

AUIRF3805 AUIRF3805S AUIRF3805L

55V

2.6mΩ

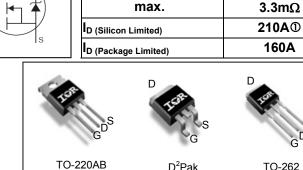
AUIRF3805L

Features

- 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 wide variety of other applications.



typ.

 V_{DSS}

AUIRF3805

R_{DS(on)}

G	D	S
Gate	Drain	Source

AUIRF3805S

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRF3805	TO-220	Tube	50	AUIRF3805
AUIRF3805L	TO-262	Tube	50	AUIRF3805L
	D ² -Pak	Tube	50	AUIRF3805S
AUIRF3805S	D -Pak	Tape and Reel Left	800	AUIRF3805STRL

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	Symbol Parameter		Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)	210①	
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)	150①	
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V (Package Limited)	160	A
I _{DM}	Pulsed Drain Current ②	890	
P _D @T _C = 25°C	Maximum Power Dissipation	300	W
	Linear Derating Factor	2.0	W/°C
V _{GS}	Gate-to-Source Voltage	± 20	V
E _{AS}	Single Pulse Avalanche Energy (Thermally Limited) ③	650	
E _{AS} (tested)	Single Pulse Avalanche Energy Tested Value 3	940	mJ
I _{AR}	Avalanche Current ②	See Fig.15,16, 12a, 12b	А
E _{AR}	Repetitive Avalanche Energy 6		mJ
TJ	Operating Junction and	-55 to + 175	
T _{STG}	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	Тур.	Max.	Units
R _{θJC}	Junction-to-Case		0.50@	
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ⑦			°C/W
R _{eJA} Junction-to-Ambient Ø – 62		C/W		
$R_{ ext{ heta}JA}$	Junction-to-Ambient (PCB Mount, steady state) ®		40	

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



Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Тур.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	55			V	V _{GS} = 0V, I _D = 250µA
$\Delta V_{(BR)DSS} / \Delta T_J$	Breakdown Voltage Temp. Coefficient		0.051		V/°C	Reference to 25°C, $I_D = 1mA$
R _{DS(on)}	Static Drain-to-Source On-Resistance		2.6	3.3	mΩ	V _{GS} = 10V, I _D = 75A ④**
V _{GS(th)}	Gate Threshold Voltage	2.0		4.0	V	V _{DS} = V _{GS} , I _D = 250μA
gfs	Forward Trans conductance	75			S	V _{DS} = 25V, I _D = 75A**
1	Drain-to-Source Leakage Current			20	μA	V _{DS} =55V, V _{GS} = 0V
IDSS	Drain-to-Source Leakage Current			250	μΑ	V _{DS} =55V,V _{GS} = 0V,T _J =125°C
1	Gate-to-Source Forward Leakage			200	5	V _{GS} = 20V
I _{GSS}	Gate-to-Source Reverse Leakage			-200		V _{GS} = -20V

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

-		-			
Q _g	Total Gate Charge	 190	290		I _D = 75A**
Q _{gs}	Gate-to-Source Charge	 52		nC	$V_{DS} = 44V$
Q _{gd}	Gate-to-Drain Charge	 72			V _{GS} = 10V④
t _{d(on)}	Turn-On Delay Time	 150			$V_{DD} = 28V$
t _r	Rise Time	 20		20	I _D = 75A**
t _{d(off)}	Turn-Off Delay Time	 93		ns	R _G = 2.6Ω
t _f	Fall Time	 87			V _{GS} = 10V ④
L _D	Internal Drain Inductance	 4.5		nH	Between lead, 6mm (0.25in.)
L _S	Internal Source Inductance	 7.5			from package and center of die contact
C _{iss}	Input Capacitance	 7960			V _{GS} = 0V
C _{oss}	Output Capacitance	 1260			V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	 630		~	f = 1.0MHz, See Fig. 5
C _{oss}	Output Capacitance	 4400		pF	$V_{GS} = 0V, V_{DS} = 1.0V f = 1.0MHz$
C _{oss}	Output Capacitance	 980			$V_{GS} = 0V, V_{DS} = 44V f = 1.0MHz$
C _{oss eff.}	Effective Output Capacitance	 1550			V_{GS} = 0V, V_{DS} = 0V to 44V

Diode Characteristics

	Parameter	Min.	Тур.	Max.	Units	Conditions
ls	Continuous Source Current (Body Diode)			210①		MOSFET symbol showing the
I _{SM}	Pulsed Source Current (Body Diode) ①			890		integral reverse
V_{SD}	Diode Forward Voltage			1.3	V	T」= 25°C,I _S = 75A**,V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time		36	54	ns	T _J = 25°C ,I _F = 75A**, V _{DD} = 28V
Q _{rr}	Reverse Recovery Charge		47	71	nC	di/dt = 100A/µs ④
t _{on}	Forward Turn-On Time	Intrinsio	Intrinsic turn-on time is negligible (turn-on is dominated by Ls+LD)			

Notes:

 Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 160A. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)

- ② Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- (3) This value determined from sample failure population, starting $T_J = 25^{\circ}$ C, L = 0.23mH, $R_G = 25\Omega$, $I_{AS} = 75A$, $V_{GS} = 10V$.
- ④ Pulse width \leq 1.0ms; duty cycle \leq 2%.
- \odot C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.
- ⑥ Limited by T_{Jmax}, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑦ This is only applied to TO-220AB package.
- It is applied to D²Pak When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994
- (9) R_{θ} is measured at T_J of approximately 90°C
- ID-220 device will have an Rth value of 0.45°C/W.
- ** All AC and DC test condition based on old Package limitation current = 75A.



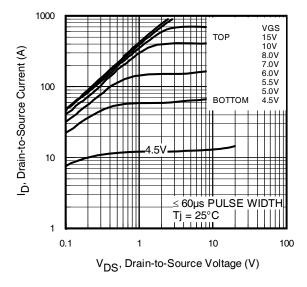
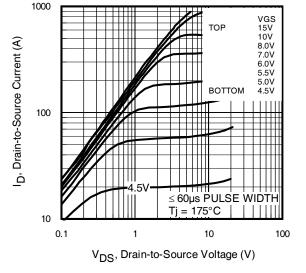
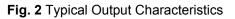


Fig. 1 Typical Output Characteristics





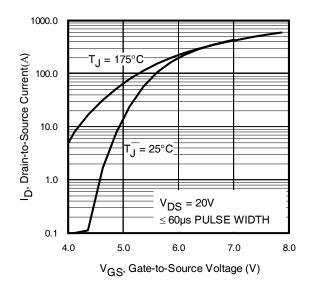


Fig. 3 Typical Transfer Characteristics

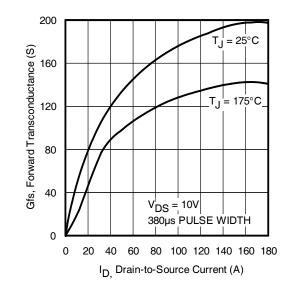
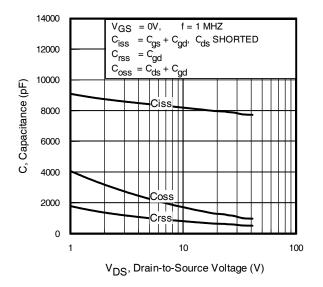
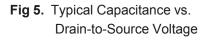


Fig. 4 Typical Forward Transconductance vs. Drain Current







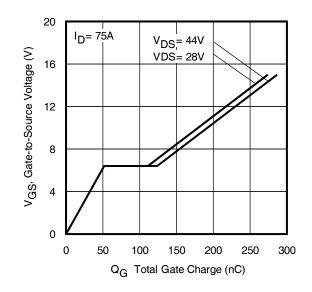
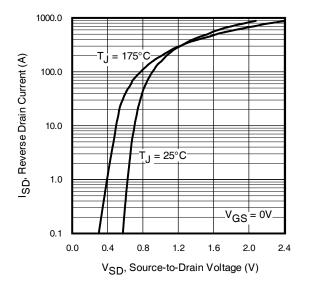
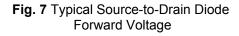


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage





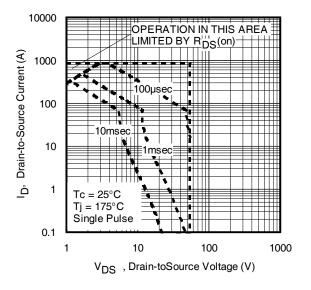


Fig 8. Maximum Safe Operating Area



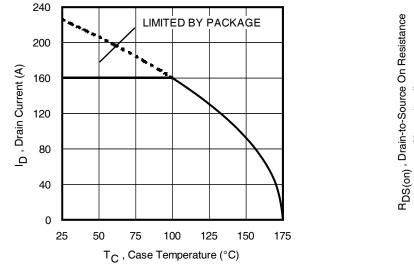
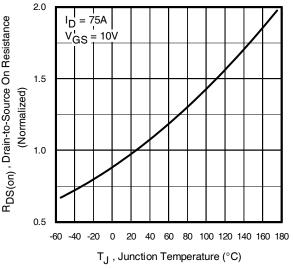
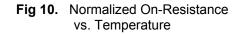


Fig 9. Maximum Drain Current vs. Case Temperature





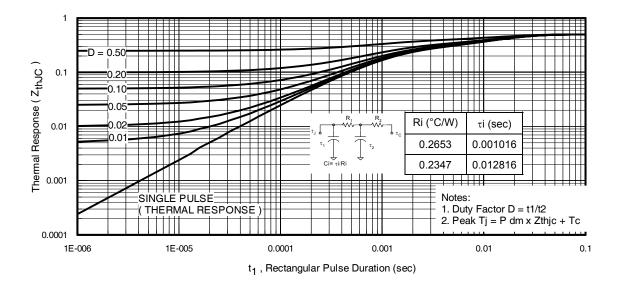


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

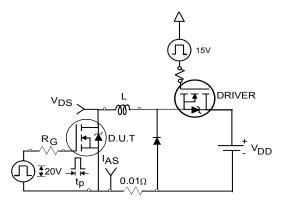


Fig 12a. Unclamped Inductive Test Circuit

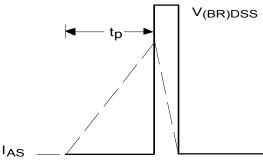
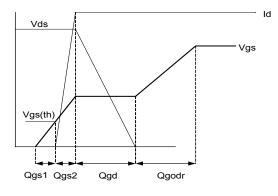
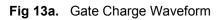


Fig 12b. Unclamped Inductive Waveforms





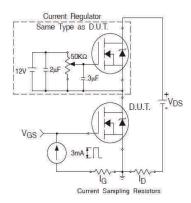


Fig 13b. Gate Charge Test Circuit

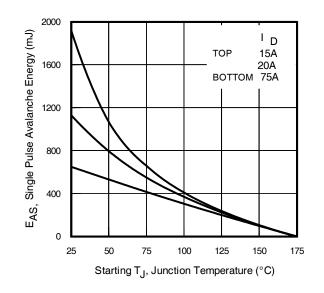


Fig 12c. Maximum Avalanche Energy vs. Drain Current

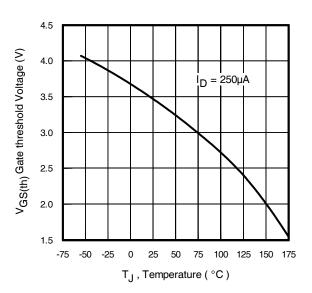


Fig 14. Threshold Voltage vs. Temperature



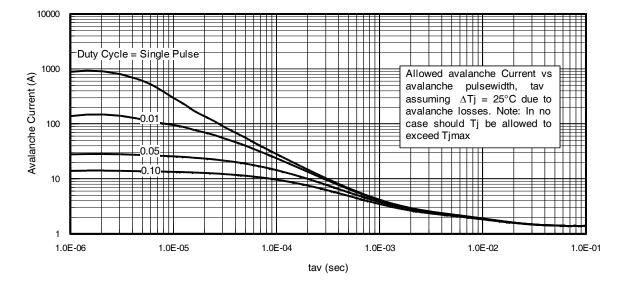
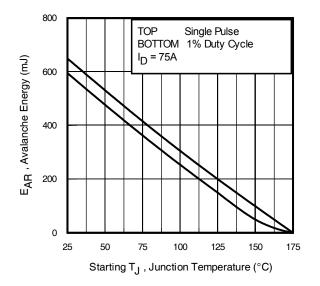
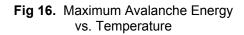


Fig 15. Typical Avalanche Current vs. Pulse width





Notes on Repetitive Avalanche Curves , Figures 15, 16: (For further info, see AN-1005 at www.infineon.com)

- Avalanche failures assumption: Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax}. This is validated for every part type.
- 2. Safe operation in Avalanche is allowed as long as Tjmax is not exceeded.
- 3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
- 4. PD (ave) = Average power dissipation per single avalanche pulse.
- 5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
- 6. Iav = Allowable avalanche current.
- 7. ΔT = Allowable rise in junction temperature, not to exceed T_{jmax} (assumed as 25°C in Figure 15, 16).
 - tav = Average time in avalanche.
 - D = Duty cycle in avalanche = tav ·f

ZthJC(D, tav) = Transient thermal resistance, see Figures 13)

$$\begin{split} \textbf{P}_{D \;(ave)} &= 1/2 \; (\; 1.3 \cdot \textbf{BV} \cdot \textbf{I}_{av}) = \Delta T / \; \textbf{Z}_{thJC} \\ \textbf{I}_{av} &= 2 \Delta T / \; \textbf{[} 1.3 \cdot \textbf{BV} \cdot \textbf{Z}_{th} \textbf{]} \\ \textbf{E}_{AS \;(AR)} &= \textbf{P}_{D \;(ave)} \cdot \textbf{t}_{av} \end{split}$$

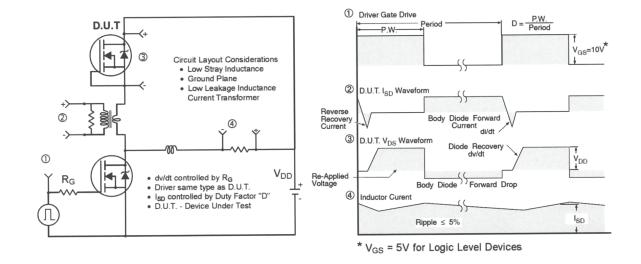


Fig 17. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

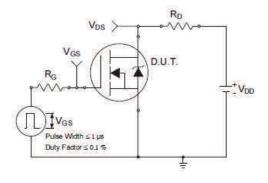


Fig 18a. Switching Time Test Circuit

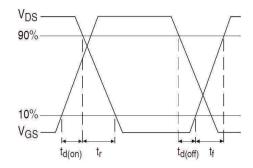
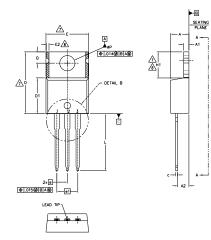


Fig 18b. Switching Time Waveforms

infineon



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





A

BASE METAL

1/6\

 $|_{\mathbb{A}}$ ь1.ь3

SECTION C-C & D-D

DETAIL B

NOTES:

- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994. 1.-
- 2.-3 -
- DIMENSIONING AND TOLERANGUNG AS FER ASME 114.5 MF 1994. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS] LEAD DIMENSION AND FINISH UNCONTROLLED IN L1. 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 OUTERMOST EXTREMES OF THE PLASTIC BODY.
- <u>/5.-</u> DIMENSION 61, 63 & c1 APPLY TO BASE METAL ONLY.
- 6.-CONTROLLING DIMENSION : INCHES.
- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1 7. – 8.-
- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
- UTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE. 9.-

	DIMENSIONS				
SYMBOL	MILLIM	ETERS	INC	HES	
	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
е	2.54	BSC	.100	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
ØP	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

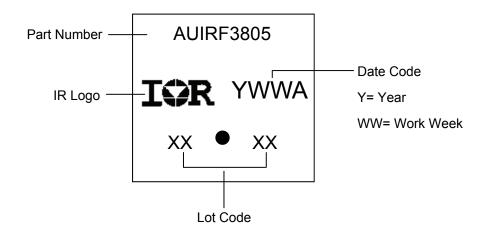
DIODES

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

TO-220AB Part Marking Information

E1 🛆

VEW A

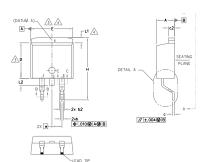


TO-220AB package is not recommended for Surface Mount Application.



D²Pak (TO-263AB) Package Outline (Dimensions are shown in millimeters (inches))

S





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 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 Y	DIMENSIONS					
	MB	MILLIM	MILLIMETERS		HES		
	0 L	MIN.	MAX.	MIN.	MAX.		
d_	А	4.06	4.83	.160	.190		
	A1	0.00	0.254	.000	.010		
	b	0.51	0.99	.020	.039		
	b1	0.51	0.89	.020	.035		
	b2	1.14	1.78	.045	.070		
	b3	1.14	1.73	.045	.068		
	С	0.38	0.74	.015	.029		
	с1	0.38	0.58	.015	.023		
	c2	1.14	1.65	.045	.065		
	D	8.38	9.65	.330	.380		
	D1	6.86	_	.270	_		
	E	9.65	10.67	.380	.420		
	E1	6.22	_	.245	_		
	е	2.54	BSC	.100	BSC		
	Н	14.61	15.88	.575	.625		
	L	1.78	2.79	.070	.110		
	L1	_	1.68	_	.066		
	L2	—	1.78	-	.070		

AUIRF3805S

Lot Code

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LEAD ASSIGNMENTS

NOTES

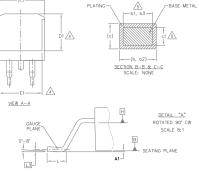
5

Date Code

WW= Work Week

Y= Year

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



D²Pak (TO-263AB) Part Marking Information

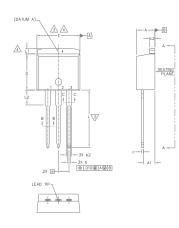
Part Number

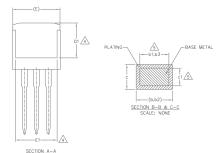
IR Logo

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
E	9.65	10.67	.380	.420	3,4
Ε1	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	



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].
- 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. 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

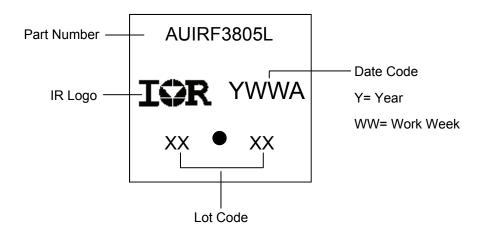
HEXFET DIODES

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



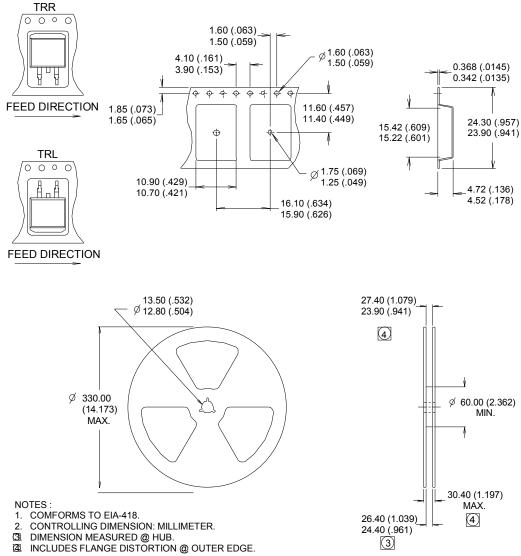
S Y M		N			
В	MILLIM	ETERS	INC	HES	N O T E S
0 L	MIN.	MAX.	MIN.	MAX.	S
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
С	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245		4
е	2.54	2.54 BSC		BSC	
L	13.46	14.10	.530	.555	
L1	_	1.65	-	.065	4
L2	3.56	3.71	.140	.146	

TO-262 Part Marking Information





D²Pak (TO-263AB) Tape & Reel Information (Dimensions are shown in millimeters (inches))



4



Qualification Information

			Automotive				
		(per AEC-Q101)					
		Comments: This part number(s) passed Automotive qualification. Infineon's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.					
	Moisture Sensitivity Level		N/A				
Moisture			MSL1, 260°C				
		Class M4 (+/-425V) [†]					
	Machine Model		AEC-Q101-002				
505	Liver on Dady Madel	Class H3A (+/-4000V) [†]					
ESD	Human Body Model	AEC-Q101-001					
	Channed Davies Medal	Class C5 (+/-1000V) [†] AEC-Q101-005					
	Charged Device Model						
RoHS Compliant		Yes					

† Highest passing voltage.

Revision History

Date	Comments
9/30/2015	 Updated datasheet with corporate template Corrected ordering table on page 1.
8/23/2017	Corrected part marking on pages 9,10,11.

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