

#### **AUTOMOTIVE GRADE**

# AUIRF3315S

#### **Features**

- Advanced Planar Technology
- Low On-Resistance
- Dynamic dV/dT Rating
- 175°C Operating Temperature
- Fast Switching

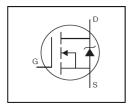
Description

- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Timax

Specifically designed for Automotive applications, this cellular design of HEXFET® Power MOSFETs utilizes the latest processing techniques to

achieve low on-resistance per silicon area. This benefit combined with the

- Lead-Free, RoHS Compliant
- Automotive Qualified \*



HEXFE1	<sup>®</sup> Power MOSFET
V <sub>DSS</sub>	150V
R <sub>DS(on)</sub> max.	82mΩ
I <sub>D</sub>	21A



G	D	S
Gate	Drain	Source

# fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in Automotive and a wide variety of other applications.

Base nort number	Dookogo Typo	Standard Pack		Orderable Part Number
Base part number	Package Type	Form	Quantity	Orderable Part Number
AUIRF3315S	D <sup>2</sup> -Pak	Tube	50	AUIRF3315S
AUIRESS 135	D-Pak	Tape and Reel Left	800	AUIRF3315STRL

### **Absolute Maximum Ratings**

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 specifications 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 (TA) is 25°C, unless otherwise specified.

Symbol	Parameter	Max.	Units	
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	21		
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	15	Α	
I <sub>DM</sub>	Pulsed Drain Current ①	84		
P <sub>D</sub> @T <sub>A</sub> = 25°C	Maximum Power Dissipation	3.8	307	
P <sub>D</sub> @T <sub>C</sub> = 25°C	Maximum Power Dissipation	94	W	
	Linear Derating Factor	0.63	W/°C	
$V_{GS}$	Gate-to-Source Voltage	± 20	V	
E <sub>AS</sub>	Single Pulse Avalanche Energy (Thermally Limited) ②	350	mJ	
I <sub>AR</sub>	Avalanche Current ①	12	А	
E <sub>AR</sub>	Repetitive Avalanche Energy ®	9.4	mJ	
dv/dt	Peak Diode Recovery ③	2.5	V/ns	
T <sub>J</sub>	Operating Junction and	-55 to + 175		
T <sub>STG</sub>	Storage Temperature Range		°C	
	Soldering Temperature, for 10 seconds (1.6mm from case)	300		

## **Thermal Resistance**

Symbol	Parameter	Тур.	Max.	Units
$R_{ heta JC}$	Junction-to-Case®		1.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient ( PCB Mount, steady state) ©		40	C/VV

HEXFET® is a registered trademark of Infineon.

<sup>\*</sup>Qualification standards can be found at www.infineon.com



# Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Тур.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	150			V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_{J}$	Breakdown Voltage Temp. Coefficient		0.187		V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance			82	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$
1	Drain to Source Leakage Current			25		$V_{DS} = 150V, V_{GS} = 0V$
I <sub>DSS</sub>	Drain-to-Source Leakage Current			250	μA	$V_{DS} = 120V, V_{GS} = 0V, T_{J} = 125^{\circ}C$
I <sub>GSS</sub>	Gate-to-Source Forward Leakage			100	n ^	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage			-100	nA	$V_{GS} = -20V$

# Dynamic Electrical Characteristics @ $T_J = 25$ °C (unless otherwise specified)

	T / / O / O		0.5		104
$Q_g$	Total Gate Charge	 	95		I <sub>D</sub> = 12A
$Q_{gs}$	Gate-to-Source Charge	 	11	nC	V <sub>DS</sub> = 120V
$Q_gd$	Gate-to-Drain Charge	 	47		V <sub>GS</sub> = 10V4
$t_{d(on)}$	Turn-On Delay Time	 9.6			$V_{DD} = 75V$
$t_r$	Rise Time	 32		no	I <sub>D</sub> = 12A
$t_{d(off)}$	Turn-Off Delay Time	 49		ns	$R_G = 5.1\Omega$ ,
$t_f$	Fall Time	 38			$R_D = 5.9\Omega$ , $\textcircled{4}$
$L_D$	Internal Drain Inductance	 4.5			Between lead, 6mm (0.25in.)
Ls	Internal Source Inductance	 7.5			from package and center of die contact
$C_{iss}$	Input Capacitance	 1300			$V_{GS} = 0V$
Coss	Output Capacitance	 300		рF	$V_{DS} = 25V$
C <sub>rss</sub>	Reverse Transfer Capacitance	 160			f = 1.0MHz, See Fig.5

## **Diode Characteristics**

	Parameter	Min.	Тур.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)			21		MOSFET symbol showing the
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①			84		integral reverse p-n junction diode.
$V_{SD}$	Diode Forward Voltage			1.3	V	$T_J = 25^{\circ}C, I_S = 12A, V_{GS} = 0V $ ④
t <sub>rr</sub>	Reverse Recovery Time		174	260	ns	$T_J = 25^{\circ}C$ , $I_F = 12A$
$Q_{rr}$	Reverse Recovery Charge		1.2	1.7	μC	di/dt = 100A/µs ④
t <sub>on</sub>	Forward Turn-On Time	Intrinsi	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )			

#### Notes:

- $\, \oplus \,$  Repetitive rating; pulse width limited by max. junction temperature. (See fig.11)
- $\odot$  Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 4.9mH, R<sub>G</sub> = 25 $\Omega$ , I<sub>AS</sub> = 12A. (See fig.12)
- $\label{eq:loss_def} \text{ } \text{ } I_{SD} \leq 12A, \text{ } \text{di/dt} \leq 140A/\mu\text{s}, \text{ } V_{DD} \leq V_{(BR)DSS}, \text{ } T_J \leq 175^{\circ}\text{C}.$
- 4 Pulse width  $\leq 300 \mu s$ ; duty cycle  $\leq 2\%$ .
- S When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994

©  $R_{\theta}$  is measured at  $T_J$  of approximately 90°C

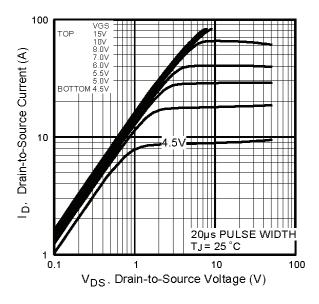


Fig. 1 Typical Output Characteristics

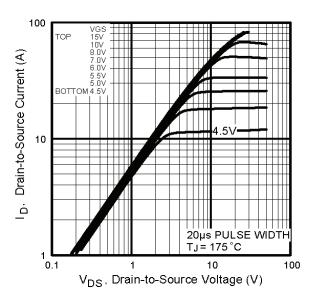


Fig. 2 Typical Output Characteristics

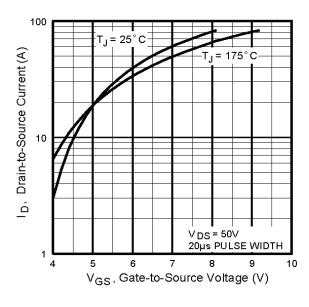
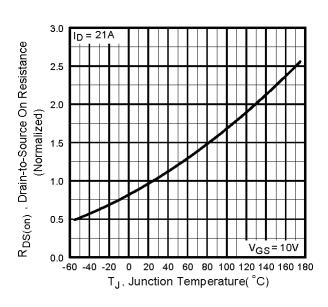


Fig. 3 Typical Transfer Characteristics



**Fig. 4** Normalized On-Resistance vs. Temperature

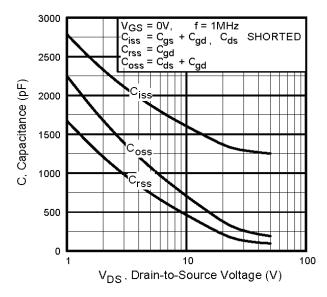


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

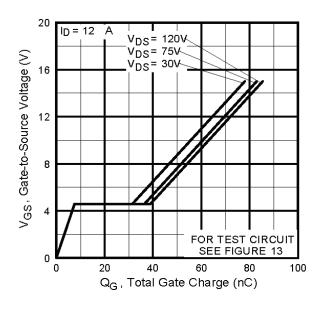
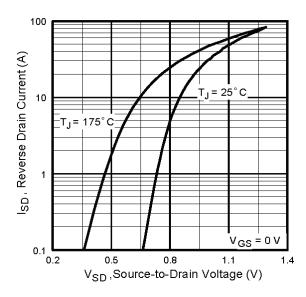


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage



**Fig. 7** Typical Source-to-Drain Diode Forward Voltage

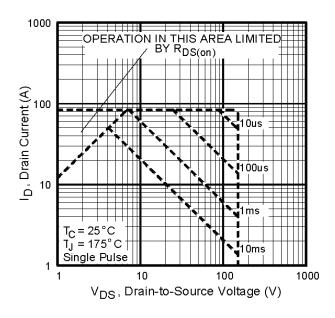
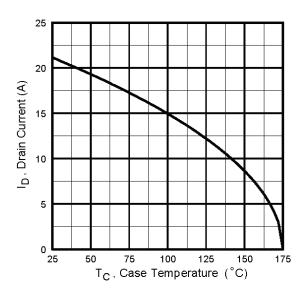


Fig 8. Maximum Safe Operating Area





**Fig 9.** Maximum Drain Current vs. Case Temperature

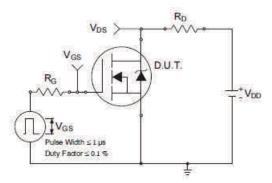


Fig 10a. Switching Time Test Circuit

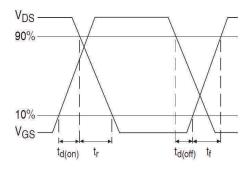


Fig 10b. Switching Time Waveforms

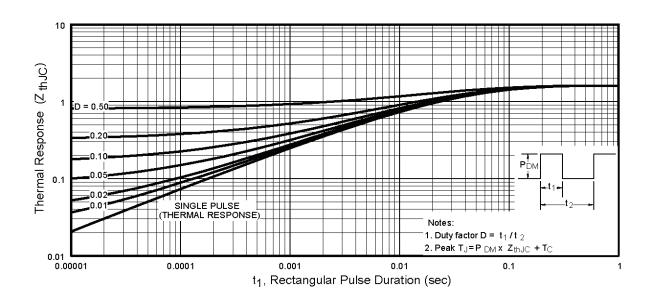


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



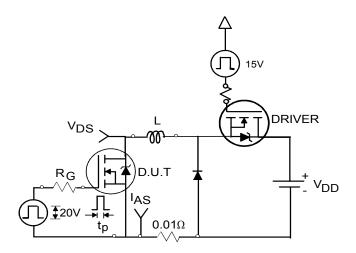


Fig 12a. Unclamped Inductive Test Circuit

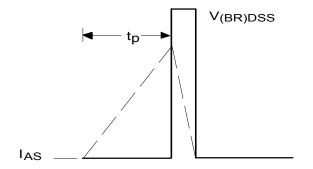


Fig 12b. Unclamped Inductive Waveforms

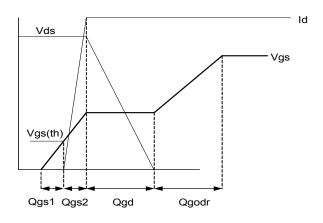


Fig 13a. Gate Charge Waveform

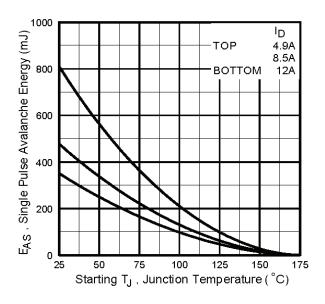


Fig 12c. Maximum Avalanche Energy vs. Drain Current

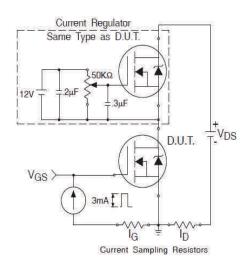
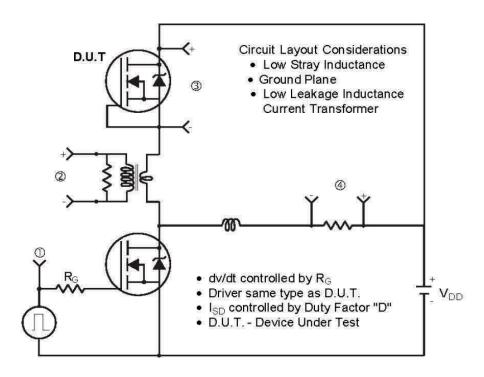


Fig 13b. Gate Charge Test Circuit



# Peak Diode Recovery dv/dt Test Circuit



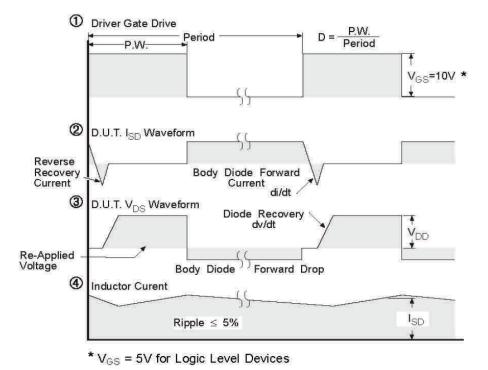
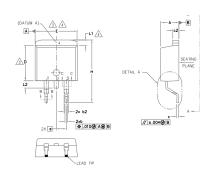
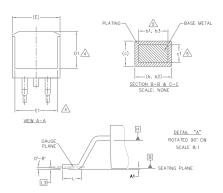


Fig 14. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs



## D<sup>2</sup>Pak (TO-263AB) Package Outline (Dimensions are shown in millimeters (inches))





NIO	TI	-		
NO	ш	-	J	

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.

4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.

5. DIMENSION 61, 63 AND c1 APPLY TO BASE METAL ONLY.

- 6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 7. CONTROLLING DIMENSION: INCH.
- 8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

S	DIMENSIONS					
M B	MILLIM	HES	O T E S			
0 L	MIN.	MAX.	MIN.	MAX.	S	
А	4.06	4.83	.160	.190		
A1	0.00	0.254	.000	.010		
Ь	0.51	0.99	.020	.039		
ь1	0.51	0.89	.020	.035	5	
b2	1.14	1.78	.045	.070		
ь3	1.14	1.73	.045	.068	5	
С	0.38	0.74	.015	.029		
с1	0.38	0.58	.015	.023	5	
c2	1.14	1.65	.045	.065		
D	8.38	9.65	.330	.380	3	
D1	6.86	_	.270	_	4	
E	9.65	10.67	.380	.420	3,4	
E1	6.22	_	.245	_	4	
е	2.54	BSC	.100	.100 BSC		
Н	14.61	15.88	.575	.625		
L	1.78	2.79	.070	.110		
L1	_	1.68	_	.066	4	
L2	_	1.78	_	.070		
L3	0.25	BSC	.010	BSC		

#### LEAD ASSIGNMENTS

#### DIODES

1.— ANODE (TWO DIE) / OPEN (ONE DIE) 2, 4.— CATHODE 3.— ANODE

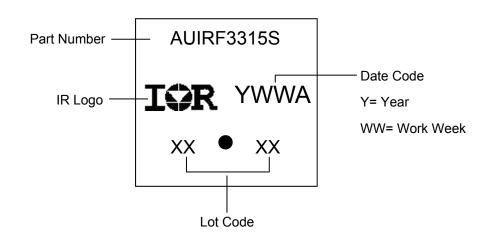
#### HEXFET

IGBTs, CoPACK

1.- GATE 2, 4.- DRAIN 3.- SOURCE

1.- GATE 2, 4.- COLLECTOR 3.- EMITTER

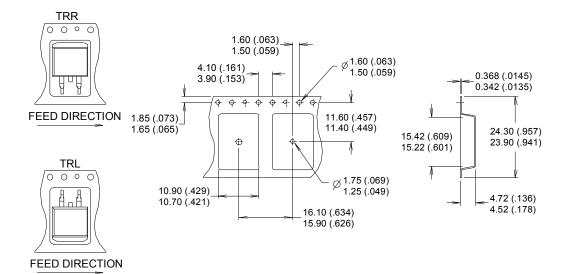
# D<sup>2</sup>Pak (TO-263AB) Part Marking Information

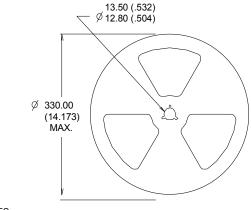


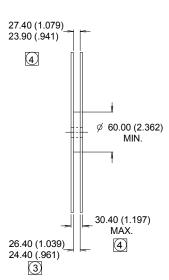
Note: For the most current drawing please refer to IR website at <a href="http://www.irf.com/package/">http://www.irf.com/package/</a>



## D<sup>2</sup>Pak (TO-263AB) Tape & Reel Information (Dimensions are shown in millimeters (inches))







#### NOTES:

- 1. COMFORMS TO EIA-418.
- CONTROLLING DIMENSION: MILLIMETER.
- 3 DIMENSION MEASURED @ HUB.
- INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/



#### **Qualification Information**

<u> </u>	don inioniadon							
		Automotive						
			(per AEC-Q101)					
Qualification Level Comments: This part number(s) passed Automotive qualification.			is part number(s) passed Automotive qualification. Infineon's					
		Industrial and Consumer qualification level is granted by extension of the high						
		Automotive level.						
Moisture	Sensitivity Level	D <sup>2</sup> -Pak MSL1						
			Class M4 (+/- 600V) <sup>†</sup>					
	Machine Model	AEC-Q101-002						
FOD	Liveran Dady Madal	Class H1C (+/- 2000V) <sup>†</sup>						
ESD	ESD Human Body Model		AEC-Q101-001					
Charried Davies Madel		Class C5 (+/- 2000V) <sup>†</sup>						
	Charged Device Model	AEC-Q101-005						
RoHS Co	mpliant	Yes						
		1						

<sup>†</sup> Highest passing voltage.

#### **Revision History**

Date	Comments		
11/13/2015	<ul> <li>Updated datasheet with corporate template</li> <li>Corrected ordering table on page 1.</li> <li>Corrected typo in test condition current from "43A" to "12A" for VSD and trr/Qrr on page 2.</li> </ul>		

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