Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ③	——	63	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑧	12.5	——	
$R_{\theta JA}$	Junction-to-Ambient ⑨	20	——	
$R_{\theta J\text{-}Can}$	Junction-to-Can ④⑩	——	5.0	
$R_{\theta J\text{-}PCB}$	Junction-to-PCB Mounted	1.4	——	
	Linear Derating Factor ④	0.2		W/°C

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

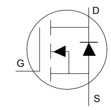
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.10	——	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	51	62	mΩ	V_{GS} = 10V, I_D = 8.9A ⑦
$V_{GS(th)}$	Gate Threshold Voltage	3.0	4.0	5.0	V	V_{DS} = V_{GS}, I_D = 25μA
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	——	-13	——	mV/°C	
gfs	Forward Transconductance	8.8	——	——	S	V_{DS} = 25V, I_D = 8.9A
R_G	Internal Gate Resistance	——	3.5	5.0	Ω	
I_{DSS}	Drain-to-Source Leakage Current	——	——	5.0	μA	V_{DS} = 100V, V_{GS} = 0V
		——	——	250		V_{DS} = 80V, 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		V_{GS} = -20V

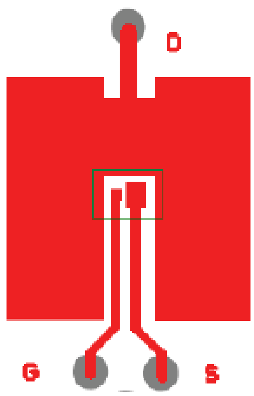
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	——	8.3	13	nC	V_{DS} = 50V
Q_{gs1}	Gate-to-Source Charge	——	1.9	——		V_{GS} = 10V
Q_{gs2}	Gate-to-Source Charge	——	0.77	——		I_D = 8.9A
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	3.2	——		See Fig. 11
Q_{godr}	Gate Charge Overdrive	——	2.4	——		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	——	4.0	——		
Q_{oss}	Output Charge	——	4.7	——	nC	V_{DS} = 16V, V_{GS} = 0V
$t_{d(on)}$	Turn-On Delay Time	——	3.8	——	ns	V_{DD} = 50V
t_r	Rise Time	——	6.4	——		I_D = 8.9A
$t_{d(off)}$	Turn-Off Delay Time	——	7.1	——		R_G = 6.8Ω
t_f	Fall Time	——	3.6	——		V_{GS} = 10V ⑦
C_{iss}	Input Capacitance	——	515	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	110	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	30	——		f = 1.0 MHz
C_{oss}	Output Capacitance	——	530	——		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0 MHz
C_{oss}	Output Capacitance	——	70	——		V_{GS} = 0V, V_{DS} = 80V, f = 1.0 MHz
C_{oss}	Output Capacitance	——	115	——		V_{GS} = 0V, V_{DS} = 0 to 80V

Notes ① through ⑩ are on page 3

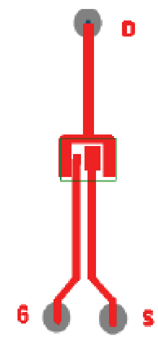
Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	14.4	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ⑤	—	—	58		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 8.9A, V_{GS} = 0V ⑦
t_{rr}	Reverse Recovery Time	—	33	—	ns	T_J = 25°C, I_F = 8.9A, V_{DD} = 25V
Q_{rr}	Reverse Recovery Charge	—	38	—	nC	dv/dt = 100A/μs ⑦



③ Surface mounted on 1 in. square Cu board (still air).

⑨ Mounted to a PCB with small clip heatsink (still air)



⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink (still air).

① Click on this section to link to the appropriate technical paper.
② Click on this section to link to the DirectFET® Website.
③ Surface mounted on 1 in. square Cu board, steady state.
④ T_C measured with thermocouple mounted to top (Drain) of part.
⑤ Repetitive rating; pulse width limited by max. junction temperature.
⑥ Starting T_J = 25°C, L = 0.944mH, R_G = 25Ω, I_{AS} = 8.9A.
⑦ Pulse width ≤ 400μs; duty cycle ≤ 2%.
⑧ Used double sided cooling, mounting pad with large heatsink.
⑨ Mounted on minimum footprint full size board with metalized back and with small clip heat sink.
⑩ R_θ is measured at T_J of approximately 90°C.

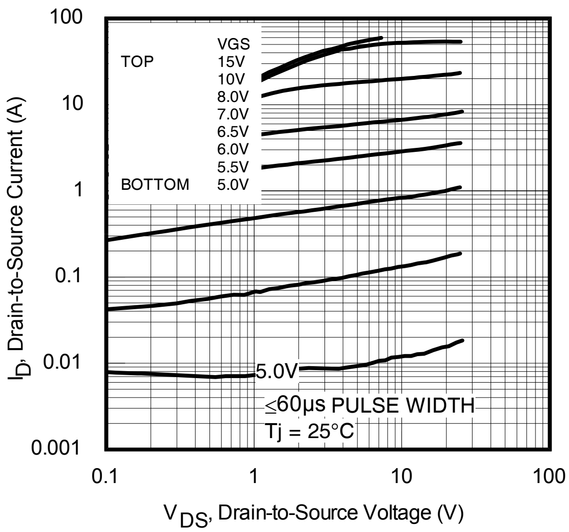


Fig. 1 Typical Output Characteristics

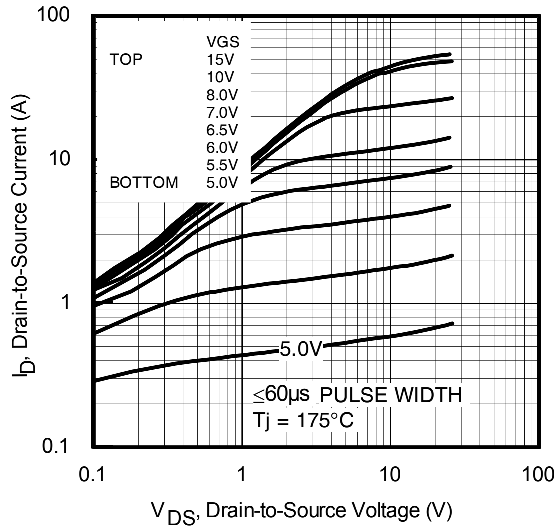


Fig. 2 Typical Output Characteristics

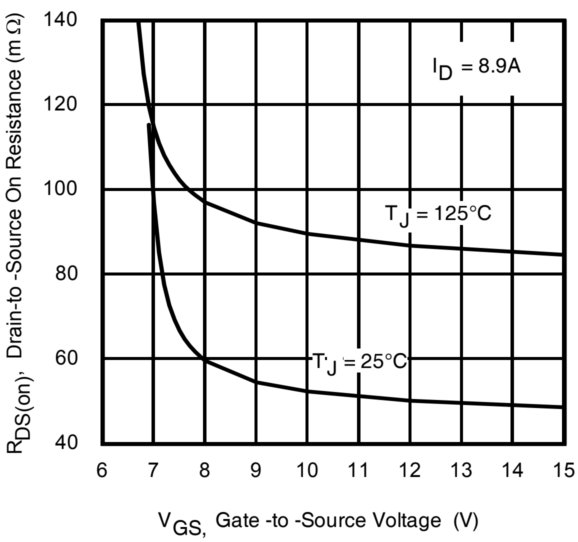


Fig. 3 Typical On-Resistance vs. Gate Voltage

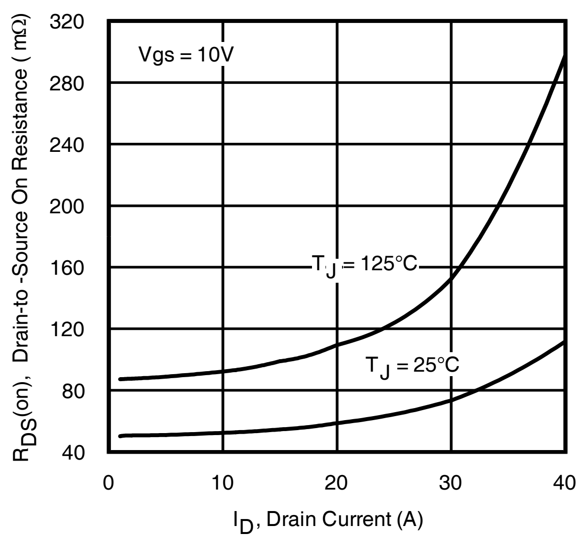


Fig. 4 Typical On-Resistance vs. Drain Current

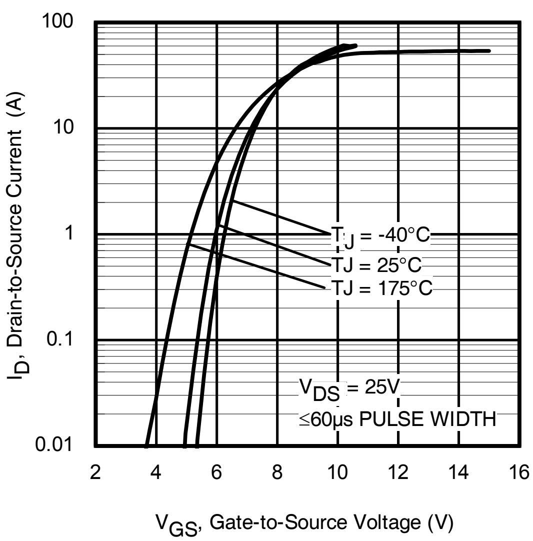


Fig 5. Transfer Characteristics

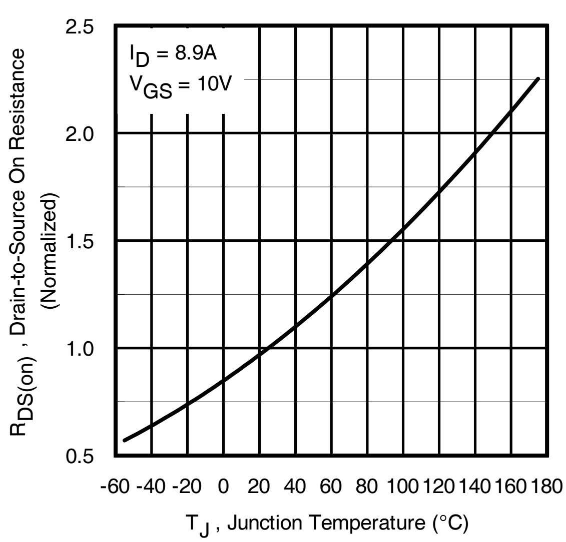


Fig 6. Normalized On-Resistance vs. Temperature

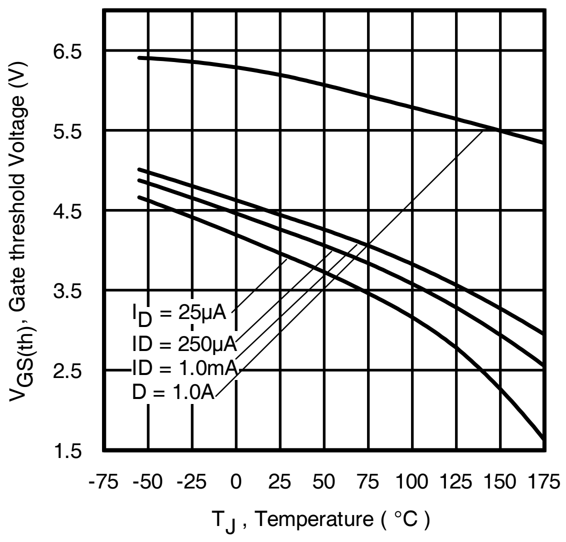


Fig. 7 Typical Threshold Voltage vs. Junction Temperature

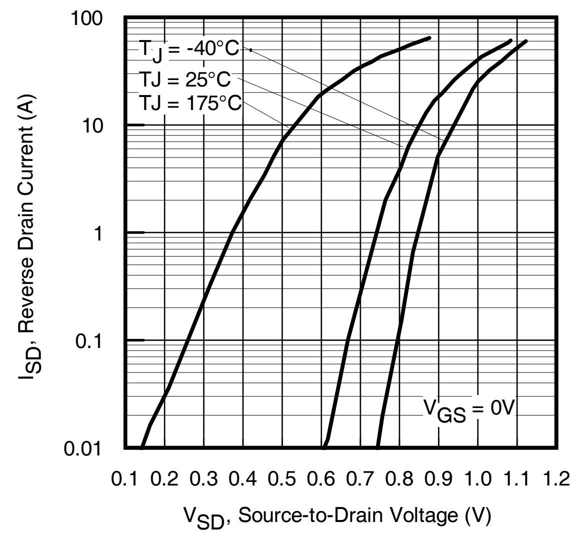


Fig 8. Typical Source-Drain Diode Forward Voltage

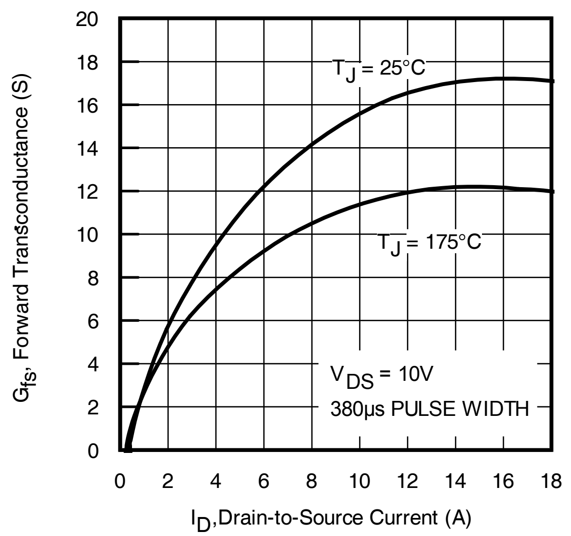


Fig 9. Typical Forward Trans conductance vs. Drain Current

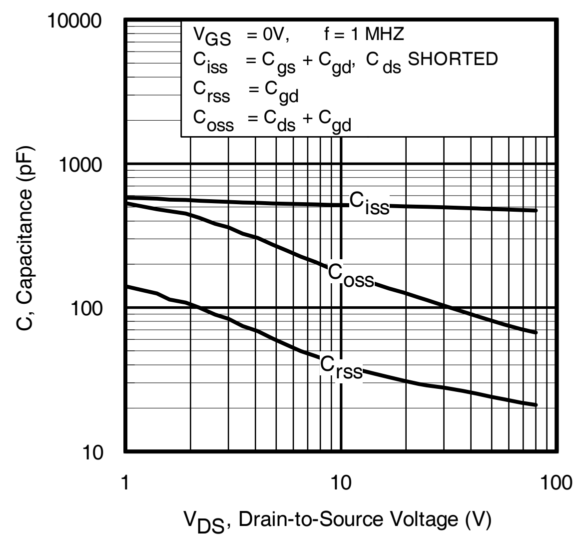


Fig 10. Typical Capacitance vs. Drain-to-Source Voltage

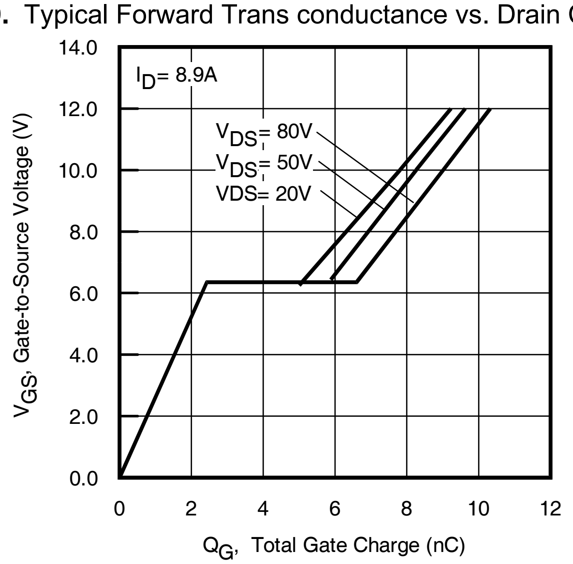


Fig 11. Typical Gate Charge vs. Gate-to-Source Voltage

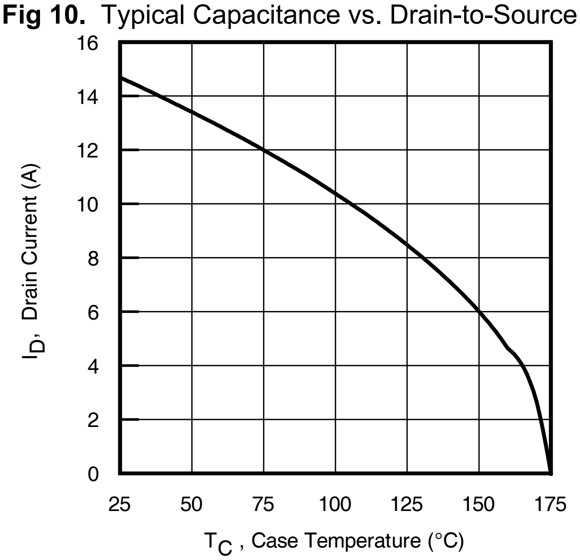


Fig 12. Maximum Drain Current vs. Case Temperature

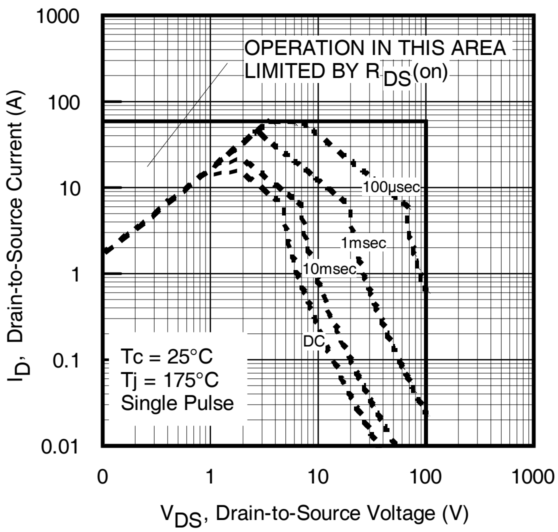


Fig 13. Maximum Safe Operating Area

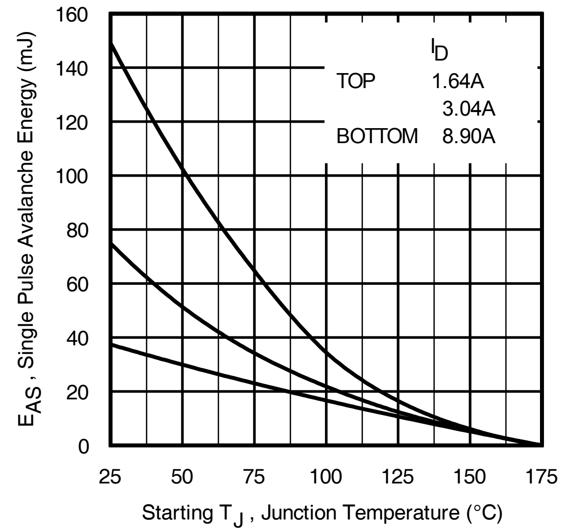


Fig 14. Maximum Avalanche Energy vs. Temperature

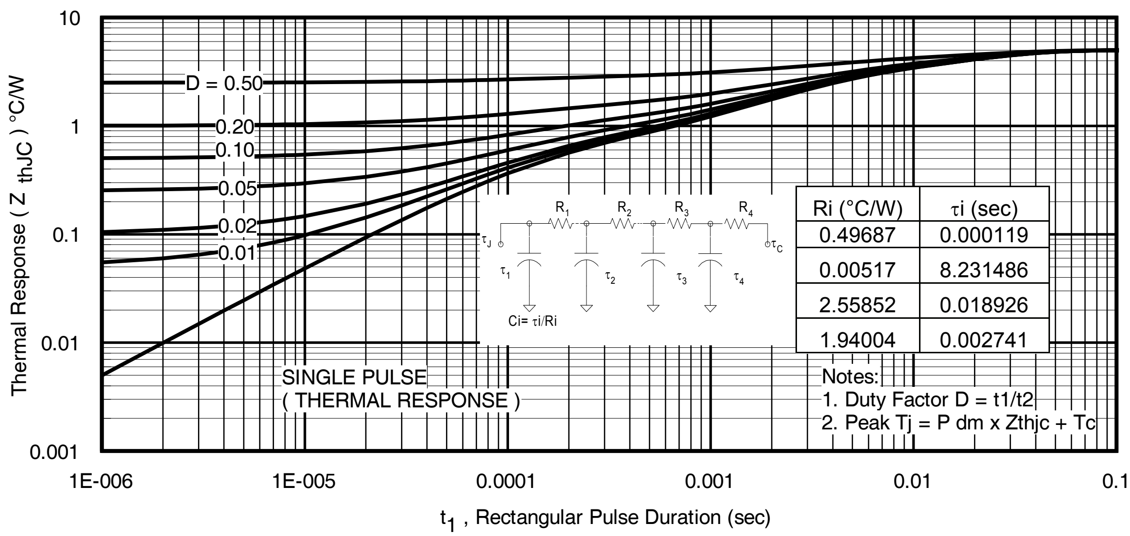


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

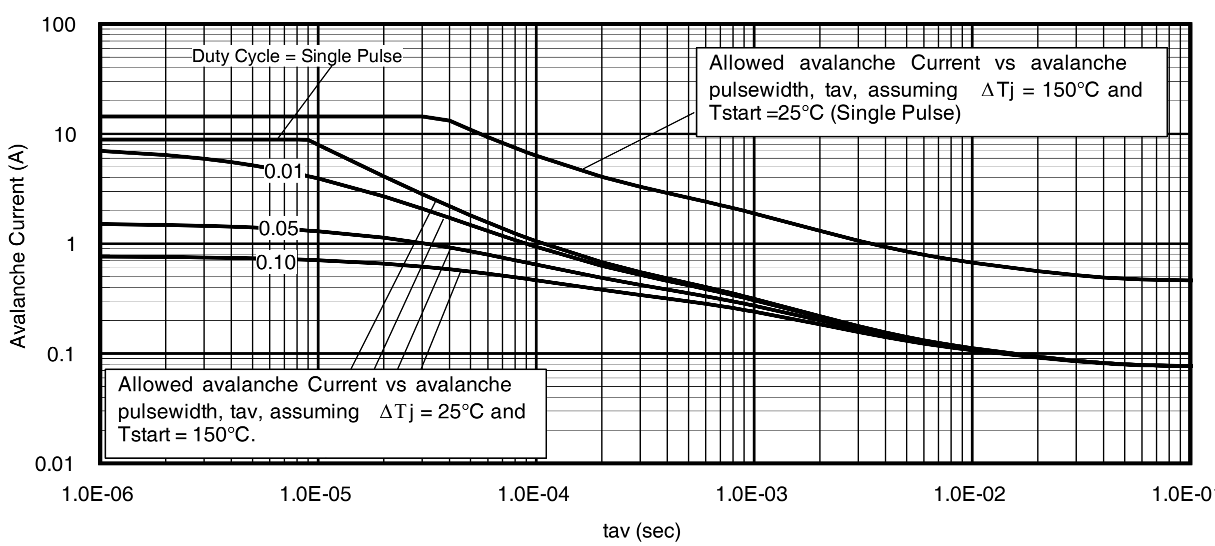


Fig 16. Typical Avalanche Current vs. Pulse Width

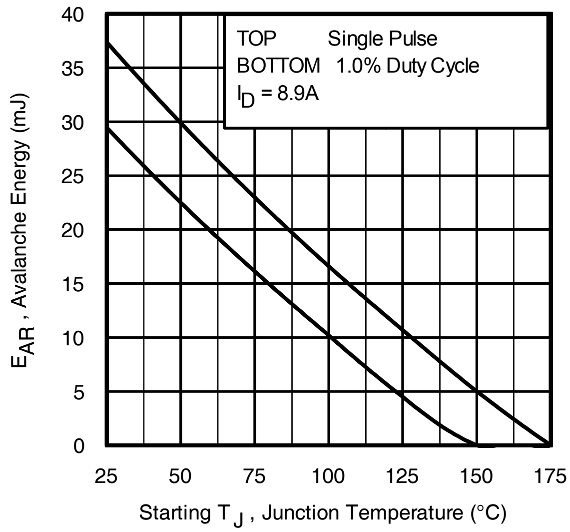


Fig 17. Maximum Avalanche Energy vs. Temperature

Notes on Repetitive Avalanche Curves , Figures 16, 17:
(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 18a, 18b.
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 16, 17).
   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 15)

$$P_{D\ (ave)} = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$
$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$
$$E_{AS\ (AR)} = P_{D\ (ave)} \cdot t_{av}$$

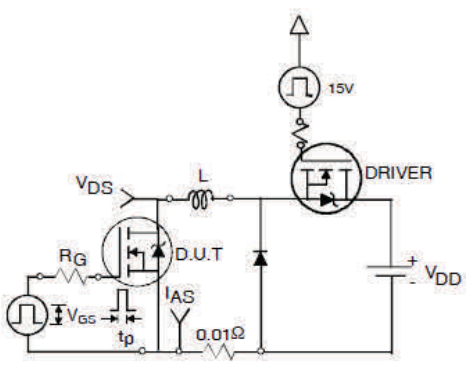


Fig 18a. Unclamped Inductive Test Circuit

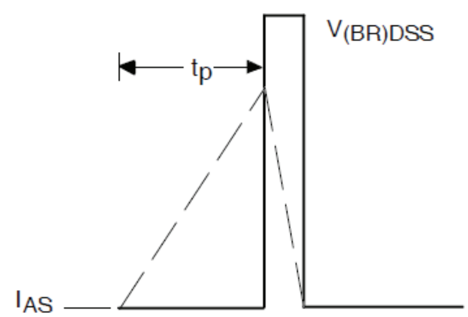


Fig 18b. Unclamped Inductive Waveforms

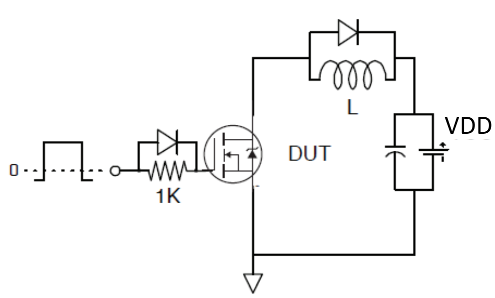


Fig 19a. Gate Charge Test Circuit

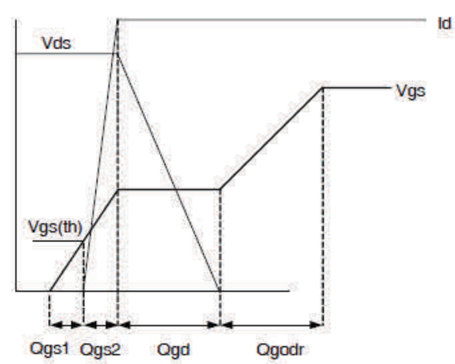


Fig 19b. Gate Charge Waveform

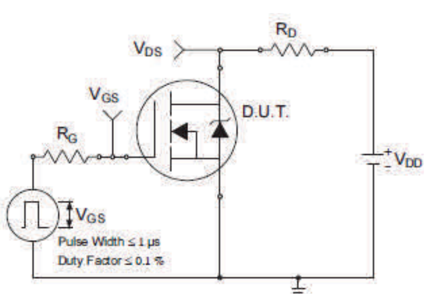


Fig 20a. Switching Time Test Circuit

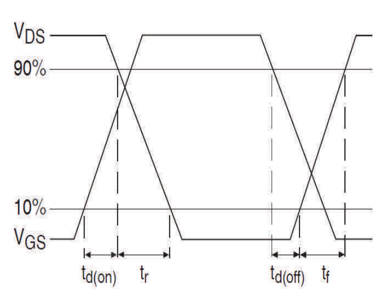
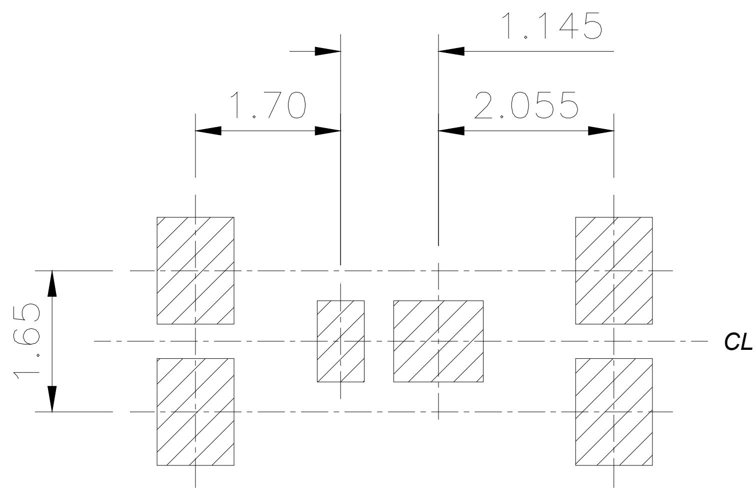
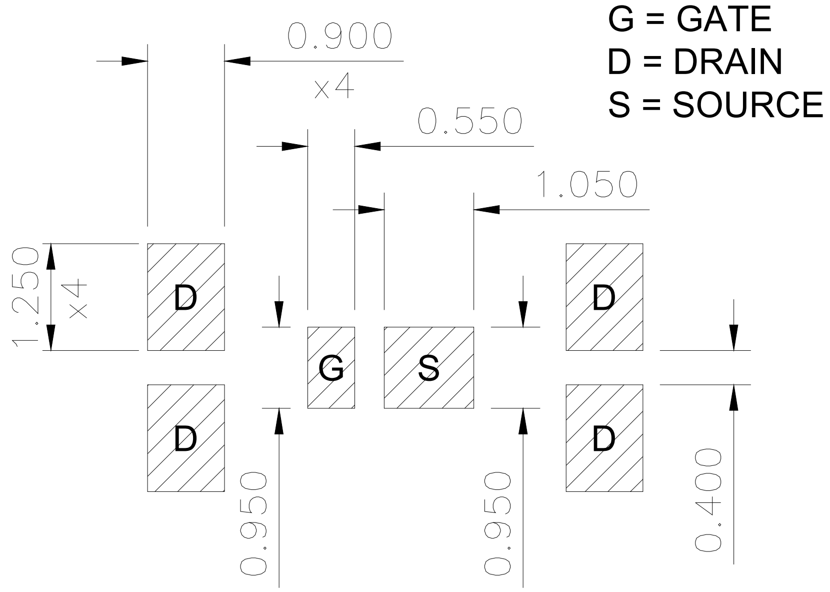


Fig 20b. Switching Time Waveforms

DirectFET® Board Footprint, SB (Small Size Can).

Please see DirectFET® application note AN-1035 for all details regarding the assembly of DirectFET®.
This includes all recommendations for stencil and substrate designs.

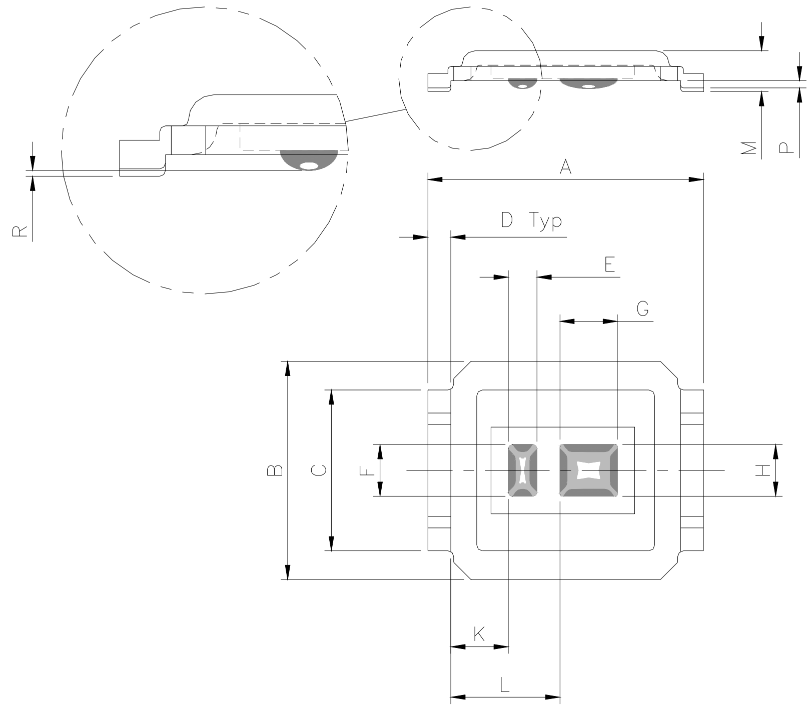




Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

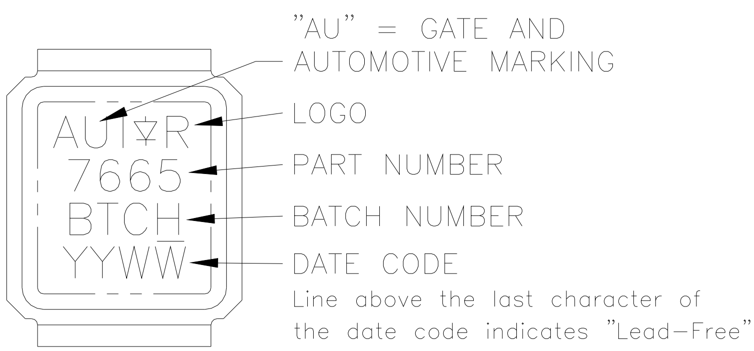
DirectFET® Outline Dimension, SB Outline (Small Size Can).

Please see DirectFET® application note AN-1035 for all details regarding the assembly of DirectFET®. This includes all recommendations for stencil and substrate designs.



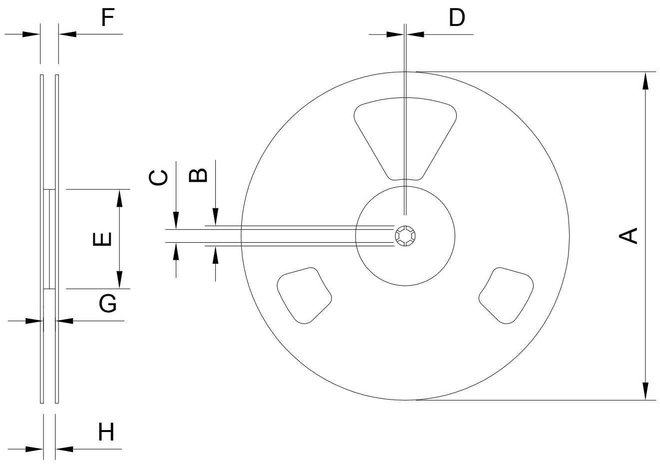
DIMENSIONS				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	4.75	4.85	0.187	0.191
B	3.70	3.95	0.146	0.156
C	2.75	2.85	0.108	0.112
D	0.35	0.45	0.014	0.018
E	0.48	0.52	0.019	0.020
F	0.88	0.92	0.035	0.036
G	0.98	1.02	0.039	0.040
H	0.88	0.92	0.035	0.036
J	N/A	N/A	N/A	N/A
K	0.95	1.05	0.037	0.041
L	1.85	1.95	0.073	0.077
M	0.68	0.74	0.027	0.029
P	0.08	0.17	0.003	0.007
R	0.02	0.08	0.001	0.003

DirectFET® Part Marking



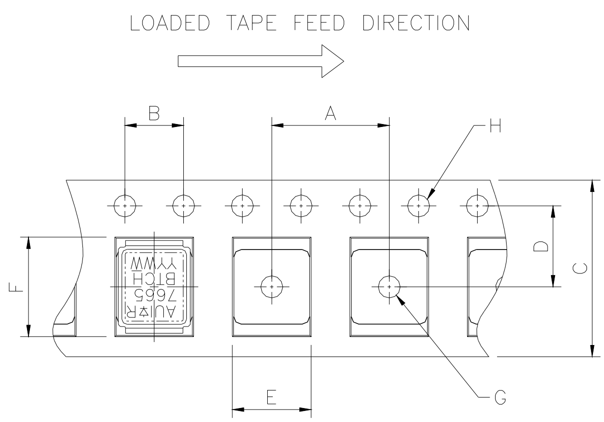
Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

DirectFET® Tape & Reel Dimension (Showing component orientation)



NOTE: Controlling dimensions in mm
Std reel quantity is 4800 parts, ordered as AUIRF7665S2TR.

REEL DIMENSIONS				
STANDARD OPTION **(QTY 4800)**				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	330.0	N.C	12.992	N.C
B	20.2	N.C	0.795	N.C
C	12.8	13.2	0.504	0.520
D	1.5	N.C	0.059	N.C
E	100.0	N.C	3.937	N.C
F	N.C	18.4	N.C	0.724
G	12.4	14.4	0.488	0.567
H	11.9	15.4	0.469	0.606



NOTE: CONTROLLING DIMENSIONS IN MM

DIMENSIONS				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	7.90	8.10	0.311	0.319
B	3.90	4.10	0.154	0.161
C	11.90	12.30	0.469	0.484
D	5.45	5.55	0.215	0.219
E	4.00	4.20	0.158	0.165
F	5.00	5.20	0.197	0.205
G	1.50	N.C	0.059	N.C
H	1.50	1.60	0.059	0.063

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		DFET2 Small Can	MSL1
ESD	Machine Model	Class B AEC-Q101-002	
	Human Body Model	Class 2 AEC-Q101-001	
	Charged Device Model	Class IV AEC-Q101-005	
RoHS Compliant		Yes	

Revision History

Date	Comments
10/5/2015	• Updated datasheet with corporate template • Corrected ordering table on page 1. • Updated Tape and Reel option on page 10

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