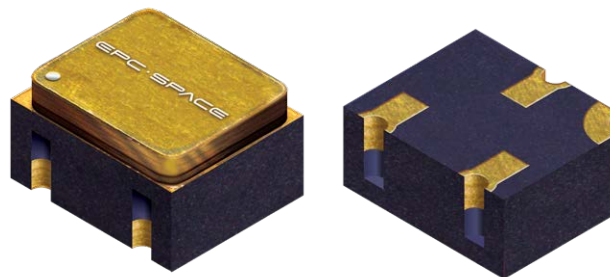


Features

- Ultra-low Q_G For High Efficiency
- Logic Level
- Light Weight
- No Wire Bond for Higher Reliability and Low Inductance
- Total Ionizing Dose LDR Immune
- Total Ionizing Dose HDR Immune
- Single Event Effect (SEE) Hardened
 - SEE immunity for LET of 83.2 MeV/(mg/cm²) in Si with V_{DS} up to 100% of rated Breakdown
- Neutron
 - Maintains Pre-Rad specification for up to 4×10^{15} Neutrons/cm²



JANS2N7674UBC*

**Rad-Hard eGaN® 60 V, 1 A,
580 mΩ Surface Mount (UB)**

Description

EPC Space Rad-Hard eGaN® power switching HEMTs have been specifically designed for critical applications in Space and other the high reliability environments. These devices have exceptionally high electron mobility and a low temperature coefficient resulting in very low $R_{DS(on)}$ values. The lateral structure of the die provides for very low gate charge (Q_G) and extremely fast switching times. These features enable faster power supply switching frequencies resulting in higher power densities, higher efficiencies and more compact packaging.

* JANS qualification pending

Application

- Commercial Satellite EPS & Avionics
- Deep Space Probes
- High Speed Rad-Hard DC-DC Conversion
- Rad-Hard Motor Controllers
- Nuclear Facilities

Thermal Characteristics

Symbol	Parameter-Conditions	Value	Units
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 3)	200	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	62.9	

I/O Pin Assignment (Bottom View)

Pin	Symbol	Description
1	G	Gate
2	D	Drain
3	S	Source
4	L	Lid Pad Connection



Absolute Maximum Rating ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter-Conditions	Value	Units
V_{DS}	Drain to Source Voltage (Note 1)	60	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	72	
I_D	Continuous Drain Current I_D @ $V_{GS} = 5\text{ V}$, $T_C = 25^\circ\text{C}$	1	A
I_{DM}	Single-Pulse Drain Current $t_{pulse} \leq 80\text{ }\mu\text{s}$	4	
V_{GS}	Gate to Source Voltage (Note 2)	+6 / -4	V
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$
T_{sol}	Package Mounting Surface Temperature	260	
ESD	ESD Class	1A(ΔA)	
Weight	Device Weight	0.058	g

Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted. Typical (TYP) values are for reference only.)

Parameter	Symbol	Test Conditions		MIN	TYP	MAX	Units
Drain to Source Voltage	$B_{V_{DS}}$	$V_{GS} = 0\text{ V}$		60			V
Drain to Source Leakage	I_{DSS}	$V_{DS} = 60\text{ V}$ $V_{GS} = 0\text{ V}$	$T_C = 25^\circ\text{C}$		0.17	100	μA
			$T_C = 125^\circ\text{C}$		0.35	180	
Gate to Source Forward Leakage	I_{GSSF}	$V_{GS} = 5\text{ V}$	$T_C = 25^\circ\text{C}$		2	600	
Gate to Source Reverse Leakage	I_{GSSR}	$V_{GS} = -3\text{ V}$	$T_C = 25^\circ\text{C}$		0.27	100	
Gate to Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 0.14\text{ mA}$	$T_C = 25^\circ\text{C}$	0.8	1.8	2.5	V
Gate to Source Threshold Voltage Temperature Coefficient	$\Delta V_{GS(th)} / \Delta T$	$V_{DS} = V_{GS}$, $I_D = 0.14\text{ mA}$	$-55^\circ\text{C} < T_A < 150^\circ\text{C}$		2.34		mV/°C
Drain to Source Resistance (Note 4)	$R_{DS(on)}$	$I_D = 1\text{ A}$, $V_{GS} = 5\text{ V}$	$T_C = 25^\circ\text{C}$		340	580	m Ω
Source to Drain Forward Voltage	V_{SD}	$I_S = 0.5\text{ A}$, $V_G = 0\text{ V}$	$T_C = 25^\circ\text{C}$		2.5	3	V

Dynamic Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted. Typical (TYP) values are for reference only.)

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
Input Capacitance	C_{ISS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$		18	28	pF
Output Capacitance	C_{OSS}			17	30	
Reverse transfer Capacitance	C_{RSS}			0.1	2	
Gate Resistance (Note 5)	R_G	$f = 1\text{ MHz}$, $V_{DS} = V_{GS} = 0\text{ V}$		12.6		Ω
Total Gate Charge (Note 6)	Q_G	$V_{DS} = 30\text{ V}$, $I_D = 0.5\text{ A}$		142	175	pC
Gate to Source Charge (Note 6)	Q_{GS}			20	46	
Gate to Drain Charge (Note 6)	Q_{GD}			30	40	
Output Charge (Note 5)	Q_{OSS}	$V_{GS} = 0\text{ V}$, $V_{DS} = 30\text{ V}$		764	1145	
Source to Drain Recovery Charge (Note 5)	Q_{RR}	$I_D = 1\text{ A}$, $V_{DS} = 30\text{ V}$		0		

Radiation Characteristics

EPC Space eGaN[®] HEMTs are tested according to MIL-STD-750 Method 1019 for total ionizing dose validation. Every manufacturing lot is tested for total ionizing dose of 1 Mrad of Gamma radiation exposure with an in-situ bias for the following conditions:

ON	$V_{GS} = 5 \text{ V}$
NO BIAS	$V_{DS} = V_{GS} = 0 \text{ V}$
OFF	$V_{DS} = 80\% B_{VDSS}$

Electrical Characteristics up to 1000 krad ($T_C = 25^\circ\text{C}$ unless otherwise noted. Typical (TYP) values are for reference only.)

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
Drain to Source Voltage	B_{VDSS}	$V_{GS} = 0 \text{ V}, I_D = 0.1 \text{ mA}$	60			V
Gate to Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 0.14 \text{ mA}$	0.8	1.8	2.5	
Drain to Source Leakage	I_{DSS}	$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$		0.35	100	μA
Gate to Source Forward Leakage	I_{GSSF}	$V_{GS} = 5 \text{ V}$		2	500	
Gate to Source Reverse Leakage	I_{GSSR}	$V_{GS} = -4 \text{ V}$		0.27	100	
Drain to Source Resistance (Note 4)	$R_{DS(on)}$	$I_D = 1 \text{ A}, V_{GS} = 5 \text{ V}$		365	580	$\text{m}\Omega$

Typical Single Event Effect Safe Operating Area

Note : All Radiation Single Event Effects testing are performed in heavy ion environments such as the K-500 Cyclotron at Texas A&M.

Test		Environment			V_{DS} Voltage (V)	
See SOA	Ion	LET $\text{MeV}(\text{mg}/\text{cm}^2)$ in Si (+/-5%)	Range μm (+/- 7.5%)	Energy MeV (+/-10%)	$V_{GS} = 0 \text{ V}$	$V_{GS} = -4\text{V}$
	Xe	63.6	71.3	963	60	60
	Au	83.2	121.4	2256	60	60

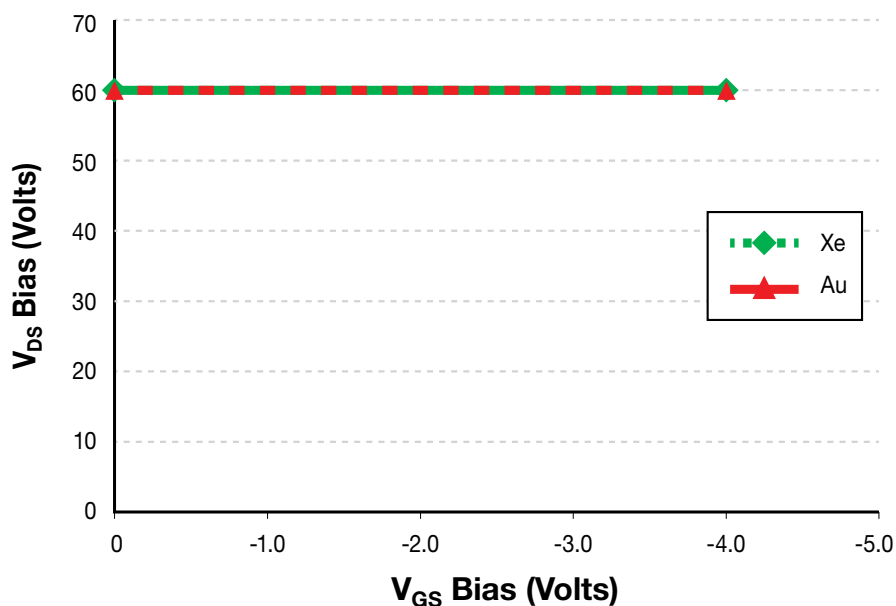


Figure 1. Typical Single Event Effect Safe Operating Area

Figure 2: Typical Gate-Source Leakage Current vs. Ambient Temp.

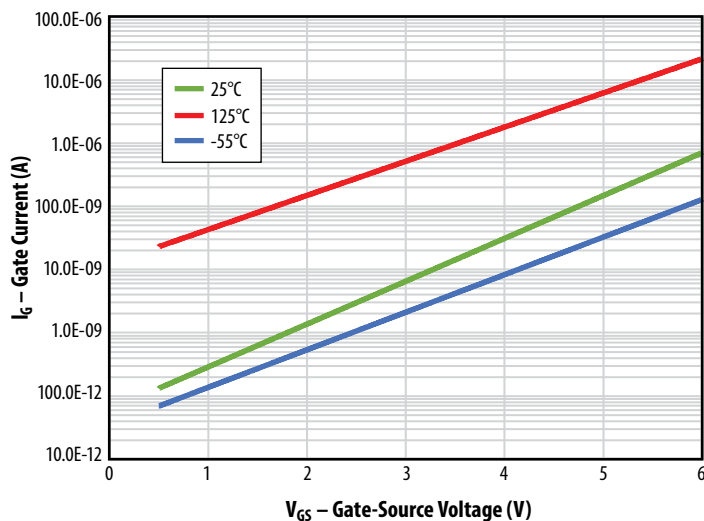


Figure 3: Typical Drain-Source Leakage Current vs. Ambient Temp.

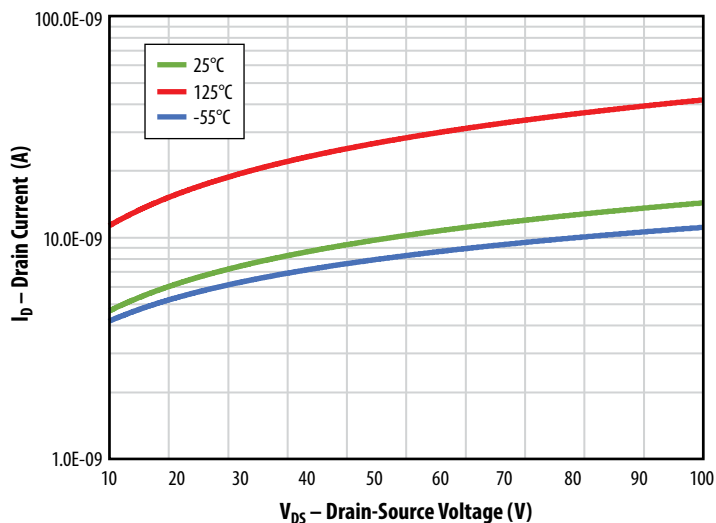


Figure 4: Typical Output Characteristics at 25°C

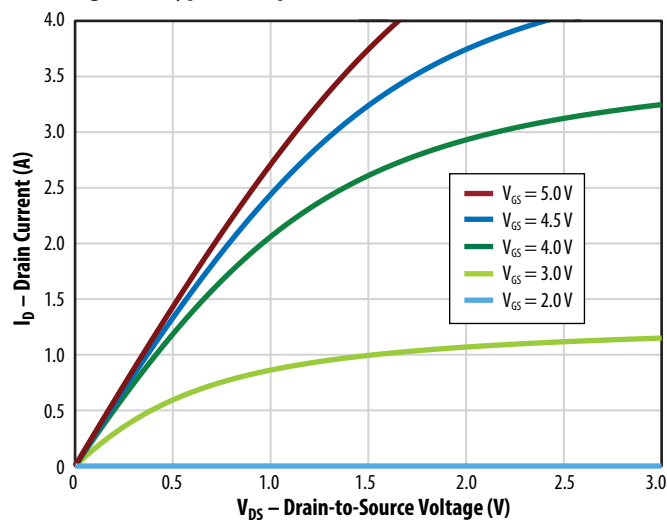


Figure 5: Typical Output Characteristics at 125°C

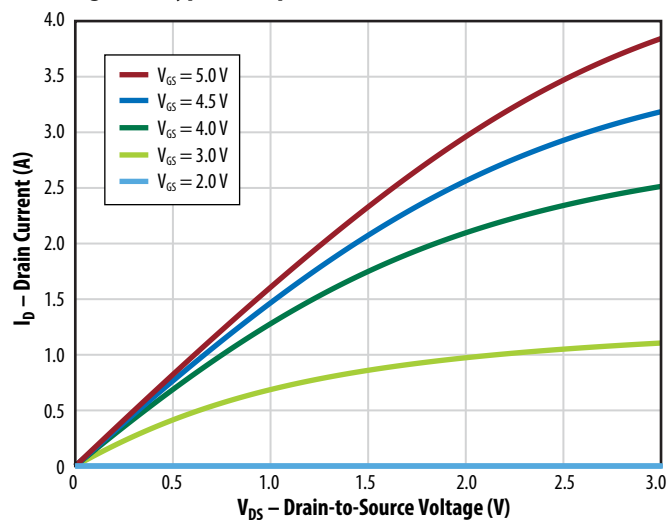


Figure 6: Transfer Characteristics

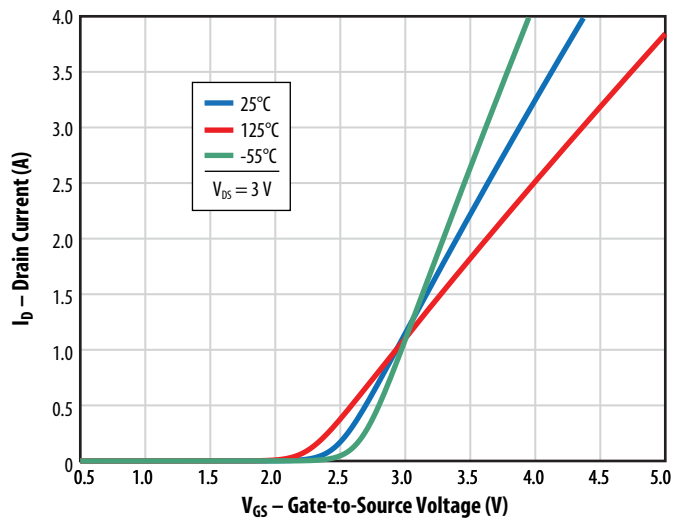


Figure 7: Reverse Drain-Source Characteristics

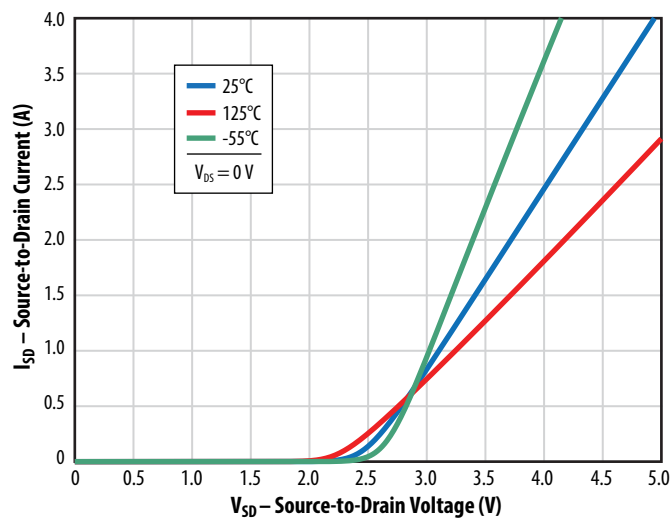


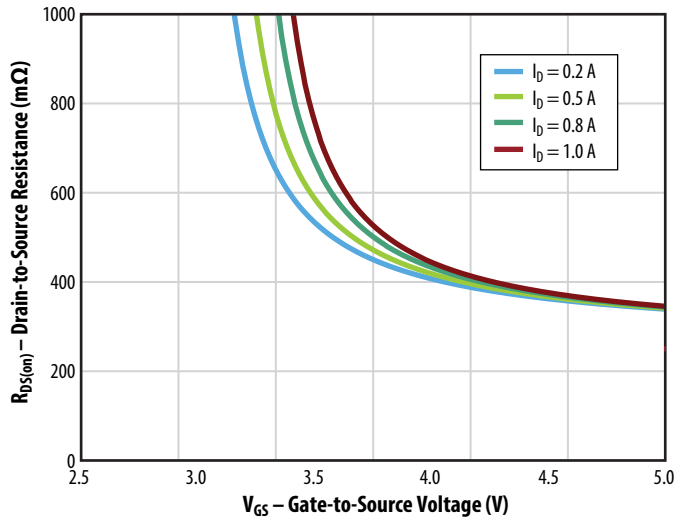
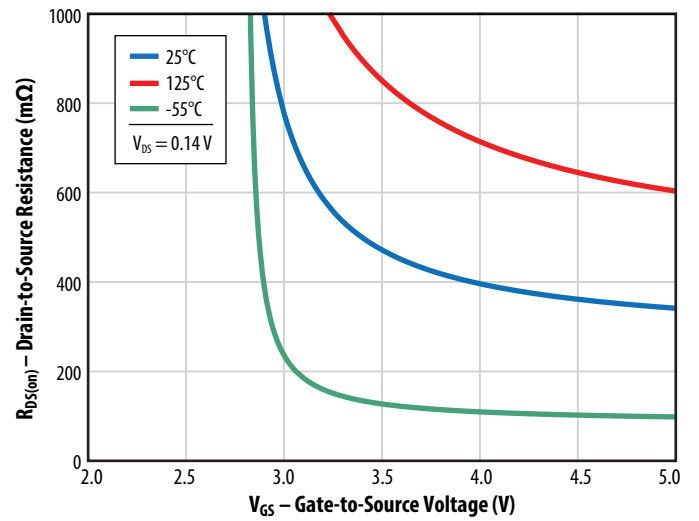
Figure 8: $R_{DS(on)}$ vs. V_{GS} for Various Drain CurrentsFigure 9: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

Figure 10: Normalized On-State Resistance vs. Temperature

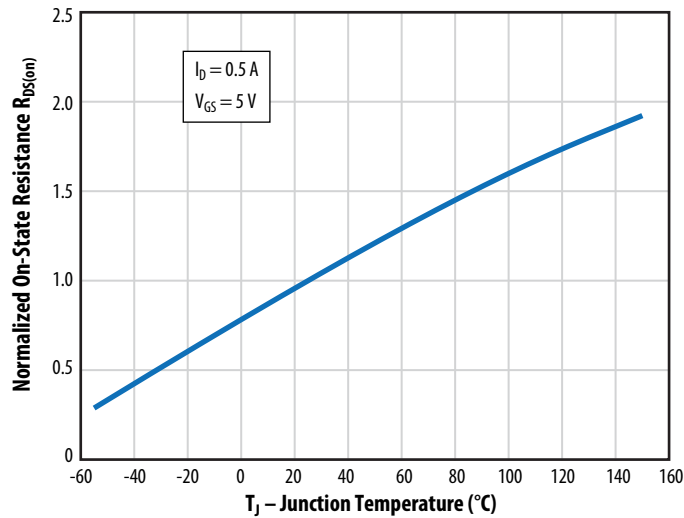


Figure 11: Normalized Threshold Voltage vs. Temperature

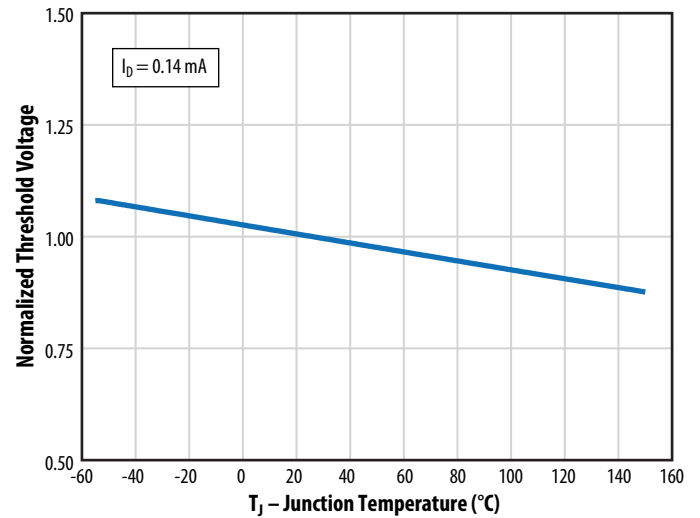


Figure 12: Capacitance (Linear Scale)

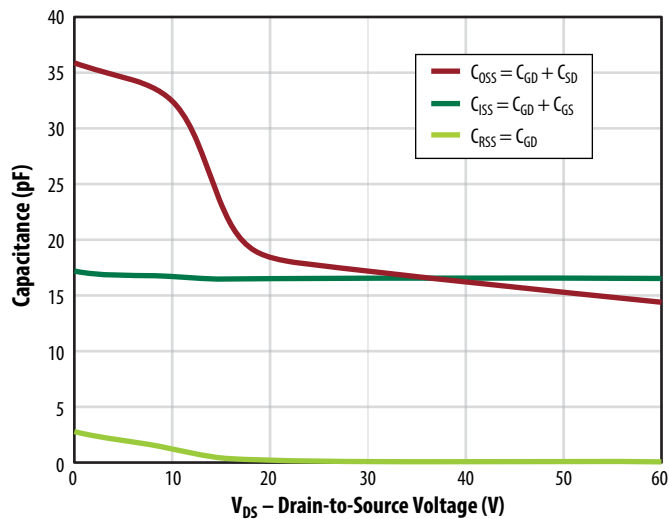
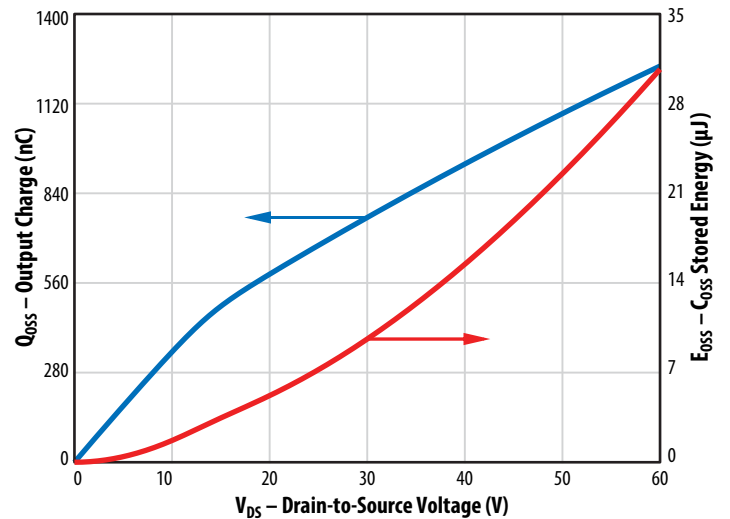
Figure 13: Output Charge and C_{OSS} Stored Energy

Figure 14: Gate Charge

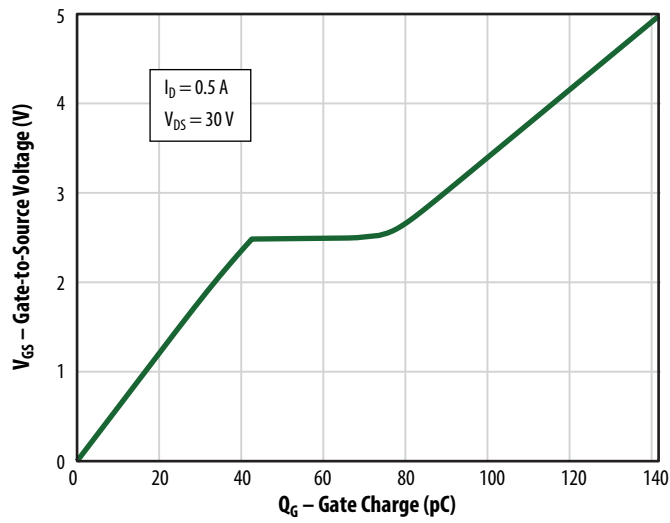


Figure 15: Safe Operating Area

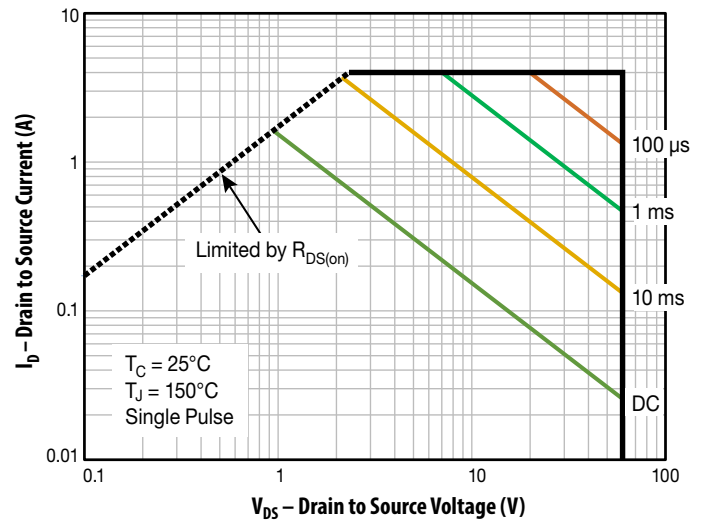
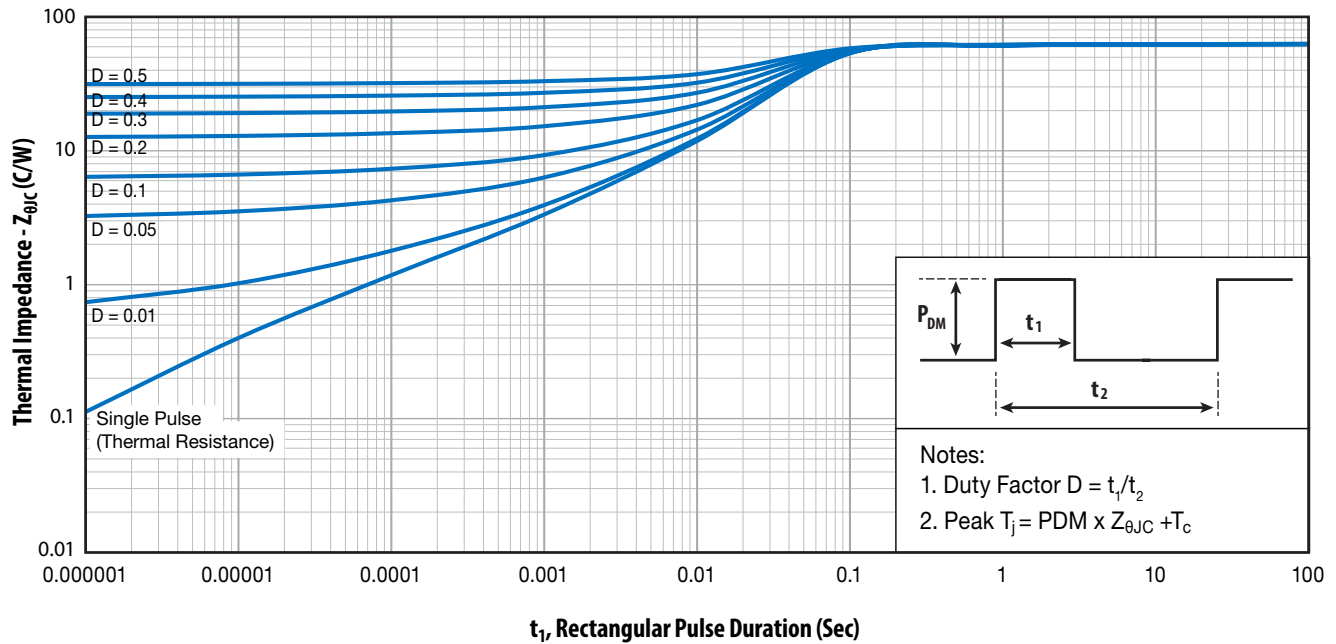
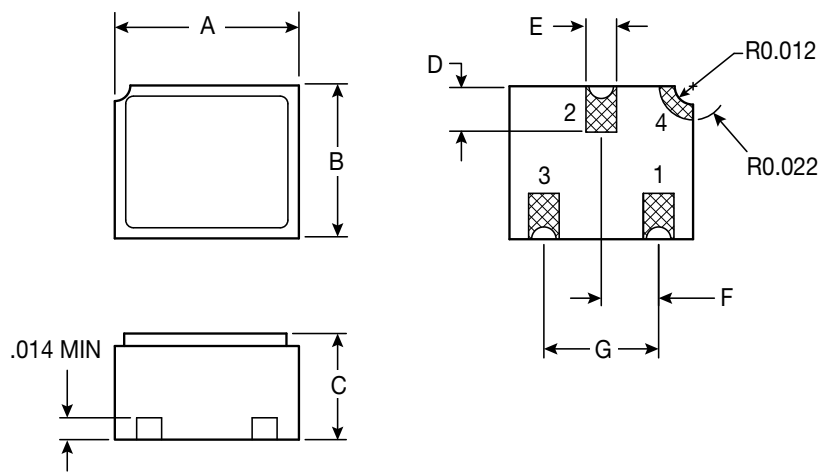


Figure 16: Transient Thermal Impedance, Junction-to-Case



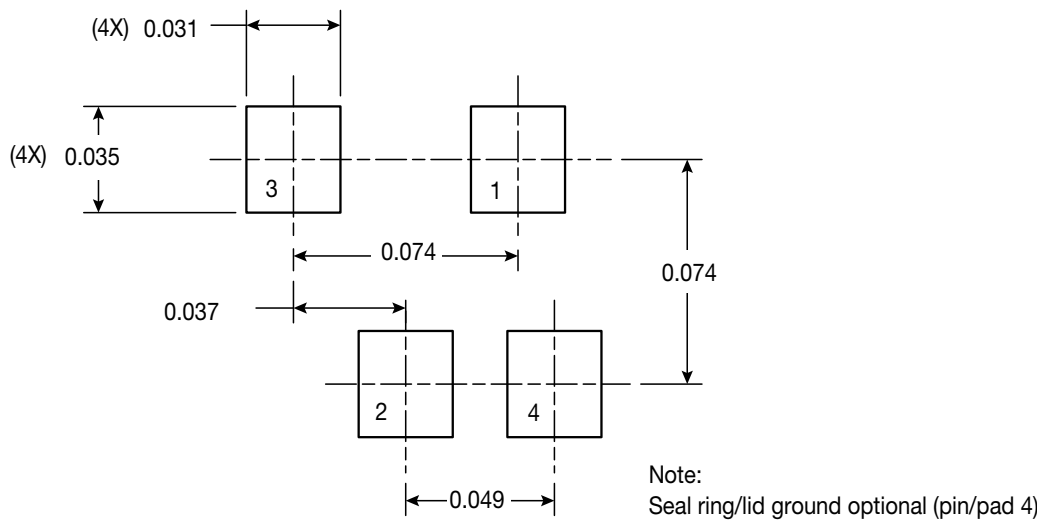
Package Outline and Dimensions



Symbol	Inches		Millimeters	
	MIN	MAX	MIN	MAX
A	0.115	0.128	2.921	3.251
B	0.095	0.108	2.413	2.743
C	0.064	0.082	1.625	2.083
D	0.024	0.036	0.610	0.910
E	0.016	0.024	0.410	0.610
F	0.035	0.039	0.889	0.991
G	0.071	0.079	1.803	2.006

Standard Terminal Pad finish is a solder alloy of 63%Sn 37%Pb.

UB Footprint for Printed Circuit Board Design



Notes

- Note 1. Never exceed the absolute maximum V_{DS} of the device otherwise permanent damage/destruction may result.
- Note 2. Never exceed the absolute maximum V_{GS} of the device otherwise permanent damage/destruction may result. We recommend a V_{GS} of 5V for optimum operation across life and radiation.
- Note 3. $R_{\theta JA}$ measured with LCC3 package mounted to double-sided PCB, 0.063" thickness with 1.0 square inches of copper area on the top (mounting side) and a flood etch (3 square inches) on the bottom side.
- Note 4. Measured using four wire (Kelvin) sensing and pulse measurement techniques. Measurement pulse width is 80 μs and duty cycle is 1%, maximum.
- Note 5. Guaranteed by design/device construction. Not tested.
- Note 6. The gate charge parameters are measured based on the MIL-STD-750.3471 Condition B. A high speed constant gate current (I_{const}) is provided to the Gate of the DUT during the time that the ground switch (G_S) is OFF (t_{off}). The DUT is switched ON and OFF using ground-sensed switch G_S . The gate current is adjusted to yield the desired charge per unit time ($I_{const} \cdot \text{time per division}$) on the measuring oscilloscope. The G_S pulse drive ON time (t_{on}) is adjusted for the desired observability of the gate-source voltage (V_{GS}) waveform. The maximum duty cycle of the ground switch (t_{off}/t_{on}) should be set to 1% maximum. Please note that all gate-related signals are referenced to the "Source Sense" pin on the package. At all times during the measurement, the maximum gate-source voltage is clamped to 5 V_{DC} .

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