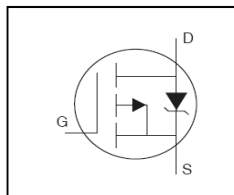


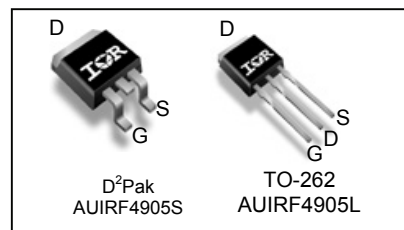
Features

- Advanced Planar Technology
- P-Channel MOSFET
- Low On-Resistance
- 150°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to T_{jmax}
- Lead-Free, RoHS Compliant
- Automotive Qualified *



HEXFET® Power MOSFET

V_{DS}	-55V
$R_{DS(on)}$ max.	20mΩ
I_D (Silicon Limited)	-70A
I_D (Package Limited)	-42A



Description

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 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.

G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRF4905L	TO-262	Tube	50	AUIRF4905L
AUIRF4905S	D²-Pak	Tube	50	AUIRF4905S
		Tape and Reel Left	800	AUIRF4905STRL

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 (T_A) is 25°C, unless otherwise specified.

Symbol	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	-70	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	-44	
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V (Package Limited)	-42	
I_{DM}	Pulsed Drain Current ①	-280	
P_D @ $T_C = 25^\circ\text{C}$	Maximum Power Dissipation	170	W
	Linear Derating Factor	1.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	140	mJ
E_{AS} (tested)	Single Pulse Avalanche Energy Tested Value ⑥	790	
I_{AR}	Avalanche Current ①	See Fig.15,16, 12a, 12b	A
E_{AR}	Repetitive Avalanche Energy ①		mJ
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑧	—	0.75	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount, steady state) ⑦⑧		40	

HEXFET® is a registered trademark of Infineon.

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

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	-55	—	—	V	V _{GS} = 0V, I _D = -250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	-0.054	—	V/°C	Reference to 25°C, I _D = -1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	20	mΩ	V _{GS} = -10V, I _D = -42A ③
V _{GS(th)}	Gate Threshold Voltage	-2.0	—	-4.0	V	V _{DS} = V _{GS} , I _D = -250μA
g _{fs}	Forward Trans conductance	19	—	—	S	V _{DS} = -25V, I _D = -42A
I _{DSS}	Drain-to-Source Leakage Current	—	—	-25	μA	V _{DS} = -55V, V _{GS} = 0V
		—	—	-250	μA	V _{DS} = -44V, V _{GS} = 0V, T _J = 125°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	-100	nA	V _{GS} = -20V
	Gate-to-Source Reverse Leakage	—	—	100	nA	V _{GS} = 20V

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

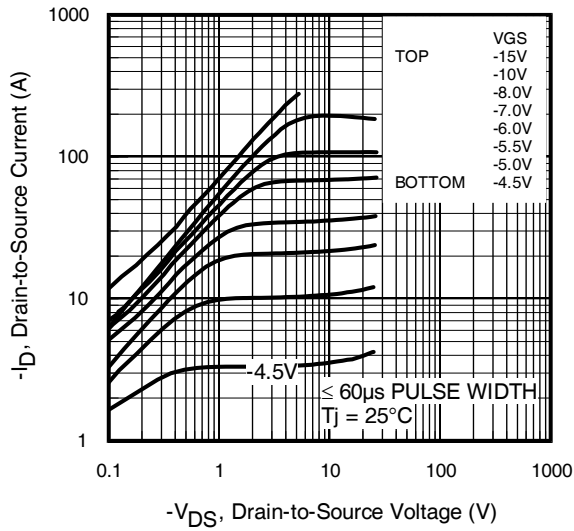
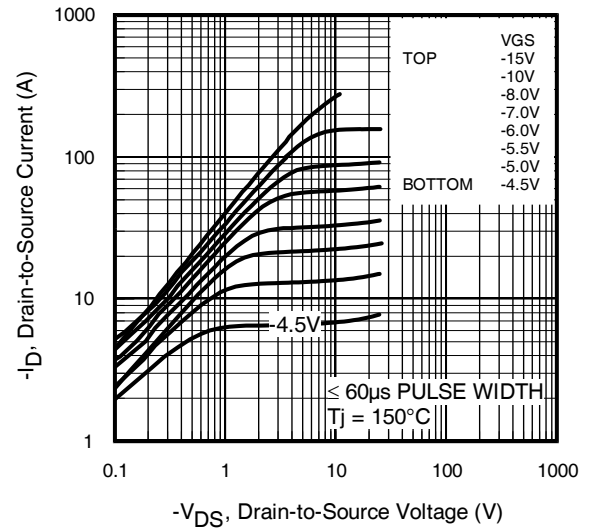
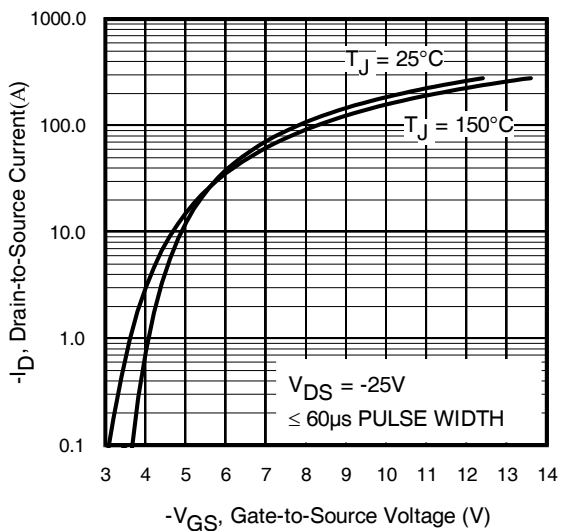
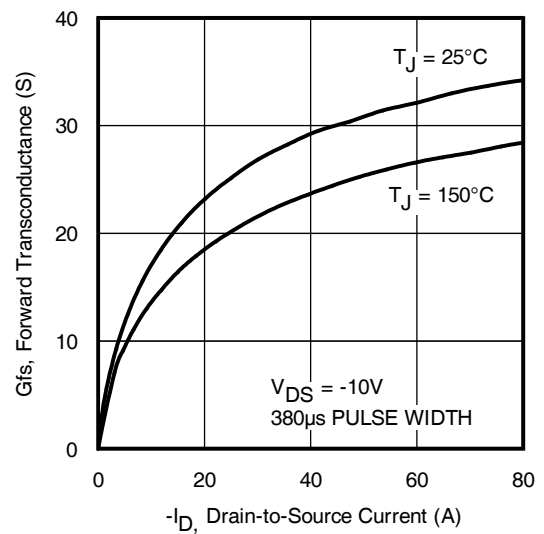
Q _g	Total Gate Charge	—	120	180	nC	I _D = -42A
Q _{gs}	Gate-to-Source Charge	—	32	—		V _{DS} = -44V
Q _{gd}	Gate-to-Drain Charge	—	53	—		V _{GS} = -10V ③
t _{d(on)}	Turn-On Delay Time	—	20	—	ns	V _{DD} = -28V
t _r	Rise Time	—	99	—		I _D = -42A
t _{d(off)}	Turn-Off Delay Time	—	51	—		R _G = 2.6Ω,
t _f	Fall Time	—	64	—		V _{GS} = -10V ③
L _D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	7.5	—		
C _{iss}	Input Capacitance	—	3500	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	1250	—		V _{DS} = -25V
C _{rss}	Reverse Transfer Capacitance	—	450	—		f = 1.0MHz
C _{oss}	Output Capacitance	—	4620	—		V _{GS} = 0V, V _{DS} = -1.0V f = 1.0MHz
C _{oss}	Output Capacitance	—	940	—		V _{GS} = 0V, V _{DS} = -44V f = 1.0MHz
C _{oss eff.}	Effective Output Capacitance	—	1530	—		V _{GS} = 0V, V _{DS} = 0V to -44V ④

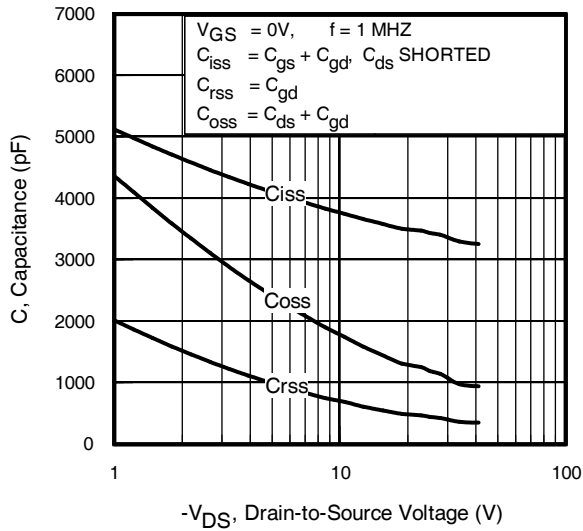
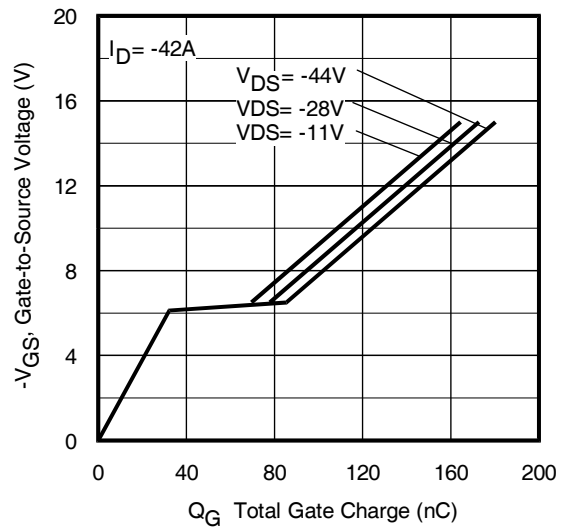
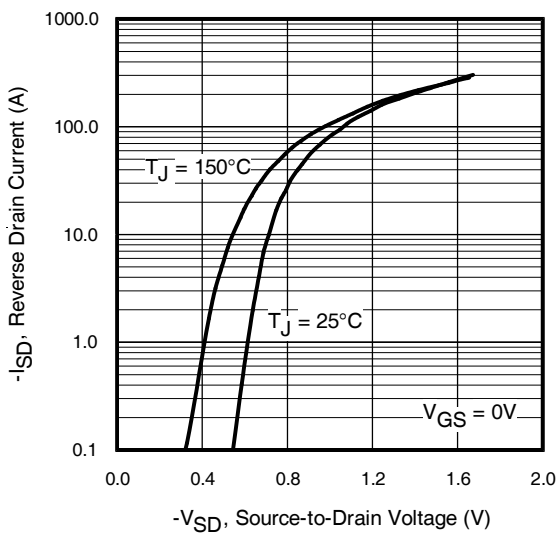
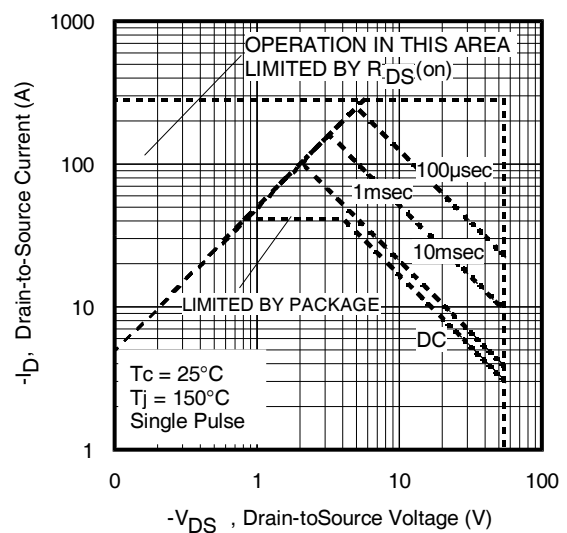
Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	-42	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	-280		
V _{SD}	Diode Forward Voltage	—	—	-1.3	V	T _J = 25°C, I _S = -42A, V _{GS} = 0V ③
t _{rr}	Reverse Recovery Time	—	61	92	ns	T _J = 25°C, I _F = -42A, V _{DD} = -28V
Q _{rr}	Reverse Recovery Charge	—	150	220	nC	di/dt = 100A/μs ③
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L _S +L _D)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig.11)
- ② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.16mH, R_G = 25Ω, I_{AS} = -42A, V_{GS} = -10V. Part not recommended for use above this value.
- ③ Pulse width ≤ 1.0ms; duty cycle ≤ 2%.
- ④ 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}.
- ⑤ Limited by T_{Jmax}, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑥ This value determined from sample failure population, starting T_J = 25°C, L = 0.08mH, R_G = 25Ω, I_{AS} = 66A, V_{GS} = 10V.
- ⑦ This is applied to D² Pak, When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994
- ⑧ R_θ 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 Typical Forward Trans conductance 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

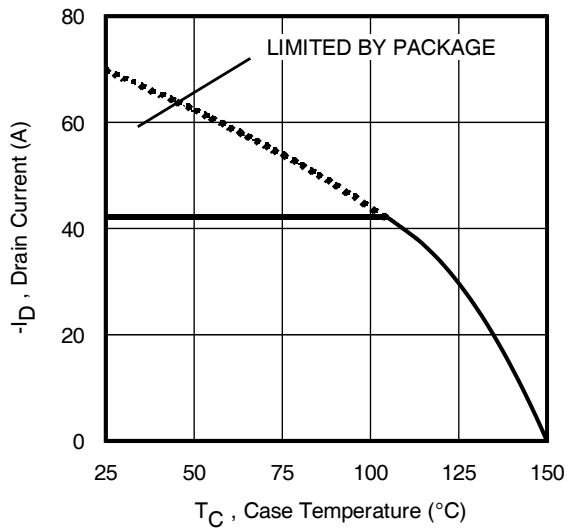


Fig 9. Maximum Drain Current vs. Case Temperature

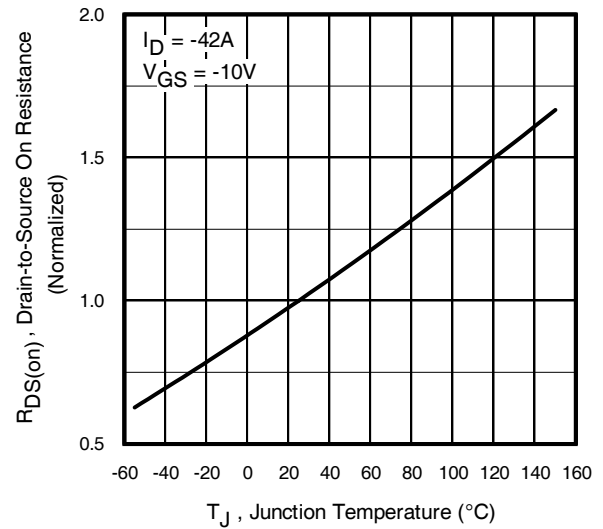


Fig 10. Normalized On-Resistance vs. Temperature

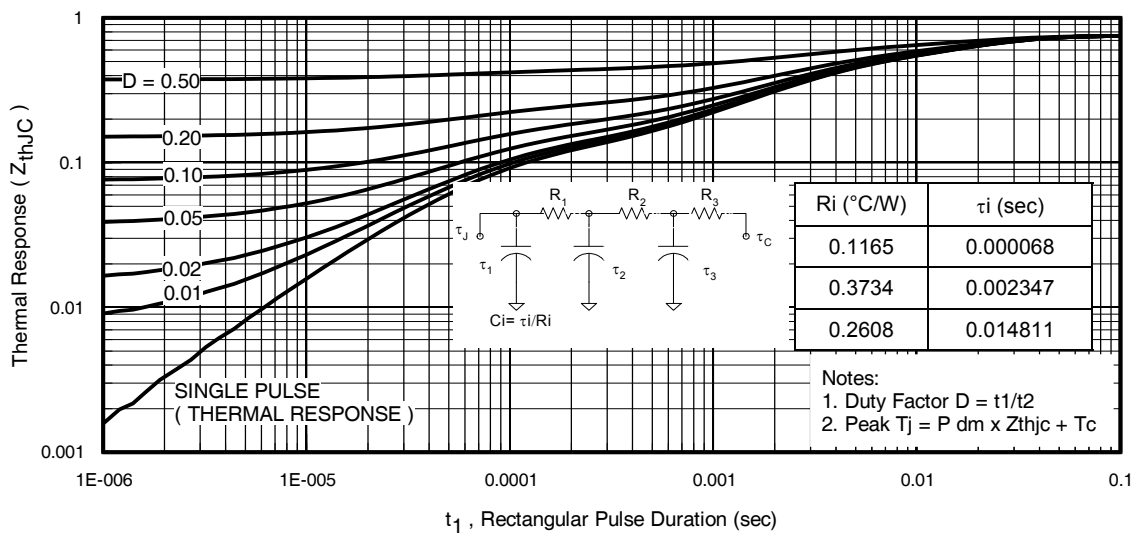
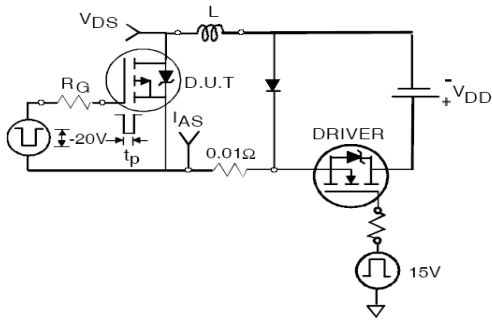
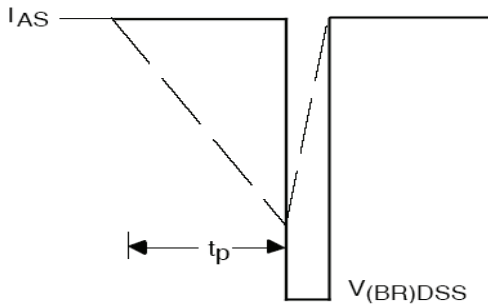
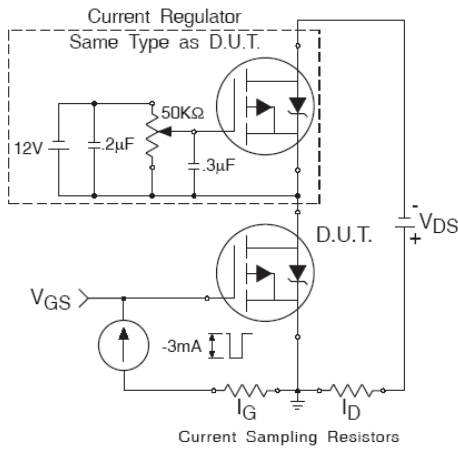
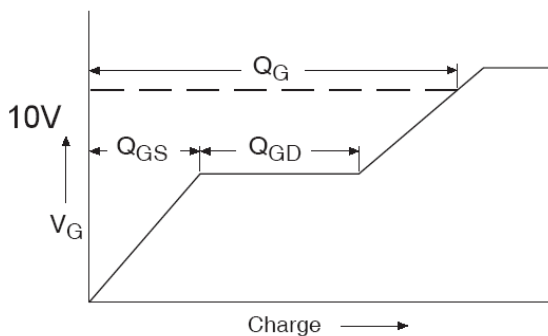
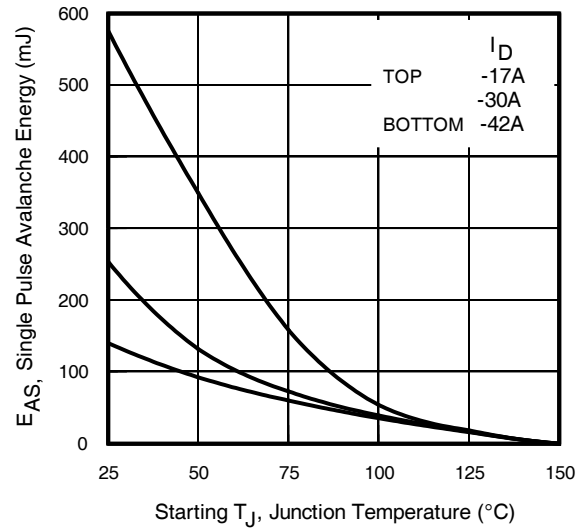
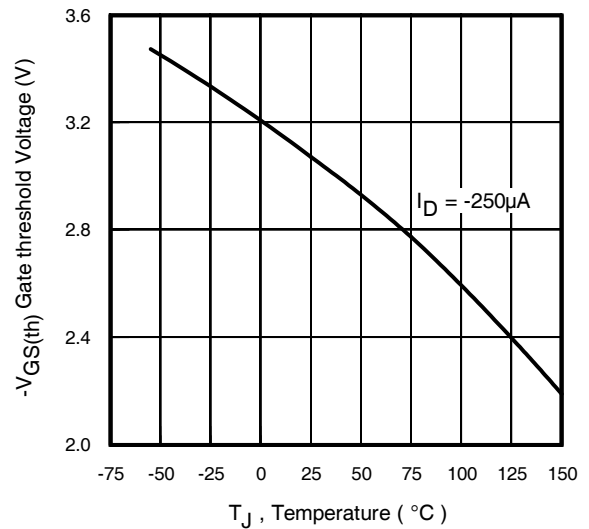


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case


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

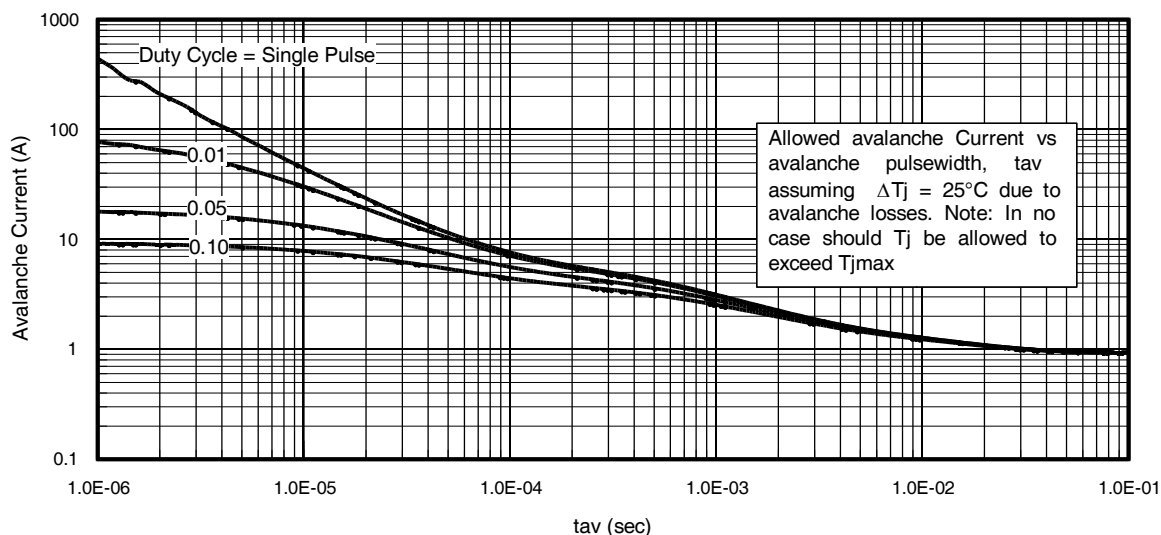


Fig 15. Avalanche Current vs. Pulse width

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

1. 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 T_{Jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
4. $P_{D(ave)}$ = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6. I_{av} = Allowable avalanche current.
7. ΔT = Allowable rise in junction temperature, not to exceed T_{Jmax} (assumed as 25°C in Figure 14, 15).
 t_{av} = Average time in avalanche.
 D = Duty cycle in avalanche = $t_{av} \cdot f$
 $Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 13)

$$P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$

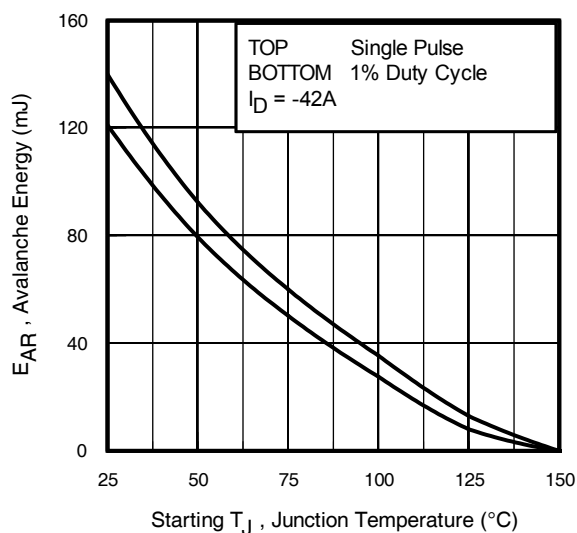


Fig 16. Maximum Avalanche Energy vs. Temperature

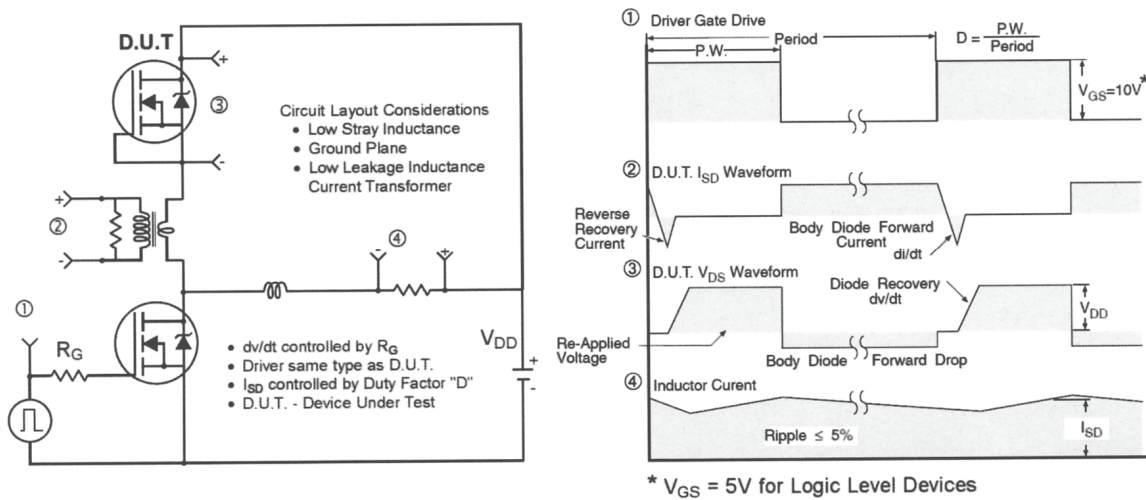


Fig 17. Peak Diode Recovery dv/dt Test Circuit for P-Channel HEXFET® Power MOSFETs

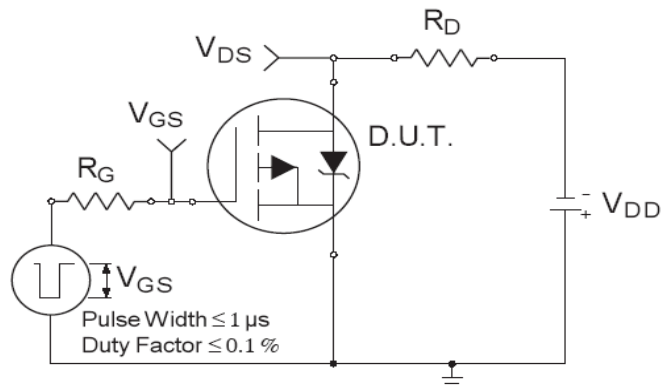


Fig 18a. Switching Time Test Circuit

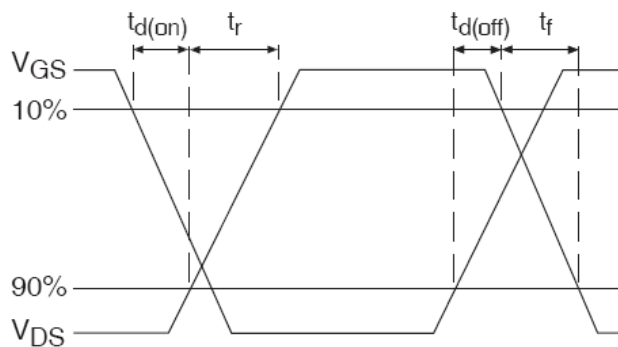
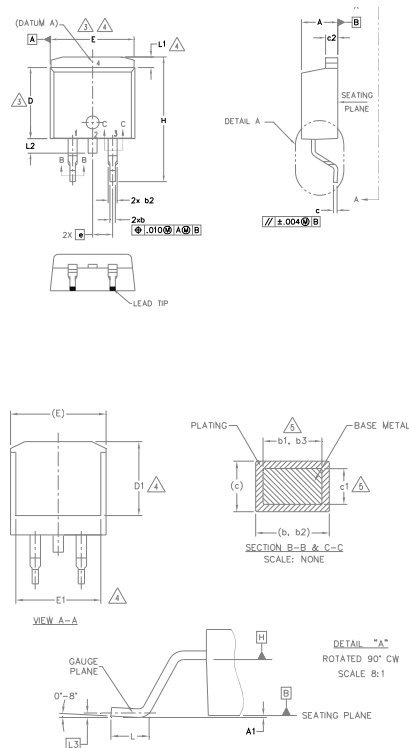


Fig 18b. Switching Time Waveforms

D²Pak (TO-263AB) 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 0.127 [0.005"] 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 b1, b3 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.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	5
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	5
c	0.38	0.74	.015	.029	5
c1	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	3,4
E1	6.22	—	.245	—	4
e	2.54 BSC		.100 BSC		4
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	—	1.68	—	.066	
L2	—	1.78	—	.070	
L3	0.25 BSC		.010 BSC		

LEAD ASSIGNMENTS

DIODES

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

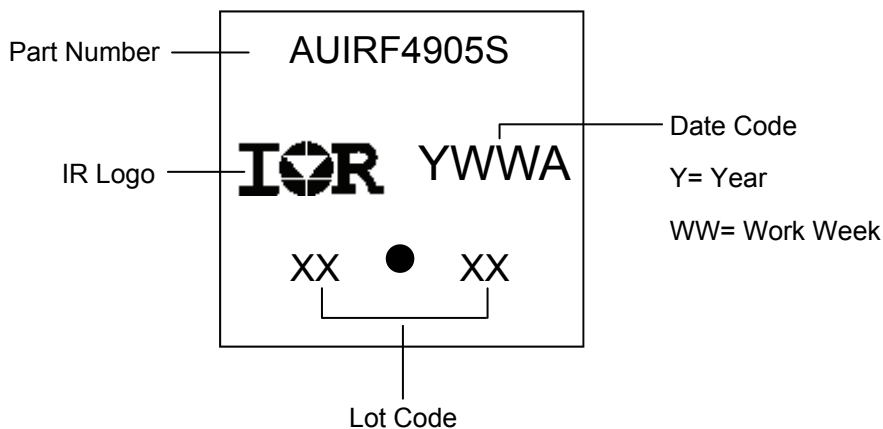
HEXFET

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

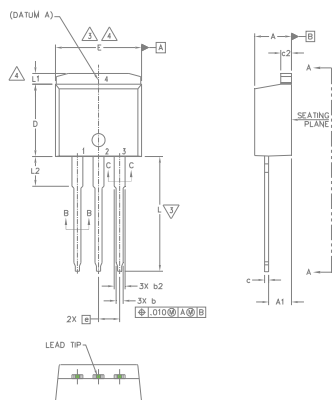
IGBTs, CoPACK

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

D²Pak (TO-263AB) Part Marking Information



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

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 0.127 [0.005"] 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 b1 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

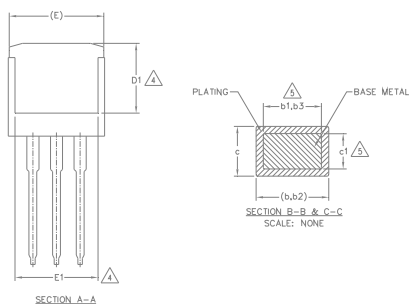
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

HEXFET

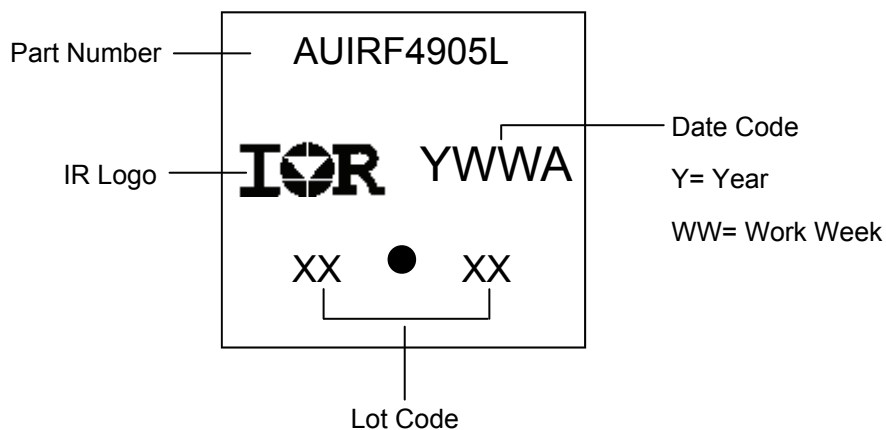
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

DIODES

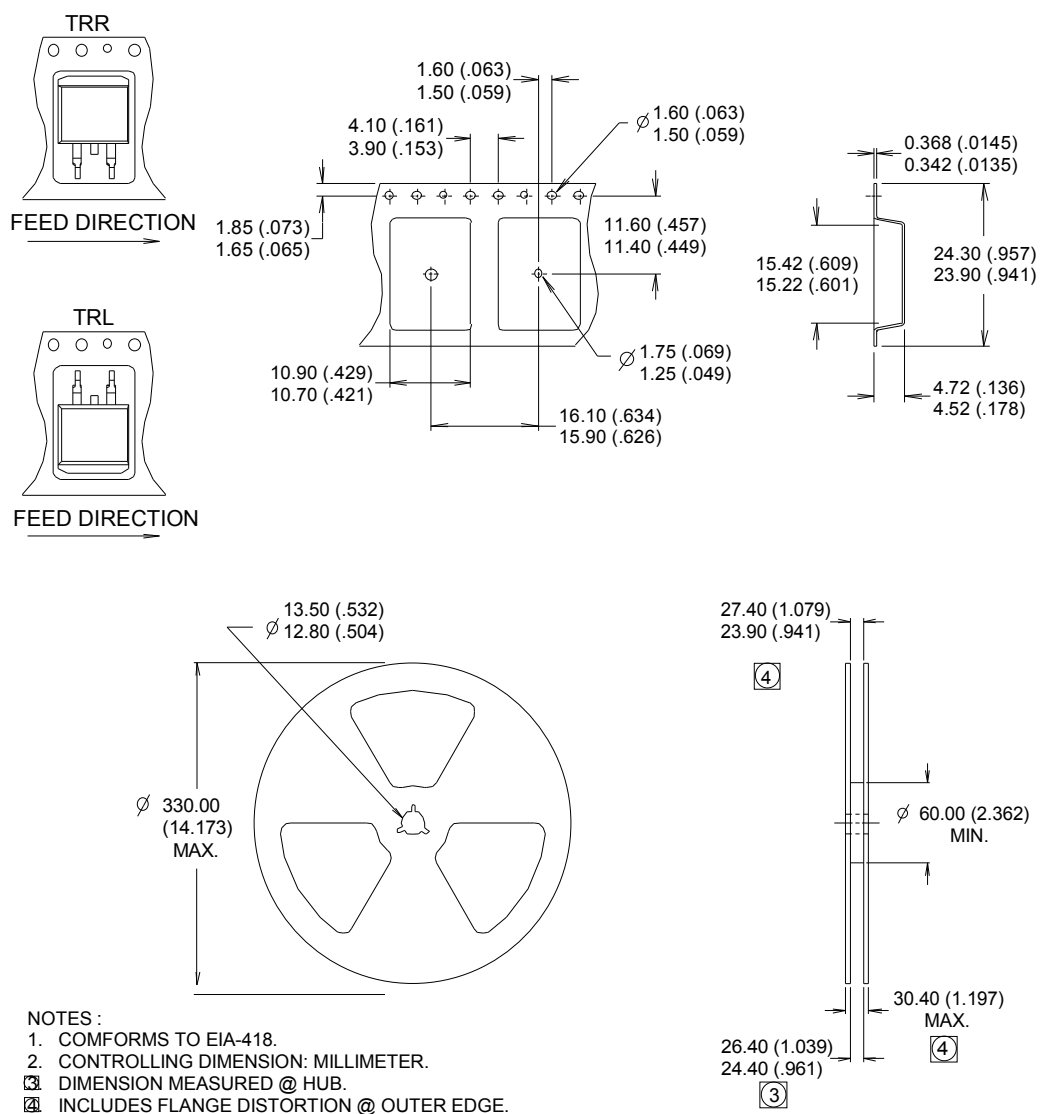
- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
- 2.- CATHODE
- 3.- ANODE



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	5
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	5
b3	1.14	1.73	.045	.068	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	
c2	1.14	1.65	.045	.065	5
D	8.38	9.65	.330	.380	
D1	6.86	—	.270	—	
E	9.65	10.67	.380	.420	
E1	6.22	—	.245	—	3,4
e	2.54 BSC		.100 BSC		4
L	13.46	14.10	.530	.555	4
L1	—	1.65	—	.065	
L2	3.56	3.71	.140	.146	

TO-262 Part Marking Information


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

D²Pak (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

Qualification Level		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		TO-262 Pak	MSL1
		D ² -Pak	
ESD	Machine Model	Class M4 (+/- 425V) [†] AEC-Q101-002	
	Human Body Model	Class H2 (+/- 4000V) [†] AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 1125V) [†] AEC-Q101-005	
RoHS Compliant		Yes	

† Highest passing voltage.

Revision History

Date	Comments
11/13/2015	- Updated datasheet with corporate template - Corrected ordering table on page 1.

Published by

Infineon Technologies AG
81726 München, Germany

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