

AUIRFZ48N

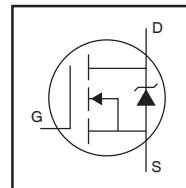
HEXFET® Power MOSFET

Features

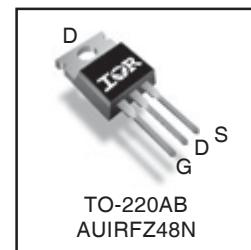
- Advanced Planar Technology
- Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified*

Description

Specifically designed for Automotive applications, this Stripe Planar 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.



$V_{(BR)DSS}$	55V
$R_{DS(on)}$ typ. max	11mΩ
	14mΩ
I_D	69A



G	D	S
Gate	Drain	Source

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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	69	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	49	
I_{DM}	Pulsed Drain Current ①	270	
$P_D @ T_C = 25^\circ C$	Power Dissipation	160	W
	Linear Derating Factor	1.1	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	265	mJ
$E_{AS} (\text{tested})$	Single Pulse Avalanche Energy Tested Value ⑥	290	
I_{AR}	Avalanche Current ①	See Fig.12a, 12b, 15, 16	A
E_{AR}	Repetitive Avalanche Energy ⑤		mJ
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑦	—	0.95	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(\text{BR})\text{DSS}}$	Drain-to-Source Breakdown Voltage	55	—	—	V	$V_{GS} = 0V, I_D = 250\mu\text{A}$
$\Delta V_{(\text{BR})\text{DSS}}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.054	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1.0\text{mA}$
$R_{DS(\text{on})}$	Static Drain-to-Source On-Resistance	—	11	14	$\text{m}\Omega$	$V_{GS} = 10V, I_D = 40\text{A}$ ③
$V_{GS(\text{th})}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 100\mu\text{A}$
g_{fs}	Forward Transconductance	24	—	—	S	$V_{DS} = 10V, I_D = 40\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 55V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	—	42	63	nC	$I_D = 40\text{A}$
Q_{gs}	Gate-to-Source Charge	—	9.0	—		$V_{DS} = 44V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	17	—		$V_{GS} = 10V$ ③
$t_{d(on)}$	Turn-On Delay Time	—	12	—	ns	$V_{DD} = 28V$
t_r	Rise Time	—	62	—		$I_D = 40\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	—	37	—		$R_G = 7.6\Omega$
t_f	Fall Time	—	37	—		$V_{GS} = 10V$ 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	—	1900	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	470	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	120	—		$f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	2180	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss} eff.	Effective Output Capacitance	—	340	—		$V_{GS} = 0V, V_{DS} = 44V, f = 1.0\text{MHz}$
		—	610	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 44V$ ④

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_s	Continuous Source Current (Body Diode)	—	—	69	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	270		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_s = 40\text{A}, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	71	110	ns	$T_J = 25^\circ\text{C}, I_F = 40\text{A}, V_{DD} = 28V$
Q_{rr}	Reverse Recovery Charge	—	230	345	nC	$dI/dt = 100\text{A}/\mu\text{s}$ ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).
- ② Limited by $T_{J\text{max}}$, starting $T_J = 25^\circ\text{C}$, $L = 0.24\text{mH}$ $R_G = 50\Omega$, $I_{AS} = 40\text{A}$, $V_{GS} = 10V$. Part not recommended for use above this value.
- ③ Pulse width $\leq 1.0\text{ms}$; duty cycle $\leq 2\%$.
- 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 $T_{J\text{max}}$, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑥ This value determined from sample failure population, starting $T_J = 25^\circ\text{C}$, $L = 0.24\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 40\text{A}$, $V_{GS} = 10V$.
- ⑦ R_θ is measured at T_J approximately 90°C .

Qualification Information[†]

		Automotive (per AEC-Q101) ^{††}	
Qualification Level		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		TO-220	N/A
ESD	Machine Model	Class M3 (+/- 400V) ^{†††} AEC-Q101-002	
	Human Body Model	Class H1C (+/- 1500V) ^{†††} AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) ^{†††} AEC-Q101-005	
RoHS Compliant		Yes	

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

^{††} Exceptions (if any) to AEC-Q101 requirements are noted in the qualification report.

^{†††} Highest passing voltage.

AUIRFZ48N

International
Rectifier

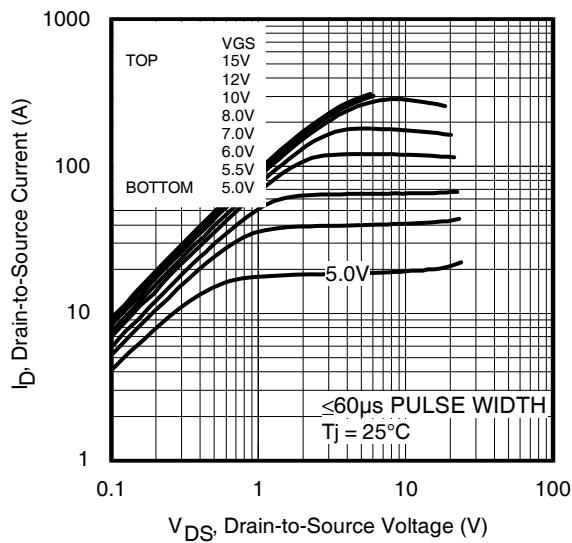


Fig 1. Typical Output Characteristics

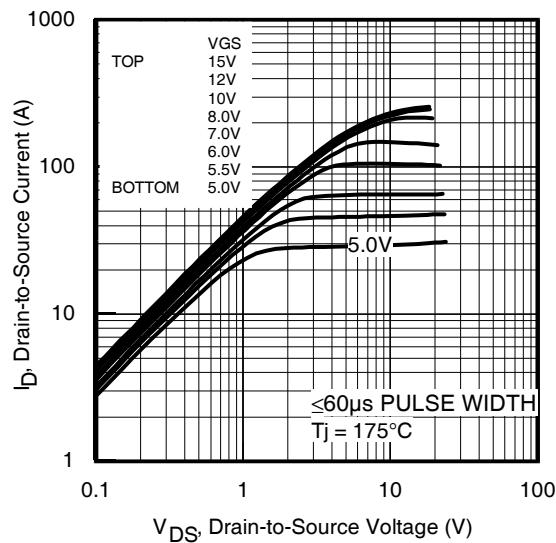


Fig 2. Typical Output Characteristics

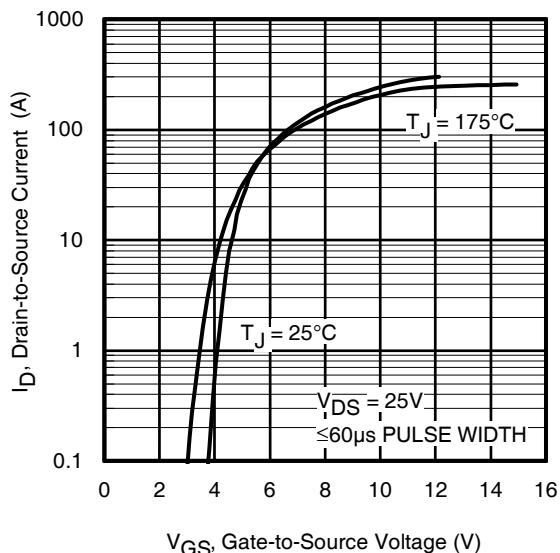


Fig 3. Typical Transfer Characteristics

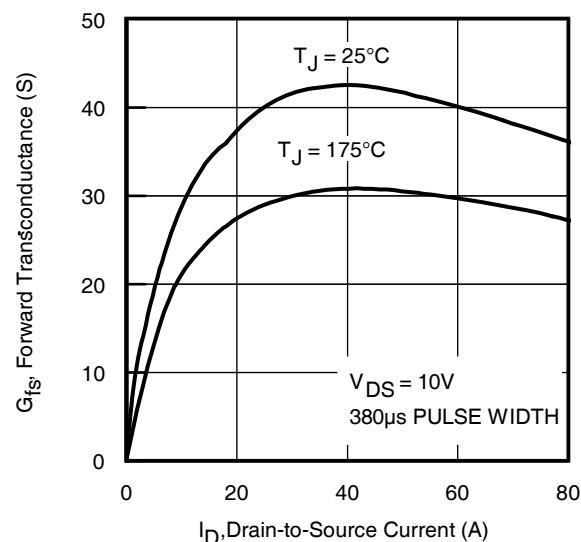


Fig 4. Typical Forward Transconductance vs. Drain Current

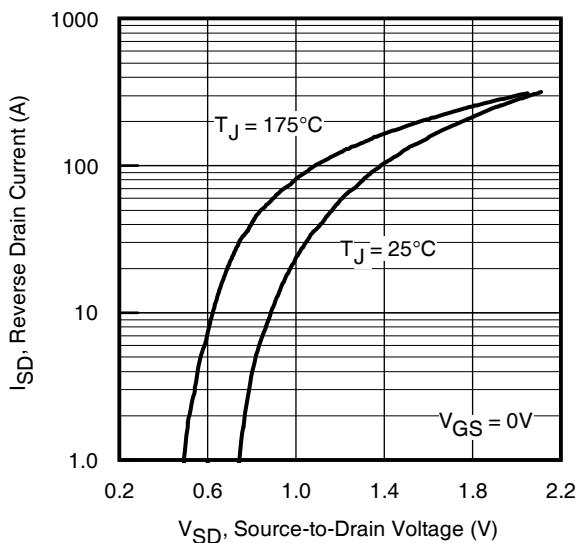


Fig 5. Typical Source-Drain Diode Forward Voltage

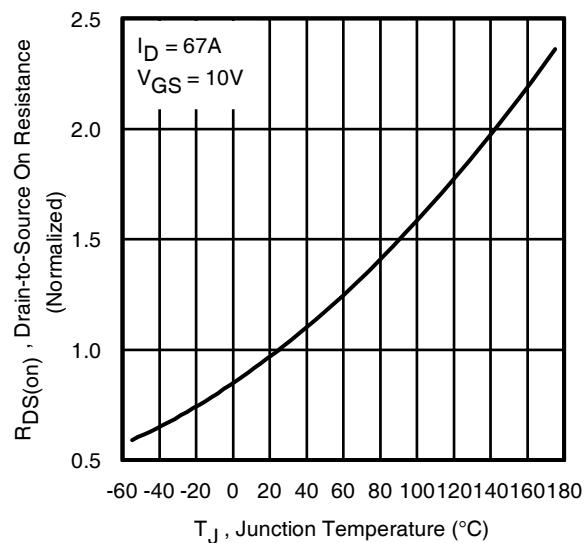
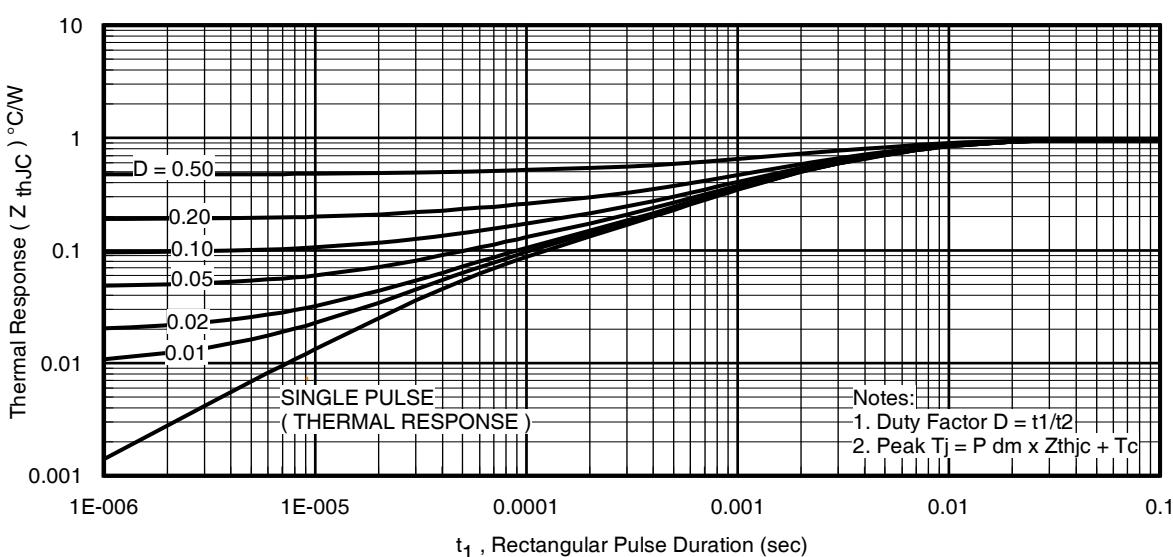
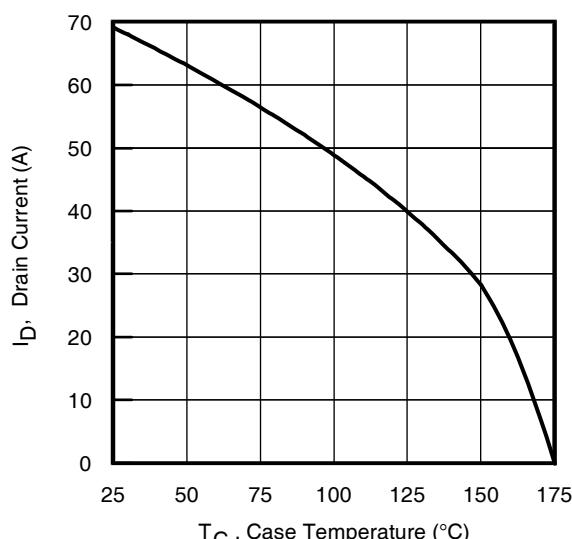
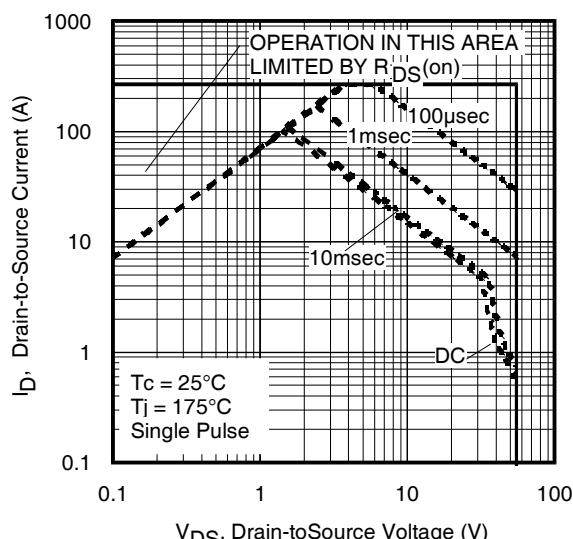
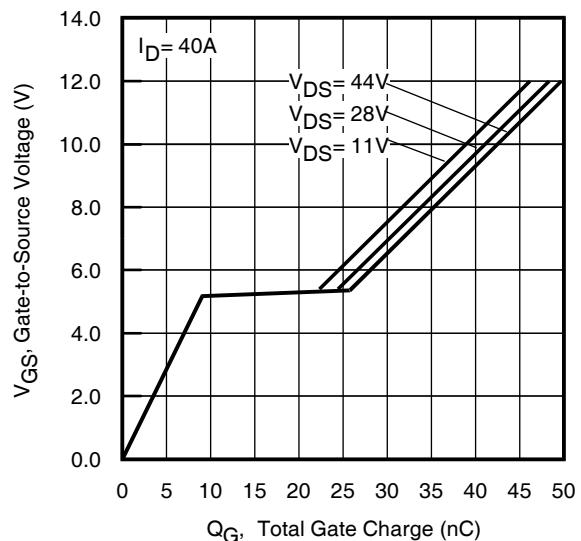
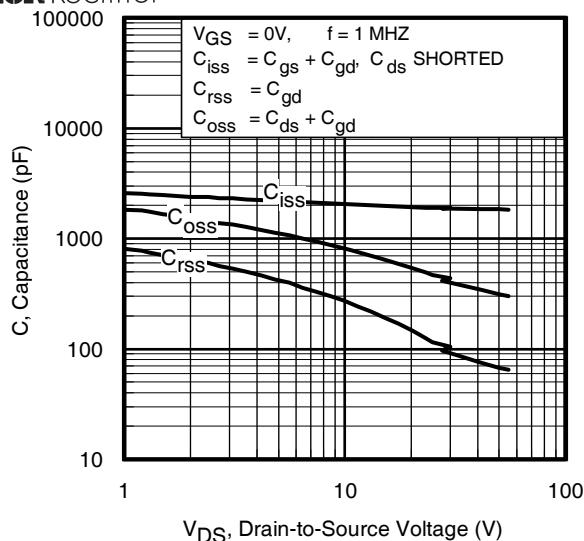


Fig 6. Normalized On-Resistance vs. Temperature



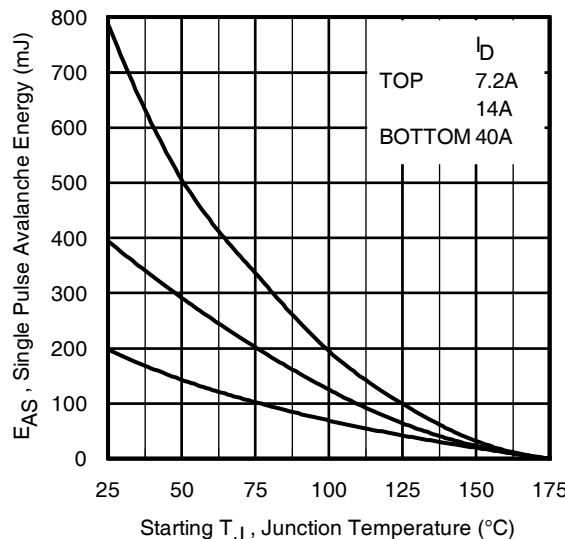


Fig 12. Maximum Avalanche Energy vs. Drain Current

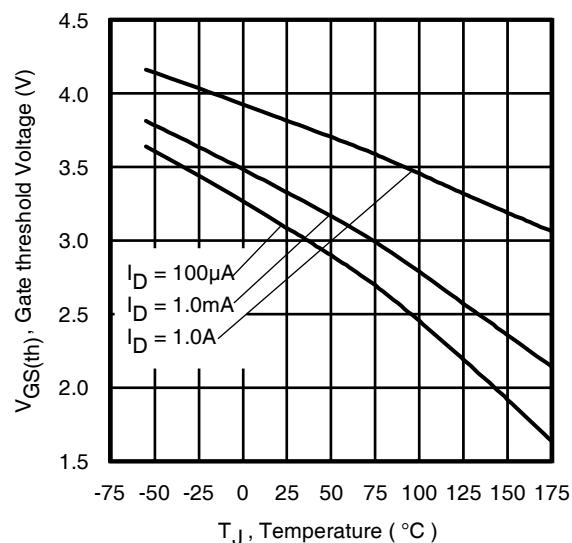


Fig 13. Threshold Voltage vs. Temperature

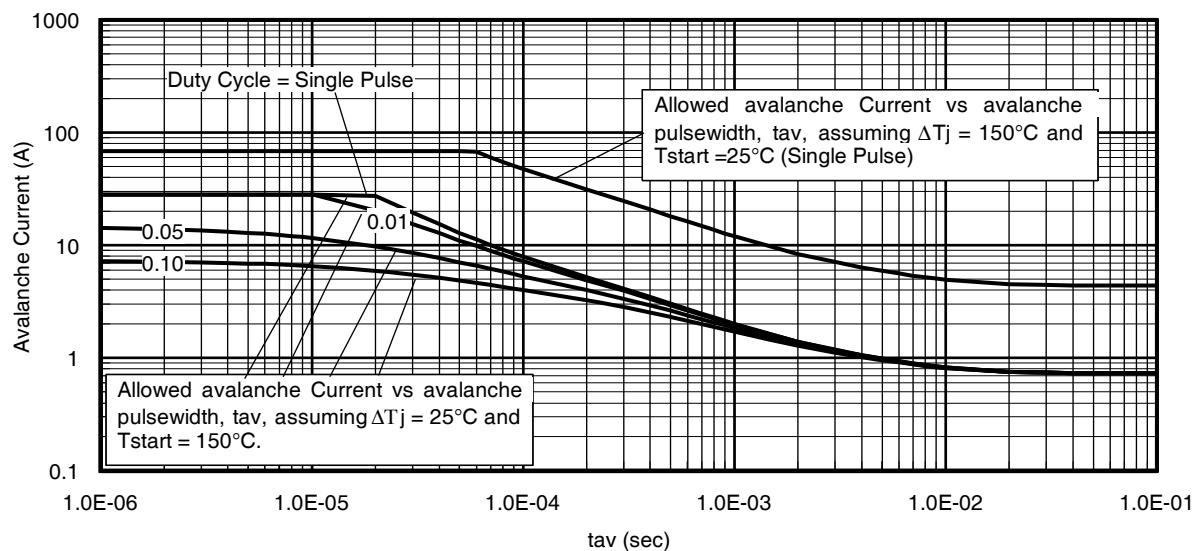


Fig 14. Typical Avalanche Current vs.Pulsewidth

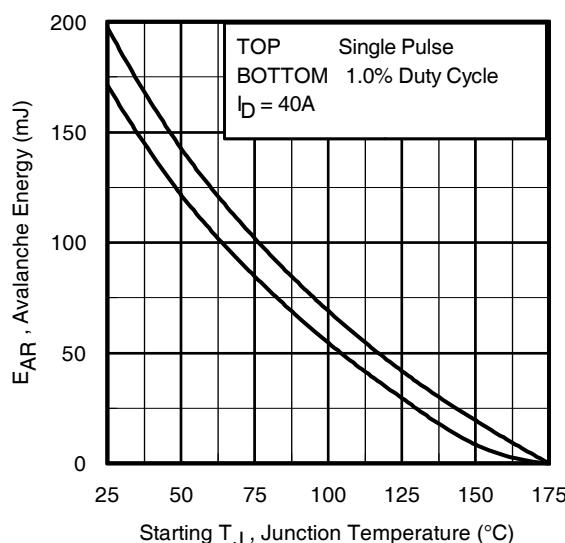


Fig 15. Maximum Avalanche Energy vs. Temperature

Notes on Repetitive Avalanche Curves , Figures 14, 15:
(For further info, see AN-1005 at www.irf.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 17a, 17b.
4. $P_{D(ave)} = \text{Average power dissipation per single avalanche pulse.}$
5. $BV = \text{Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).}$
6. $I_{av} = \text{Allowable avalanche current.}$
7. $\Delta T = \text{Allowable rise in junction temperature, not to exceed } T_{jmax} \text{ (assumed as } 25^\circ C \text{ in Figure 14, 15).}$
 $t_{av} = \text{Average time in avalanche.}$
 $D = \text{Duty cycle in avalanche} = t_{av} \cdot f$
 $Z_{thJC}(D, t_{av}) = \text{Transient thermal resistance, see figure 11)}$

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

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

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

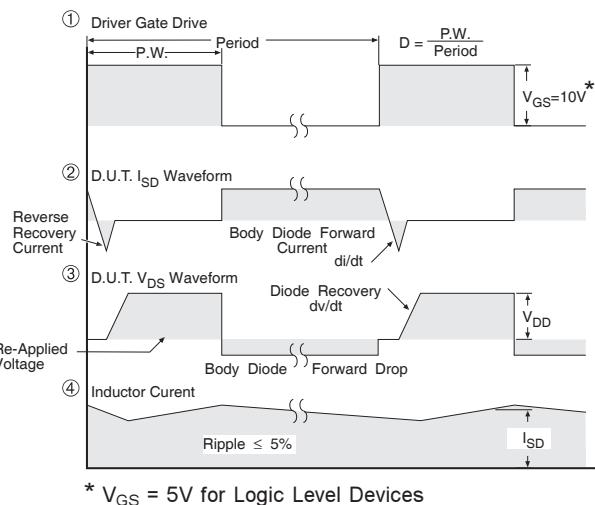
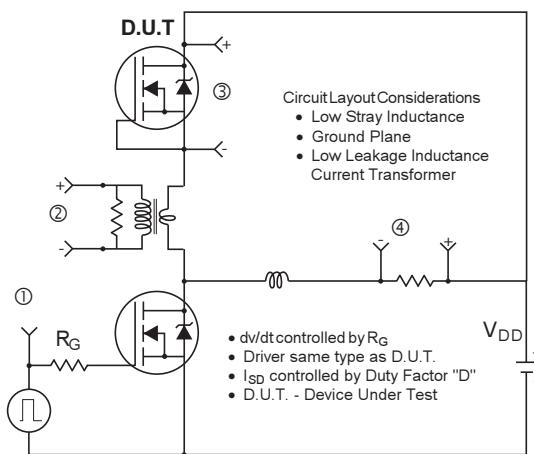


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

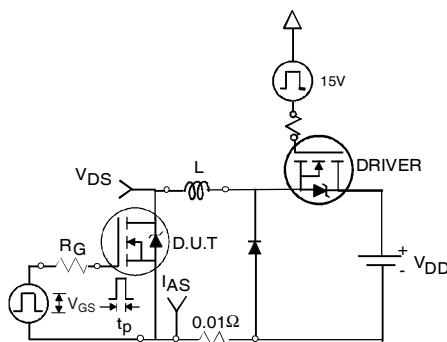


Fig 17a. Unclamped Inductive Test Circuit

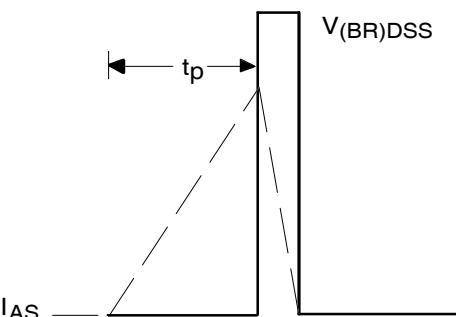


Fig 17b. Unclamped Inductive Waveforms

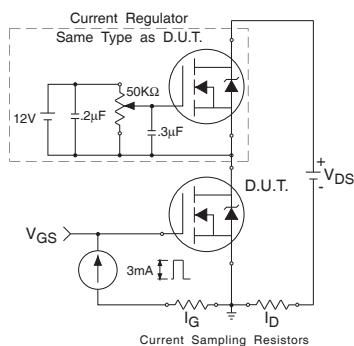


Fig 18a. Gate Charge Test Circuit

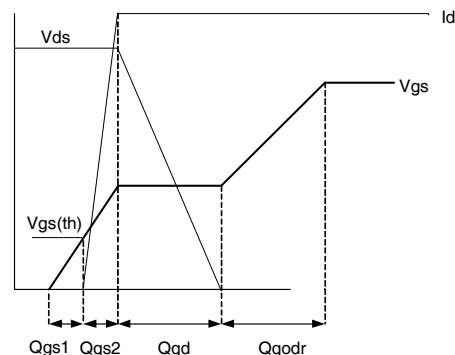


Fig 18b. Gate Charge Waveform

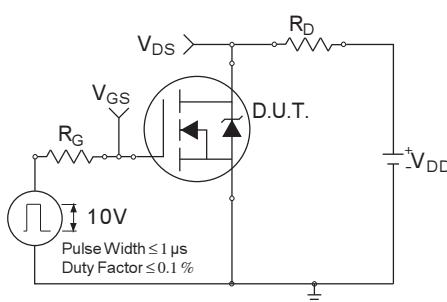


Fig 19a. Switching Time Test Circuit

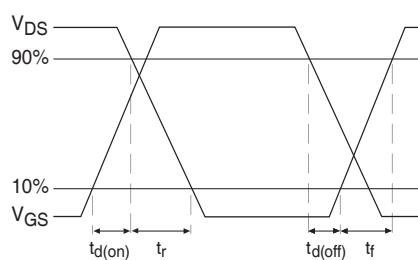
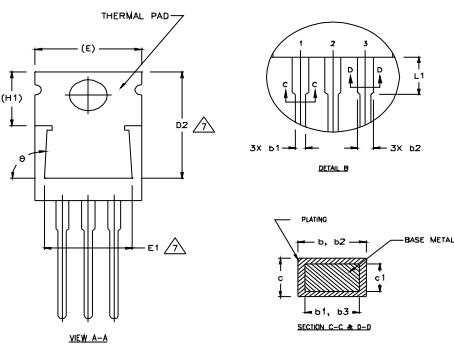
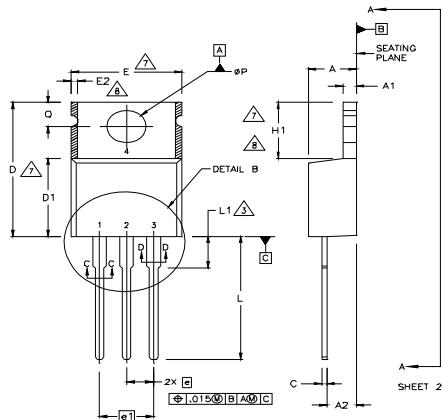


Fig 19b. Switching Time Waveforms

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- 3 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 5 DIMENSION B1 & C1 APPLY TO BASE METAL ONLY.
- 6 CONTROLLING DIMENSION : INCHES.
- 7 THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
- 8 DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRRREGULARITIES ARE ALLOWED.

LEAD ASSIGNMENTS

HEXFET
1.- GATE
2 - DRAIN
3 - SOURCE

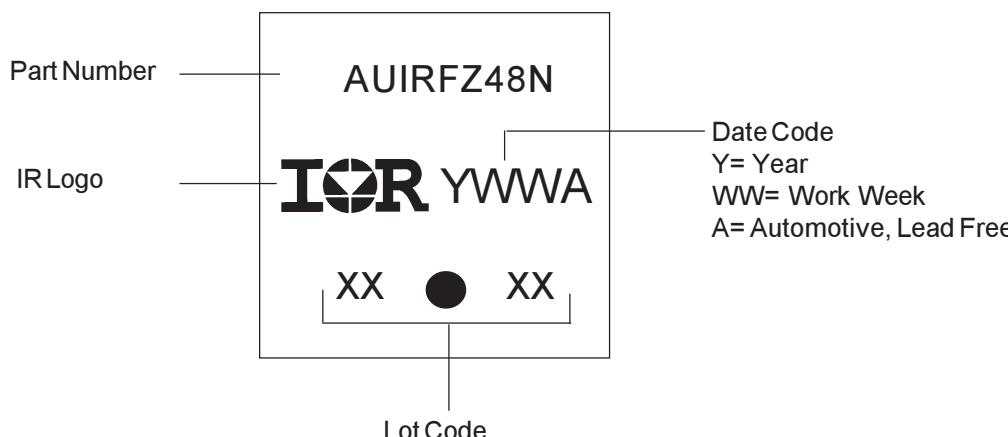
IGBTs, COPACK
1.- GATE
2.- COLLECTOR
3.- Emitter

DIODES
1.- ANODE/OPEN
2.- CATHODE
3.- ANODE

SYMBOL	DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	3.56	4.82	.140	.190
A1	0.51	1.40	.020	.055
A2	2.04	2.92	.080	.115
b	0.38	1.01	.015	.040
b1	0.38	0.96	.015	.038
b2	1.15	1.77	.045	.070
b3	1.15	1.73	.045	.068
c	0.36	0.61	.014	.024
c1	0.36	0.56	.014	.022
D	14.22	16.51	.560	.650
D1	8.38	9.02	.330	.355
D2	12.19	12.88	.480	.507
E	9.66	10.66	.380	.420
E1	8.38	8.89	.330	.350
e	2.54 BSC		.100 BSC	
e1	5.08		.200 BSC	
H1	5.85	6.55	.230	.270
L	12.70	14.73	.500	.580
L1	-	6.35	-	.250
øP	3.54	4.08	.139	.161
Q	2.54	3.42	.100	.135
Ø	90°-93°		90°-93°	

Lot Code

TO-220AB Part Marking Information

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

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRFZ48N	TO-220	Tube	50	AUIRFZ48N

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For technical support, please contact IR's Technical Assistance Center
<http://www.irf.com/technical-info/>

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ООО "ЛайфЭлектроникс"

"LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибуторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибуторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помочь разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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