International Rectifier

Automotive grade

AUIR3320S

LOW EMI CURRENT SENSE HIGH SIDE SWITCH

Features

- Load current feedback
- Programmable over current shutdown
- Active clamp
- ESD protection
- Input referenced to Vcc
- Over temperature shutdown
- Switching time optimized for low EMI
- Reverse battery protection
- Lead-Free, Halogen-Free, RoHS compliant

Product Summary

Rds(on)	4 mΩ max.
Vcc op.	6 to 26V
Current Ratio	6000
Prog. Ishutdown	10 to 55A
Vclamp	40V

Description

The AUIR3320(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. Over current shutdown occurs when Vifb-Vin > 4.7V. The current shutdown threshold is adjusted by selecting the proper RIfb. 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.

Packages

D²Pak
Pin 4 and 5 fused
AUIR3320S

Ordering Information

Base Part Number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIR3320S	D2-Pak-5-Leads	Tube	50	AUIR3320S
		Tape and reel left	800	AUIR3320STRL
		Tape and reel right	800	AUIR3320STRR

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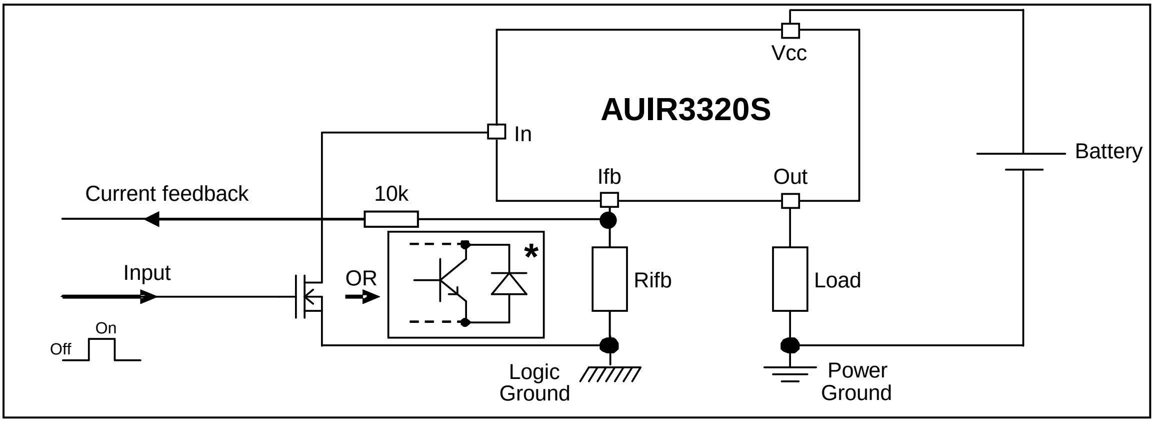
Typical Connection



*The diode between the collector and the emitor is necessary for the reverse battery protection

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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. (Tj=-40°..150°C, Vcc=6..26V Tambient=25°C unless otherwise specified).

Symbol	Parameter	Min.	Max.	Units
Vcc-Vin	Maximum Vcc voltage	-16	37	V
Vcc-Vin cont.	Maximum continuous Vcc voltage	-16	26	
Vcc-Vfb	Maximum Ifb voltage	-16	33	
Vcc-Vout	Maximum output voltage	-0.3	37	
Ids cont.	Maximum body diode continuous current Rth=60°C/W (1) Tambient=25°C	—	2.8	A
Ids pulsed	Maximum body diode pulsed current (1)	—	100	
Pd	Maximum power dissipation Rth=60°C/W Tambient=25°C	—	2	W
Tj max.	Maximum operating junction temperature	-40	150	°C
	Maximum storage temperature	-55	150	
Min Rfb	Minimum on the resistor on Ifb pin	0.3	—	kΩ
Ifb max.	Max. Ifb current	-50	50	mA

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
Rth1	Thermal resistance junction to ambient D²-Pak Std footprint	60	—	°C/W
Rth2	Thermal resistance junction to ambient D²-Pak 1" sqrt. footprint	40	—	
Rth3	Thermal resistance junction to case D²-Pak	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
Iout	Continuous output current			A
	Tambient=85°C, Rth=5°C/W, Tj=150°C		45	
	Tambient=85°C, Rth=40°C/W, Tj=150°C	—	16	
Rifb	Recommended Ifb resistor (2)(3)	0.3	3.5	kΩ
Pulse min.	Minimum turn-on pulse width	1	—	ms
Fmax.	Maximum operating frequency	—	200	Hz

(2) If Rifb is too low, the device can be damaged.
(3) If Rifb is too high, the device may not switch on.

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Protection Characteristics

Tj=-40°..150°C, Vcc=6..26V, Rifb=500 to 3.5kΩ. Typical value are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Vifb-Vin@Isd	Over-current shutdown threshold	3.8	4.7	5.9	V	
Tsd	Over temperature threshold	—	165	—	°C	See fig. 5
OV	Over voltage protection (not latched)	26	29	33	V	
Isdf	Fixed over current shutdown	55	75	105	A	Vifb<Vifb-Vin@Isd
Isd_560	Programmable over current shutdown	34	50	71		Rifb=560Ω
Treset	Time to reset protection	—	50	500	µs	See fig. 5
Min. pulse	Min. pulse width (no WAIT state)	—	900	2000		Tj=25°C
WAIT	WAIT function timer	0.4	1	2	ms	See fig. 4 and 5
Rds(on) rev.	Reverse battery On state resistance, Tj=25°C	—	4	6	mΩ	Vcc-Vin=-14V, Iout=30A
	Tj=125°C	—	6	9		

Static Electrical Characteristics

Tj=-40°..150°C, Vcc=6..26V (unless otherwise specified). Typical value are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Vcc op.	Operating Voltage range	6	—	26	V	
Icc off	Supply leakage current	—	1.5	5	µA	Vin=Vcc, Vcc-Vout=14V, Vcc-Vifb=14V, Tj=25°C
Iin, on	On state IN positive current	1.5	3	6	mA	Vcc-Vin=14V, Tj=25°C
Vih	High level Input threshold voltage (4)	—	5.4	6.3	V	
Vil	Low level Input threshold voltage (4)	4	4.9	5.8		
Vhyst	Input hysteresis Vih-Vil	0.2	0.4	1.5		
Iout	Drain to source leakage current	—	1.2	5	µA	Vin=Vcc, Vcc-Vifb=0V, Vcc-Vout=14V, Tj=25°C
Rds(on)	On state resistance (5) Tj=25°C	—	3.3	4	mΩ	Iout=30A, Vcc-Vin=14V
	On state resistance (5) Tj=25°C	—	3.5	5.5		Iout=17A, Vcc-Vin=6V
	On state resistance (5)(6) Tj=150°C	—	5.5	6.5		Iout=30A, Vcc-Vin=14V
V clamp1	Vcc to Vout clamp voltage 1	36	39	43	V	Iout=50mA
V clamp2	Vcc to Vout clamp voltage 2	—	40	—		Iout=30A, Tj=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

Vcc=14V, Resistive load=0.5Ω, Tj=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Tdon	Turn on delay time to 10% Vcc	70	170	300	µs	See figure 2
tr1	Rise time to Vcc-Vout=5V	30	100	210		
tr2	Rise time to Vcc-Vout=0.1Vcc	30	125	250		
Eon	Turn on energy	—	15	—	mJ	
Tdoff	Turn off delay time	30	70	140	µs	
Tf	Fall time to Vout=10% of Vcc	20	100	250		
Eoff	Turn off energy	—	9	—	mJ	

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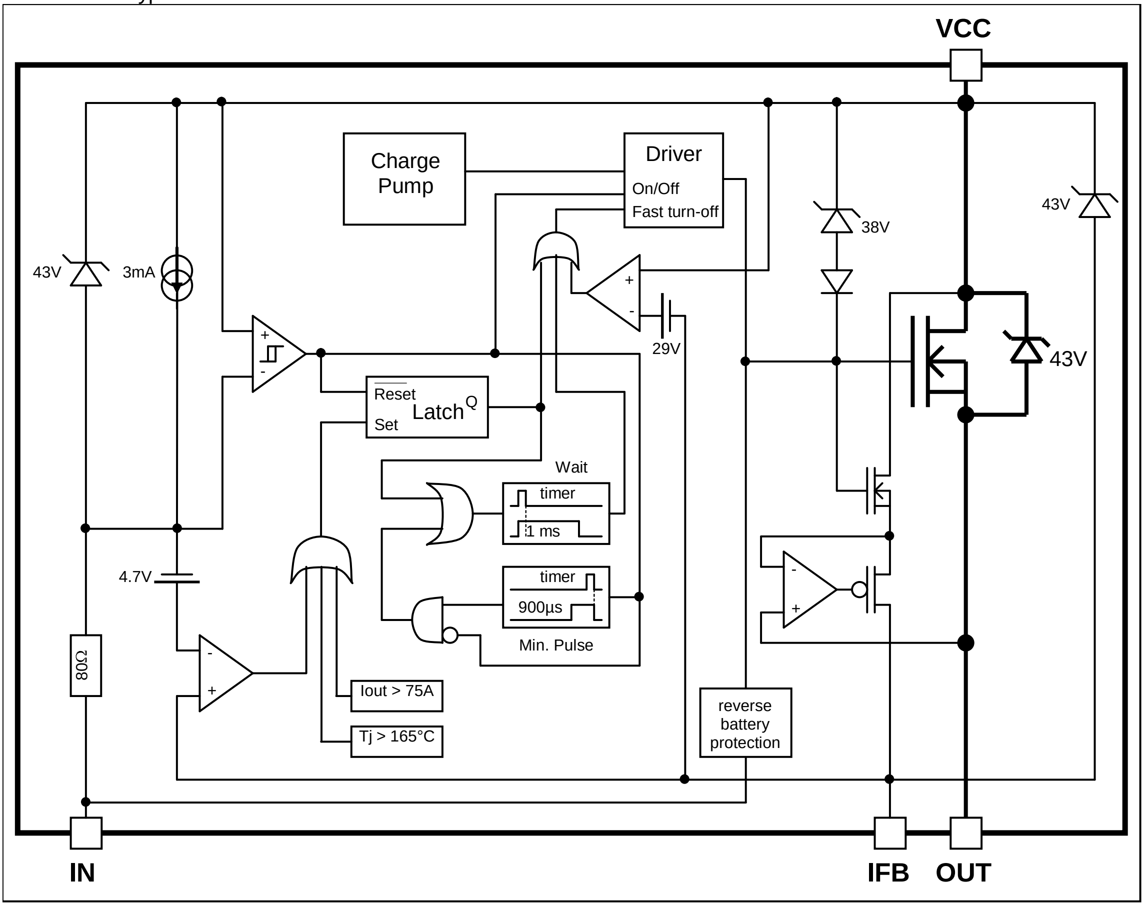
Current Sense Characteristics

Tj=-40°..150°C, Vcc=6..26V (unless otherwise specified). Typical value are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ratio	I Load/Iifb current ratio	4900	6000	6600	—	Rifb=500Ω, Iout=30A
Ratio_TC	I Load/Iifb variation over temperature (6)	-4	—	+4	%	Tj=-40°C to 150°C
Offset	Load current diagnostic offset	-0.4	0	+0.4	A	Iout=2A
Trst	Ifb response time (low signal)	—	1	—	µs	90% of the Iout step

Functional Block Diagram

All values are typical



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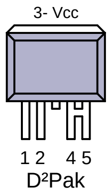
Lead Assignments

1- In
2- Ifb
3- Vcc (tab)
4- Out
5- Out



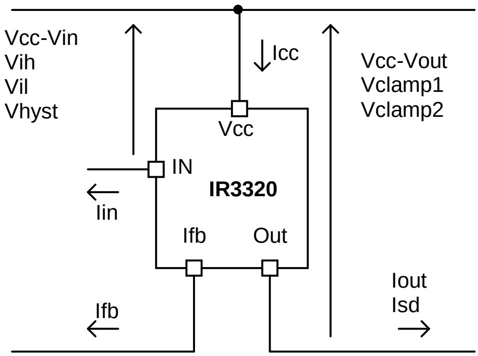


Figure 1 – Voltages and current definitions

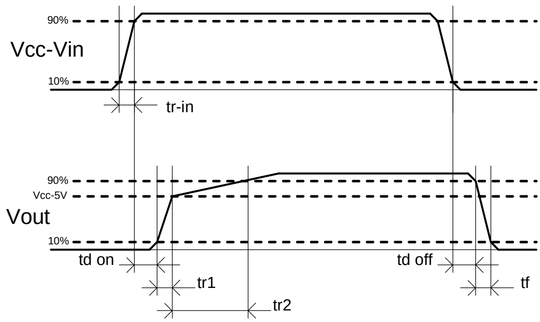


Figure 2 – Switching time definitions

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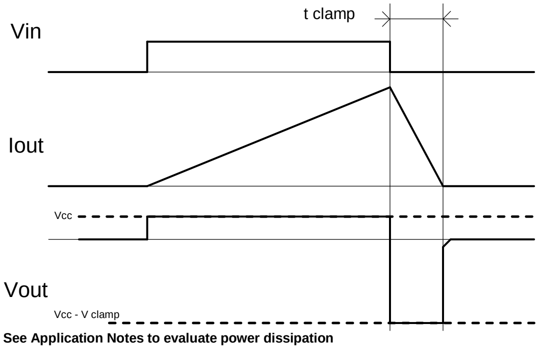

Figure 3 – Active clamp waveforms

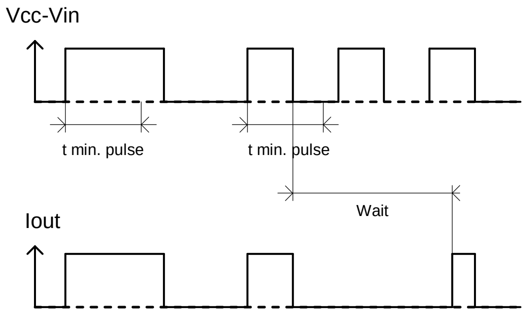

Figure 4 – Min. pulse and Wait function

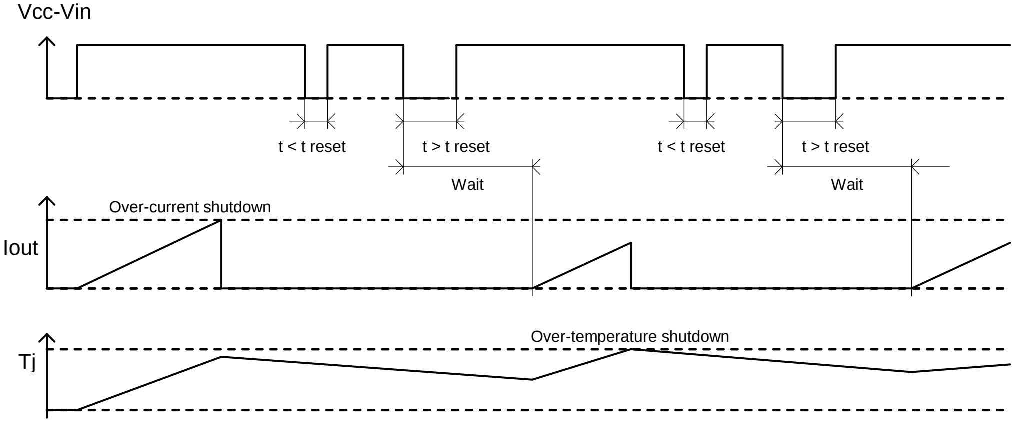

Figure 5 – Protection Timing Diagrams

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All curves are typical characteristics. Tj=25°C, Rifb=500ohm, Vcc=14V (unless otherwise specified).

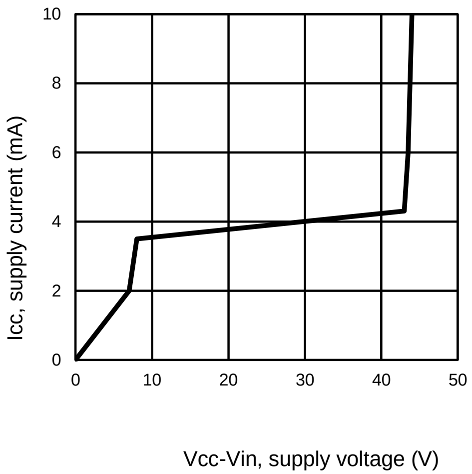

Figure 6 – Icc (mA) Vs Vcc-Vin (V)

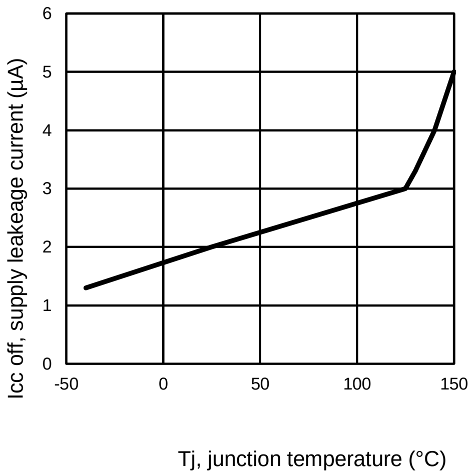

Figure 7 – Icc off (µA) Vs Tj (°C)

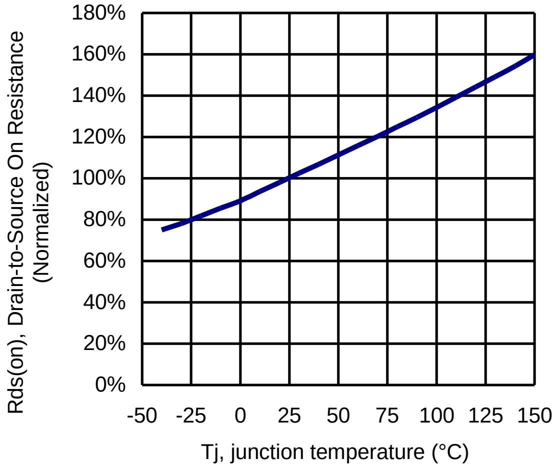

Figure 8 - Normalized Rds(on) (%) Vs Tj (°C)

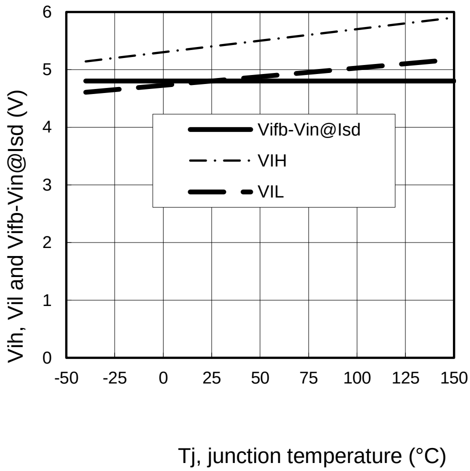

Figure 9 – Vih, Vil and Vifb-Vin@Isd (V) Vs Tj (°C)

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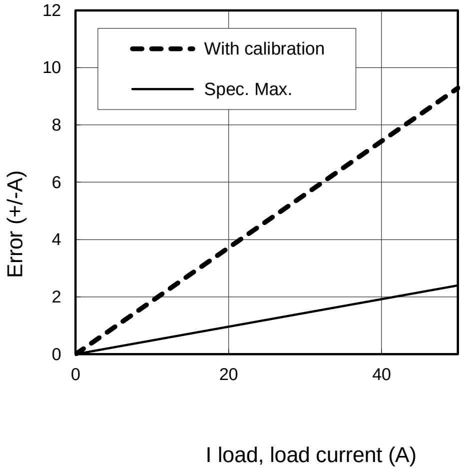

Figure 10 – Error (+/- A) Vs I load (A)

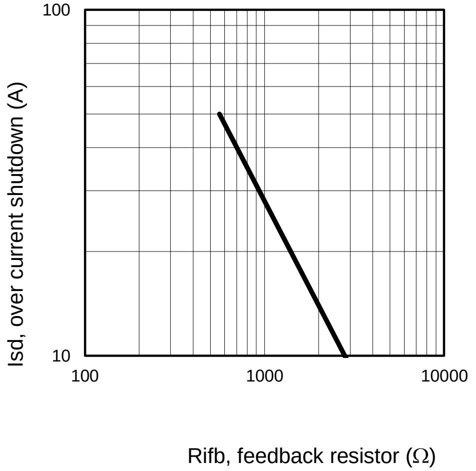

Figure 11 – Ids (A) Vs Rifb (Ω)

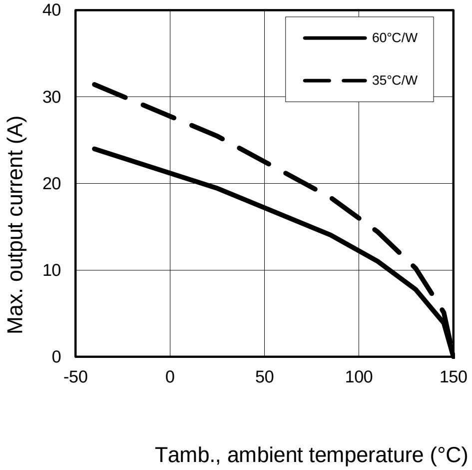

Figure 12 – Max. Iout (A) Vs Tamb. (°C)

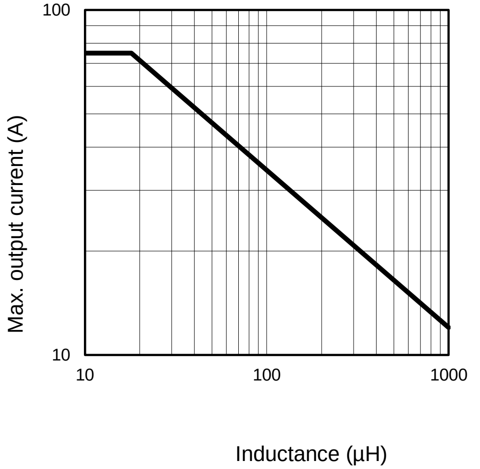

Figure 13 – Max. Iout (A) Vs inductance (µH)

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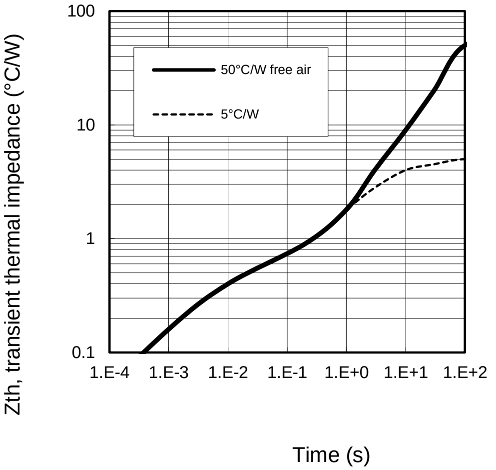

Figure 14 – Transient thermal impedance (°C/W) Vs time (s)

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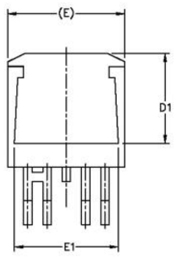
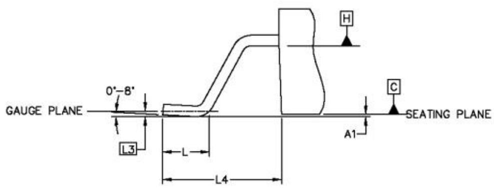
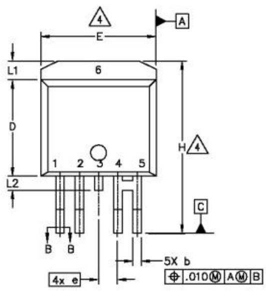
Case Outline - D2PAK - 5 Leads

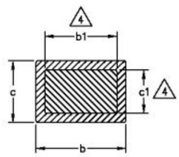


VIEW A–A



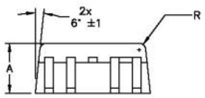
DETAIL "A"
ROTATED 90°
SCALE 8:1

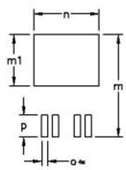




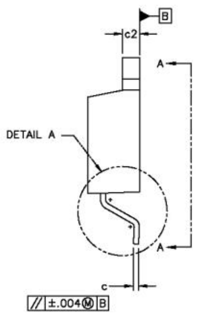
SECTION B–B
SCALE: NONE

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1		0.254		.010	
b	0.66	0.91	.026	.036	4
b1	0.66	0.81	.026	.032	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86		.270		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	1.70 BSC		.067 BSC		
H	14.73	15.49	.580	.609	
L	1.14	1.39	.045	.055	
L1		1.65		.065	
L2	1.27	1.78	.050	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	1.93		.076		
p	3.81		.150		
R	0.51	0.71	.020	.028	





FOOT PRINT
SCALE 2:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: MILLIMETERS
6. LEADS AND DRAIN ARE PLTED WITH 100% Sn

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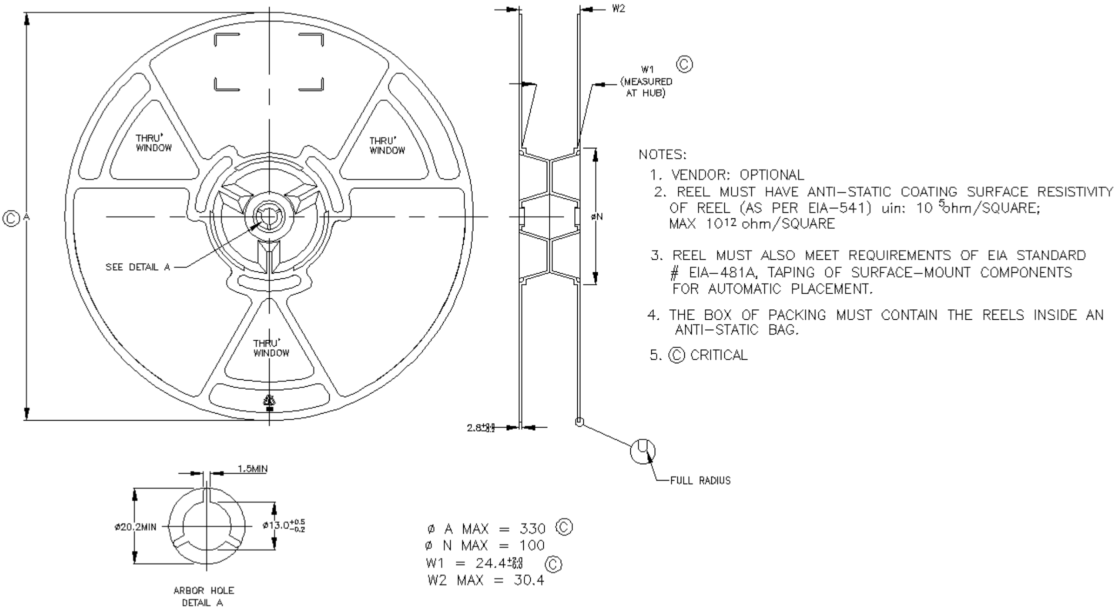
Tape & Reel - D2PAK – 5 leads



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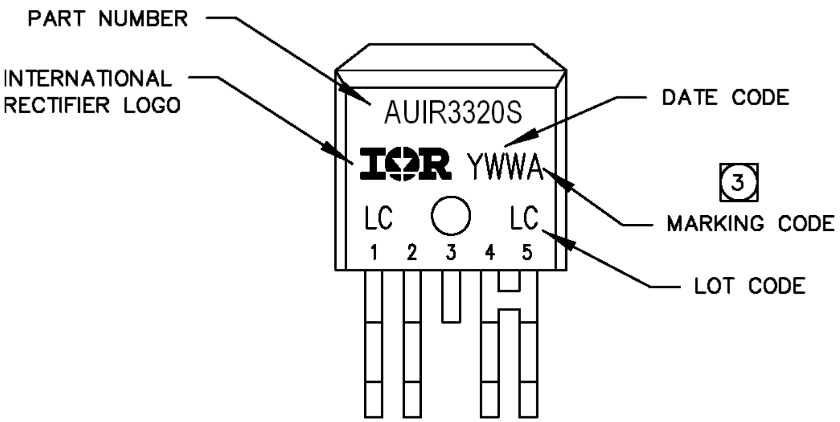
Part Marking Information



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		D2PAK-5L	MSL1, 260°C (per IPC/JEDEC J-STD-020)
ESD	Machine Model	Class M3 (400V) (per AEC-Q100-003)	
	Human Body Model	Class H2 (4,000 V) (per AEC-Q100-002)	
	Charged Device Model	Class C4 (1000 V) (per AEC-Q100-011)	
IC Latch-Up Test		Class II, Level A (per AEC-Q100-004)	
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.

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For technical support, please contact IR's Technical Assistance Center
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Tel: (310) 252-7105

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Revision History

Revision	Date	Notes/Changes
A7	June, 4th 2012	Initial release
A8	August, 13rd 2012	-Update switching limits -Update Iratio max limit
A9	August, 30th 2012	Update Tj max.

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AMEYA360
Components Supply Platform

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