International TOR Rectifier

Automotive Grade AUIRS21811S

HIGH AND LOW SIDE DRIVER

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 10V to 20V
- Undervoltage lockout for both channels
- 3.3V and 5V input logic compatible
- Matched propagation delay for both channels
- Lower di/dt gate driver for better noise immunity
- Output source/sink current capability of 1.9A/2.3A typical
- · Leadfree, RoHS compliant
- Automotive qualified*

Typical Applications

- Piezo injection
- Electric Power Steering
- Fan and compressor
- Starter/alternator

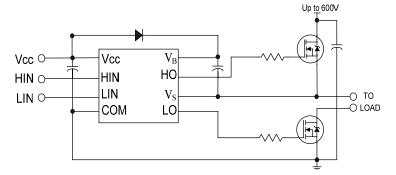
Product Summary

	•
Topology	High and Low Side Driver
V _{OFFSET}	≤ 600V
V _{OUT}	10V – 20V
I _{o+} & I _{o-} (typical)	1.9A & 2.3A
t _{on} & t _{off} (typical)	135ns

Package Options



Typical Connection Diagram



(Refer to Lead Assignments for correct pin configuration). This/These diagram(s) show electrical connections only. Please refer to our Application Notes and Design Tips for proper circuit board layout.

AUIRS21811S

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





Table of Contents	Page
Typical Connection Diagram	1
Description/Feature Comparison	3
Qualification Information	4
Absolute Maximum Ratings	5
Recommended Operating Conditions	5
Dynamic Electrical Characteristics	6
Static Electrical Characteristics	6
Functional Block Diagram	7
Input/Output Pin Equivalent Circuit Diagram	8
Lead Definitions	9
Lead Assignments	9
Application Information and Additional Details	10
Parameter Temperature Trends	11-13
Package Details	14
Tape and Reel Details	15
Part Marking Information	16
Ordering Information	17
Important Notice	18



Description

The AUIRS21811S is a high voltage, high speed power MOSFET and IGBT driver 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 3.3 V logic. The output drivers feature a high pulse current buffer stage. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high-side configuration which operates up to 600V.

Feature Comparison: AUIRS21811/AUIRS2181/AUIRS2183/AUIRS2184

Part	Input Logic	Cross- Conduction Prevention logic	Dead-Time	Ground Pins	Ton/Toff (typical)
21811	HIN/LIN	No	none	COM	135/135 ns
2181				COM	160/200 ns
21814	HIN/LIN	No	none	V _{SS} /COM	100/200 118
2183			Internal 500ns	COM	180/220 ns
21834	HIN/LIN	Yes	Programmable 0.4 – 5 us	V _{SS} /COM	100/220 118
2184			Internal 500ns	COM	600/330 pg
21844	IN/SD	Yes	Programmable 0.4 – 5 us	V _{SS} /COM	600/230 ns





Qualification Information[†]

Qualification Leve	I	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 Sensitivi	ty Level	MSL3 ^{†††} 260°C (per IPC/JEDEC J-STD-020)				
	Machine Model	Class M3 (Pass +/-250V) (per AEC-Q100-003)				
ESD Human Body Model		Class H2 (Pass +/-2500V) (per AEC-Q100-002)				
	Charged Device Model	Class C5 (Pass +/-1250V) (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 COM 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.

Symbol	Definition	Min	Max	Units
V _B	High side floating absolute voltage	-0.3	620	
Vs	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
V_{CC}	Low side and logic fixed supply voltage	-0.3	20	V
V_{LO}	Low side output voltage	-0.3	$V_{CC} + 0.3$	
V_{IN}	Logic input voltage (HIN & LIN)	COM - 0.3	$V_{CC} + 0.3$	
dV _S /dt	Allowable offset supply voltage transient	_	50	V/ns
P_{D}	Package power dissipation @ TA ≤ 25°C	_	0.625	W
Rth_JA	Thermal resistance, junction to ambient		200	°C/W
TJ	Junction temperature	_	150	
Ts	Storage temperature	-50	150	°C
TL	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. $V_{\rm S}$ and offset rating are 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_S	High side floating supply offset voltage	†	600	
V_{HO}	High side floating output voltage	V_S	V_B	V
V_{CC}	Low side and logic fixed supply voltage	10	20	V
V_{LO}	Low side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN & LIN)	COM	V_{CC}	
T _A	Ambient temperature	-40	125	°C

[†] Logic operational for V_S of -5V to +600V. Logic state held for V_S of -5V to $-V_{BS}$. (Please refer to Figure 4 for more details).

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Dynamic Electrical Characteristics

Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C \leq Tj \leq 125°C with bias conditions of $V_{CC} = V_{BS} = 15V$, $V_{S} = COM$, $C_{L} = 1000pF$.

Symbol	Definition	Min	Тур	Max	Units	Test Conditions
t _{on}	Turn-on propagation delay	_	135	230		$V_S = 0V$
t _{off}	Turn-off propagation delay	_	135	230		$V_S = 0V \text{ or } 600V$
MT	Delay matching, HO & LO turn-on/off	_	_	35	ns	
t _r	Turn-on rise time	_	_	60		V _S = 0V
t _f	Turn-off fall time	_		35		$V_S = 0V$

Static Electrical Characteristics

Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C \leq Tj \leq 125°C with bias conditions of V_{CC} = V_{BS} = 15V and V_{S} = COM. The V_{IN} and I_{IN} parameters are referenced to V_{SS} /COM and are applicable to the respective input leads: HIN and LIN. The V_{O} and I_{O} parameters are referenced to V_{S} /COM and are applicable to the respective output leads: HO and LO.

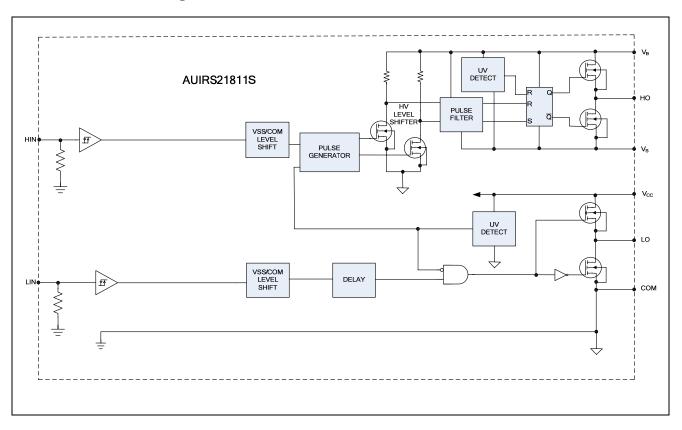
Symbol	Definition	Min	Тур	Max	Units	Test Conditions
V _{IH}	Logic "1" input voltage	2.5	_	_		V _{CC} = 10V to 20V
V_{IL}	Logic "0" input voltage	_	_	8.0	V	V _{CC} = 10V to 20V
V_{OH}	High level output voltage, V_{BIAS} - V_{O}	_	_	1.4	V	$I_O = 0mA$
V_{OL}	Low level output voltage, Vo	_	_	0.2		I _O = 20mA
I_{LK}	Offset supply leakage current	_	_	50		$V_{B} = V_{S} = 600V$
I_{QBS}	Quiescent V _{BS} supply current	25	80	200		V _{IN} = 0V or 5V
I _{QCC}	Quiescent V _{CC} supply current	55	130	260	μΑ	VIN - 0 V 01 3 V
I _{IN+}	Logic "1" input bias current		25	60		$V_{IN} = 5V$
I _{IN-}	Logic "0" input bias current		_	1.0		V _{IN} = 0V
$V_{\text{CCUV+}} \ V_{\text{BSUV+}}$	V _{CC} and V _{BS} supply undervoltage positive going threshold	8.0	8.9	9.8		
$V_{\text{CCUV-}} \ V_{\text{BSUV-}}$	V_{CC} and V_{BS} supply undervoltage negative going threshold	7.4	8.2	9.0	V	
V_{CCUVH} V_{BSUVH}	V_{CC} and V_{BS} supply undervoltage Hysteresis	0.3	0.7	_		
I _{O25+} ^(†)	Output high short circuit pulsed current	1.4	1.9			$V_O = 0V$, $PW \le 10us$, $T_J = 25^{\circ}C$
I _{O25-} ^(†)	Output low short circuit pulsed current	1.8	2.3		А	$V_O = 15V$, $PW \le 10us$, $T_J = 25^{\circ}C$
$I_{O+}^{(\dagger)(\dagger\dagger)}$	Output high short circuit pulsed current	1.2	_	_		$V_O = 0V$, PW $\leq 10us$
I _{O-} ^(†) (††)	Output low short circuit pulsed current	1.5	_	_		$V_O = 15V$, PW $\leq 10us$

^(†) Guaranteed by design

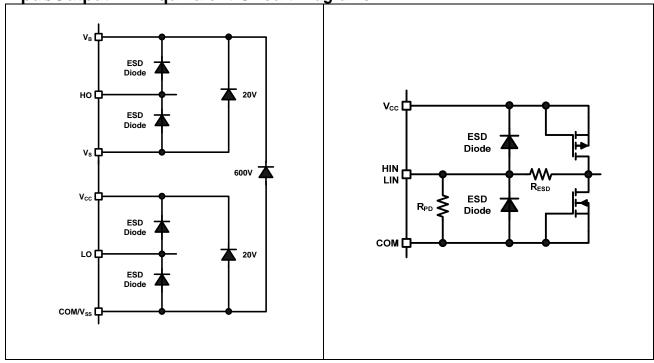
^(††) I_{O+} and I_{O-} decrease with rising temperature



Functional Block Diagrams



Input/Output Pin Equivalent Circuit Diagrams



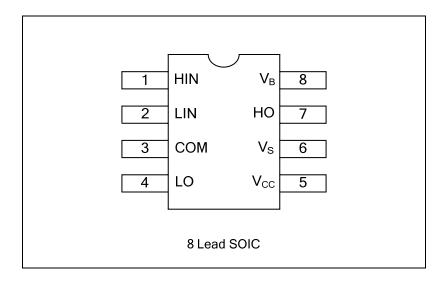
8



Lead Definitions: AUIRS21811S

Pin#	Symbol	Description			
1	HIN	Logic input for high-side driver output (HO), in phase			
2	LIN	Logic input for low-side driver output (LO), in phase			
3	COM	Low-side return			
4	LO	Low-side gate drive output			
5	V_{CC}	w-side and logic fixed supply			
6	Vs	High-side floating supply return			
7	НО	High-side gate drive output			
8	V_B	High-side floating supply			

Lead Assignments





Application Information and Additional Details

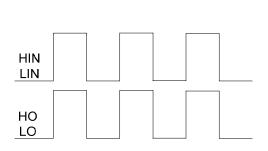


Figure 1. Input/Output Timing Diagram

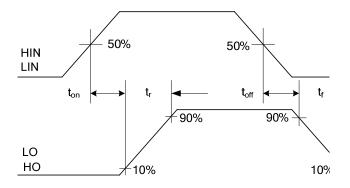


Figure 2. Switching Time Waveform Definitions

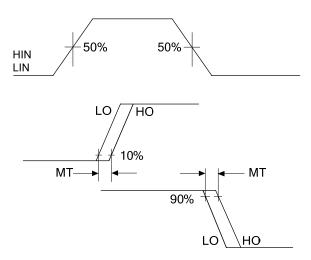


Figure 3. Delay Matching Waveform Definitions



Parameter Temperature Trends

Figures 4-16 provide information on the experimental performance of the AUIRS21811S 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 °C, 25 °C, and 125 °C) in order to generate the curves. Each line in the graphs consist 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 curve were determined by calculating the averaged experimental value of the parameter (for a given temperature).

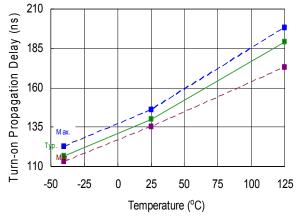


Figure 4. Turn-On Propagation Delay vs. Temperature

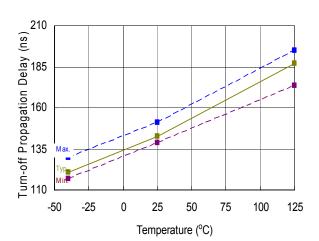


Figure 5. Turn-Off Propagation Delay vs. Temperature

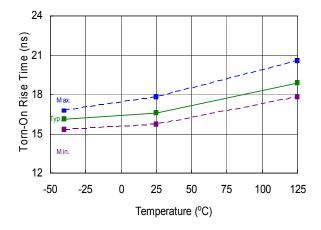


Figure 6. Turn-On Rise Time vs. Temperature

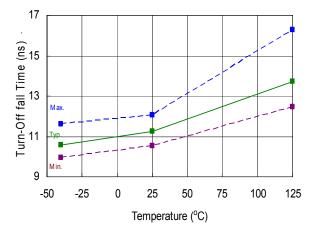


Figure 7. Turn-Off Fall Time vs. Temperature

-50

-25

0

AUIRS21811S

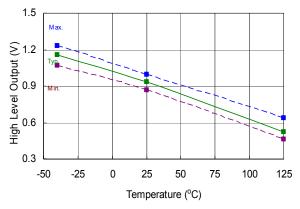


Figure 8. High Level Output Voltage vs. Temperature (Io = 0 mA)

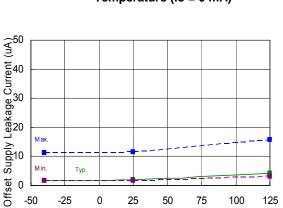


Figure 10. Offset Supply Leakage Current vs. Temperature

Temperature (°C)

50

75

125

100

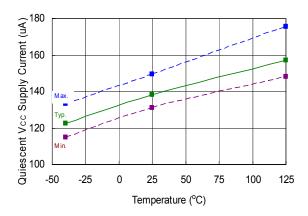


Figure 12. V_{CC} Supply Current vs. **Temperature**

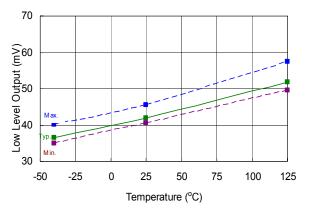


Figure 9. Low Level Output vs. **Temperature**

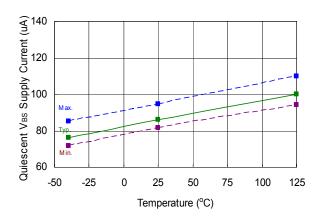


Figure 11. V_{BS} Supply Current vs. Temperature

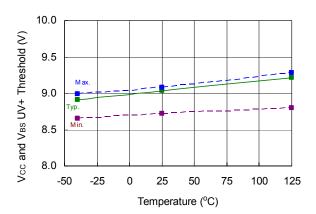


Figure 13. V_{CC} Undervoltage Threshold (+) vs. Temperature

AUIRS21811S

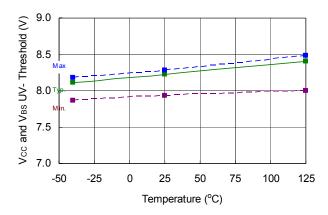


Figure 14. V_{CC} Undervoltage Threshold (-) vs. Temperature

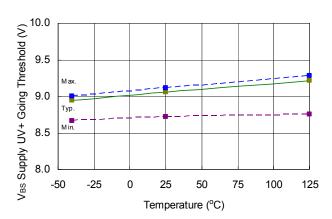


Figure 15. V_{BS} Undervoltage Threshold (+) vs. Temperature

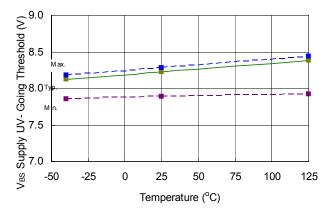
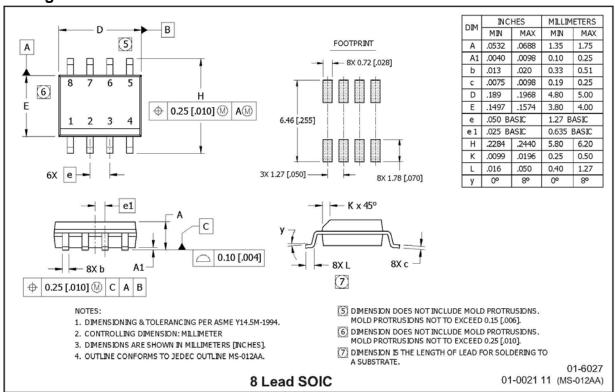


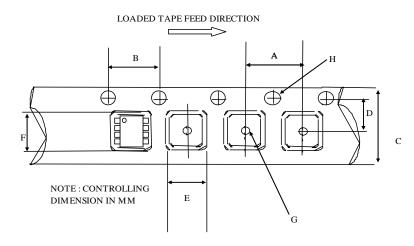
Figure 16. V_{BS} Undervoltage Threshold (-) vs. Temperature

AUIRS21811S

Package Details: SOIC 8

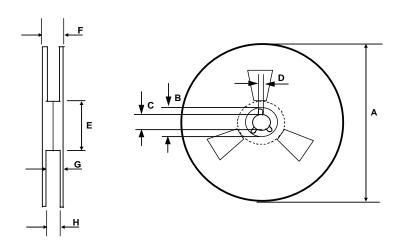


Tape and Reel Details: SOIC8



CARRIER TAPE DIMENSION FOR 8SOICN

	Me	etric	lmp	erial	
Code	Min	Max	Min	Max	
Α	7.90	8.10	0.311	0.318	
В	3.90	4.10	0.153	0.161	
С	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	
Н	1.50	1.60	0.059	0.062	



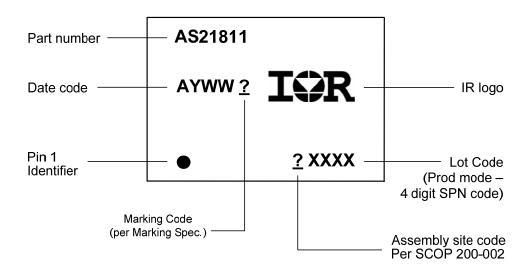
REEL DIMENSIONS FOR 8SOICN

	Me	etric	lmp	erial
Code	Min	Max	Min	Max
Α	329.60	330.25	12.976	13.001
В	20.95	21.45	0.824	0.844
С	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
Н	12.40	14.40	0.488	0.566



Part Marking Information

SOIC8:







Order Information

Dage Bort Namelson	Daalaana Tama	Standard F	Pack	Commission Don't Number
Base Part Number	Package Type	Form	Quantity	Complete Part Number
ALUDOOAAA	SOIC8N	Tube/Bulk	95	AUIRS21811S
AUIRS21811	SOICON	Tape and Reel	2500	AUIRS21811STR

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WORLD HEADQUARTERS:

233 Kansas St., El Segundo, California 90245 Tel: (310) 252-7105 **Revision History**

Date	hange b	Comment
8/6/08	CIC	First draft: all changes wrt AUIRS2181(4)(S) datasheet
		Updated all references to IC name
		Changed references of ton/toff to reflect requested 120ns/120ns spec
		Updated expected I _{QBS} and I _{QCC} specs
9/8/08	CIC	Changed product summary topology to "Half-Bridge"
		Changed product summary I _{O+} & I _{O-} from typ values to min values
		Removed reference to deadtime in the product summary
		Removed typical applications section
		Removed references to other parts in feature comparison section
		Changed V _{IN} from 2.7V min to 2.5V min
		Changed V _{OH} from 1.2V max to 1.4V max
		Changed V _{OL} from 0.1V max to 0.2V max
		Updated functional block diagrams
		Updated lead definitions and lead assignments, added device label for lead assignment
		Added typical application diagram section Added simplified block diagram section
		Added simplified block diagram section Added input/output pin equivalent diagrams
		Added in application info and additional details section
		Added in parameter temperature trend section
10/31/08	CIC	Changed VB max to 620V (align with rest of 20V clamp drivers spec)
2/24/09	CIC	Updated the qual table (showing "TBD" for ESD/LU ratings)
2/26/09	CIC	Removed IRS218114
2/20/03	CIC	Removed Simplified Bock Diagram
	CIC	Removed Typical Application Diagram
3/10/09		Removed Parameter Temp Trend Section
		Updated page number references
3/23/09	CIC	Changed Io+/- units to A from mA
5/20/09	CIC	Added ESD and LU ratings
5, 2 5, 0 5	APBU	Front page: "Logic and power ground +/- 5V offset" sentence erased (only one
	, 50	ground exists).
6/9/09		Page 3: "designed for minimum driver cross-conduction" sentence erased.
		Page 5, 6, 8: Vss related sentences erased or modified (Vss does not exist).
	CIC	Removed min spec on lo+/- parameters
7/17/09		Changed typ ton/toff to 135ns
9/08/09	APBU	Added Typical Applications on front page, Extended Feature comparison table,
		added junction temperature range in Dynamic and Static electrical characteristic
		tables.
9/14/09	APBU	Added tri-temp plots, added ESD passing threshold voltage, corrected I _{O+/-} & T _{on/off}
		typical value on front page to be consistent with data in table
9/15/09	APBU	Corrected list of Typical Applications on front page
9/16/09	APBU	Dyn el. Char table: Max turn on and off prop. Delay changed from 180 ns to 210 ns,
		removed temperature range from Statics and Dynamic Electrical Characteristic
		tables
9/16/09	CIC	Change the year to 2009 in header
9/10/09		Separated Marking info and order info in two pages
9/17/09	CIC	Fixed ESD passing thresholds
10/6/09	APBU	LU rating to "tbd", added SOA page, updated marking, updated table of content,
		added guaranteed by design note for IO+/- parameters, removed typ. t _r /t _f ,
10/08/09	APBU	Removed SOA page and updated table of content.
10/09/09	APBU	Changed Max turn on/off to 230ns to allow for tri-temp variations
	1	·

AUIRS21811S

1/6/2010	APBU	Removed Latch Up Rating from Qual Info page; updated ton/toff typical in comparison table for AUIRS2181(4)S to 160/200ns & for AUIRS2184(4)S to 600/230ns; modified disclaimer under Absolute Max. Rating; added Important Notice
2/24/10	APBU	Page 6: Added I _{O25+} and I _{O25-} specification and the note
05/07/10	APBU	Corrected topology to High and Low Side driver on front page.
28 July 2010	APBU	Clamp voltage changed from 25V to 20V in input output pin equivalent circuit diagram.

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