

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	40	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.031	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$
$R_{DS(on)}$ SMD	Static Drain-to-Source On-Resistance	—	1.5	2.0	$m\Omega$	$V_{GS} = 10V, I_D = 75A$ ④ ⑩
$R_{DS(on)}$ TO-220	Static Drain-to-Source On-Resistance	—	1.8	2.3	$m\Omega$	$V_{GS} = 10V, I_D = 75A$ ④ ⑩
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Trans conductance	130	—	—	S	$V_{DS} = 10V, I_D = 75A$ ⑩
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 40V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 40V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -20V$

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

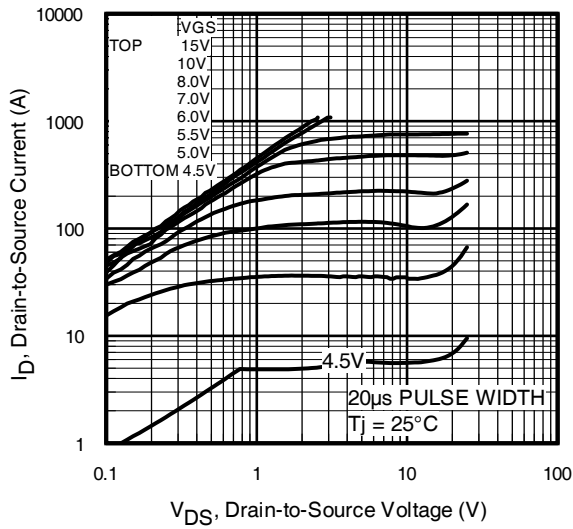
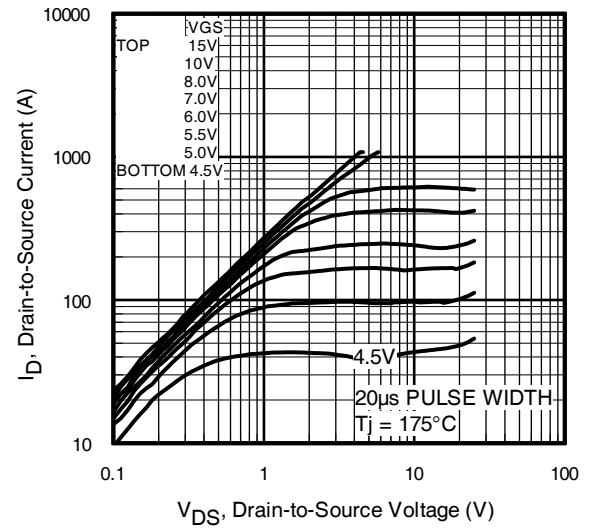
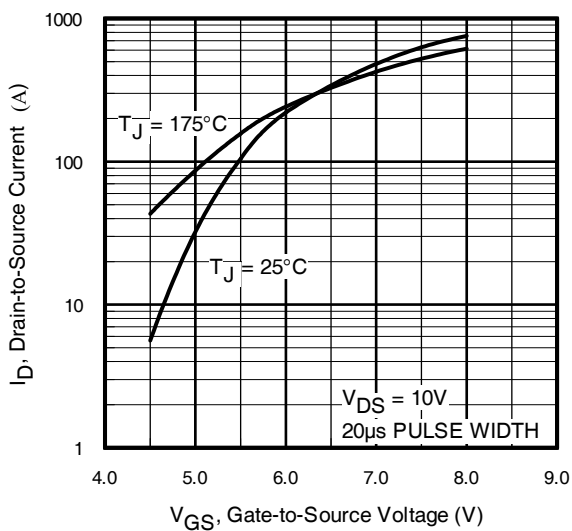
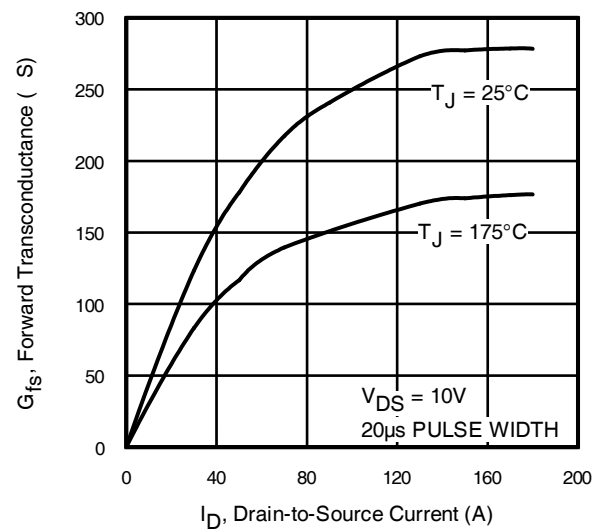
Q_g	Total Gate Charge	—	160	240	nC	$I_D = 75A$ ⑩
Q_{gs}	Gate-to-Source Charge	—	41	62		$V_{DS} = 32V$
Q_{gd}	Gate-to-Drain Charge	—	66	99		$V_{GS} = 10V$ ④
$t_{d(on)}$	Turn-On Delay Time	—	13	—	ns	$V_{DD} = 20V$
t_r	Rise Time	—	120	—		$I_D = 75A$ ⑩
$t_{d(off)}$	Turn-Off Delay Time	—	130	—		$R_G = 2.5\Omega$
t_f	Fall Time	—	130	—		$V_{GS} = 10V$ ④
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	—	6450	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1690	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	840	—		$f = 1.0MHz$, See Fig. 5
C_{oss}	Output Capacitance	—	5350	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz$
C_{oss}	Output Capacitance	—	1520	—		$V_{GS} = 0V, V_{DS} = 32V, f = 1.0MHz$
$C_{oss\ eff.}$	Effective Output Capacitance	—	2210	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 32V$ ⑤

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	270	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	1080		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 75A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	56	84	ns	$T_J = 25^\circ\text{C}, I_F = 75A, V_{DD} = 20V$
Q_{rr}	Reverse Recovery Charge	—	67	100	nC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 195A. 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 Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 0.24mH$, $R_G = 25\Omega$, $I_{AS} = 75A$, $V_{GS} = 10V$. Part not recommended for use above this value.
- ④ Pulse width $\leq 1.0ms$; duty cycle $\leq 2\%$.
- ⑤ $C_{oss\ eff.}$ 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 This value determined from sample failure population, starting $T_J = 25^\circ\text{C}$, $L = 0.24mH$, $R_G = 25\Omega$, $I_{AS} = 75A$, $V_{GS} = 10V$.
- ⑦ This 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
- ⑧ Max $R_{DS(on)}$ for D²Pak and TO-262 (SMD) devices.
- ⑨ TO-220 device will have an R_{th} value of 0.45°C/W .
- ⑩ All AC and DC test condition based on old Package limitation current = 75A.


Fig. 1 Typical Output Characteristics

Fig. 2 Typical Output Characteristics

Fig. 3 Typical Transfer Characteristics

Fig. 4 Typical Forward Transconductance vs. Drain Current

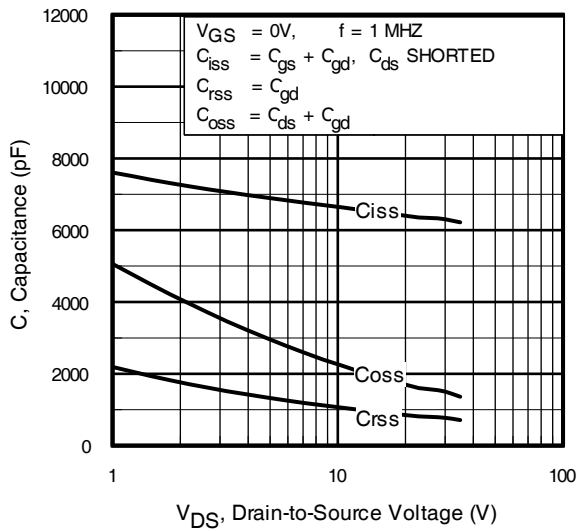


Fig 5. Typical Capacitance vs.
Drain-to-Source Voltage

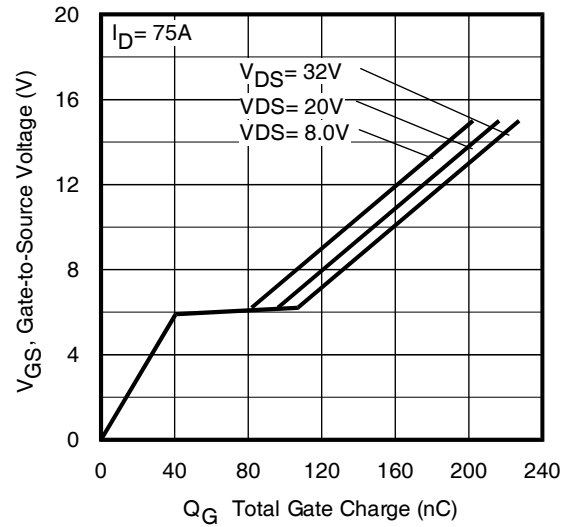


Fig 6. Typical Gate Charge vs.
Gate-to-Source Voltage

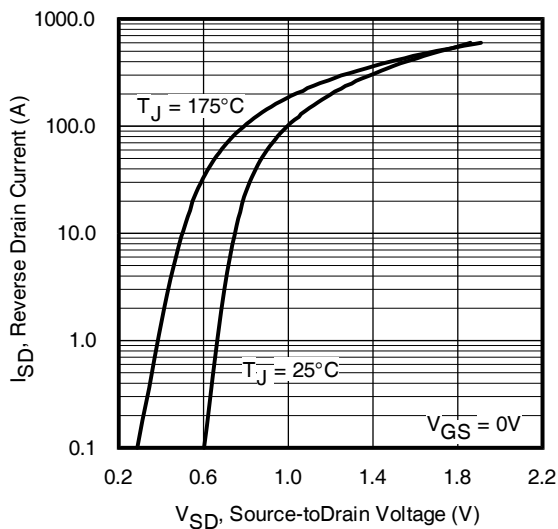


Fig. 7 Typical Source-to-Drain Diode
Forward Voltage

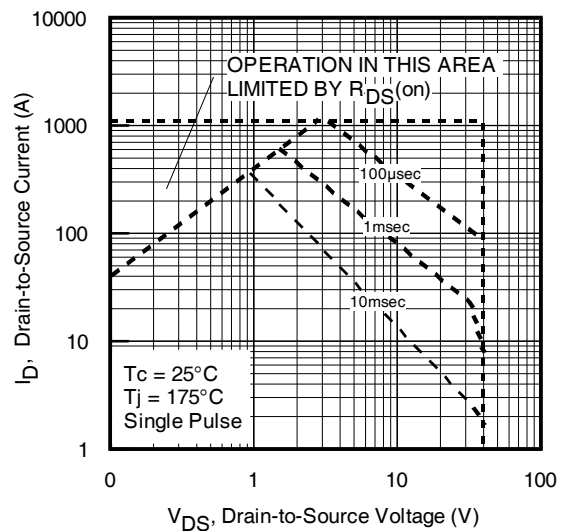
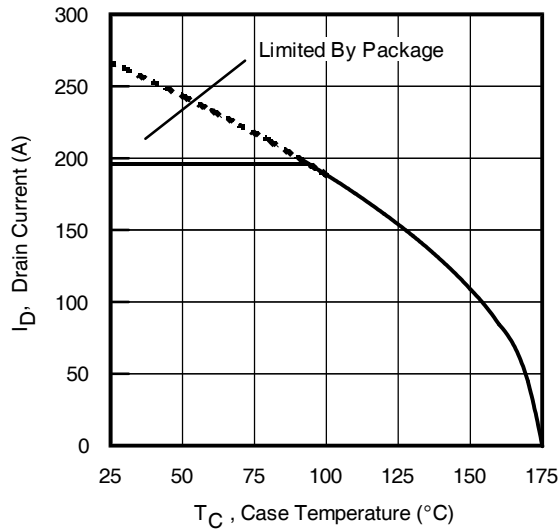
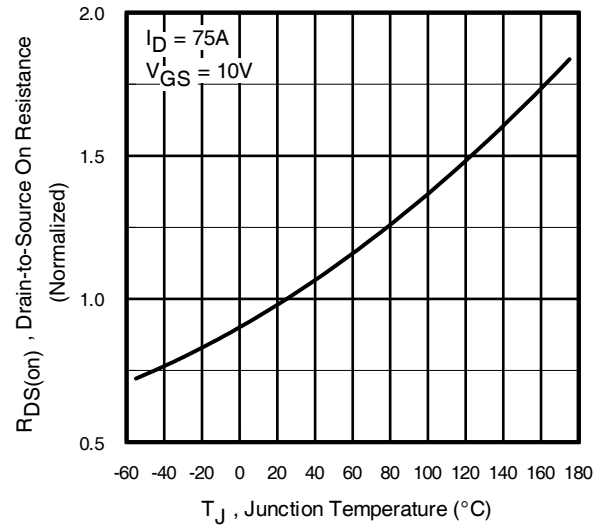
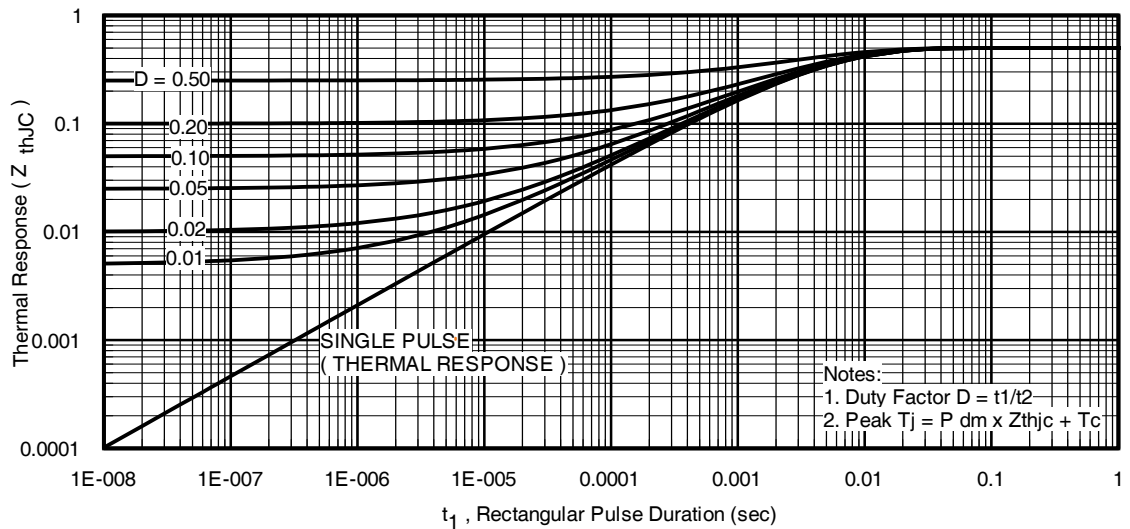
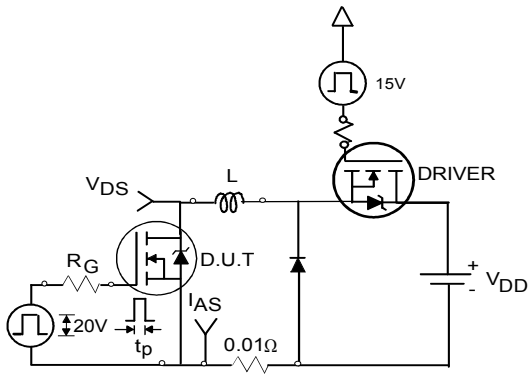
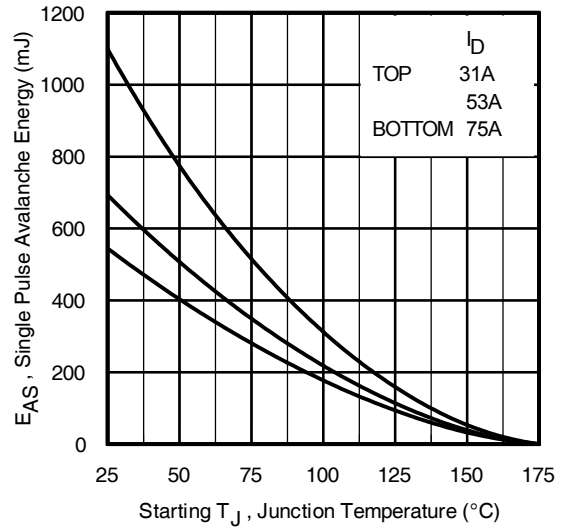
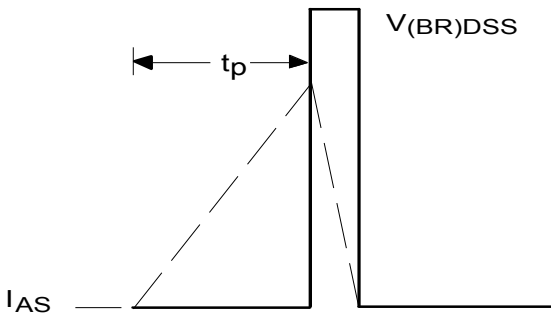
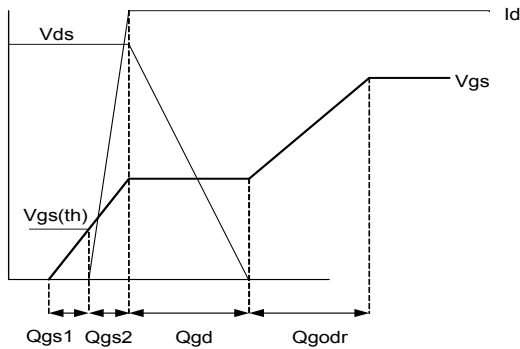
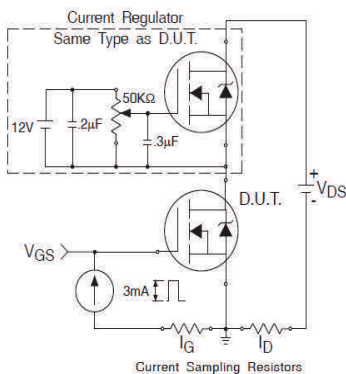
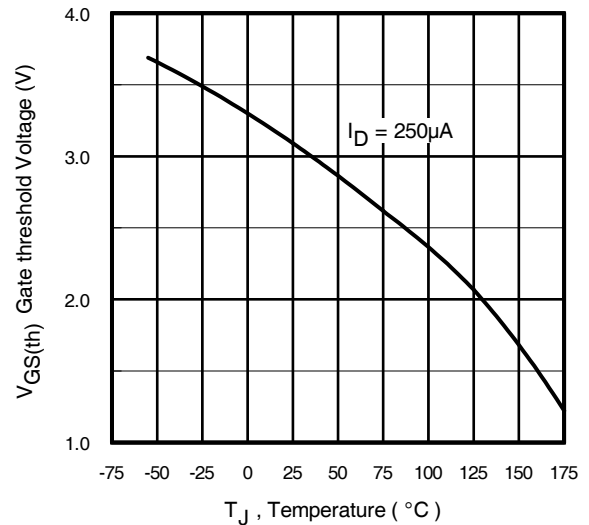


Fig 8. Maximum Safe Operating Area


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 12c. Maximum Avalanche Energy vs. Drain Current

Fig 12b. Unclamped Inductive Waveforms

Fig 13a. Gate Charge Waveform

Fig 13b. Gate Charge Test Circuit

Fig 14. Threshold Voltage vs. Temperature

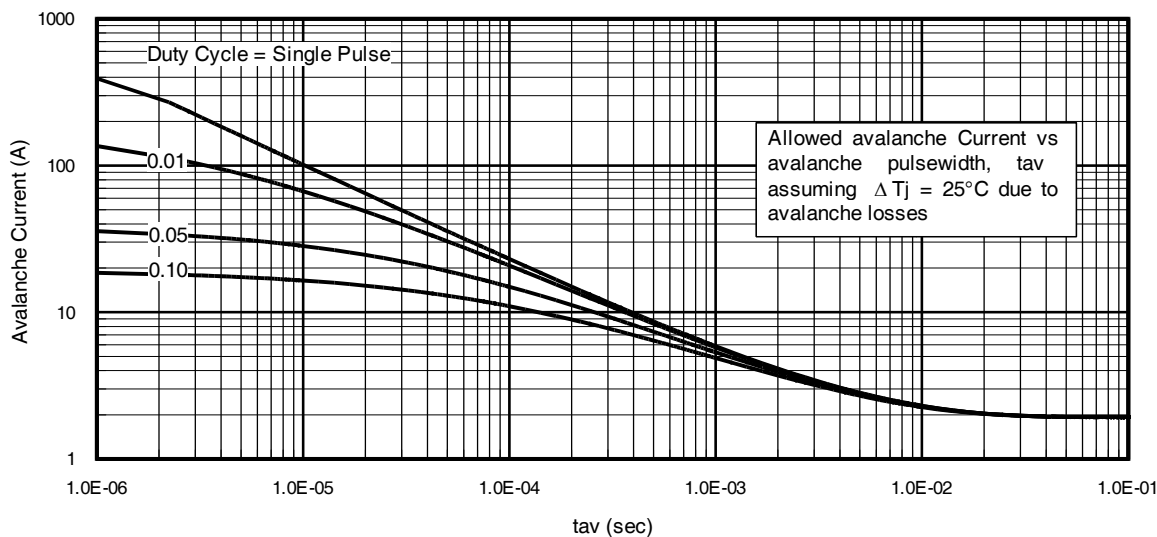


Fig 15. Typical Avalanche Current vs. Pulse width

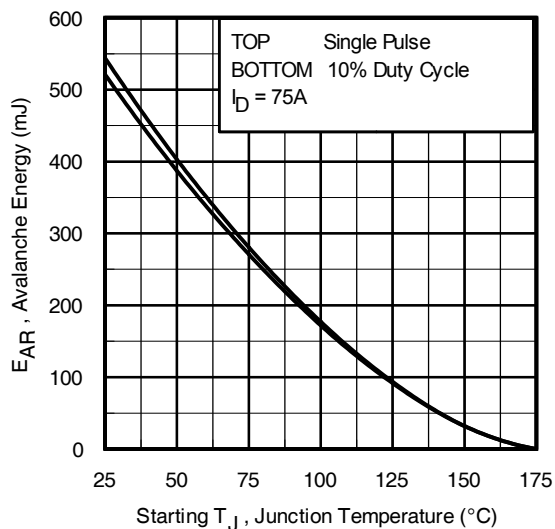


Fig 16. Maximum Avalanche Energy vs. Temperature

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 15, 16).
 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)

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

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

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

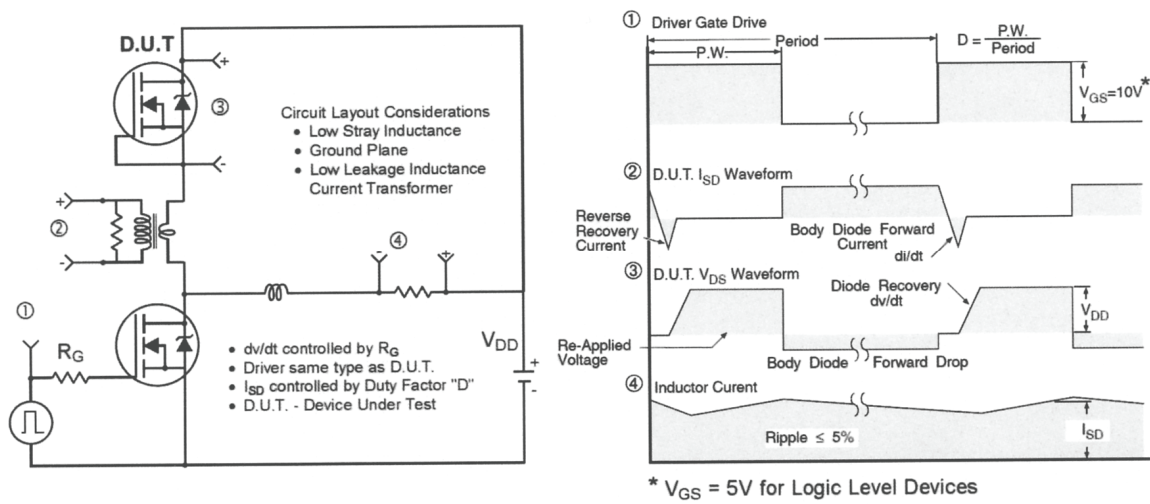


Fig 17. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

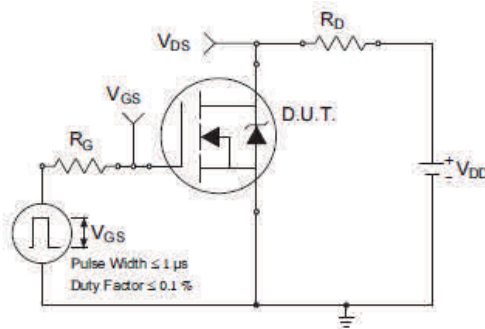


Fig 18a. Switching Time Test Circuit

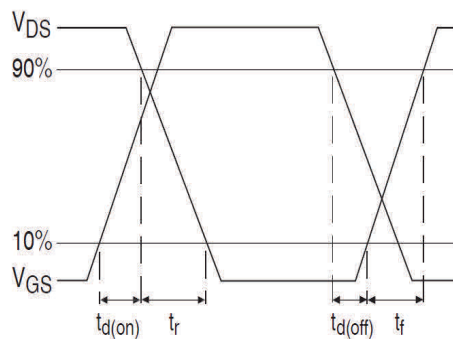
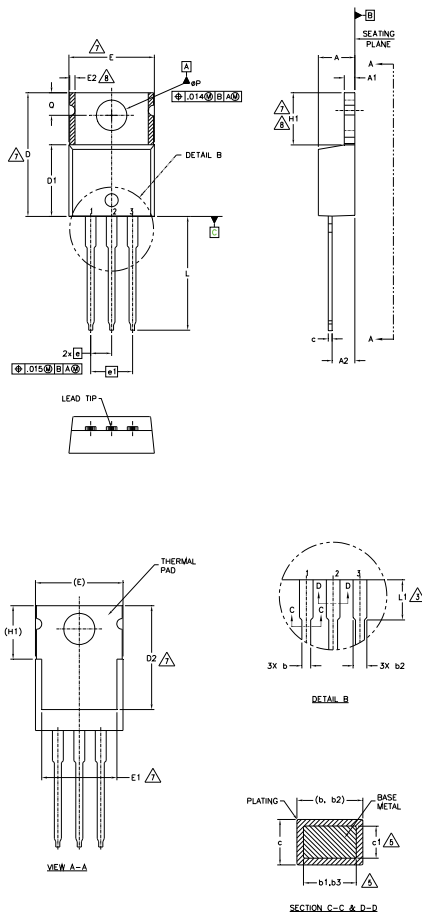


Fig 18b. Switching Time Waveforms

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

NOTES:

- 1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
- 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- 3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4.- DIMENSION D, D1 & 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, b3 & 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 IRREGULARITIES ARE ALLOWED.
- 9.- OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	5
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	
b2	1.14	1.78	.045	.070	5
b3	1.14	1.73	.045	.068	
c	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	7
D2	11.68	12.88	.460	.507	
E	9.65	10.67	.380	.420	
E1	6.86	8.89	.270	.350	4,7
E2	—	0.76	—	.030	7
e	2.54 BSC		.100 BSC		8
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	
L	12.70	14.73	.500	.580	7,8
L1	3.56	4.06	.140	.160	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

LEAD ASSIGNMENTS
HEXFET

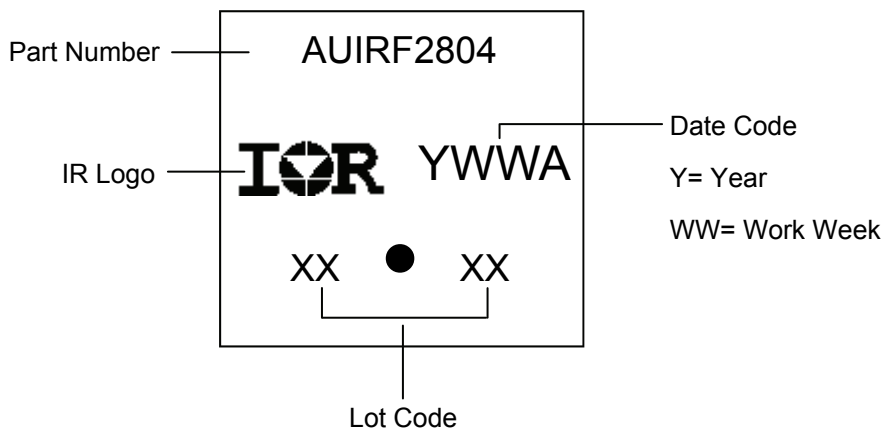
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE

IGBTs, CoPACK

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

DIODES

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

TO-220AB Part Marking Information


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

Figure 1 consists of four detail drawings of a lead tip:

- VIEW A-A:** A top view showing a rectangular base with two vertical pins. Dimensions include (E) for total width, (F) for pin width, (G) for pin spacing, (H) for total height, and (I) for pin height. A feature (J) is indicated on the right side.
- DETAIL A-A:** A side view showing the profile of the lead tip. Dimensions include (K) for total width, (L) for base width, (M) for base height, (N) for tip height, and (O) for tip width. A feature (P) is indicated on the right side.
- SECTION B-B & C-C:** A cross-section showing the internal structure of the lead tip. Dimensions include (Q) for total width, (R) for base width, (S) for base height, (T) for tip height, and (U) for tip width. A feature (V) is indicated on the right side.
- DETAIL A-A:** A detail view of the lead tip, showing the profile and dimensions (W) and (X). A feature (Y) is indicated on the right side.

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.

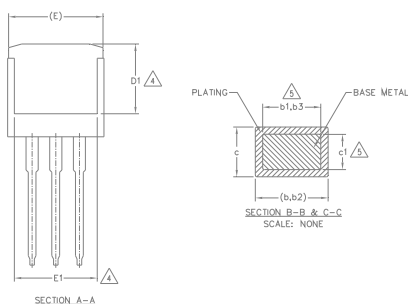
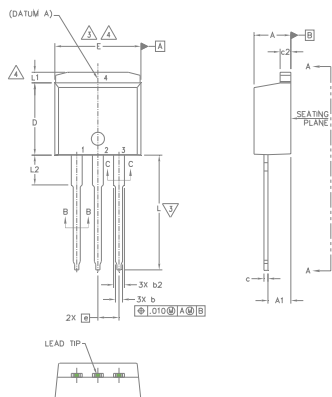
SYM BOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	—	.270	—	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	—	.245	—	4
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		

1.- GATE	1.- GATE
2, 4.- DRAIN	2, 4.- COLLECTOR
3.- SOURCE	3.- EMITTER

Diagram illustrating the label layout for the AU-IRF2804S component:

- Part Number:** AUIRF2804S
- IR Logo:** IOR
- Date Code:** YWWA
 - Y= Year
 - WW= Work Week
- Lot Code:** XX ● XX

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

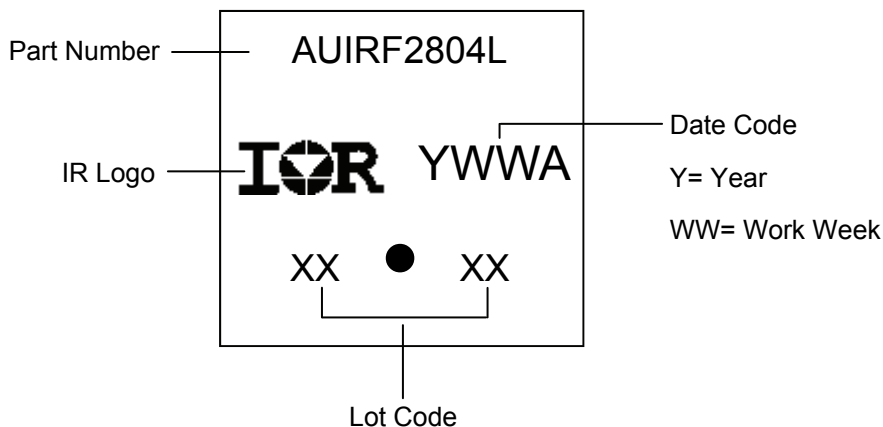
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

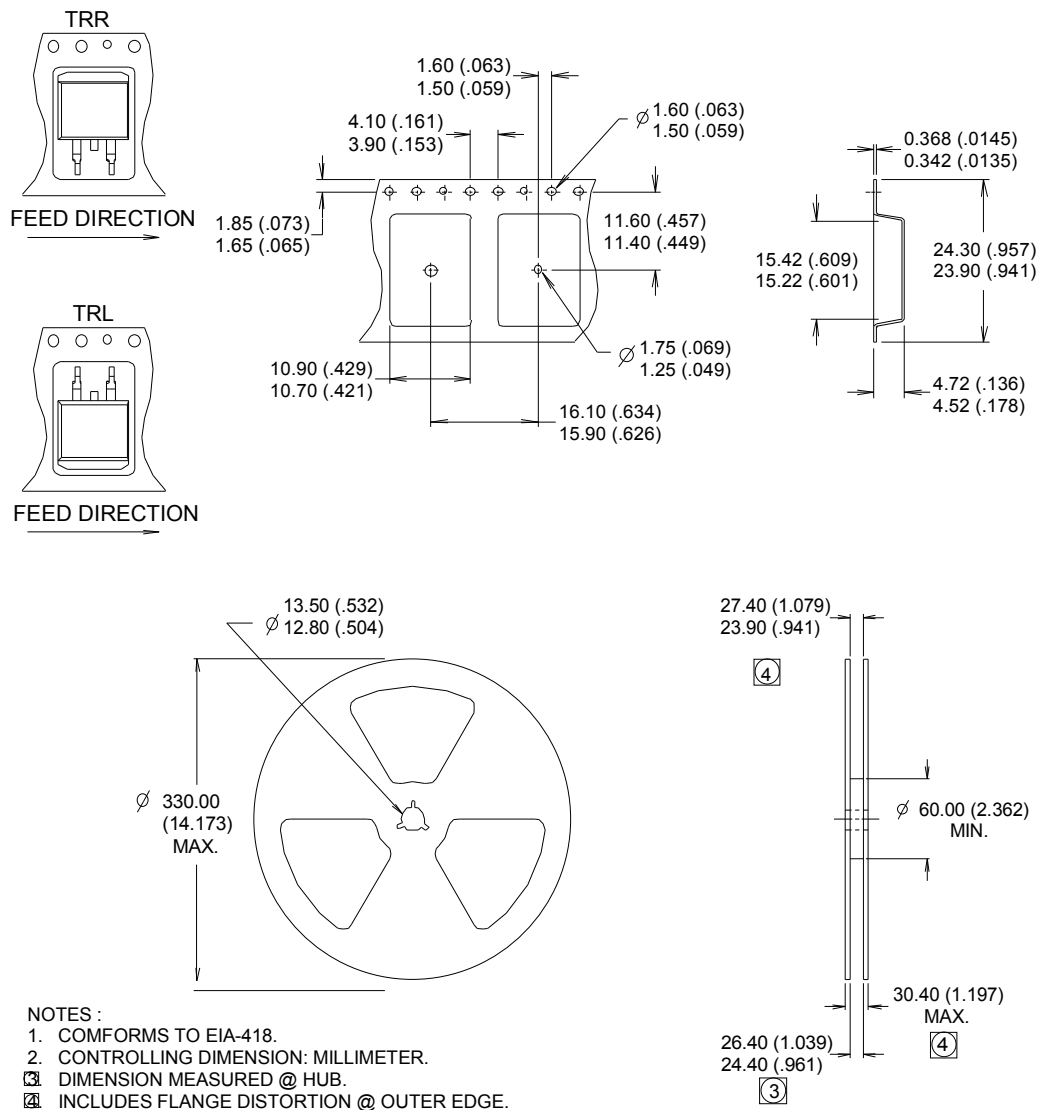
DIODES

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

SYM BOL	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	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
e	2.54 BSC		.100 BSC		
L	13.46	14.10	.530	.555	4
L1	—	1.65	—	.065	
L2	3.56	3.71	.140	.146	

TO-262 Part Marking Information



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


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-220AB	N/A
		TO-262	MSL1
		D ² -Pak	
ESD	Machine Model	Class M4 [†] AEC-Q101-002	
	Human Body Model	Class H3A [†] AEC-Q101-001	
	Charged Device Model	Class C5 [†] AEC-Q101-005	
RoHS Compliant		Yes	

† Highest passing voltage.

Revision History

Date	Comments
9/30/2015	- Updated datasheet with corporate template. - Corrected ordering table on page 1.
8/22/2017	Corrected part marking on pages 9,10,11.

Published by

Infineon Technologies AG
81726 München, Germany

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