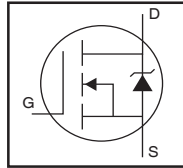
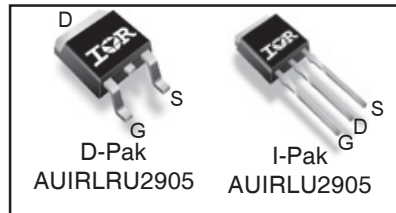


- Advanced Planar Technology
- Logic-Level Gate Drive
- Low On-Resistance
- Dynamic dV/dT Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified



HEXFET® Power MOSFET

$V_{(BR)DSS}$	<b>55V</b>
$R_{DS(on)}$ max.	<b>27mΩ</b>
$I_D$	<b>42A</b>



<b>G</b>	<b>D</b>	<b>S</b>
Gate	Drain	Source

**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.

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRLR2905	Dpak	Tube	75	AUIRLR2905
		Tape and Reel	2000	AUIRLR2905TR
		Tape and Reel Left	3000	AUIRLR2905TRL
		Tape and Reel Right	3000	AUIRLR2905TRR
AUIRLU2905	lpak	Tube	75	AUIRLU2905

**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.

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	42	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	30	
$I_{DM}$	Pulsed Drain Current ①	160	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 16	V
$E_{AS}$	Single Pulse Avalanche Energy (Thermally Limited) ②	210	mJ
$E_{AS}(\text{tested})$	Single Pulse Avalanche Energy Tested Value ②	200	
$I_{AR}$	Avalanche Current ①	25	A
$E_{AR}$	Repetitive Avalanche Energy ①	11	mJ
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case )	300	

HEXFET® is a registered trademark of International Rectifier.

\*Qualification standards can be found at <http://www.irf.com/>

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case <sup>⑥</sup>	—	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount) <sup>⑤</sup>	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

**Static Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.070	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.027	$\Omega$	$V_{GS} = 10V, I_D = 25A$ <sup>④</sup>
		—	—	0.030		$V_{GS} = 5.0V, I_D = 25A$ <sup>④</sup>
		—	—	0.040		$V_{GS} = 4.0V, I_D = 21A$ <sup>④</sup>
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	21	—	—	S	$V_{DS} = 25V, I_D = 25A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$

**Dynamic Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$Q_g$	Total Gate Charge	—	—	48	nC	$I_D = 25A$
$Q_{gs}$	Gate-to-Source Charge	—	—	8.6		$V_{DS} = 44V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	25		$V_{GS} = 5.0V$ <sup>④</sup>
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{DD} = 28V$
$t_r$	Rise Time	—	84	—		$I_D = 25A$
$t_{d(off)}$	Turn-Off Delay Time	—	26	—		$R_G = 3.4\Omega$
$t_f$	Fall Time	—	15	—		$V_{GS} = 5.0V, R_D = 1.1\Omega$ <sup>④</sup>
$L_D$	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	—	1700	—		$V_{GS} = 0V$
$C_{OSS}$	Output Capacitance	—	400	—	pF	$V_{DS} = 25V$
$C_{RSS}$	Reverse Transfer Capacitance	—	150	—		$f = 1.0\text{MHz}$ , See Fig. 5

**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) <sup>①</sup>	—	—	160		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 25A, V_{GS} = 0V$ <sup>④</sup>
$dv/dt$	Peak Diode Recovery <sup>③</sup>	—	5.0	—	V/ns	$T_J = 175^\circ\text{C}, I_S = 25A, V_{DS} = 55V$
$t_{rr}$	Reverse Recovery Time	—	80	120	ns	$T_J = 25^\circ\text{C}, I_F = 25A$
$Q_{rr}$	Reverse Recovery Charge	—	210	320	nC	$di/dt = 100A/\mu s$ <sup>④</sup>
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on times 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  $V_{DD} = 25V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 470\mu H$   
 $R_G = 25\Omega, I_{AS} = 25A$ . (See Figure 12)

③  $I_{SD} \leq 25A, di/dt \leq 270A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$

④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

⑤ When mounted on 1" square PCB (FR-4 or G-10 Material ). For recommended footprint and soldering techniques refer to application note #AN-994.

⑥  $R_{\theta}$  is measured at  $T_J$  approximately  $90^\circ\text{C}$ .

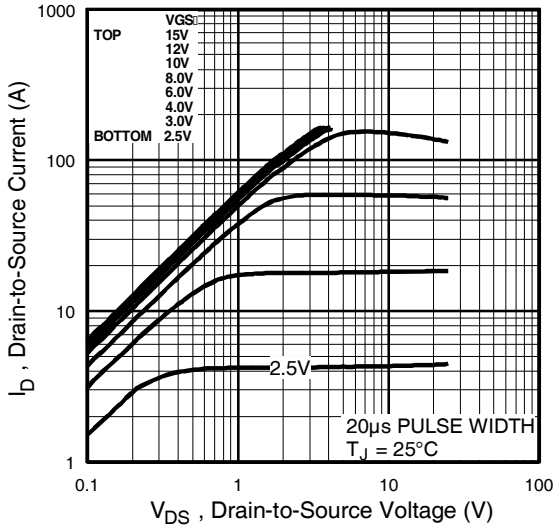


Fig 1. Typical Output Characteristics

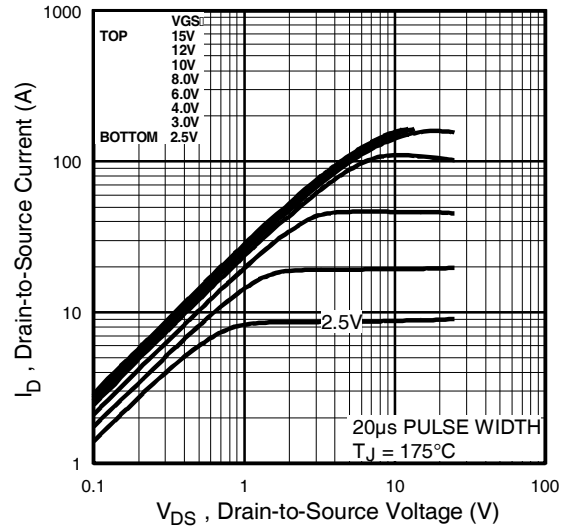


Fig 2. Typical Output Characteristics

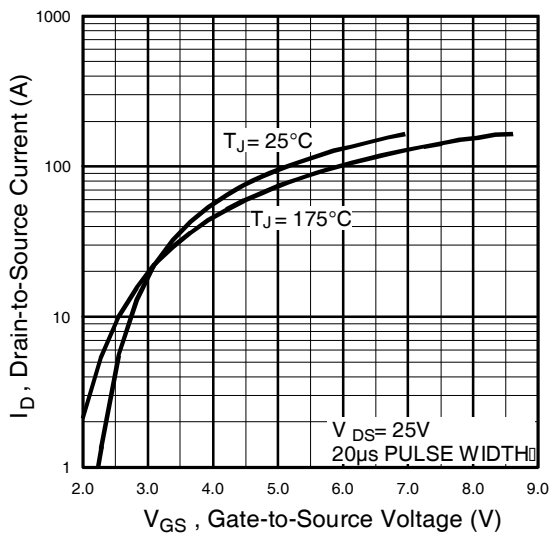


Fig 3. Typical Transfer Characteristics

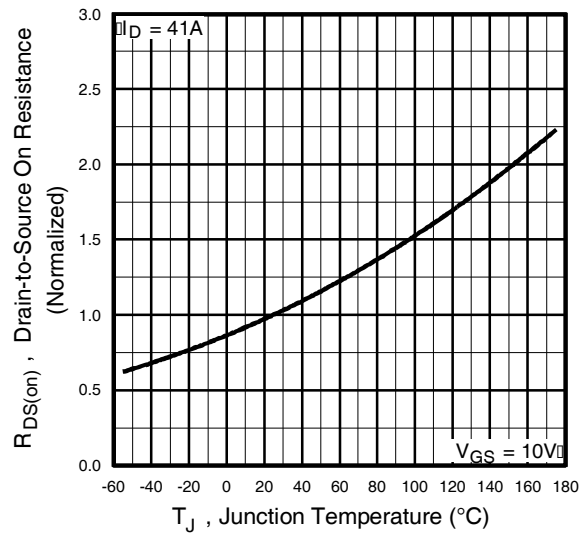
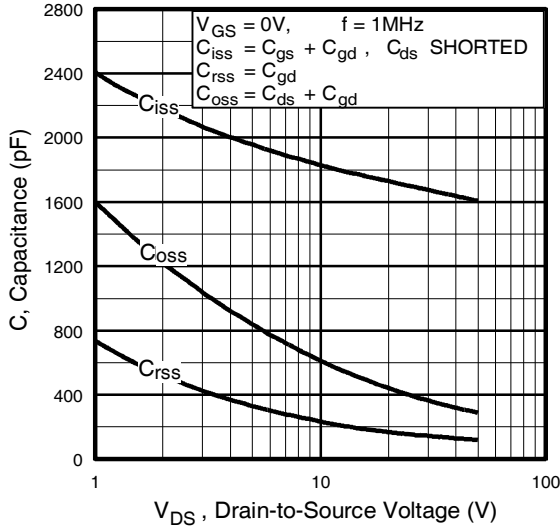
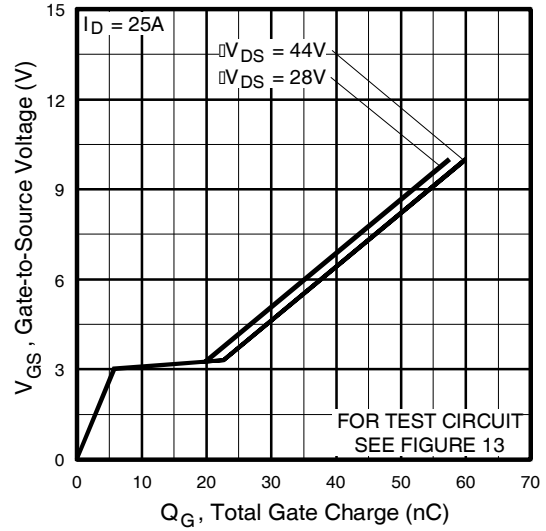


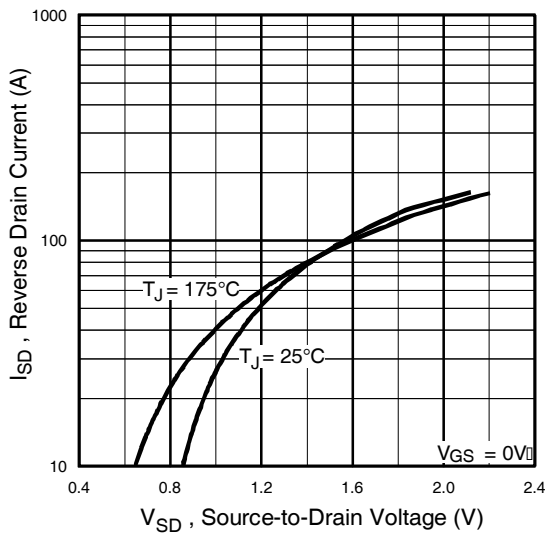
Fig 4. Normalized On-Resistance Vs. Temperature



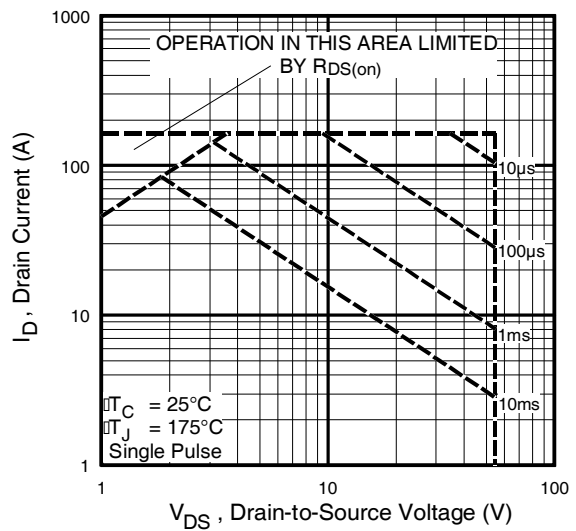
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



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



**Fig 8.** Maximum Safe Operating Area

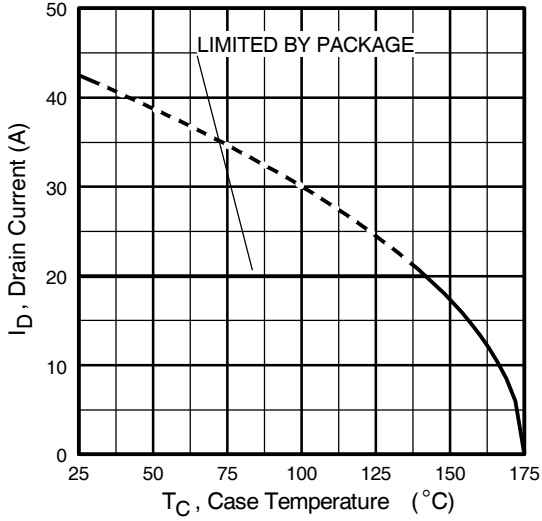


Fig 9. Maximum Drain Current Vs. Case Temperature

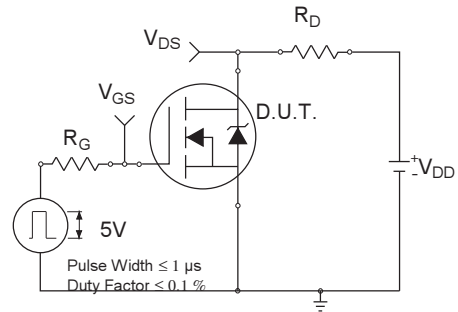


Fig 10a. Switching Time Test Circuit

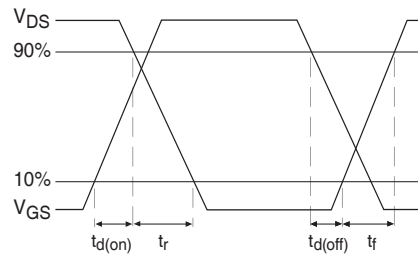


Fig 10b. Switching Time Waveforms

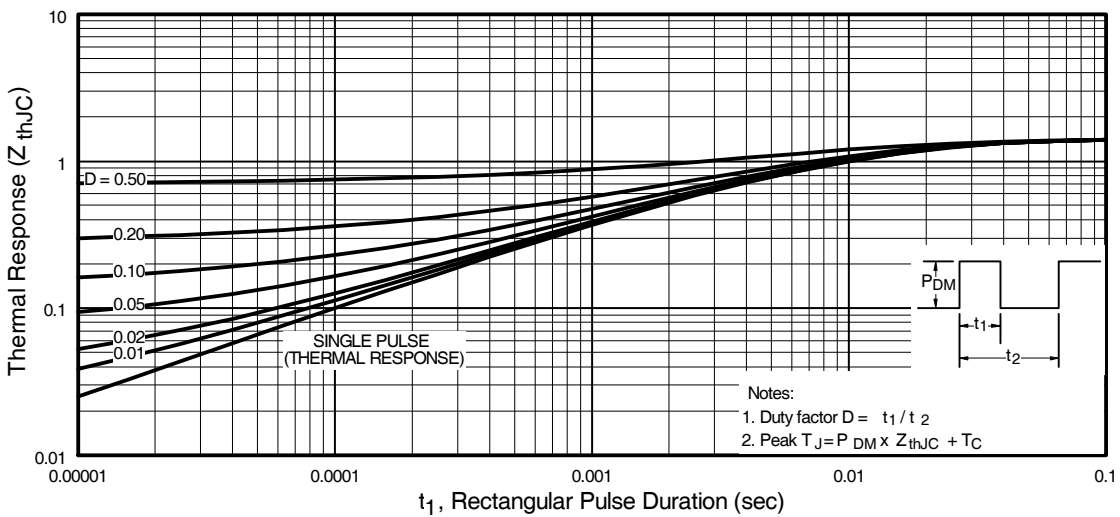


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

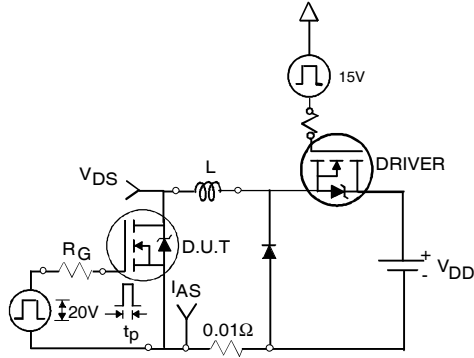


Fig 12a. Unclamped Inductive Test Circuit

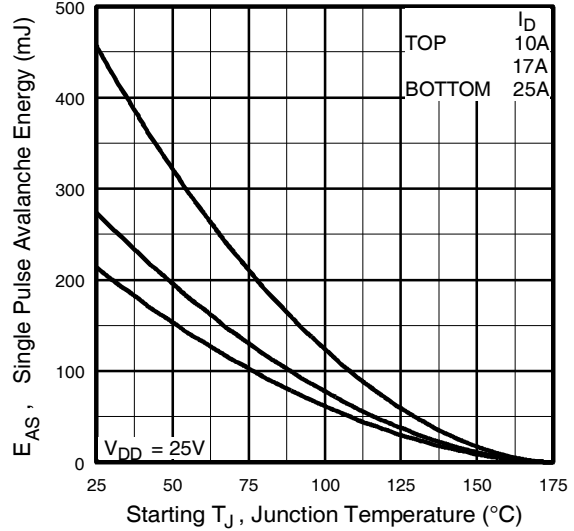


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

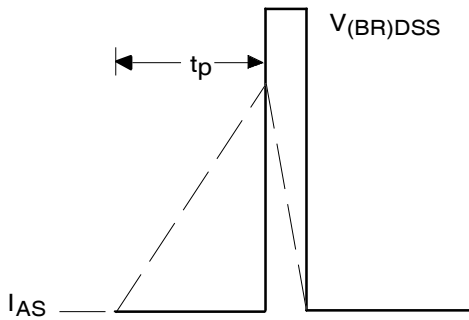


Fig 12b. Unclamped Inductive Waveforms

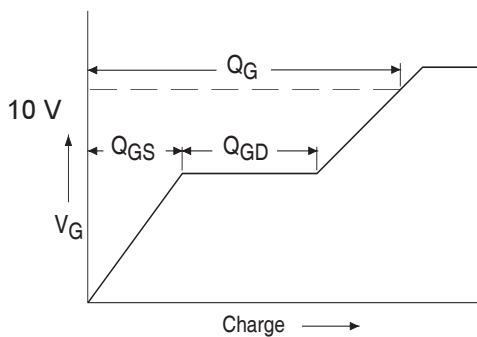


Fig 13a. Basic Gate Charge Waveform

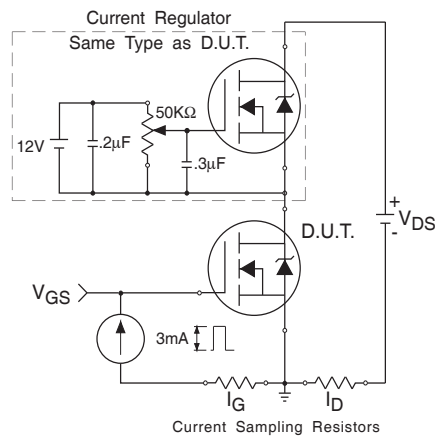
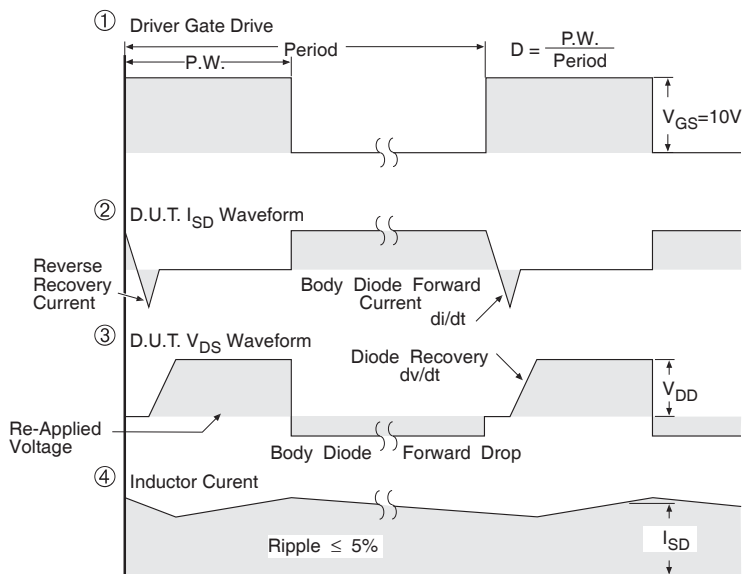
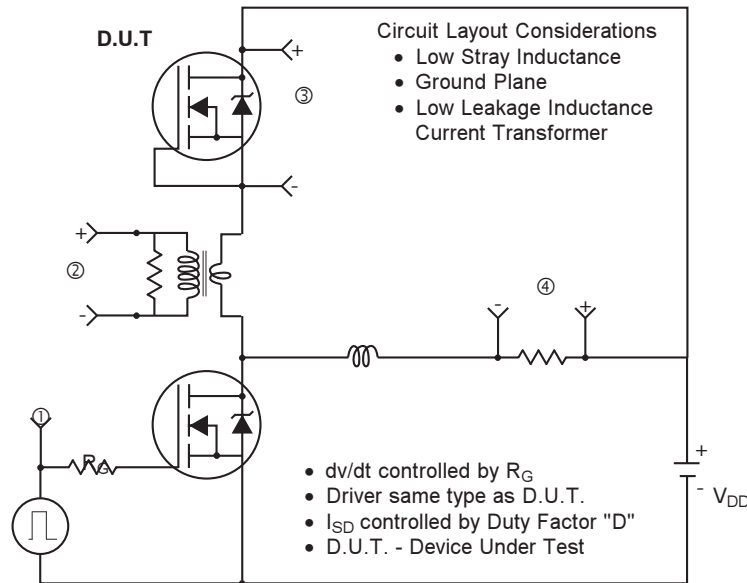


Fig 13b. Gate Charge Test Circuit

### Peak Diode Recovery dv/dt Test Circuit

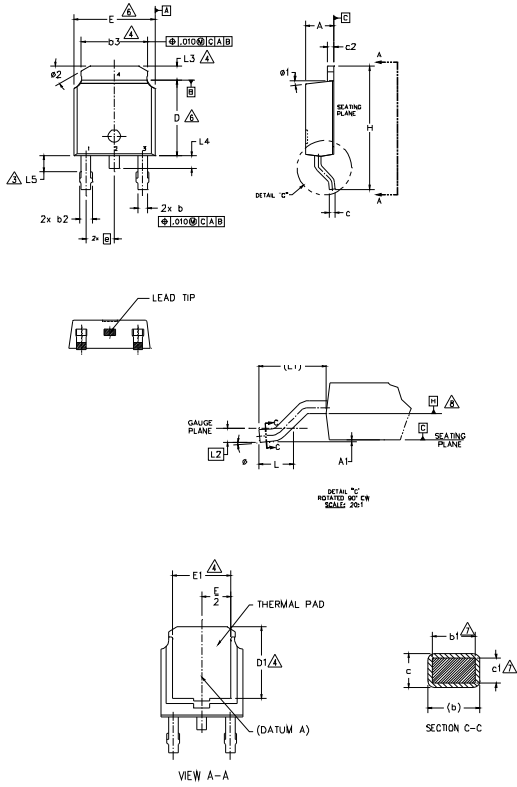


\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 14.** For N-Channel HEXFETS

## D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)

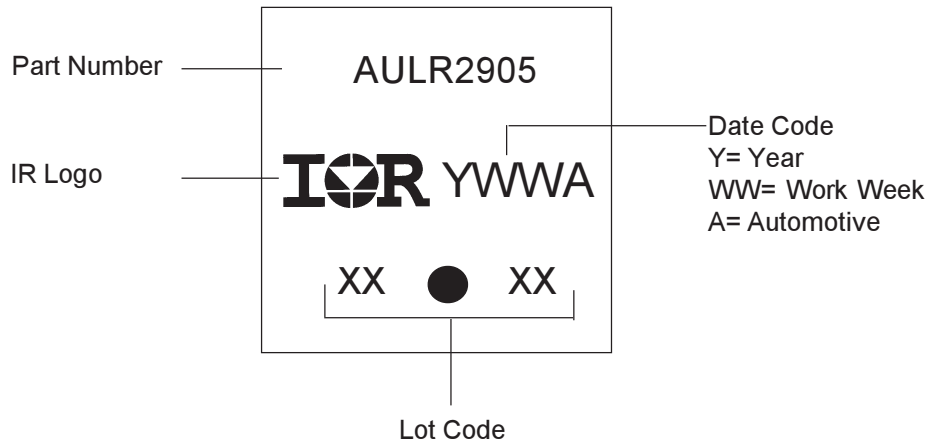


- NOTES:
- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
  - 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]
  - 3.- LEAD DIMENSION UNCONTROLLED IN L5.
  - 4.- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
  - 5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
  - 6.- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
  - 7.- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
  - 8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
  - 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.086	.094	
A1	-	0.13	-	.005	
b	0.64	0.89	.025	.035	
b1	0.65	0.79	.025	.031	7
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	4
c	0.46	0.61	.018	.024	
c1	0.41	0.56	.016	.022	7
c2	0.46	0.89	.018	.035	
D	5.97	6.22	.235	.245	
D1	5.21	-	.205	-	4
E	6.35	6.73	.250	.265	6
E1	4.32	-	.170	-	4
e	2.29 BSC		.090 BSC		
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74 BSC		.108 REF.		
L2	0.51 BSC		.020 BSC		
L3	0.89	1.27	.035	.050	4
L4	-	1.02	-	.040	
L5	1.14	1.52	.045	.060	3
ø	0"	10"	0"	10"	
ø1	0"	15"	0"	15"	
ø2	25"	35"	25"	35"	

- LEAD ASSIGNMENTS
- HEXFET
- 1.- GATE
  - 2.- DRAIN
  - 3.- SOURCE
  - 4.- DRAIN
- IGBT & CoPAK
- 1.- GATE
  - 2.- COLLECTOR
  - 3.- EMITTER
  - 4.- COLLECTOR

## D-Pak Part Marking Information

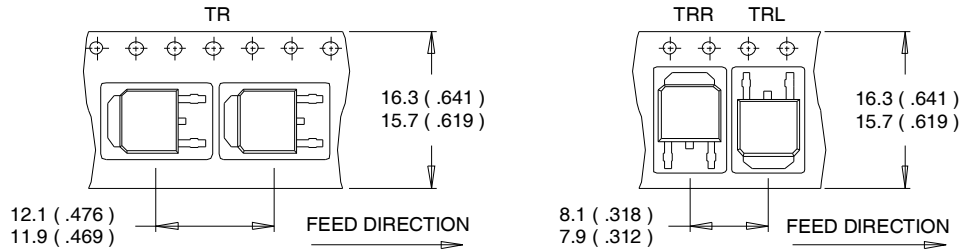


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>



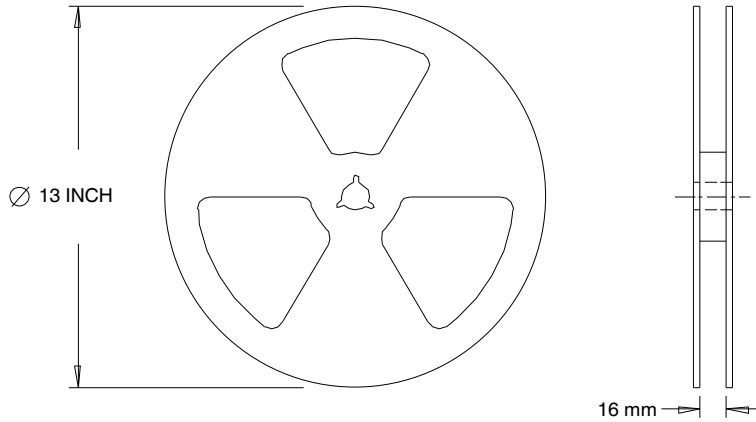
## D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



**NOTES :**

1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS ( INCHES ).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



**NOTES :**

1. OUTLINE CONFORMS TO EIA-481.

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

<b>Qualification Level</b>		Automotive (per AEC-Q101)	
		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
<b>Moisture Sensitivity Level</b>		D-PAK	MSL1
		I-PAK	MSL1
<b>ESD</b>	Machine Model	Class M4 (+/- 425V) <sup>††</sup> AEC-Q101-002	
	Human Body Model	Class H1B (+/- 1000V) <sup>††</sup> AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 1125V) <sup>††</sup> AEC-Q101-005	
<b>RoHS Compliant</b>		Yes	

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/>

†† Highest passing voltage.

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<http://www.irf.com/technical-info/>

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