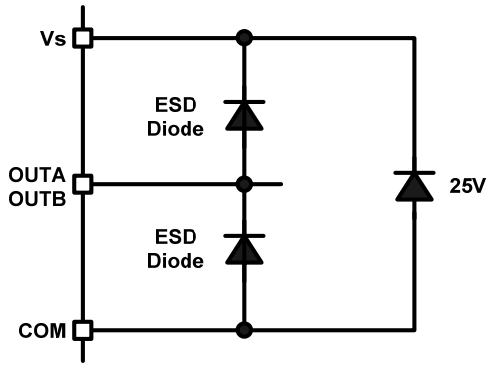
Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C ≤ Tj ≤ 125°C with bias conditions of V_{BIAS} (V_S) = 15 V, CL = 1000pF, and T_A = 25°C. The dynamic electrical characteristics are measured using the test circuit shown in Fig. 3.

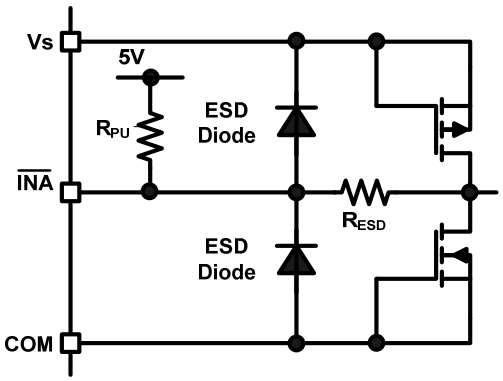
Symbol	Definition	Min	Typ	Max	Units	Test Conditions
Propagation delay characteristics					ns	Figure 2
t_{d1}	Turn-on propagation delay	—	70	150		
t_{d2}	Turn-off propagation delay	—	70	150		
t_r	Turn-on rise time	—	15	35		
t_f	Turn-off fall time	—	25	50		

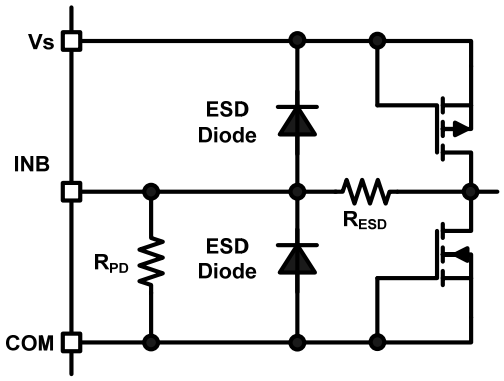
Functional Block Diagram: AUIRS4428



Input/Output Pin Equivalent Circuit Diagrams



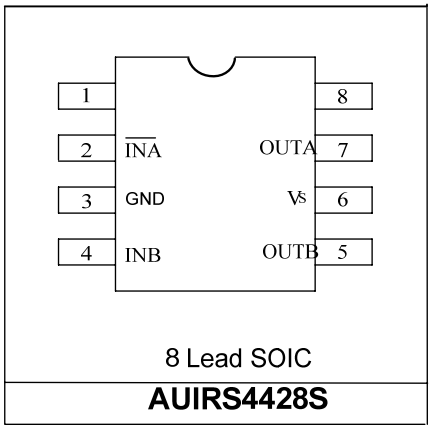




Lead Definitions

Symbol	Description
V_S	Supply voltage
GND	Ground
$\overline{INA}$	Logic input for gate driver output (OUTA), out of phase
INB	Logic input for gate driver output (OUTB), in phase
OUTA	Gate drive output A
OUTB	Gate drive output B

Lead Assignments



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AUIRS4428S

Application Information and Additional Details

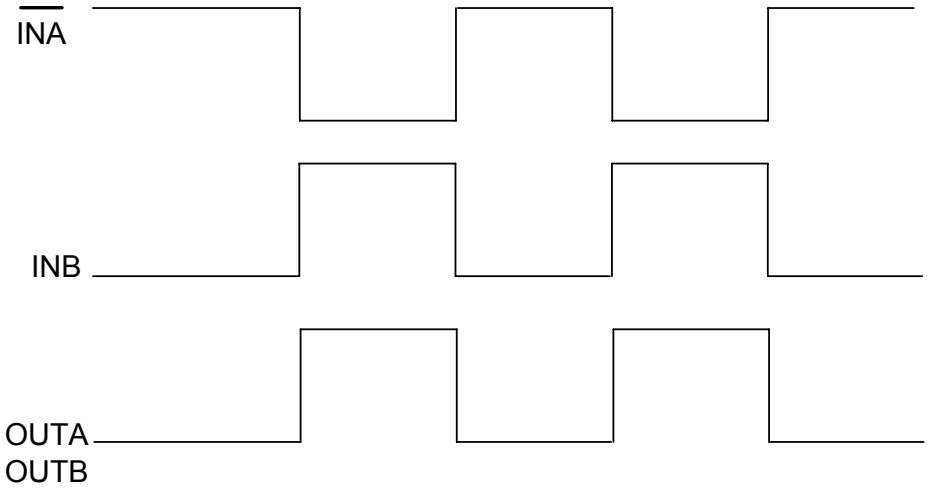


Figure 1: Input/output Timing Diagram

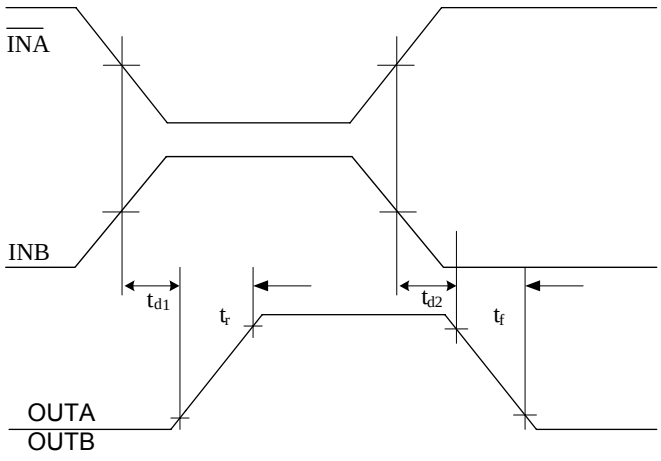


Figure 2: Switching Time Waveform Definitions

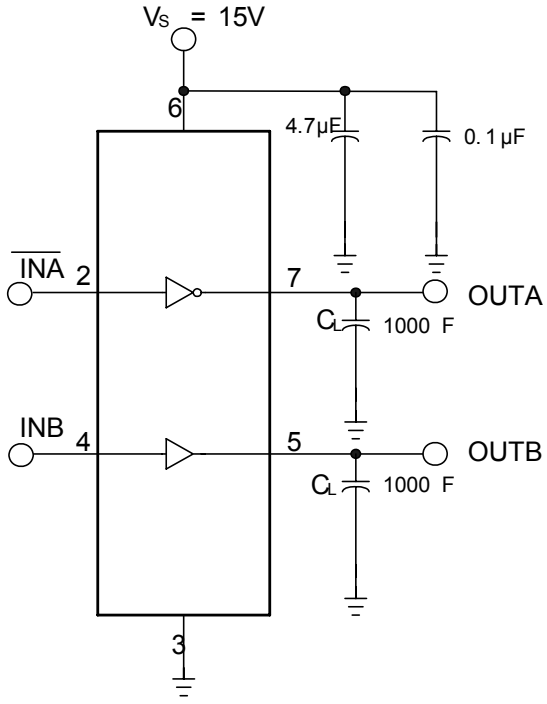


Figure 3: Advance Configuration

Parameter Trends vs. Temperature

Figures illustrated in this chapter provide information on the experimental performance of the AUIRS4428S HVIC. The line plotted in each figure is generated from actual lab data. A large number of individual samples were tested at three temperatures (-40 ºC, 25 ºC, and 125 ºC) with supply voltage of 15V in order to generate the experimental curve. The line consists of three data points (one data point at each of the tested temperatures) that have been connected together to illustrate the understood trend. The individual data points on the Typ. curve were determined by calculating the averaged experimental value of the parameter (for a given temperature).

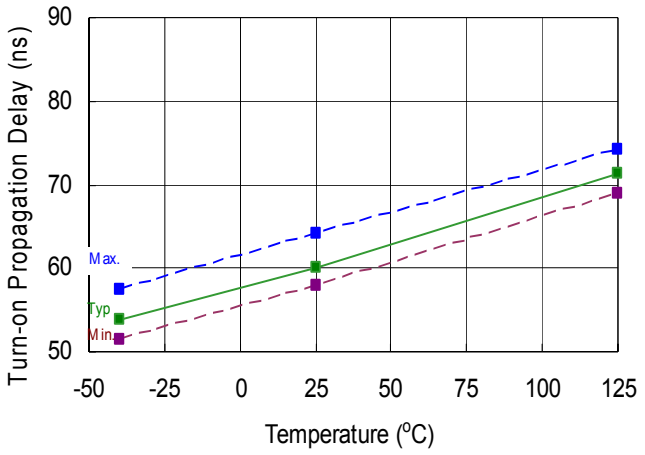


Figure 4. Turn-On Propagation Delay vs. Temperature

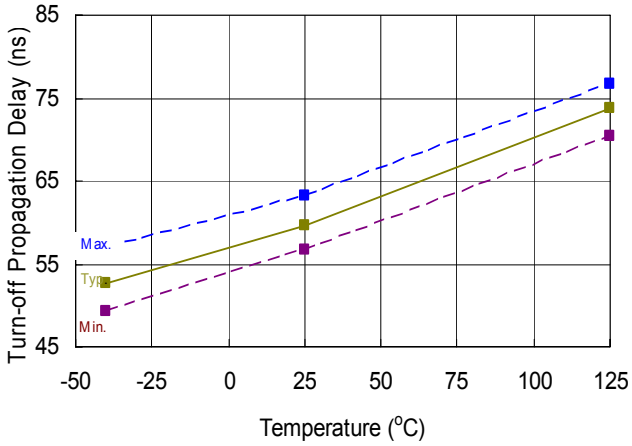


Figure 5. Turn-Off Propagation Delay vs. Temperature

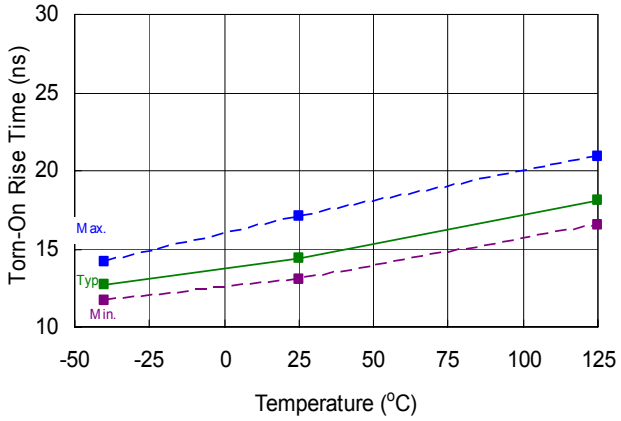


Figure 6. Turn-On Rise Time vs. Temperature

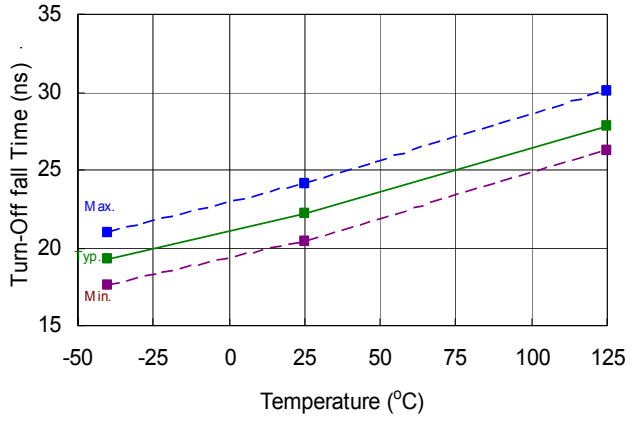


Figure 7. Turn-Off Fall Time vs. Temperature

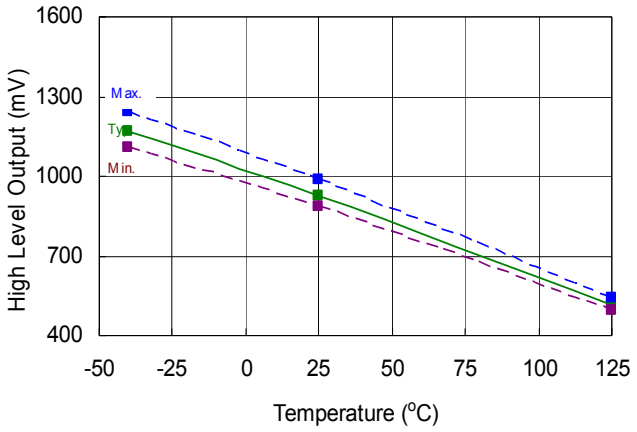


Figure 8. High Level Output Voltage vs. Temperature

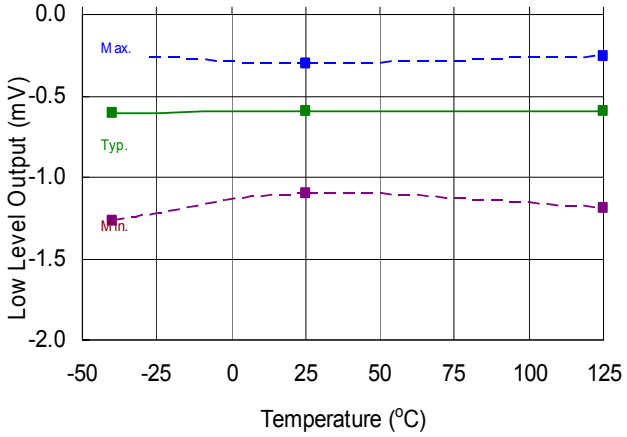


Figure 9. Low Level Output Voltage vs. Temperature

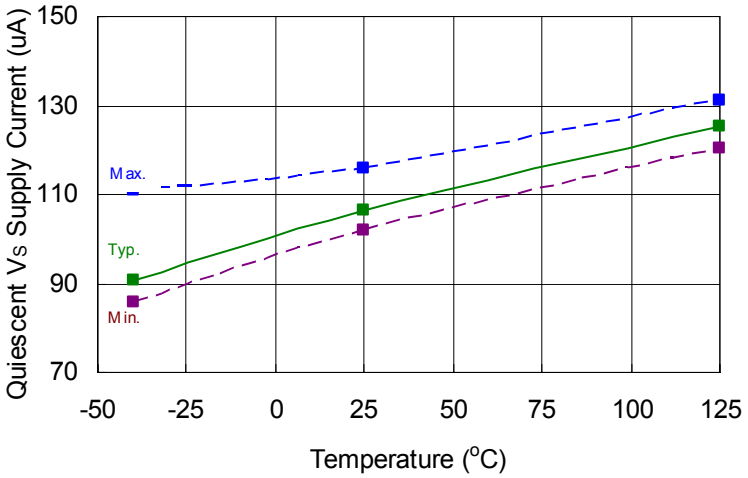
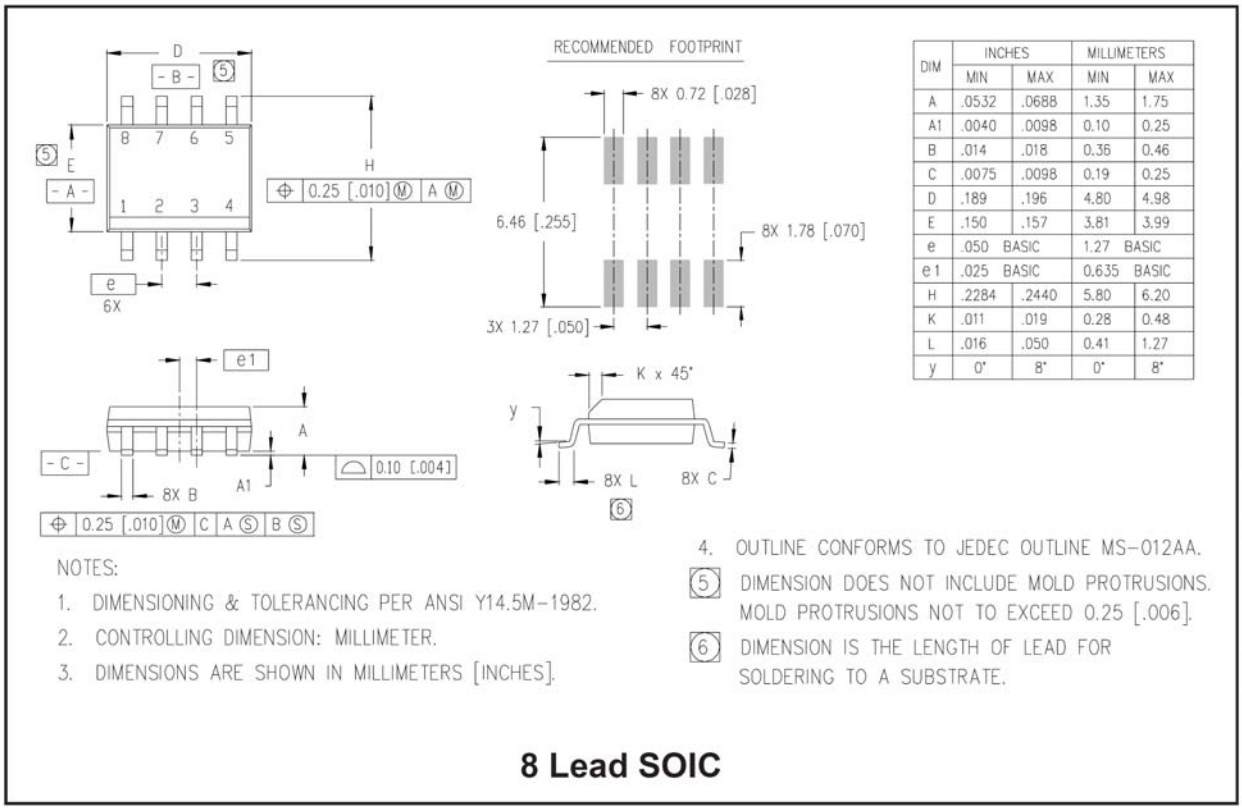


Figure 10. Quiescent V_S Supply Current vs. Temperature

Package Details: SOIC8



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
B	.014	.018	0.36	0.46
C	.0075	.0098	0.19	0.25
D	.189	.196	4.80	4.98
E	.150	.157	3.81	3.99
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.011	.019	0.28	0.48
L	.016	.050	0.41	1.27
y	0°	8°	0°	8°

NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.006].
6. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

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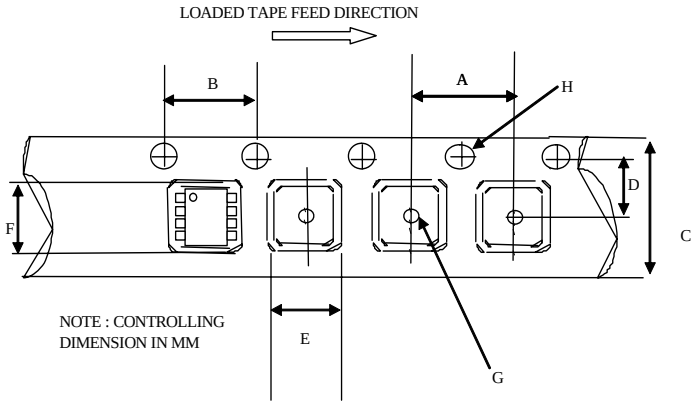
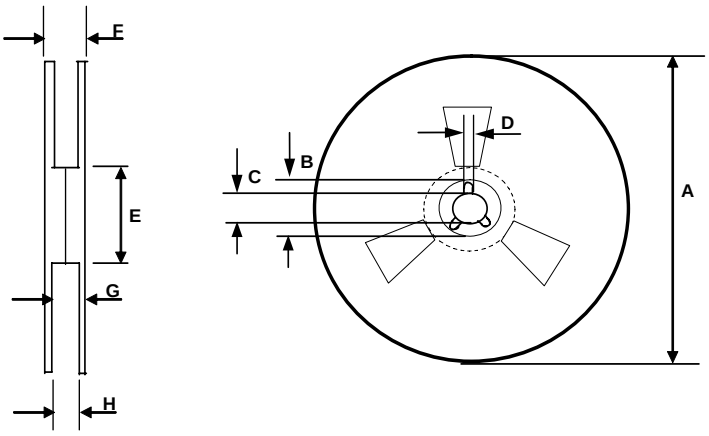
Tape and Reel Details: SOIC8



CARRIER TAPE DIMENSION FOR 8SOICN

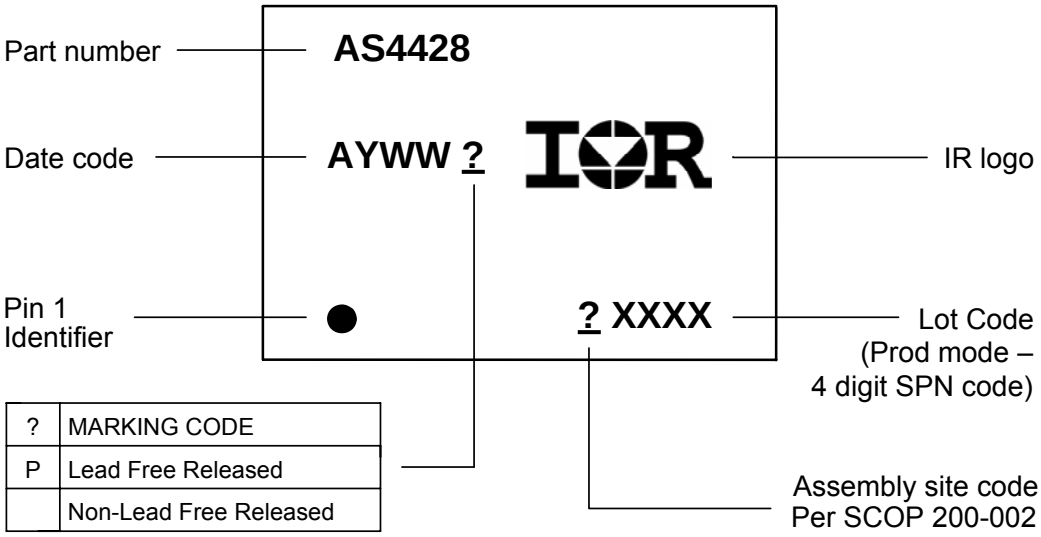
	Metric		Imperial	
Code	Min	Max	Min	Max
A	7.90	8.10	0.311	0.318
B	3.90	4.10	0.153	0.161
C	11.70	12.30	0.46	0.484
D	5.45	5.55	0.214	0.218
E	6.30	6.50	0.248	0.255
F	5.10	5.30	0.200	0.208
G	1.50	n/a	0.059	n/a
H	1.50	1.60	0.059	0.062



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

Part Marking Information



?	MARKING CODE
P	Lead Free Released
	Non-Lead Free Released

Ordering Information

Base Part Number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRS4428	SOIC8	Tube/Bulk	95	AUIRS4428S
		Tape and Reel	2500	AUIRS4428STR

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Revision History

Date	Comment
04/27/2010	First draft converted from AUIRS4426S
05/14/2010	Corrected table of content with correct page number reference; updated Input/Output equivalent circuit on Page8.
05/17/2010	Front page: Product Summary Voffset line erased; Vcc renamed Vs in Input/Output equivalent circuit schematics.
05/20/2010	Moved “-30” from max. to min for Iin-; updated tri-temp graphs; changed Td2 typ. value to 70, Iqbs typ. value to 120.