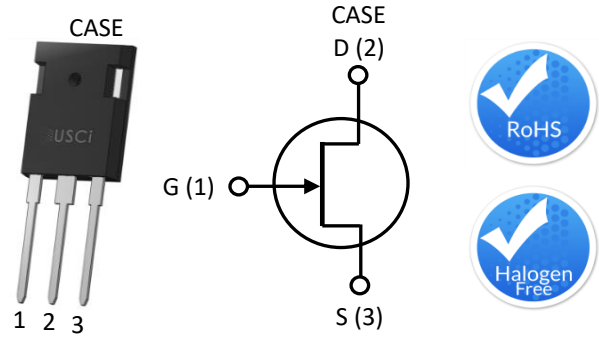


Description

United Silicon Carbide, Inc offers the high-performance G3 SiC normally-on JFET transistors. This series exhibits ultra-low on resistance ($R_{DS(ON)}$) and gate charge (Q_G) allowing for low conduction and switching loss. The device normally-on characteristics with low $R_{DS(ON)}$ at $V_{GS} = 0$ V is also ideal for current protection circuits without the need for active control, as well as for cascode operation.



Part Number	Package	Marking
UJ3N120070K3S	TO-247-3L	UJ3N120070K3S

Features

- ♦ Typical on-resistance $R_{DS(on),typ}$ of 70mΩ
- ♦ Voltage controlled
- ♦ Maximum operating temperature of 175°C
- ♦ Extremely fast switching not dependent on temperature
- ♦ Low gate charge
- ♦ Low intrinsic capacitance
- ♦ RoHS compliant

Typical Applications

- ♦ Over current protection circuits
- ♦ DC-AC inverters
- ♦ Switch mode power supplies
- ♦ Power factor correction modules
- ♦ Motor drives
- ♦ Induction heating

Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Units
Drain-source voltage	V_{DS}		1200	V
Gate-source voltage	V_{GS}	DC	-20 to +3	V
		AC ⁽¹⁾	-20 to +20	
Continuous drain current ⁽²⁾	I_D	$T_C = 25^\circ\text{C}$	33.5	A
		$T_C = 100^\circ\text{C}$	24.5	A
Pulsed drain current ⁽³⁾	I_{DM}	$T_C = 25^\circ\text{C}$	85	A
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	254	W
Maximum junction temperature	$T_{J,max}$		175	°C
Operating and storage temperature	T_J, T_{STG}		-55 to 175	°C
Max. lead temperature for soldering, 1/8" from case for 5 seconds	T_L		250	°C

(1) +20V AC rating applies for turn-on pulses <200ns applied with external $R_G > 1\Omega$.

(2) Limited by $T_{J,max}$

(3) Pulse width t_p limited by $T_{J,max}$

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

Typical Performance - Static

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Drain-source breakdown voltage	BV_{DS}	$V_{GS} = -20\text{V}, I_D = 1\text{mA}$	1200			V
Total drain leakage current	I_D	$V_{DS} = 1200\text{V},$ $V_{GS} = -20\text{V}, T_J = 25^\circ\text{C}$		5	30	μA
		$V_{DS} = 1200\text{V},$ $V_{GS} = -20\text{V}, T_J = 175^\circ\text{C}$		18		
Total gate leakage current	I_G	$V_{GS} = -20\text{V}, T_J = 25^\circ\text{C}$		5	50	μA
		$V_{GS} = -20\text{V}, T_J = 175^\circ\text{C}$		20		
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = 2\text{V}, I_D = 10\text{A},$ $T_J = 25^\circ\text{C}$		63		$\text{m}\Omega$
		$V_{GS} = 0\text{V}, I_D = 10\text{A},$ $T_J = 25^\circ\text{C}$		70	90	
		$V_{GS} = 2\text{V}, I_D = 10\text{A},$ $T_J = 175^\circ\text{C}$		139		
		$V_{GS} = 0\text{V}, I_D = 10\text{A},$ $T_J = 175^\circ\text{C}$		154		
Gate threshold voltage	$V_{G(th)}$	$V_{DS} = 5\text{V}, I_D = 35\text{mA}$	-14	-11.5	-6	V
Gate resistance	R_G	$f = 1\text{MHz}, \text{open drain}$		3.3		Ω

Typical Performance - Dynamic

Parameter	symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Input capacitance	C_{iss}	$V_{DS} = 100V,$ $V_{GS} = -20V,$ $f = 100kHz$		985		pF
Output capacitance	C_{oss}			100		
Reverse transfer capacitance	C_{rss}			95		
Effective output capacitance, energy related	$C_{oss(er)}$	$V_{DS} = 0V$ to $800V,$ $V_{GS} = -20V$		52		pF
Total gate charge	Q_G	$V_{DS}=800V, I_D = 25A,$ $V_{GS}=-18V$ to $0V$		116		nC
Gate-drain charge	Q_{GD}			63		
Gate-source charge	Q_{GS}			11		
Turn-on delay time	$t_{d(on)}$	$V_{DS}=800V, I_D=25A,$ Gate Driver $=-18V$ to $0V,$ $R_{G,EXT} = 1\Omega,$ Inductive Load, FWD: UJ2D1215T $T_J = 25^\circ C$		17		ns
Rise time	t_r			25		
Turn-off delay time	$t_{d(off)}$			29		
Fall time	t_f			39		
Turn-on energy	E_{ON}			434		μJ
Turn-off energy	E_{OFF}	$V_{DS}=800V, I_D=25A,$ Gate Driver $=-18V$ to $0V,$ $R_{G,EXT} = 1\Omega,$ Inductive Load, FWD: UJ2D1215T $T_J = 150^\circ C$		393		
Total switching energy	E_{TOTAL}			827		
Turn-on delay time	$t_{d(on)}$			17		ns
Rise time	t_r			23		
Turn-off delay time	$t_{d(off)}$			25		
Fall time	t_f			24		
Turn-on energy	E_{ON}			418		μJ
Turn-off energy	E_{OFF}			278		
Total switching energy	E_{TOTAL}			696		

Thermal Characteristics

Parameter	symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal resistance, junction-to-case	$R_{\theta JC}$			0.45	0.59	$^\circ C/W$

Typical Performance Diagrams

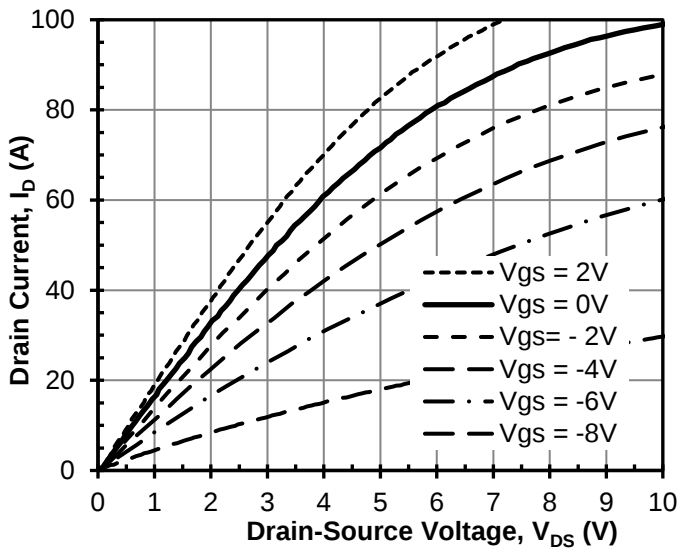


Figure 1 Typical output characteristics
at $T_J = -55^{\circ}\text{C}$

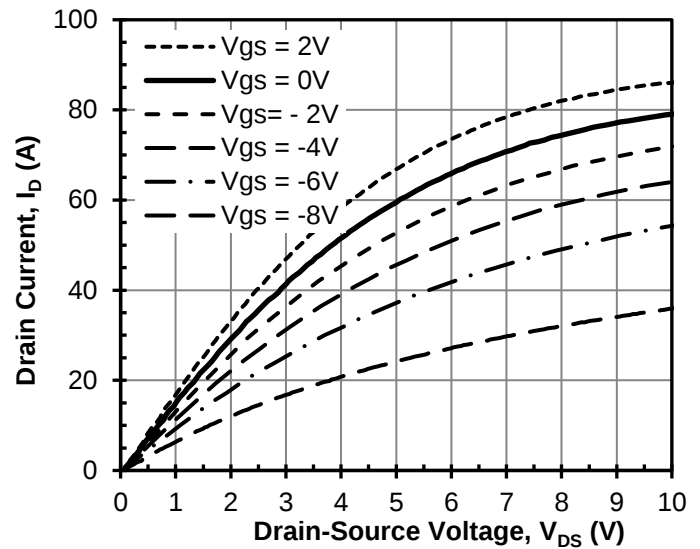


Figure 2 Typical output characteristics
at $T_J = 25^{\circ}\text{C}$

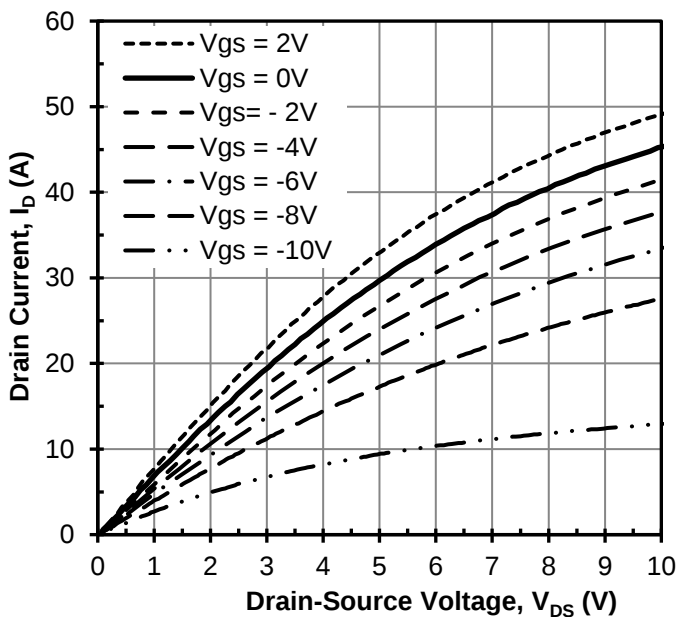


Figure 3 Typical output characteristics
at $T_J = 175^{\circ}\text{C}$

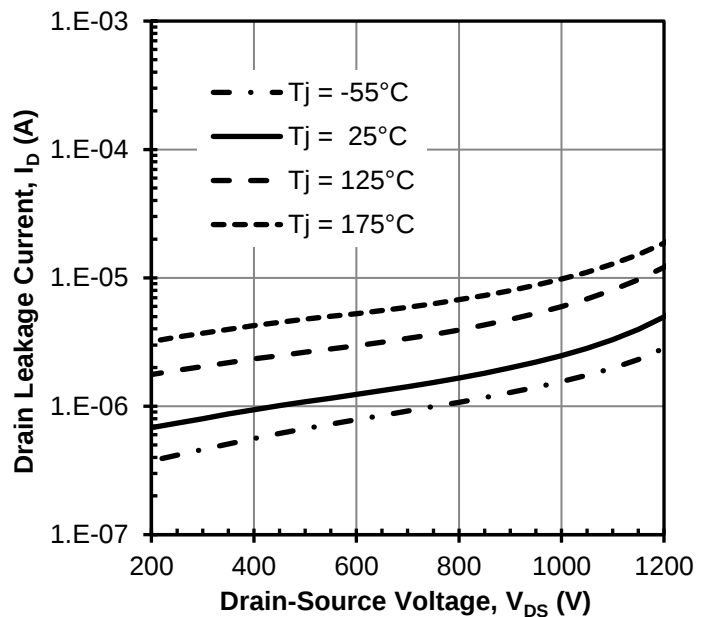


Figure 4 Typical drain-source leakage
at $V_{GS} = -20\text{V}$

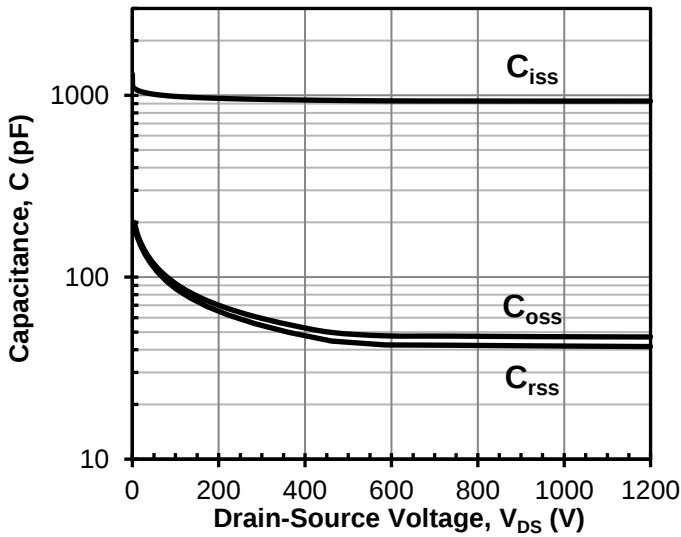


Figure 5 Typical capacitances at 100kHz
and $V_{GS} = -20V$

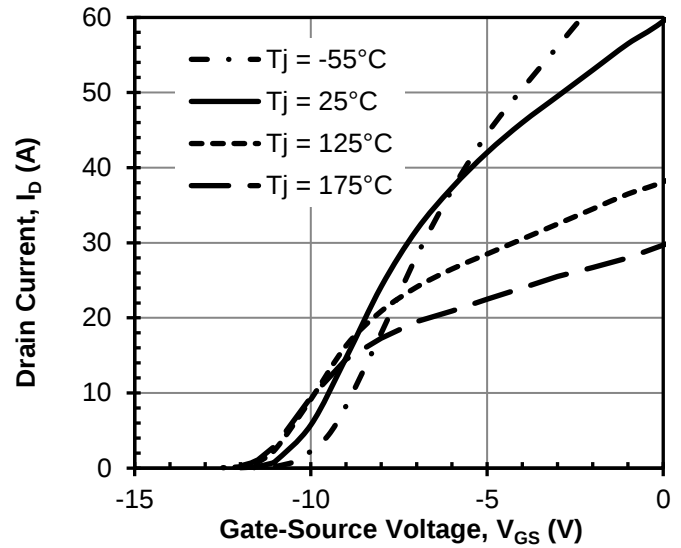


Figure 6 Typical transfer characteristics
at $V_{DS} = 5V$

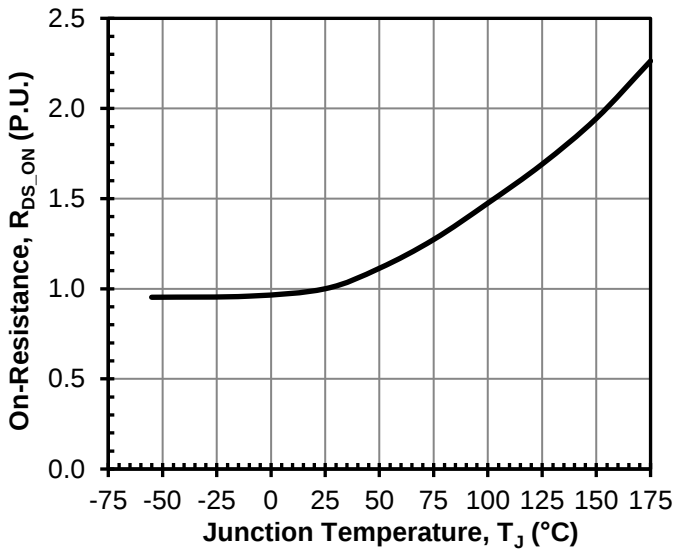


Figure 7 Normalized on-resistance vs.
temperature at $V_{GS} = 0V$ and $I_D = 10A$

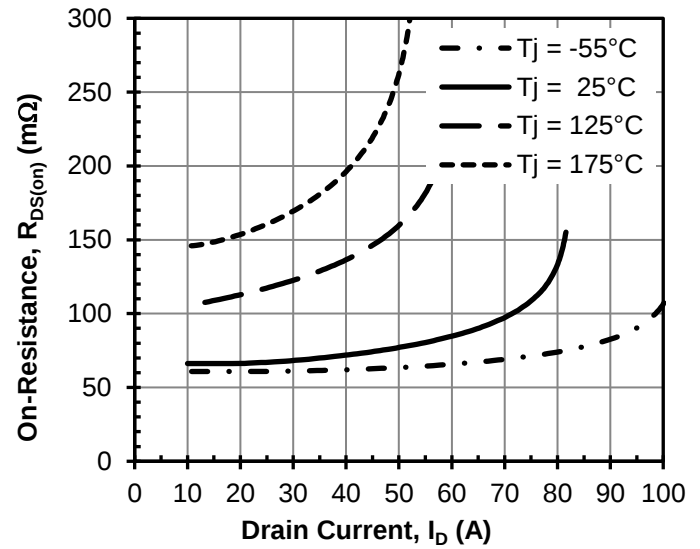


Figure 8 Typical drain-source
on-resistance at $V_{GS} = 0V$

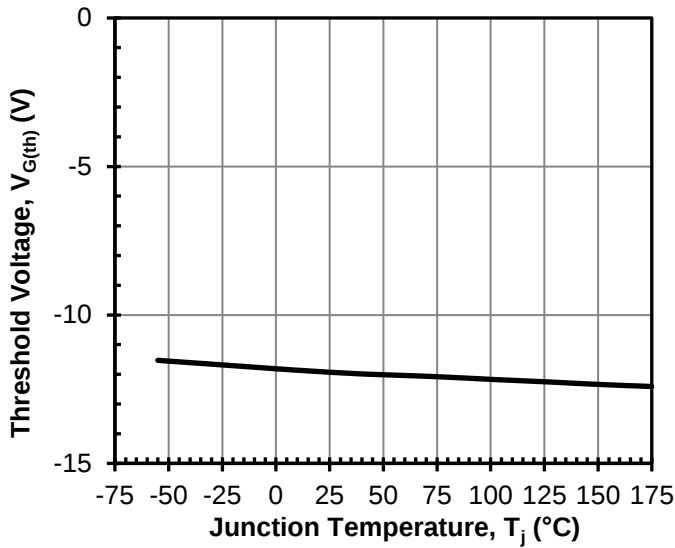


Figure 9 Threshold voltage vs. T_j
at $V_{DS} = 5V$ and $I_D = 35mA$

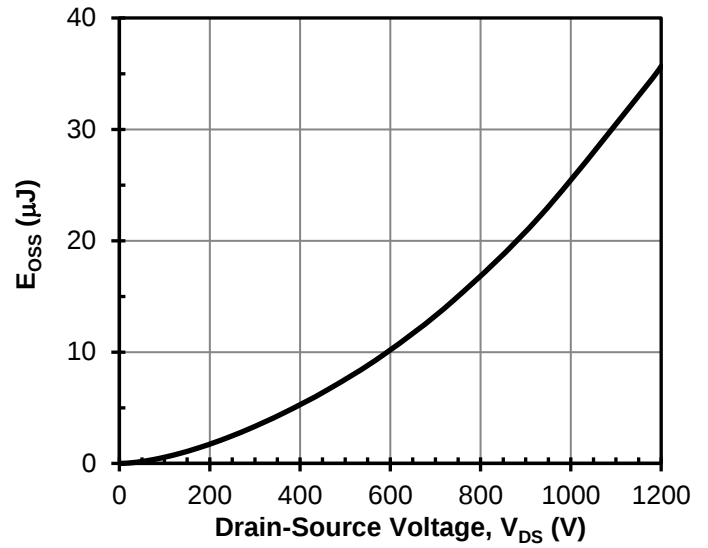


Figure 10 Typical stored energy in C_{oss}
at $V_{GS} = -20V$

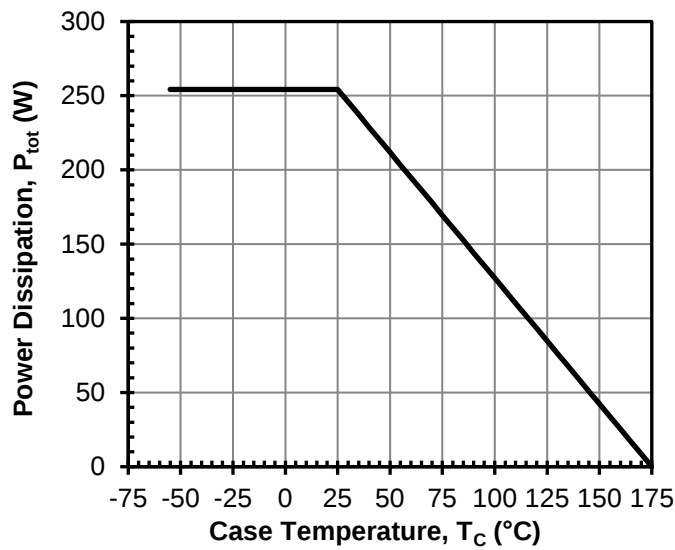


Figure 11 Total power Dissipation

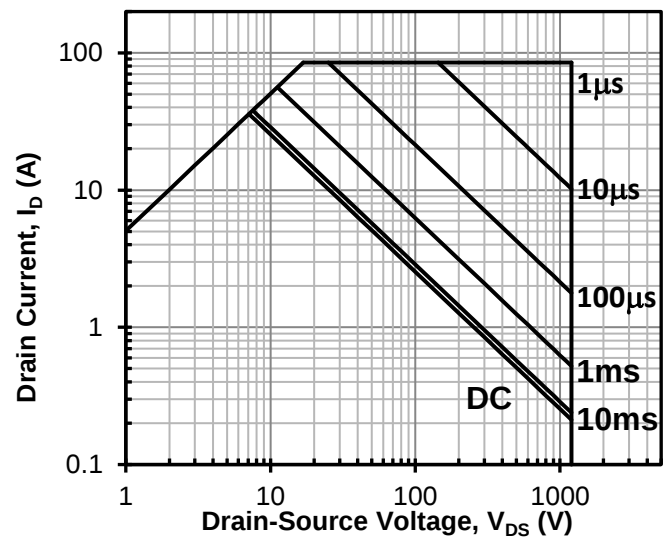


Figure 12 Safe operation area
 $T_c = 25^\circ C$, Parameter t_p

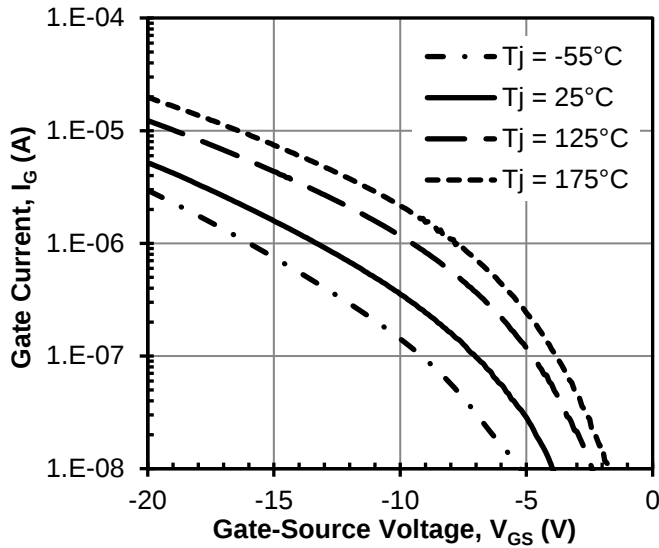


Figure 13 Typical gate leakage current
at $V_{DS} = 0V$

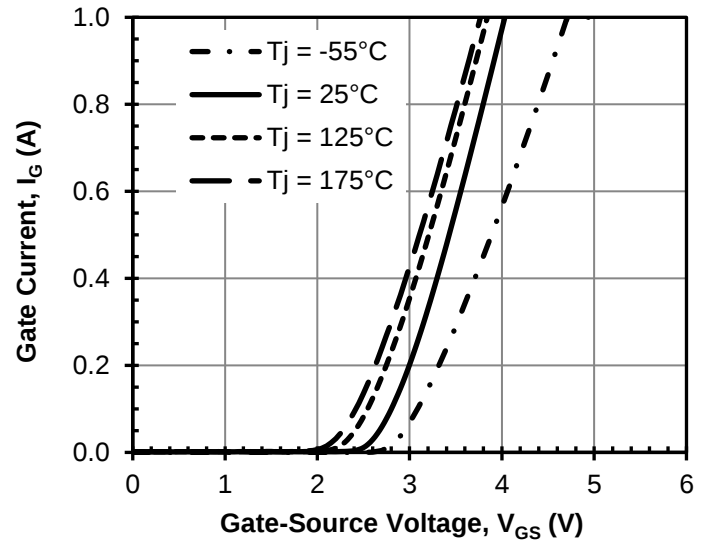


Figure 14 Typical gate forward current
at $V_{DS} = 0V$

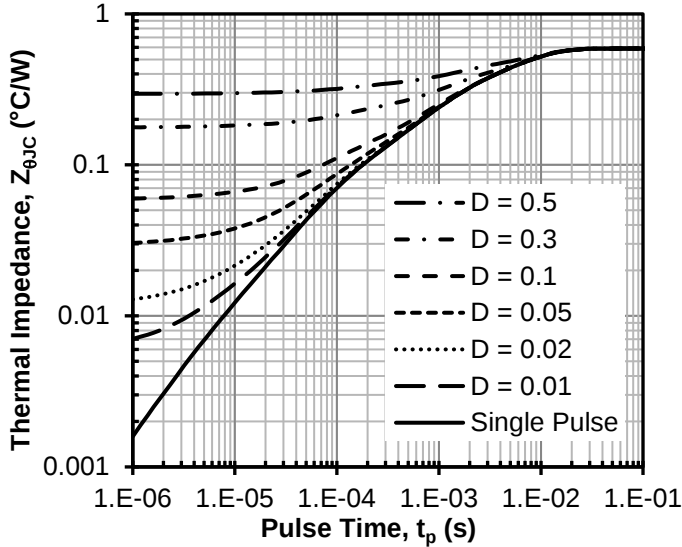


Figure 15 Maximum transient
thermal impedance

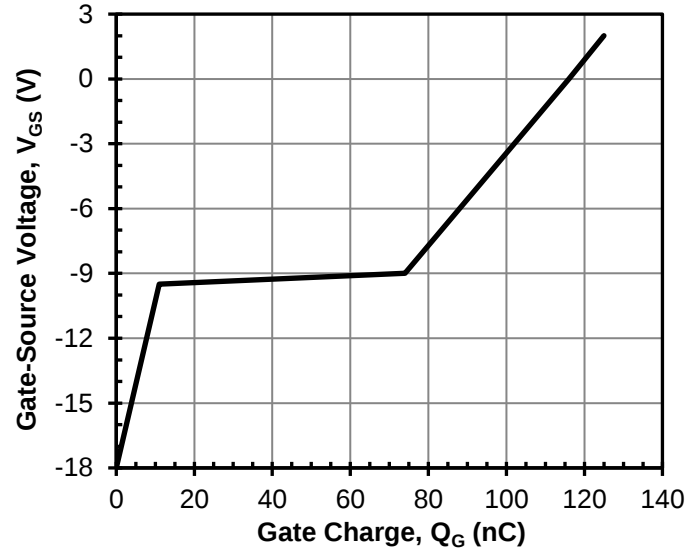


Figure 16 Typical gate charge
at $V_{DS} = 800V$ and $I_D = 25A$

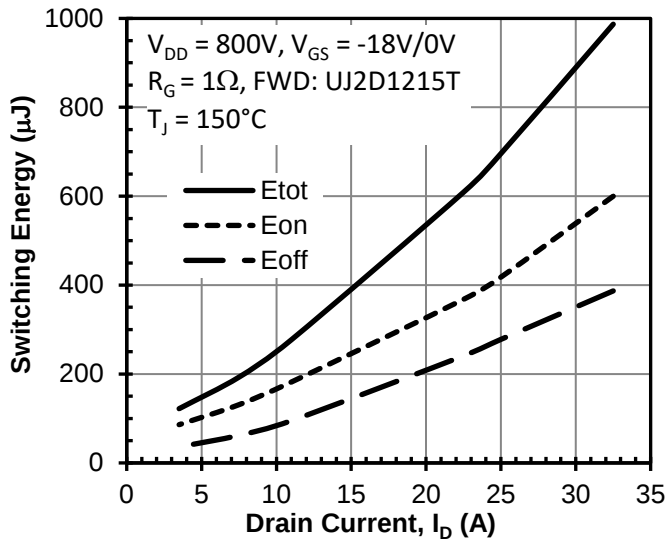


Figure 17 Clamped inductive switching energy vs. drain current at $T_J = 150^\circ\text{C}$

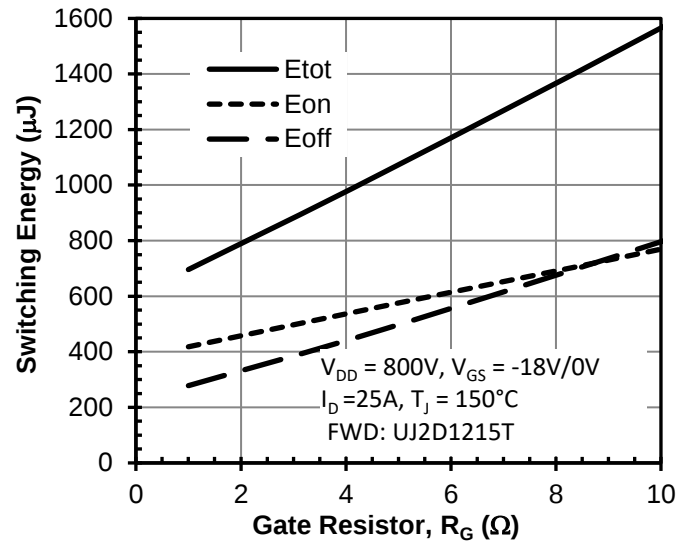


Figure 18 Clamped inductive switching energy vs. gate resistor R_G

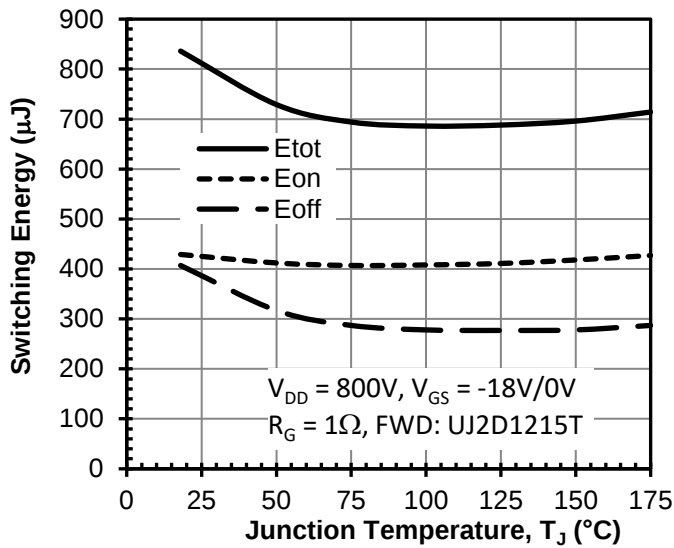


Figure 19 Clamped inductive switching energy vs. junction temperature at $I_D = 25\text{A}$

Disclaimer

United Silicon Carbide, Inc. reserves the right to change or modify any of the products and their inherent physical and technical specifications without prior notice. United Silicon Carbide, Inc. assumes no responsibility or liability for any errors or inaccuracies within.

Information on all products and contained herein is intended for description only. No license, express or implied, to any intellectual property rights is granted within this document.

United Silicon Carbide, Inc. assumes no liability whatsoever relating to the choice, selection or use of the United Silicon Carbide, Inc. products and services described herein.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[UnitedSiC:](#)

[UJ3N120070K3S](#)