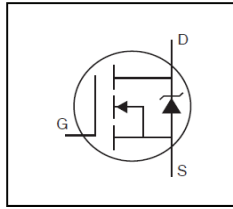


Features

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



$V_{(BR)DSS}$	24V
$R_{DS(on)}$ typ.	1.25mΩ
	max.
I_D (Silicon Limited)	380A®
I_D (Package Limited)	180A



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.

G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRFP2602	TO-247AC	Tube	25	AUIRFP2602

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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited)	380®	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited)	270®	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited)	180	
I_{DM}	Pulsed Drain Current ①	1580	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	380	W
	Linear Derating Factor	2.5	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	400	mJ
$E_{AS} (Tested)$	Single Pulse Avalanche Energy Tested Value ③	1011	
I_{AR}	Avalanche Current ①	See Fig.14,15, 17a, 17b	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 (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑦	—	0.40	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

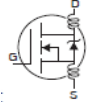
HEXFET® is a registered trademark of Infineon.

*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	24	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.02	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	1.25	1.6	mΩ	V _{GS} = 10V, I _D = 180A ③
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Trans conductance	230	—	—	S	V _{DS} = 10V, I _D = 180A
I _{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	V _{DS} = 24V, V _{GS} = 0V
		—	—	250		V _{DS} = 24V, V _{GS} = 0V, T _J = 125°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	V _{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V _{GS} = -20V

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

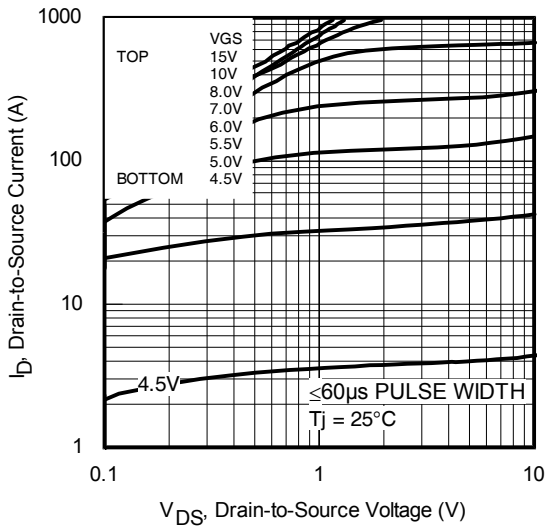
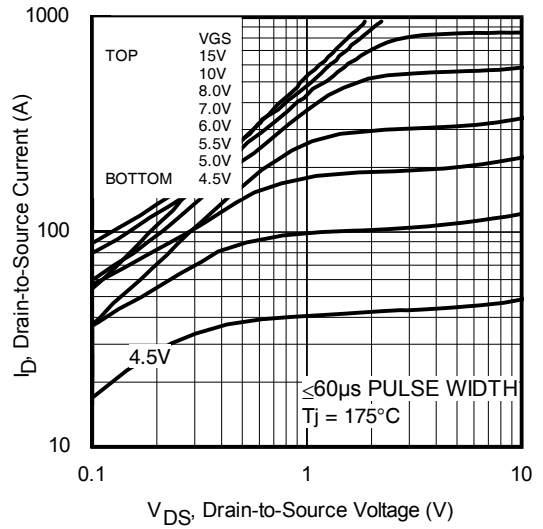
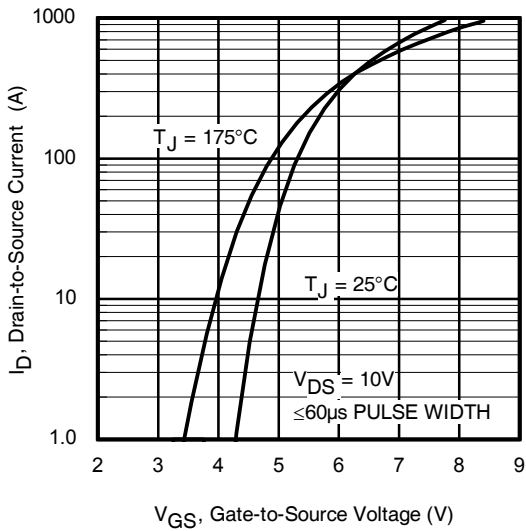
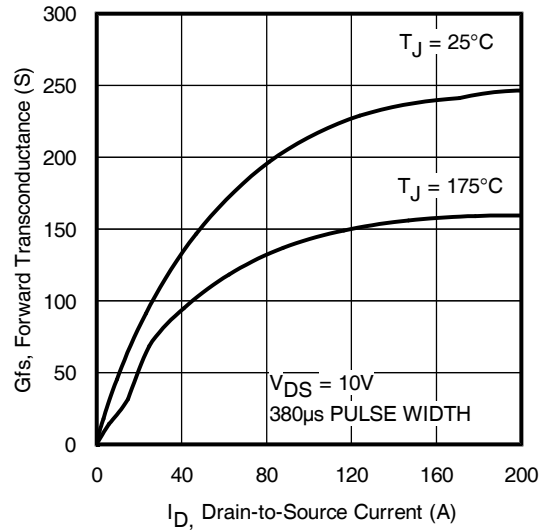
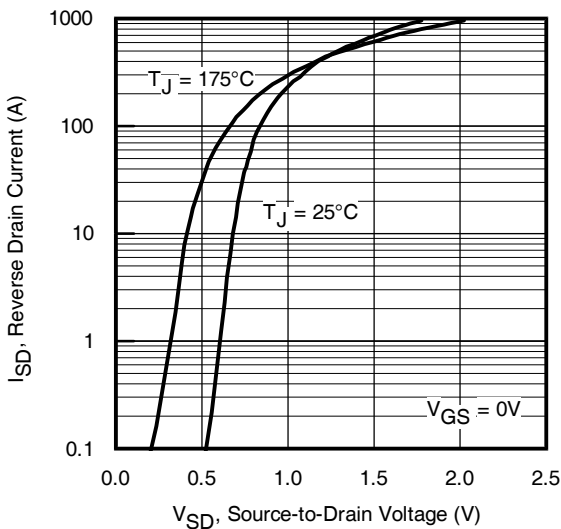
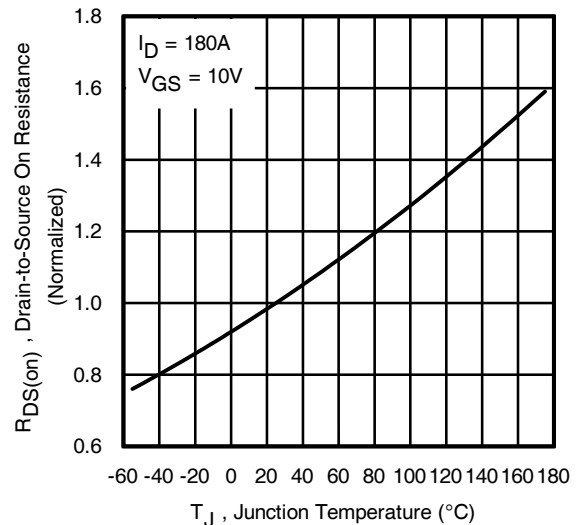
Q _g	Total Gate Charge	—	260	390	nC	I _D = 180A V _{DS} = 12V V _{GS} = 10V ③	
Q _{gs}	Gate-to-Source Charge	—	72	—			
Q _{gd}	Gate-to-Drain Charge	—	100	—			
t _{d(on)}	Turn-On Delay Time	—	70	—	ns	V _{DD} = 12V I _D = 180A R _G = 2.5Ω V _{GS} = 10V ③	
t _r	Rise Time	—	490	—			
t _{d(off)}	Turn-Off Delay Time	—	150	—			
t _f	Fall Time	—	270	—			
L _D	Internal Drain Inductance	—	5.0	—	pF	Between lead, 6mm (0.25in.) from package and center of die contact : 	
L _S	Internal Source Inductance	—	13	—			
C _{iss}	Input Capacitance	—	11220	—			
C _{oss}	Output Capacitance	—	4800	—			
C _{rss}	Reverse Transfer Capacitance	—	2660	—			
C _{oss}	Output Capacitance	—	13020	—			V _{GS} = 0V, V _{DS} = 1.0V, f = 1.0KHz
C _{oss}	Output Capacitance	—	4800	—			V _{GS} = 0V, V _{DS} = 19V, f = 1.0KHz
C _{oss eff.}	Effective Output Capacitance	—	6710	—			V _{GS} = 0V, V _{DS} = 0V to 19V ④

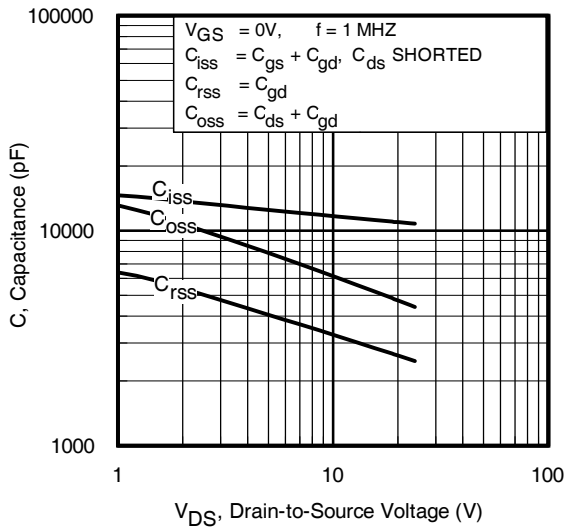
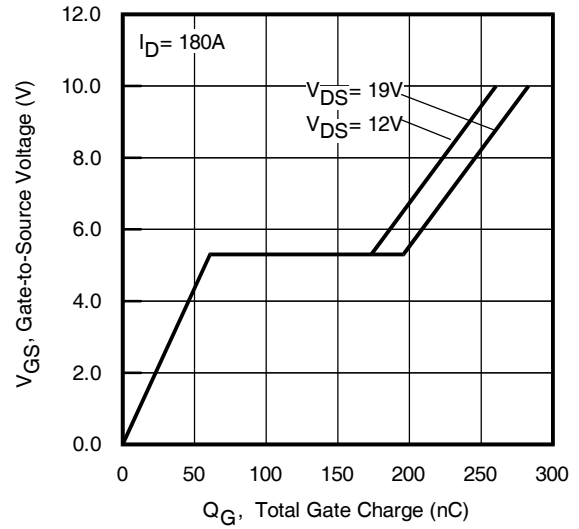
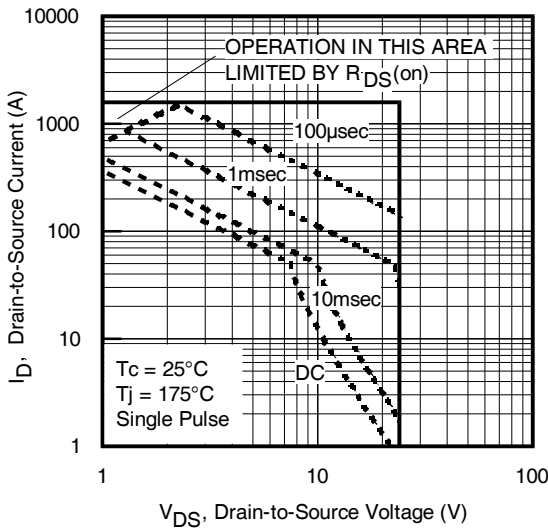
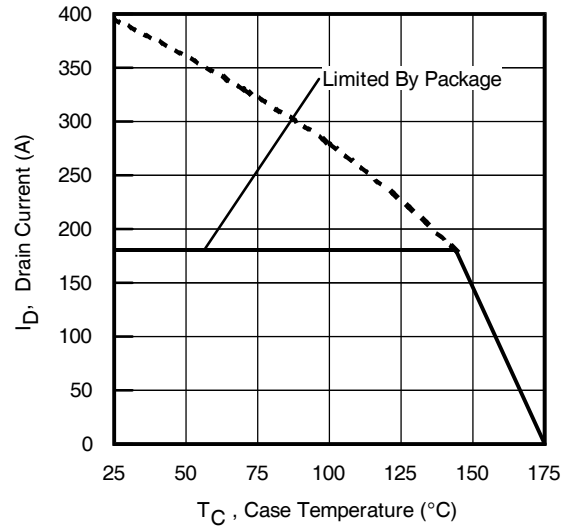
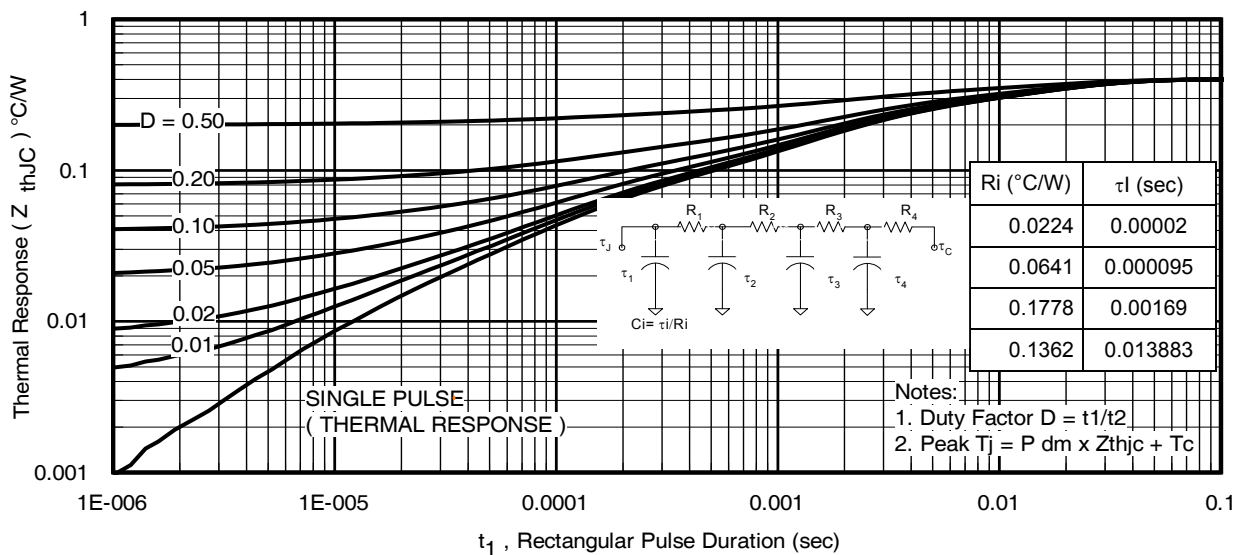
Diode Characteristics

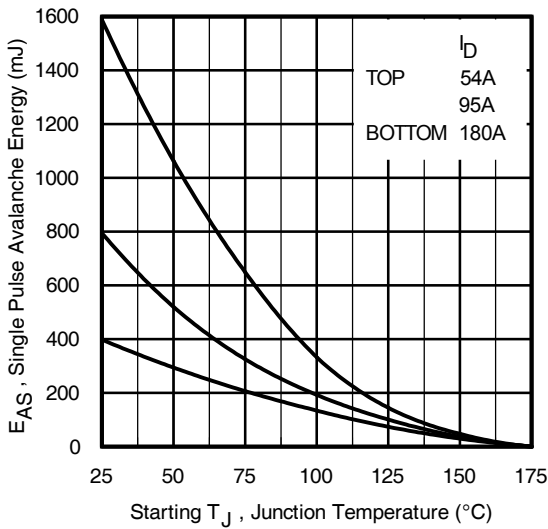
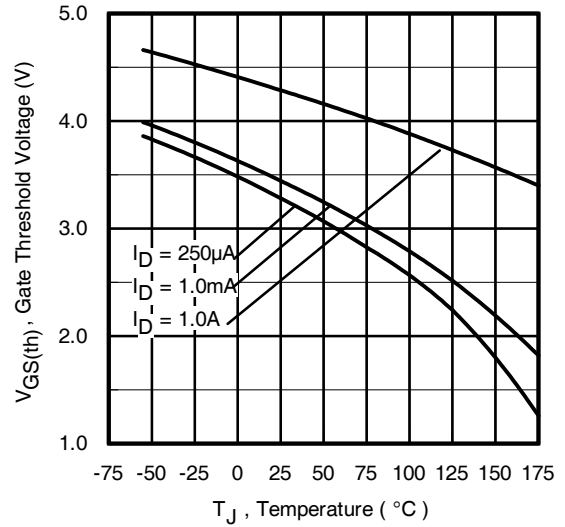
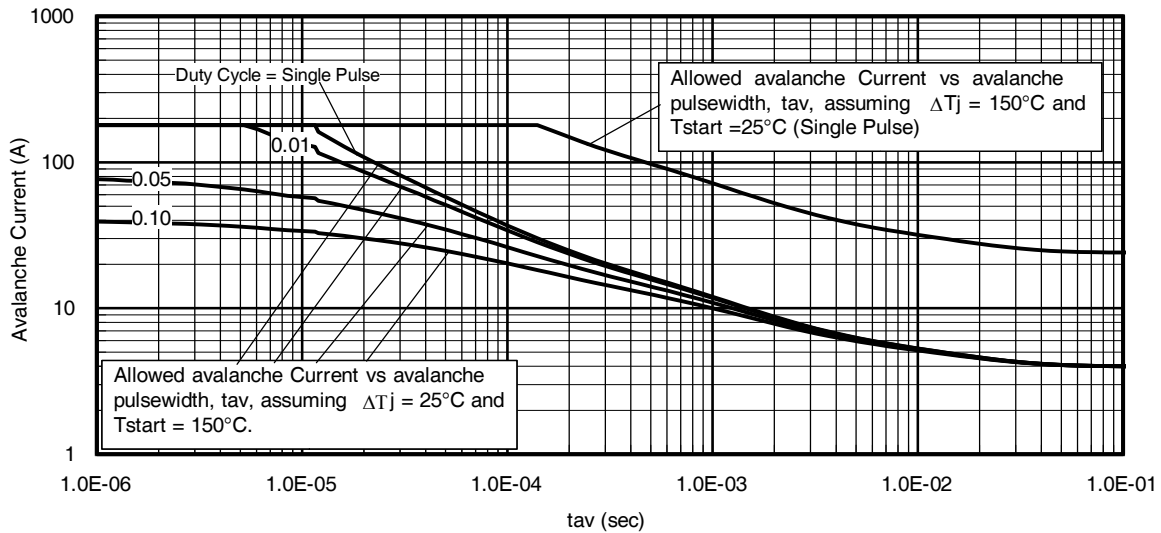
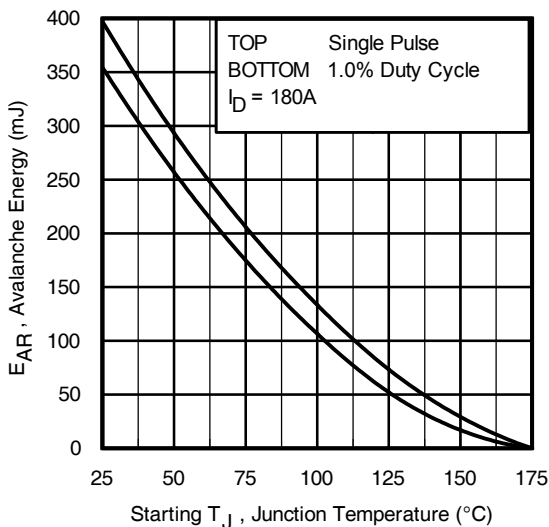
	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	380⑧	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	1580		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 180A, V _{GS} = 0V ③
t _{rr}	Reverse Recovery Time	—	55	83	ns	T _J = 25°C, I _F = 180A, V _{DD} = 12V
Q _{rr}	Reverse Recovery Charge	—	56	84	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 = 0.025mH, R_G = 25Ω, I_{AS} = 180A, 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. 100% tested to this value in production.
- ⑦ R_θ is measured at T_J of approximately 90°C.
- ⑧ Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 180A. Note that current 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 Source-Drain Diode Forward Voltage

Fig. 6. Normalized On-Resistance vs. Temperature


Fig. 7 Typical Capacitance vs. Drain-to-Source Voltage

Fig. 8 Typical Gate Charge vs. Gate-to-Source Voltage

Fig. 9 Maximum Safe Operating Area

Fig. 10 Maximum Drain Current vs. Case Temperature

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


Fig 12. Maximum Avalanche Energy vs. Drain Current

Fig 13. Threshold Voltage vs. Temperature

Fig 14. Typical Avalanche Current vs. Pulse width

Fig 15. Maximum Avalanche Energy vs. Temperature

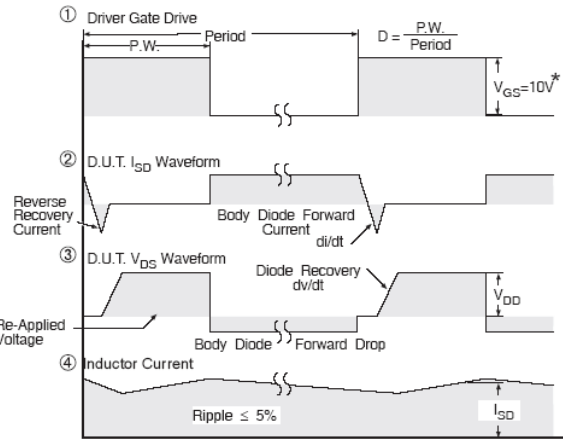
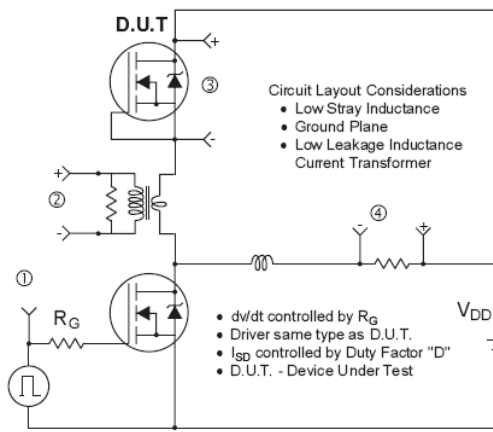
Notes on Repetitive Avalanche Curves, Figures 14, 15:
(For further info, see AN-1005 at www.infineon.com)

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 17a, 17b.
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 $25^{\circ}C$ 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)

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

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

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



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

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

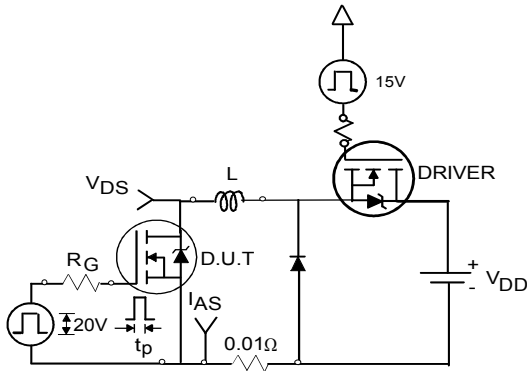


Fig 17a. Unclamped Inductive Test Circuit

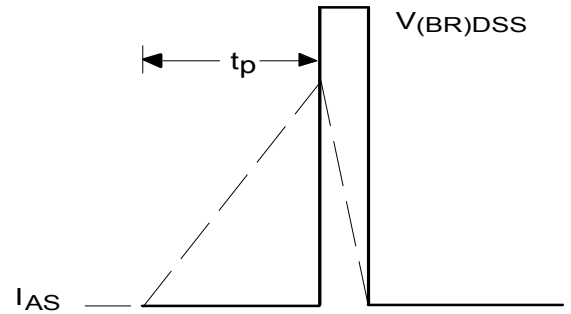


Fig 17b. Unclamped Inductive Waveforms

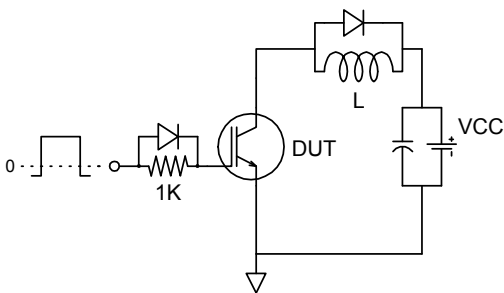


Fig 18a. Gate Charge Test Circuit

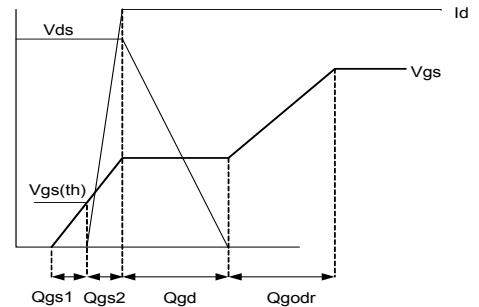


Fig 18b. Gate Charge Waveform

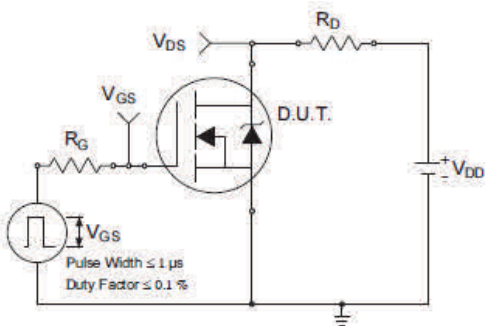


Fig 19a. Switching Time Test Circuit

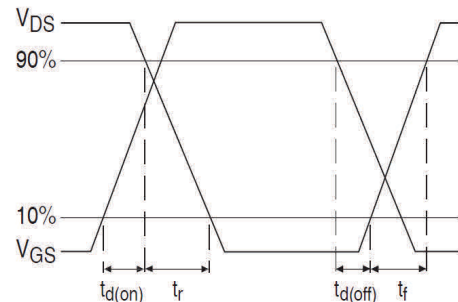
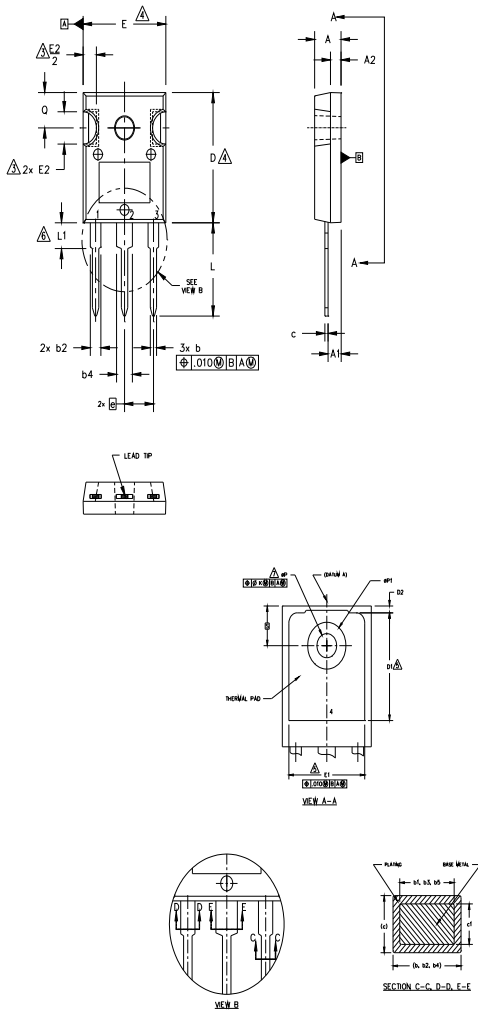


Fig 19b. Switching Time Waveforms

TO-247AC Package Outline (Dimensions are

NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES.
3. CONTOUR OF SLOT OPTIONAL.
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. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AC .

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.183	.209	4.65	5.31	
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.34	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.035	0.38	0.89	
c1	.015	.033	0.38	0.84	
D	.776	.815	19.71	20.70	4
D1	.515	-	13.08	-	5
D2	.020	.053	0.51	1.35	
E	.602	.625	15.29	15.87	4
E1	.530	-	13.46	-	
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
Øk	.010		0.25		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
ØP	.140	.144	3.56	3.66	
ØP1	-	.291	-	7.39	
Q	.209	.224	5.31	5.69	
S	.217 BSC		5.51 BSC		

LEAD ASSIGNMENTS
HEXFET

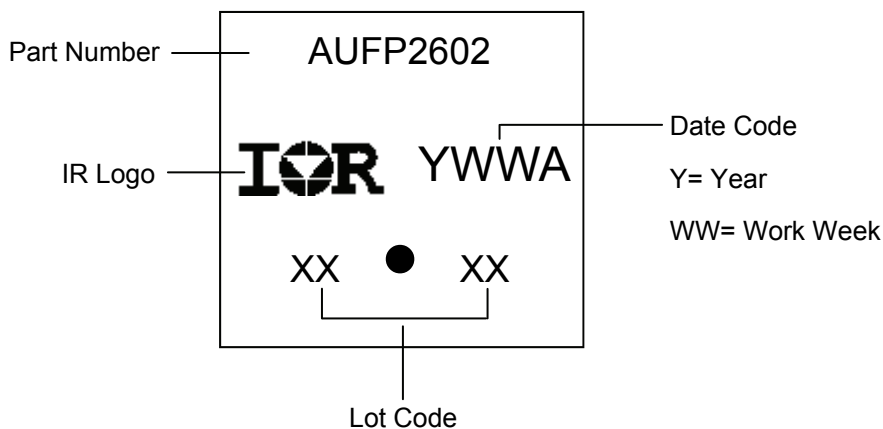
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

IGBTs, CoPACK

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

DIODES

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

TO-247AC Part Marking Information


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-247AC	N/A
ESD	Machine Model	Class M4 (+/- 800V) [†] AEC-Q101-002	
	Human Body Model	Class H2 (+/- 4000V) [†] AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) [†] AEC-Q101-005	
RoHS Compliant		Yes	

† Highest passing voltage.

Revision History

Date	Comments
2/16/2016	<ul style="list-style-type: none"> Updated datasheet with corporate template Corrected typo, Capacitance test condition from VDS=25V to VDS=19V on page 2
9/15/2017	<ul style="list-style-type: none"> Corrected typo error on part marking on page 7.

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