

## LOW EMI CURRENT SENSE HIGH SIDE SWITCH

### Features

- Load current feedback
- Over current shutdown
- Active clamp
- ESD protection
- Input referenced to Vcc
- Over temperature shutdown
- Switching time optimized for low EMI
- Reverse battery protection

### Description

The AUIR3317(S) is a fully protected 4 terminals high side switch. The input signal is referenced to Vcc. When the input voltage Vcc - Vin is higher than the specified threshold, the output power Mosfet is turned on. When the Vcc - Vin is lower than the specified Vil threshold, the output Mosfet is turned off. A current proportional to the power Mosfet current is sourced to the Ifb pin. Either over current and over temperature latches off the switch. The device is reset by pulling the input pin high. Other integrated protections (ESD, reverse battery, active clamp) make the switch very rugged in automotive environment.

### Typical Connection

### Product Summary

Rds(on)	7 mΩ max.
Vcc op.	6 to 26V
Current Ratio	8800
Over-current	120A
Vclamp	40V

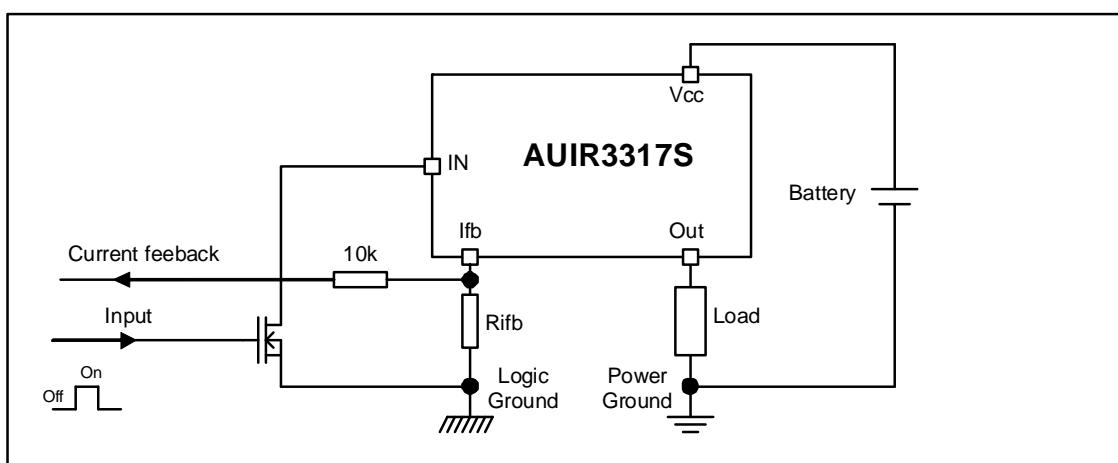
### Package



TO-220  
AUIR3317



D2Pak  
Pin 4 and 5 fused  
AUIR3317S



**Qualification Information<sup>†</sup>**

<b>Qualification Level</b>		Automotive (per AEC-Q100 <sup>††</sup> )	
		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.	
<b>Moisture Sensitivity Level</b>		D2PAK-5L	MSL1, 260°C (per IPC/JEDEC J-STD-020)
		TO220-5L	Not applicable
<b>ESD</b>	Machine Model	Class M4 (450V) (per AEC-Q100-003)	
	Human Body Model	Class H3A (4,500 V) (per AEC-Q100-002)	
	Charged Device Model	Class C4 (1000 V) (per AEC-Q100-011)	
<b>IC Latch-Up Test</b>		Class II, Level A (per AEC-Q100-004)	
<b>RoHS Compliant</b>		Yes	

<sup>†</sup> Qualification standards can be found at International Rectifier's web site <http://www.irf.com/>

<sup>††</sup> Exceptions to AEC-Q100 requirements are noted in the qualification report.

## Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are referenced to Vcc lead. (T<sub>j</sub>=-40°..150°C, V<sub>cc</sub>=6..26V Tambient=25°C unless otherwise specified).

Symbol	Parameter	Min.	Max.	Units
V <sub>cc</sub> -Vin	Maximum V <sub>cc</sub> voltage	-16	37	V
V <sub>cc</sub> -Vin cont.	Maximum continuous V <sub>cc</sub> voltage	-16	26	
V <sub>cc</sub> -V <sub>fb</sub>	Maximum I <sub>fb</sub> voltage	-16	33	
V <sub>cc</sub> -V <sub>out</sub>	Maximum output voltage	-0.3	37	
I <sub>ds</sub> cont.	Maximum body diode continuous current R <sub>th</sub> =60°C/W (1) Tambient=25°C	—	2.8	A
I <sub>ds</sub> pulsed	Maximum body diode pulsed current (1)	—	100	
P <sub>d</sub>	Maximum power dissipation R <sub>th</sub> =60°C/W Tambient=25°C	—	2	W
T <sub>j</sub> max.	Max. storage & operating temperature junction temperature	-40	150	°C
Min R <sub>fb</sub>	Minimum on the resistor on I <sub>fb</sub> pin	0.3	—	kΩ
I <sub>fb</sub> max.	Max. I <sub>fb</sub> current	-50	50	mA

(1) Limited by junction temperature. Pulsed is also limited by wiring

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>th1</sub>	Thermal resistance junction to ambient D <sup>2</sup> -Pak Std footprint	60	—	°C/W
R <sub>th2</sub>	Thermal resistance junction to case D <sup>2</sup> -Pak	0.7	—	
R <sub>th2</sub>	Thermal resistance junction to case TO220	0.7	—	

## Recommended Operating Conditions

These values are given for a quick design. For operation outside these conditions, please consult the application notes.

Symbol	Parameter	Min.	Max.	Units
I <sub>out</sub>	Continuous output current	—	23	A
	T <sub>ambient</sub> =85°C, R <sub>th</sub> =5°C/W, T <sub>j</sub> =125°C		7	
	T <sub>ambient</sub> =85°C, R <sub>th</sub> =60°C/W, T <sub>j</sub> =125°C		—	
Pulse min.	Minimum turn-on pulse width	1	—	ms
F <sub>max</sub> .	Maximum operating frequency	—	200	Hz

## Protection Characteristics

T<sub>j</sub>=-40°..150°C, V<sub>cc</sub>=6..26V

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
T <sub>sd</sub>	Over temperature threshold	—	165	—	°C	See fig. 5
OV	Over voltage protection (not latched)	26	29	33	V	
Isdf	Fixed over current shutdown	90	120	150	A	V <sub>cc</sub> -V <sub>ifb</sub> >4V(3)
treset	Time to reset protection	—	50	500	μs	See fig. 5
Min. pulse	Min. pulse width (no WAIT state)	—	900	2000		T <sub>j</sub> =25°C
WAIT	WAIT function timer	0.4	1	2	ms	See fig. 4 and 5
R <sub>ds(on)</sub> rev.	Reverse battery On state resistance T <sub>j</sub> =25°C	4	6.7	10	mΩ	V <sub>cc</sub> -V <sub>in</sub> =-14V, I <sub>out</sub> =30A
	T <sub>j</sub> =125°C	—	10	15		

(3) With V<sub>cc</sub>-V<sub>ifb</sub><4V, the Isdf is lower than specified in the datasheet

## Static Electrical Characteristics

T<sub>j</sub>=-40°..150°C, V<sub>cc</sub>=6..26V (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V <sub>cc</sub> op.	Operating Voltage range	6	—	26	V	
I <sub>cc</sub> off	Supply leakage current	—	1.5	5	μA	V <sub>in</sub> =V <sub>cc</sub> , V <sub>cc</sub> -V <sub>out</sub> =14V, V <sub>cc</sub> -V <sub>ifb</sub> =14V, T <sub>j</sub> =25°C
I <sub>in</sub> , on	On state IN positive current	1.5	3	6	mA	V <sub>cc</sub> -V <sub>in</sub> =14V, T <sub>j</sub> =25°C
V <sub>ih</sub>	High level Input threshold voltage (4)	—	5.4	6.3		
V <sub>il</sub>	Low level Input threshold voltage (4)	4	4.9	5.8	V	
V <sub>hyst</sub>	Input hysteresis V <sub>ih</sub> -V <sub>il</sub>	0.2	0.4	1.5		
I <sub>out</sub>	Drain to source leakage current	—	1.2	5	μA	V <sub>in</sub> =V <sub>cc</sub> , V <sub>cc</sub> -V <sub>ifb</sub> =0V, V <sub>cc</sub> -V <sub>out</sub> =14V, T <sub>j</sub> =25°C
R <sub>ds(on)</sub>	On state resistance (5) T <sub>j</sub> =25°C	4	5.5	7		I <sub>out</sub> =30A, V <sub>cc</sub> -V <sub>in</sub> =14V
	On state resistance (5) T <sub>j</sub> =25°C	4	6	10	mΩ	I <sub>out</sub> =17A, V <sub>cc</sub> -V <sub>in</sub> =6V
	On state resistance (5)(6) T <sub>j</sub> =150°C	7	10.5	13.5		I <sub>out</sub> =30A, V <sub>cc</sub> -V <sub>in</sub> =14V
V clamp1	V <sub>cc</sub> to V <sub>out</sub> clamp voltage 1	36	39	—	V	I <sub>out</sub> =50mA
V clamp2	V <sub>cc</sub> to V <sub>out</sub> clamp voltage 2	—	40	43		I <sub>out</sub> =30A, T <sub>j</sub> =25°C

(4) Input thresholds are measured directly between the input pin and the tab. Any parasitic resistance in common between the load current path and the input signal path can significantly affect the thresholds.

(5) Rdson is measured between the tab and the Out pin, 5mm away from the package.

(6) Guaranteed by design

## Switching Electrical Characteristics

V<sub>cc</sub>=14V, Resistive load=0.5Ω, T<sub>j</sub>=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t <sub>don</sub>	Turn on delay time to 10% V <sub>cc</sub>	30	120	300	μs	See figure 2
t <sub>r1</sub>	Rise time to V <sub>cc</sub> -V <sub>out</sub> =5V	20	50	125		
t <sub>r2</sub>	Rise time to V <sub>cc</sub> -V <sub>out</sub> =0.1V <sub>cc</sub>	30	80	200		
E <sub>on</sub>	Turn on energy	—	14	—		
t <sub>doff</sub>	Turn off delay time	30	140	350		
t <sub>f</sub>	Fall time to V <sub>out</sub> =10% of V <sub>cc</sub>	35	100	250		
E <sub>off</sub>	Turn off energy	—	7	—		

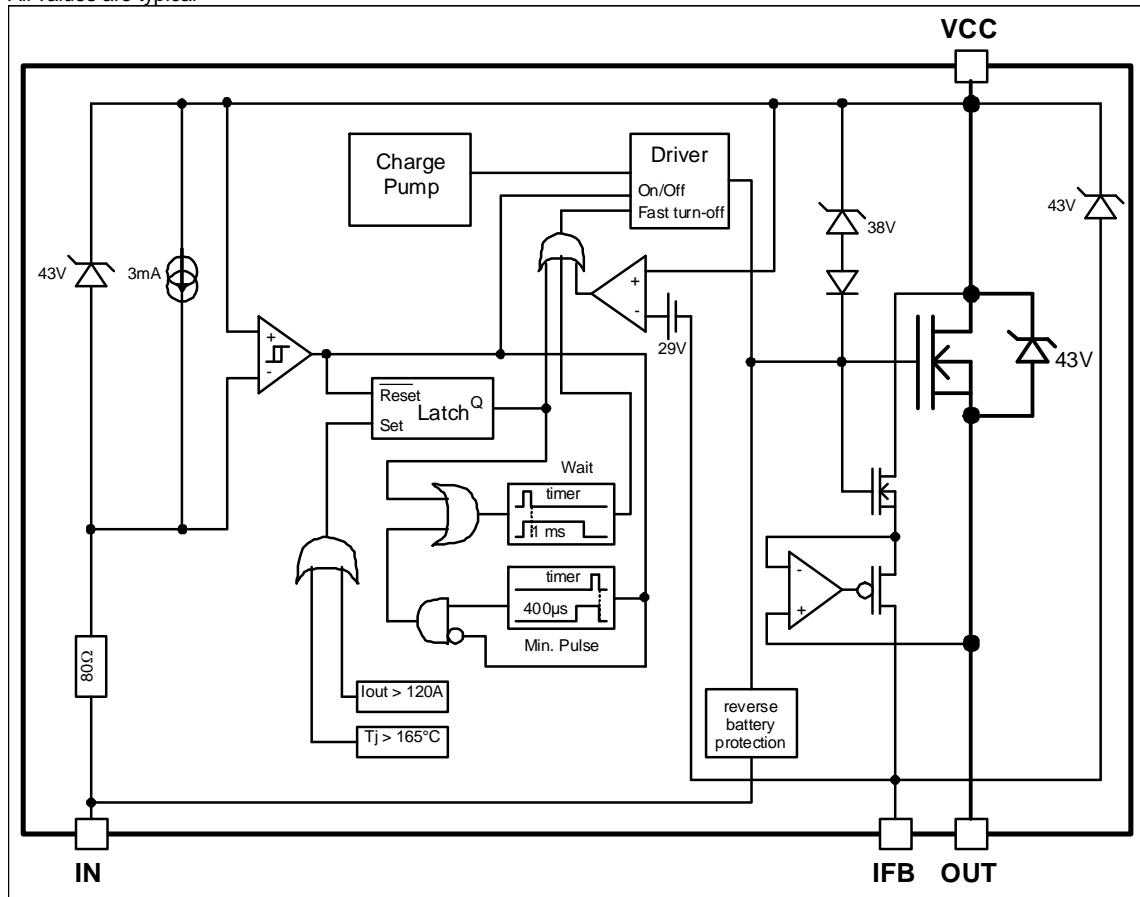
## Current Sense Characteristics

T<sub>j</sub>=-40°..150°C, V<sub>CC</sub>=6..26V (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ratio	I Load/lfb current ratio	8,200	8,800	9,950	—	Rfb=500Ω, Iout=60A
Ratio_TC	I Load/lfb variation aver temperature(6)	-5	—	+5	%	Tj=-40°C to 150°C
Offset	Load current diagnostic offset	-0.2	0	+0.25	A	Iout=2A
trst	lfb response time (low signal)	—	1	—	μs	90% of the Iout step

## Functional Block Diagram

All values are typical



## Lead Assignments

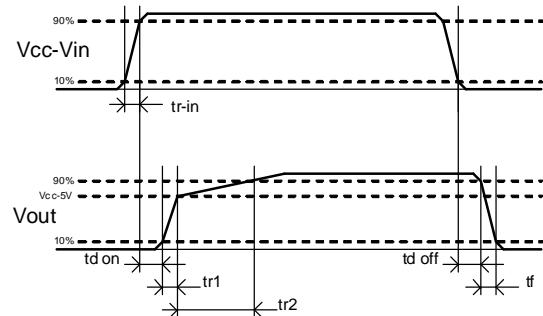
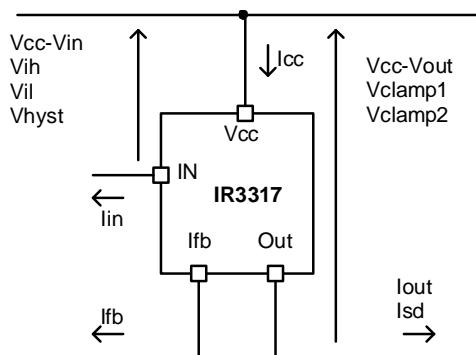
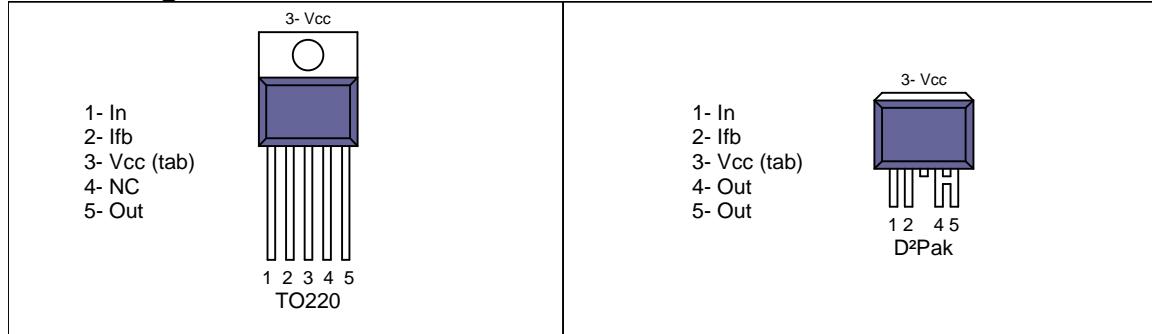
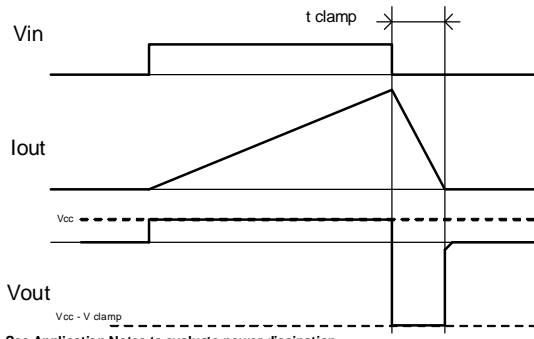
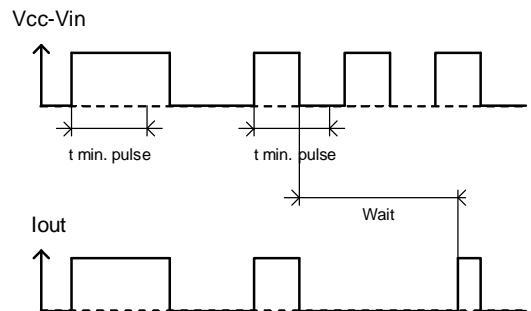


Figure 1 – Voltages and current definitions

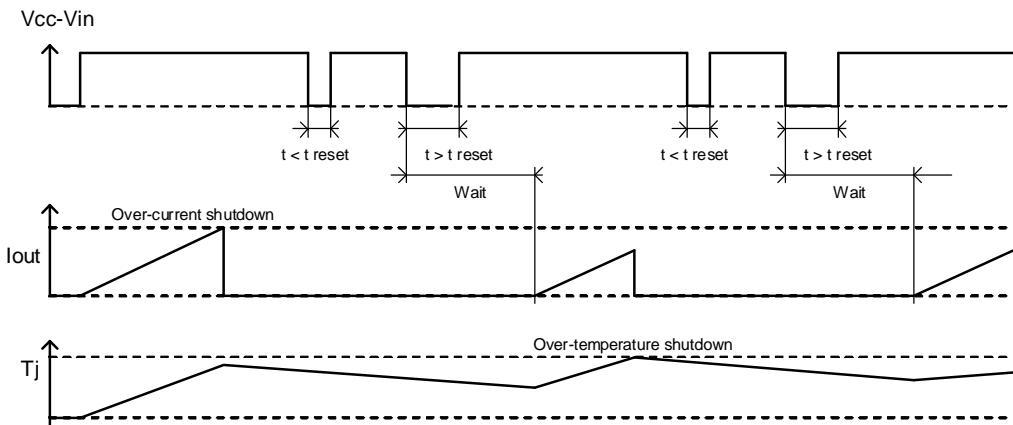
Figure 2 – Switching time definitions



**Figure 3 – Active clamp waveforms**

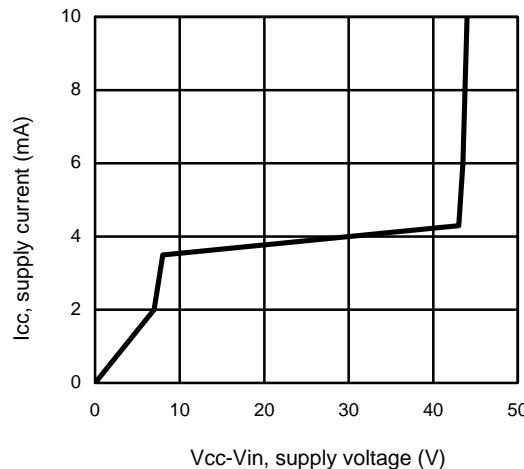


**Figure 4 – Min. pulse and Wait function**

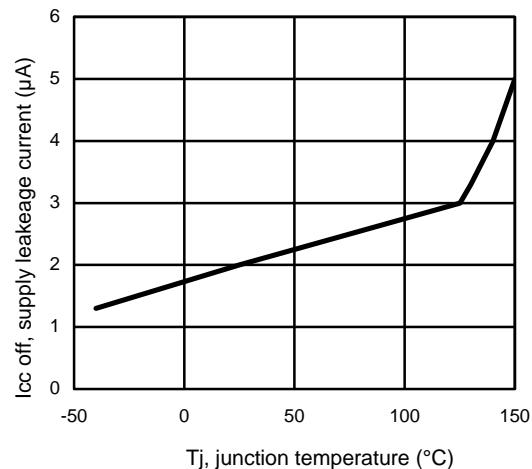


**Figure 5 – Protection Timing Diagrams**

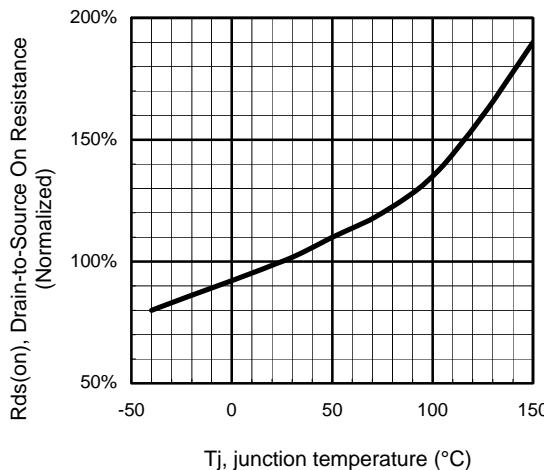
All curves are typical characteristics. Operation in hatched areas is not recommended.  $T_j=25^\circ\text{C}$ ,  $R_{\text{fb}}=500\text{ohm}$ ,  $V_{\text{cc}}=14\text{V}$  (unless otherwise specified).



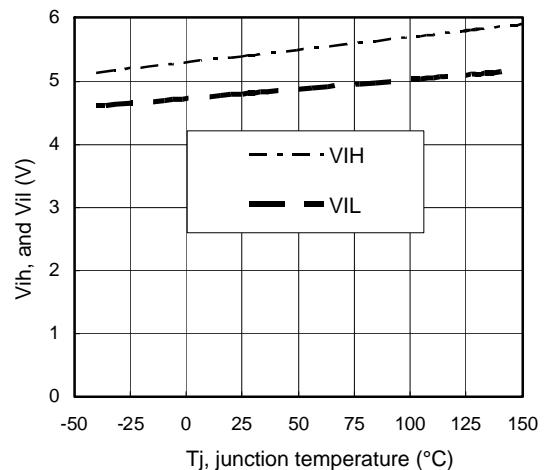
**Figure 6 – Icc (mA) Vs Vcc-Vin (V)**



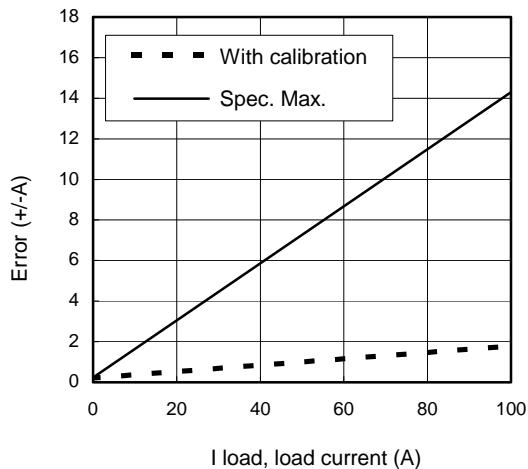
**Figure 7 – Icc off (μA) Vs Tj (°C)**



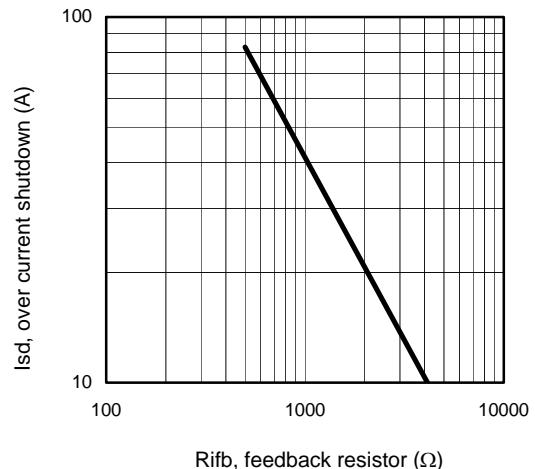
**Figure 8 - Normalized Rds(on) (%) Vs Tj (°C)**



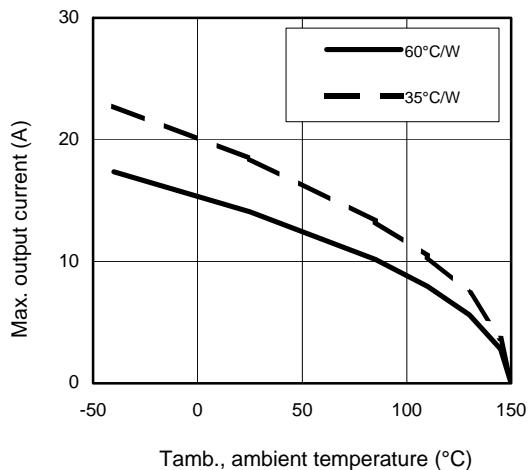
**Figure 9 – Vih and Vil (V) Vs Tj (°C)**



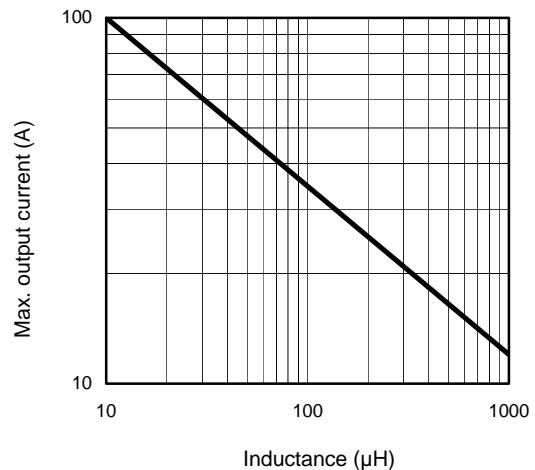
**Figure 10 – Error (+/- A) Vs I load (A)**



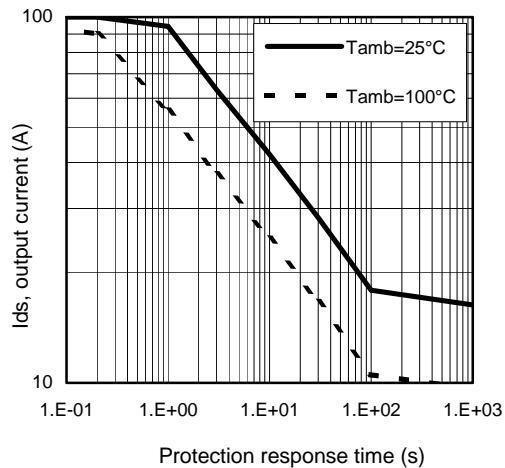
**Figure 11 – Ids (A) Vs Rifb (Ω)**



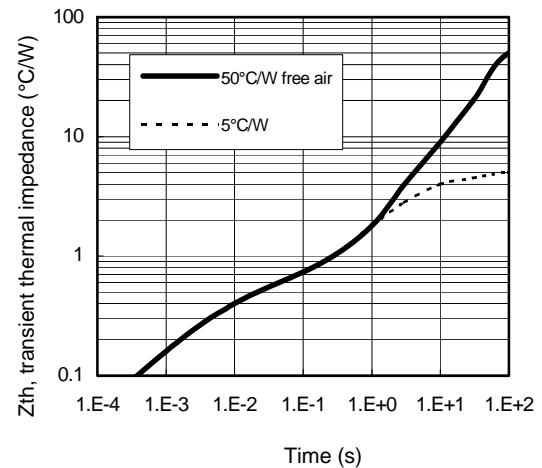
**Figure 12 – Max. Iout (A) Vs Tamb. (°C)**



**Figure 13 – Max. Iout (A) Vs inductance (μH)**

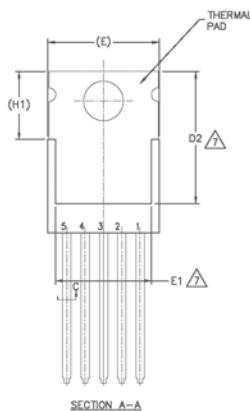
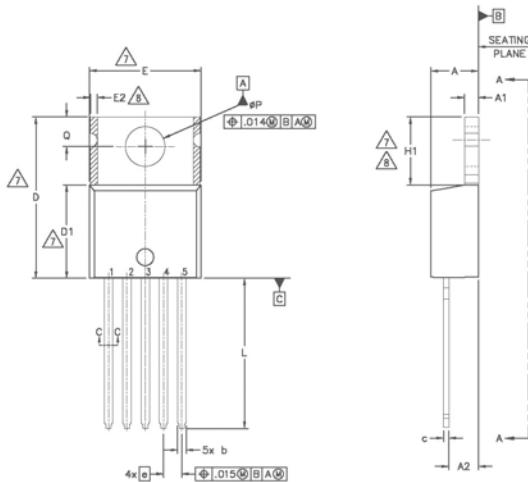


**Figure 14 –  $I_{ds}$  (A) Vs over temperature protection response time (s)**



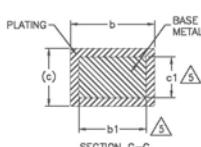
**Figure 15 – Transient thermal impedance (°C/W) Vs time (s)**

**Case Outline - TO220 - 5 Leads**



S Y M B O L	DIMENSIONS		NOT ES	
	MM INCHES	INCHES		
	MIN.	MAX.	MIN.	MAX.
A	3.56	4.83	.140	.190
A1	0.51	1.40	.020	.055
A2	2.03	2.92	.080	.115
b	0.64	0.89	.025	.035
b1	0.64	0.84	.025	.033
c	0.36	0.61	.014	.024
c1	0.36	0.56	.014	.022
D	14.22	16.51	.560	.650
D1	8.38	9.02	.330	.355
D2	11.68	12.88	.460	.507
E	9.65	10.67	.380	.420
E1	6.86	8.89	.270	.350
E2	—	0.76	—	.030
e	1.70	BSC	.067	BSC
H1	5.84	6.86	.230	.270
L	12.70	14.73	.500	.580
P	3.53	3.73	.139	.147
Q	2.54	3.05	.100	.120

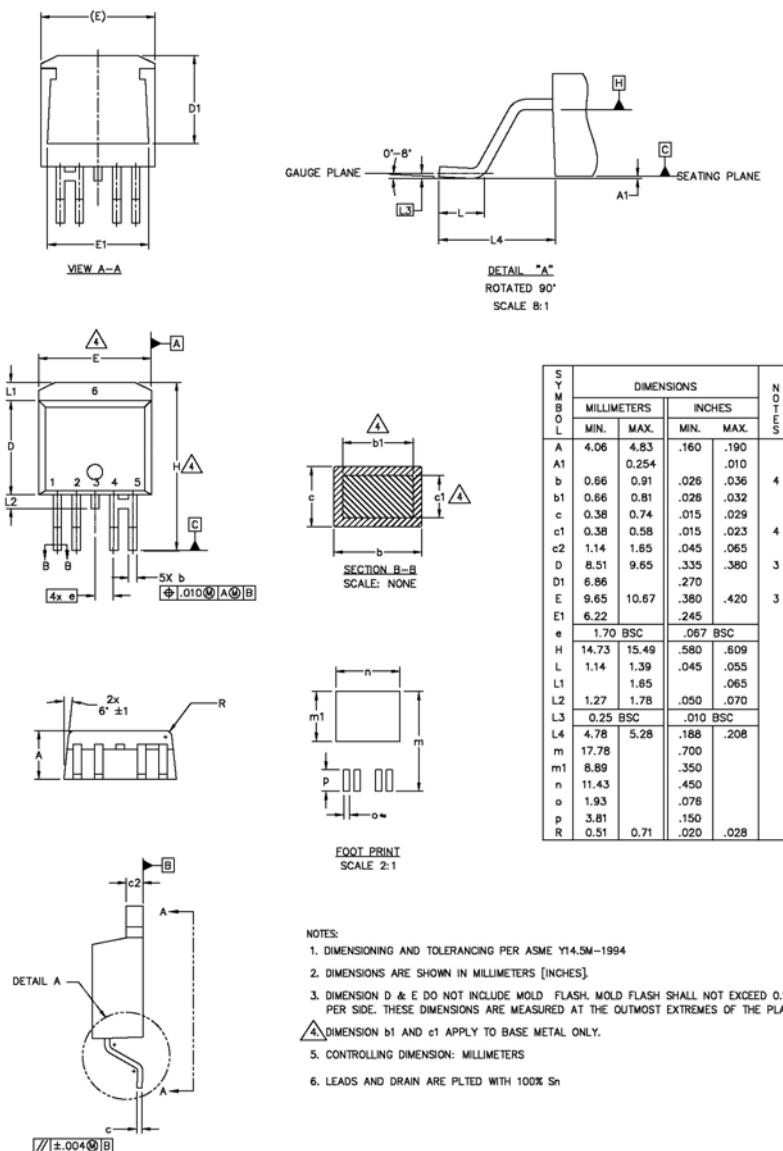
SECTION A-A



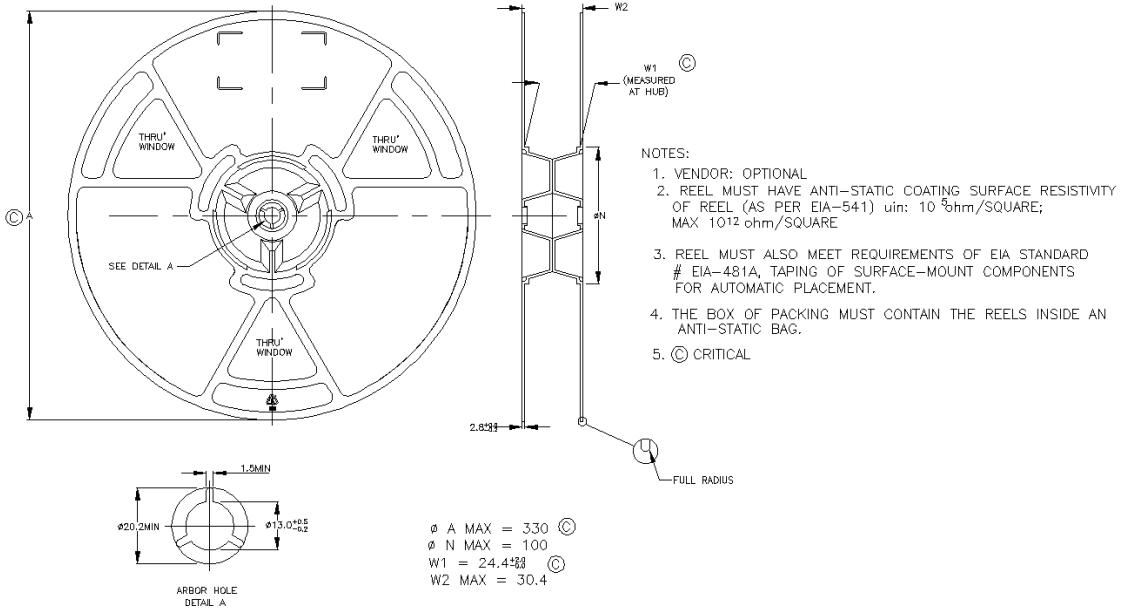
NOTES:

- 1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
- 2.- DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS).
- 3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH, MOLD FLASH TOLERANCE IS .005 (.013) MM PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 5.- DIMENSION b1 & c1 APPLY TO BASE METAL ONLY.
- 6.- CONTROLLED DIMENSION : INCHES.
- 7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E1,H1,D2 & E1
- 8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRRREGULARITIES ARE ALLOWED.
- 9.- OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.
- 10.- LEADS AND DRAIN ARE PLATED WITH 100% Sn

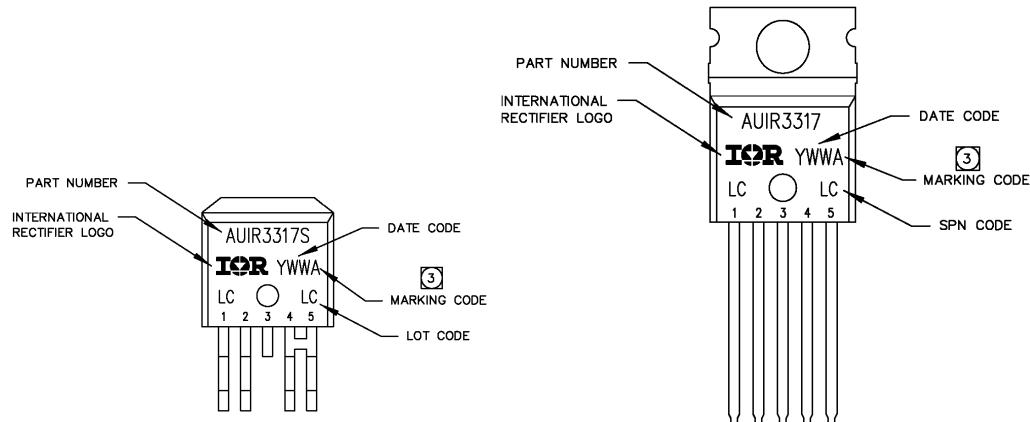
**Case Outline - D2PAK – 5 leads**



**Tape & Reel - D2PAK – 5 leads**



## Part Marking Information



## Ordering Information

Base Part Number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIR3317	TO220 – 5Leads	Tube	50	AUIR3317
		Tube	50	AUIR3317S
	D2Pak – 5Leads	Tape and reel left	800	AUIR3317STRL
		Tape and reel right	800	AUIR3317STRR

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### **Revision History**

<b>Revision</b>	<b>Date</b>	<b>Notes/Changes</b>
A		First release
B	10/06/2010	AU release
C	25/08/2011	Add test condition to lsdf page 4

# Mouser Electronics

Authorized Distributor

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