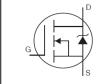


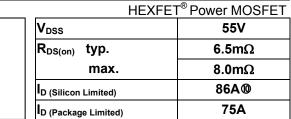
### Features

- Logic Level
- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified \*

### Description

Specifically designed for Automotive applications, this HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

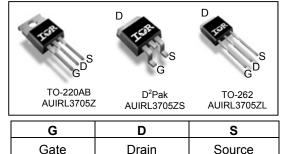




AUIRL3705Z

AUIRL3705ZS

AUIRL3705ZL



Bass nort number	Dookogo Turo	Standard Pack	Υ.	Orderable Part Number	
Base part number	Package Type	Form	Quantity		
AUIRL3705Z	TO-220	Tube	50	AUIRL3705Z	
AUIRL3705ZL	TO-262	Tube	50	AUIRL3705ZL	
	D <sup>2</sup> -Pak	Tube	50	AUIRL3705ZS	
AUIRL3705ZS	D -Pak	Tape and Reel Left	800	AUIRL3705ZSTRL	

### **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 (Silicon Limited) 86®			
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V (Silicon Limited)	61		
I <sub>D</sub> @ T <sub>C</sub> = 25°C	@ T <sub>C</sub> = 25°C Continuous Drain Current, V <sub>GS</sub> @ 10V (Package Limited)		A	
I <sub>DM</sub>	Pulsed Drain Current ①	340		
P <sub>D</sub> @T <sub>C</sub> = 25°C	Maximum Power Dissipation	130	W	
	Linear Derating Factor	0.88	W/°C	
V <sub>GS</sub>	Gate-to-Source Voltage	± 16	V	
E <sub>AS</sub>	EASSingle Pulse Avalanche Energy (Thermally Limited) (2)120			
E <sub>AS</sub> (tested) Single Pulse Avalanche Energy Tested Value 6		180	mJ	
I <sub>AR</sub>	Avalanche Current ①	See Fig.15,16, 12a, 12b	А	
E <sub>AR</sub>	Repetitive Avalanche Energy S		mJ	
TJ	Operating Junction and	-55 to + 175		
T <sub>STG</sub> Storage Temperature Range			°C	
	Soldering Temperature, for 10 seconds (1.6mm from case)	300		
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)		

**Thermal Resistance** Symbol Parameter Max. Units Тур. Junction-to-Case® 1.14  $R_{\theta JC}$ Case-to-Sink, Flat, Greased Surface ⑦ 0.50 R<sub>0CS</sub> \_\_\_\_ °C/W Junction-to-Ambient 🗇 62  $R_{\theta JA}$ Junction-to-Ambient (PCB Mount, steady state) (8) 40 R<sub>0JA</sub>

HEXFET® is a registered trademark of Infineon.

\*Qualification standards can be found at www.infineon.com



# AUIRL3705Z/S/I

Static @ T <sub>J</sub> =	25°C (unless otherwise specified)					
	Parameter	Min.	Тур.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	55			V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
$\Delta V_{(BR)DSS} / \Delta T_J$	Breakdown Voltage Temp. Coefficient		0.055		V/°C	Reference to 25°C, $I_D = 1mA$
			6.5	8.0		V <sub>GS</sub> = 10V, I <sub>D</sub> = 52A ③
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance			11	mΩ	V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 43A ③
				12		VGS = 4.5V, ID = 30A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0		3.0		$V_{DS} = V_{GS}, I_D = 250 \mu A$
gfs	Forward Trans conductance	150			S	$V_{DS} = 25V, I_D = 52A$
I <sub>DSS</sub>	Drain-to-Source Leakage Current			20 250	μA	$V_{DS} = 55V, V_{GS} = 0V$ $V_{DS} = 55V, V_{GS} = 0V, T_{J} = 125^{\circ}C$
I <sub>GSS</sub>	Gate-to-Source Forward Leakage			200		V <sub>GS</sub> = 16V
	Gate-to-Source Reverse Leakage			-200	nA	V <sub>GS</sub> = -16V
Dynamic Ele	ctrical Characteristics @ T <sub>J</sub> = 25°C (unless of	herwis	e spec	cified)	•	<u> </u>
Q <sub>g</sub>	Total Gate Charge		40	60		I <sub>D</sub> = 43A
Q <sub>gs</sub>	Gate-to-Source Charge		12		nC	$V_{DS} = 44V$
Q <sub>gd</sub>	Gate-to-Drain Charge		21			V <sub>GS</sub> = 5.0V3
t <sub>d(on)</sub>	Turn-On Delay Time		17			$V_{DD} = 28V$
t <sub>r</sub>	Rise Time		240		ns	I <sub>D</sub> = 43A
t <sub>d(off)</sub>	Turn-Off Delay Time		26		115	R <sub>G</sub> = 4.3Ω,
t <sub>f</sub>	Fall Time		83			V <sub>GS</sub> = 5.0V ③
L <sub>D</sub>	Internal Drain Inductance		4.5			Between lead, 6mm (0.25in.)
L <sub>S</sub>	Internal Source Inductance		7.5		nH	from package
C <sub>iss</sub>	Input Capacitance		2880			V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance		420			$V_{DS} = 25V$
C <sub>rss</sub>	Reverse Transfer Capacitance		220		1_	f = 1.0MHz
C <sub>oss</sub>	Output Capacitance		1500		pF	$V_{GS} = 0V, V_{DS} = 1.0V f = 1.0MHz$
C <sub>oss</sub>	Output Capacitance		330			$V_{GS} = 0V, V_{DS} = 44V f = 1.0MHz$
C <sub>oss eff.</sub>	Effective Output Capacitance		510			$V_{GS} = 0V, V_{DS} = 0V \text{ to } 44V $
Diode Charac						
	Parameter	Min.	Тур.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)			75		MOSFET symbol showing the
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①			340	A	integral reverse p-n junction diode.
V <sub>SD</sub>	Diode Forward Voltage			1.3	V	T <sub>J</sub> = 25°C,I <sub>S</sub> = 52A,V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time		16	24		T <sub>J</sub> = 25°C ,I <sub>F</sub> = 43A , V <sub>DD</sub> = 28V
Q <sub>rr</sub>	Reverse Recovery Charge		7.4	11	nC	di/dt = 100A/µs ③
t <sub>on</sub>	Forward Turn-On Time	Intrins				gible (turn-on is dominated by $L_{S}+L_{D}$ )
-011						, (

Notes:

① 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 = 0.09mH, R<sub>G</sub> = 25 $\Omega$ , I<sub>AS</sub> = 52A, V<sub>GS</sub> = 10V. Part not recommended for use above this value. ③ Pulse width  $\leq$  1.0ms; duty cycle  $\leq$  2%.

④ Coss eff. is a fixed capacitance that gives the same charging time as Coss while VDS is rising from 0 to 80% VDSS.

© Limited by T<sub>Jmax</sub>, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.

This value determined from sample failure population 100% tested to this value in production. 6

 $\bigcirc$ 

This is only applied to TO-220AB package. This is applied to D<sup>2</sup> Pak, When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering 8 techniques refer to application note #AN-994

9  $R_{\theta}$  is measured at T<sub>J</sub> of approximately 90°C

Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 75A. Note that current 10 limitations arising from heating of the device leads may occur with some lead mounting arrangements.



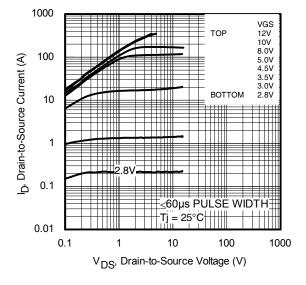


Fig. 1 Typical Output Characteristics

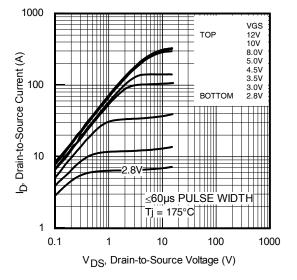


Fig. 2 Typical Output Characteristics

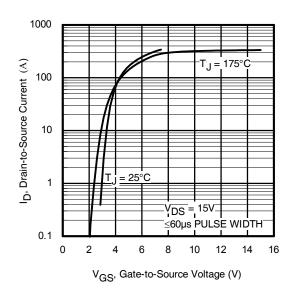


Fig. 3 Typical Transfer Characteristics

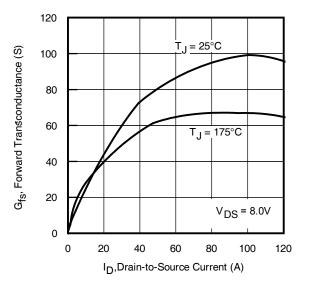


Fig. 4 Typical Forward Transconductance vs. Drain Current



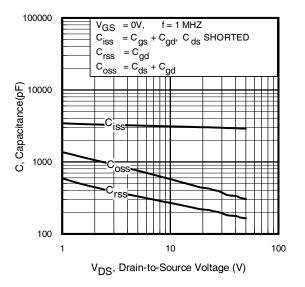


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

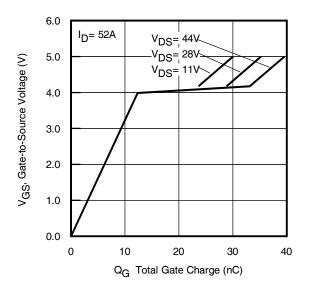


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

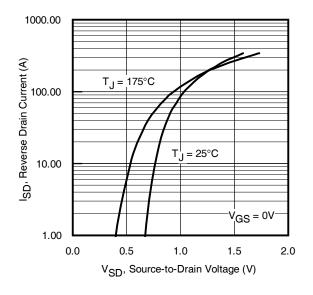


Fig. 7 Typical Source-to-Drain Diode Forward Voltage

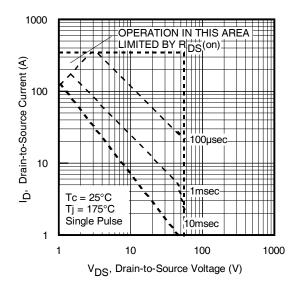


Fig 8. Maximum Safe Operating Area



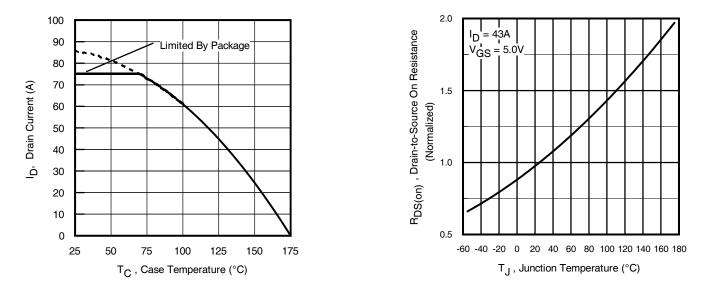
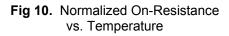


Fig 9. Maximum Drain Current vs. Case Temperature



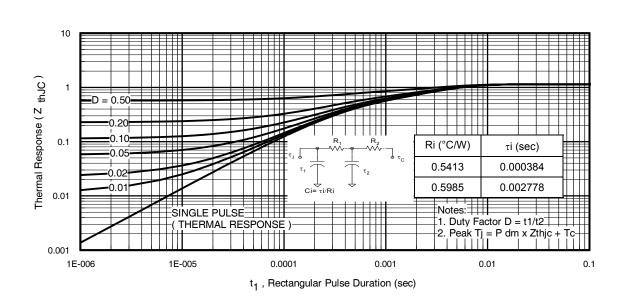


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



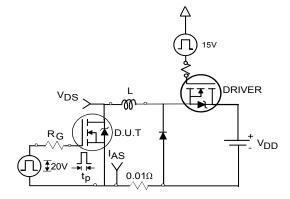


Fig 12a. Unclamped Inductive Test Circuit

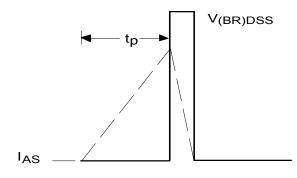


Fig 12b. Unclamped Inductive Waveforms

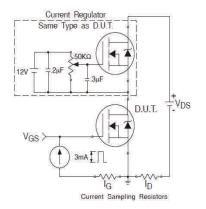


Fig 13a. Gate Charge Test Circuit

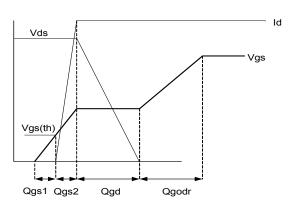


Fig 13b. Gate Charge Waveform

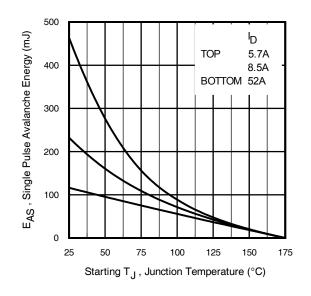


Fig 12c. Maximum Avalanche Energy vs. Drain Current

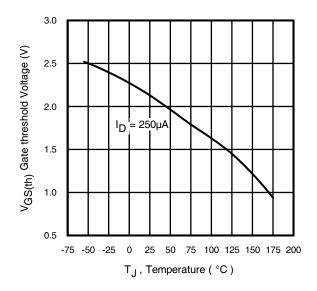


Fig 14. Threshold Voltage vs. Temperature



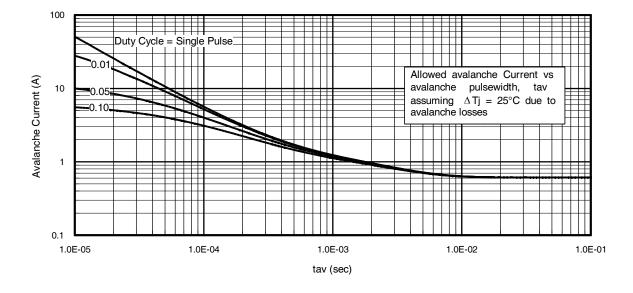


Fig 15. Avalanche Current vs. Pulse width

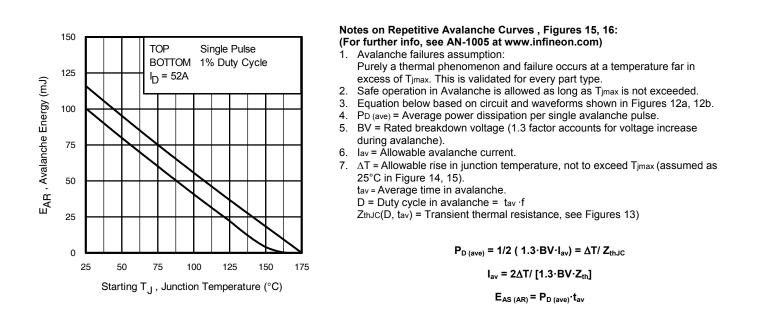


Fig 16. Maximum Avalanche Energy vs. Temperature

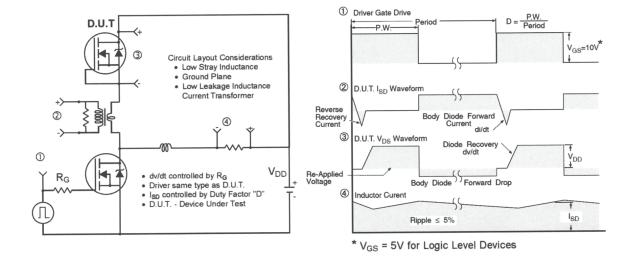


Fig 17. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

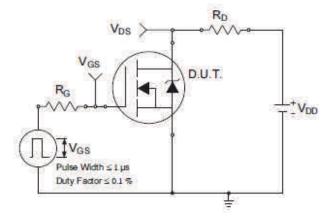


Fig 18a. Switching Time Test Circuit

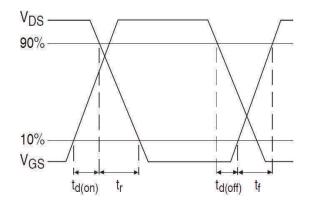
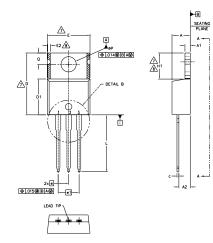


Fig 18b. Switching Time Waveforms



# AUIRL3705Z/S/L

### TO-220AB Package Outline (Dimensions are shown in millimeters (inches))





- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994. 1.-
- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]. 2.-
- LEAD DIMENSION AND FINISH UNCONTROLLED IN LI 3.-
- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE 4.-MEASURED AT THE OUTERWOST EXTREMES OF THE PLASTIC BODY.
- DIMENSION 61, 63 & c1 APPLY TO BASE METAL ONLY.
- <u>/5.</u>\_ 6.-CONTROLLING DIMENSION : INCHES.
- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1 7.-
- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED. 8.–
- UTUINE CONFORMS TO JEDEC TO -220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE. 9.-

	DIMENSIONS				
SYMBOL	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	NOTES
A	3.56	4.83	.140	.190	
A1	1,14	1.40	.045	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
с	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	-	0.76	-	.030	8
e	2.54 BSC		.100 BSC .200 BSC		
e1	5.08 BSC		.200	BSC	
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	3
øР	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

#### LEAD ASSIGNMENTS

<u>HEXFET</u> 1.- GATE 2.- DRAIN 3.- SOURCE

IGBTs, CoPACK

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

DIODES

1.- ANODE 2.- CATHODE 3.- ANODE

### **TO-220AB Part Marking Information**

e1 A

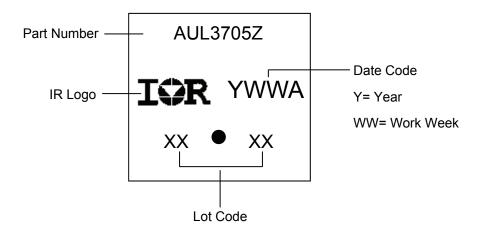
VEW A-A

DETAIL B

A

-61,63-6

SECTION C-C & D-D

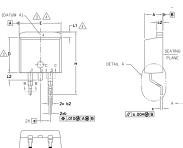


Note: For the most current drawing please refer to IR website at <a href="http://www.irf.com/package/">http://www.irf.com/package/</a>

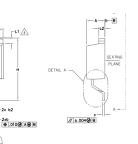


# AUIRL3705Z/S/L

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



AD TIF





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

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 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.

PLATING BASE META
ROTATED 90° CW SCALE 8:1

S Y M	DIMENSIONS				N
B O	MILLIM	ETERS	INC	INCHES	
L	MIN.	MAX.	MIN.	MAX.	O T E 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	
b3	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
Е	9.65	10.67	.380	.420	3,4
E1	6.22	—	.245	—	4
е	2.54 BSC		.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

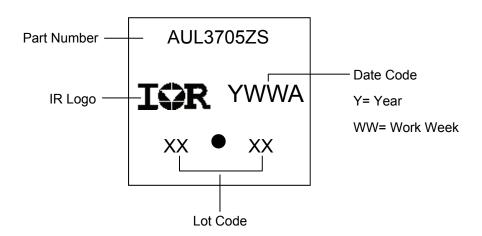
HEXFET

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

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

> IGBTS, COPACK 1.- GATE 2, 4.- COLLECTOR 3.- EMITTER

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

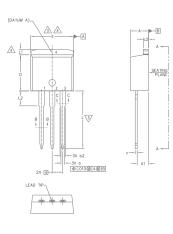


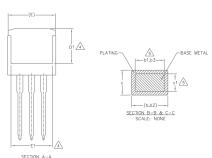
Note: For the most current drawing please refer to IR website at http://www.irf.com/package/



## AUIRL3705Z/S/L

### TO-262 Package Outline (Dimensions are shown in millimeters (inches)





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  $^{\circ}$ 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
- 5. DIMENSION 61 AND c1 APPLY TO BASE METAL ONLY.
- 6. CONTROLLING DIMENSION: INCH.
- 7.- OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE

#### LEAD ASSIGNMENTS

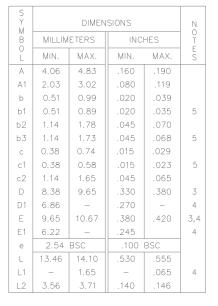
IGBTs, CoPACK

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

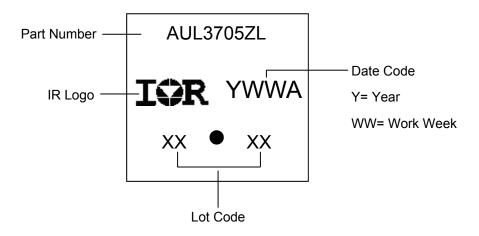
HEXFET DIODES

- 1.- ANODE (TWO DIE) / OPEN (ONE DIE) 1.- GATE
  - 2, 4.- CATHODE 3.- ANODE
- 2.- DRAIN 3.- SOURCE



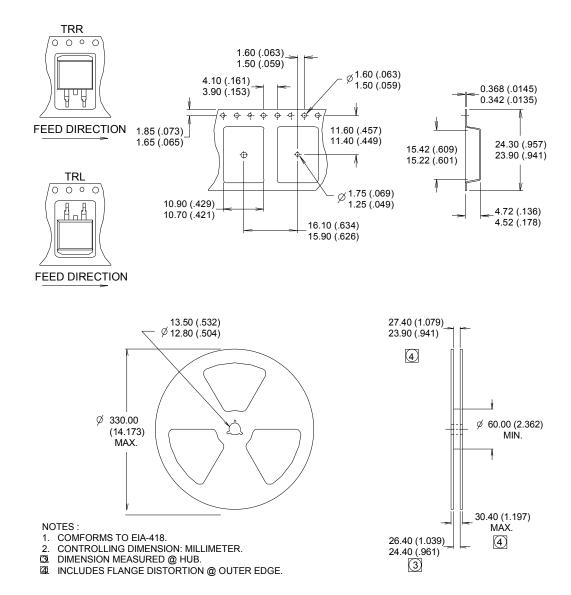


### **TO-262 Part Marking Information**



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

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



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



### **Qualification Information**

		Automotive (per AEC-Q101)			
			s part number(s) passed Automotive qualification. Infineon's onsumer qualification level is granted by extension of the higher I.		
Moisture Sensitivity Level		TO-220 Pak	N/A		
		D <sup>2</sup> -Pak	MSL1		
			Class M4 (+/- 425V) <sup>†</sup>		
	Machine Model	AEC-Q101-002			
	Human Bady Madal	Class H1C (+/- 2000V) <sup>†</sup>			
ESD	Human Body Model	AEC-Q101-001			
	Channed Davies Medal	Class C5 (+/- 1125V) <sup>†</sup>			
Charged Device Model		AEC-Q101-005			
RoHS Compliant		Yes			

### **Revision History**

Date	Comments		
10/29/2015	Updated datasheet with corporate template		
10/29/2015	Corrected ordering table on page 1.		

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