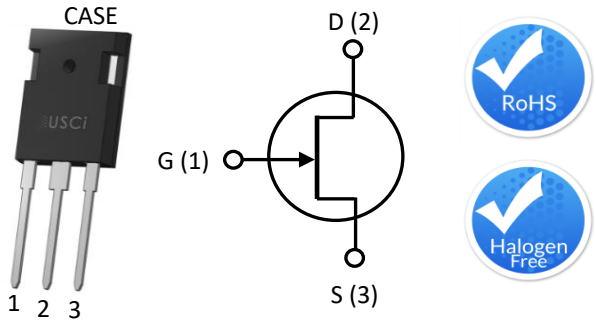
Description

United Silicon Carbide, Inc offers the xJ series of high-performance 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
UJN1205K	TO-247-3L	UJN1205K

Features

- Low On-Resistance $R_{DS(on)max}$ of 0.045Ω
- 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	I_D	T_C = 25°C	38	A
		T_C = 125°C	23	A
Pulsed drain current	I_{DM}	T_j = 125°C	80	A
		T_j = 175°C	55	
Power dissipation	P_{tot}	T_C = 25°C	230	W
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 > 1Ω.

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

Typical Performance - Static

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Drain-source breakdown voltage	BV_{DS}	V_{GS}=-20V, I_D=1mA	1200			V
Total drain leakage current	I_D	V_{DS} = 1200V, V_{GS} = -20V, T_J = 25°C		10	800	µA
		V_{DS} = 1200V, V_{GS} = -20V, T_J = 175°C		30	2400	
Total gate leakage current	I_G	V_{GS}=-20V, T_j=25°C		1	250	µA
		V_{GS}=-20V, T_j=175°C		10		
Drain-source on-resistance	$R_{DS(on)}$	V_{GS}=2V, I_D=20A, T_J = 25°C		35	45	mΩ
		V_{GS}=0V, I_D=20A, T_J = 25°C		42	55	
		V_{GS}=2V, I_D=20A, T_J = 175°C		105	135	
		V_{GS}=0V, I_D=20A, T_J = 175°C		135	165	
Gate threshold voltage	$V_{G(th)}$	V_{DS} = 5V, I_D = 70mA	-10	-6	-4	V
Gate resistance	R_G	V_{GS} = 0V, f = 1MHz		5		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		1020		pF
Output capacitance	C_{oss}			154		
Reverse transfer capacitance	C_{rss}			146		
Effective output capacitance, energy related	$C_{oss(er)}$	V_{DS} = 0V to 600V, V_{GS} = -20V		91		pF
Total gate charge	Q_G	V_{DS}=600V, I_D = 30A, V_{GS}=-15V to 2.5V		107		nC
Gate-drain charge	Q_{GD}			74		
Gate-source charge	Q_{GS}			10		
Turn-on delay time	$t_{d(on)}$	V_{DS}=600V, I_D=30A, Gate Driver =-15V to +5V, $R_{G,EXT}$ = 2.5Ω, Inductive Load, T_J = 25°C		30		ns
Rise time	t_r			28		
Turn-off delay time	$t_{d(off)}$			32		
Fall time	t_f			35		
Turn-on energy	E_{ON}			467		µJ
Turn-off energy	E_{OFF}			515		
Total switching energy	E_{TOTAL}			982		
Turn-on delay time	$t_{d(on)}$	V_{DS}=600V, I_D=30A, Gate Driver =-15V to +5V, $R_{G,EXT}$ = 2.5Ω, Inductive Load, T_J = 150°C		32		ns
Rise time	t_r			30		
Turn-off delay time	$t_{d(off)}$			32		
Fall time	t_f			33		
Turn-on energy	E_{ON}			512		µJ
Turn-off energy	E_{OFF}			448		
Total switching energy	E_{TOTAL}			960		

Thermal Characteristics

Parameter	symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal resistance, junction-to-case	$R_{\theta JC}$				0.65	°C/W

Typical Performance Diagrams

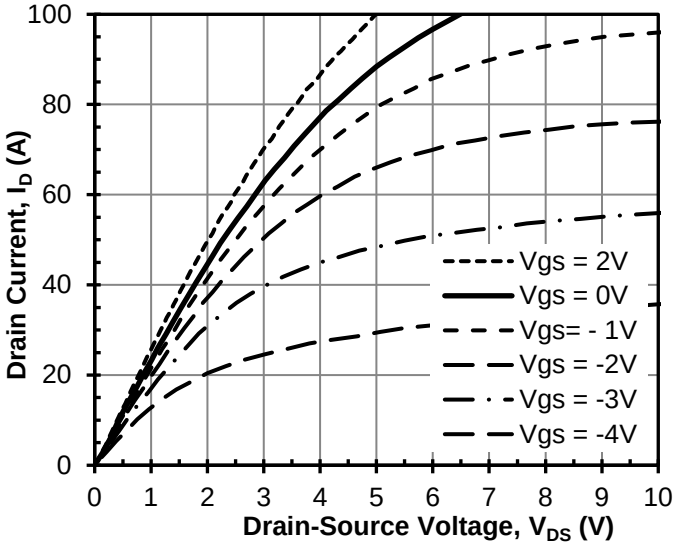


Figure 1 Typical output characteristics at T_j = 25°C

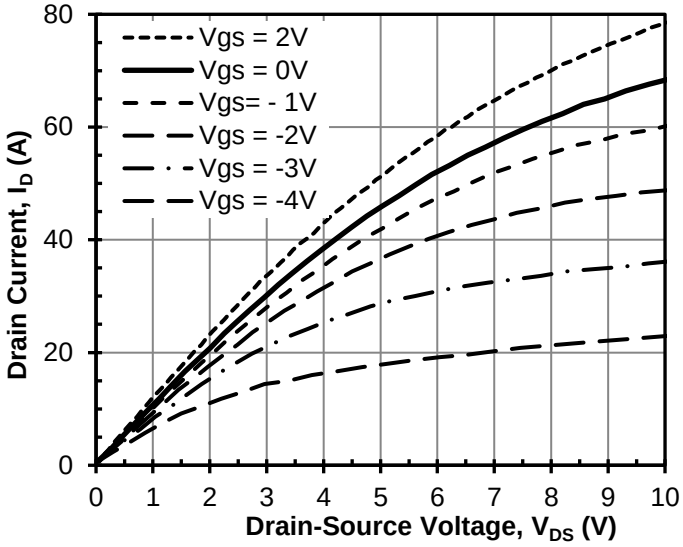


Figure 2 Typical output characteristics at T_j = 125°C

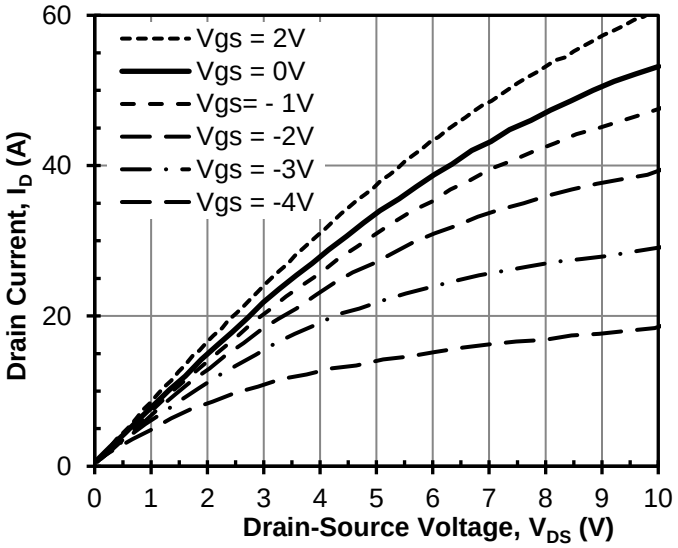


Figure 3 Typical output characteristics at T_j = 175°C

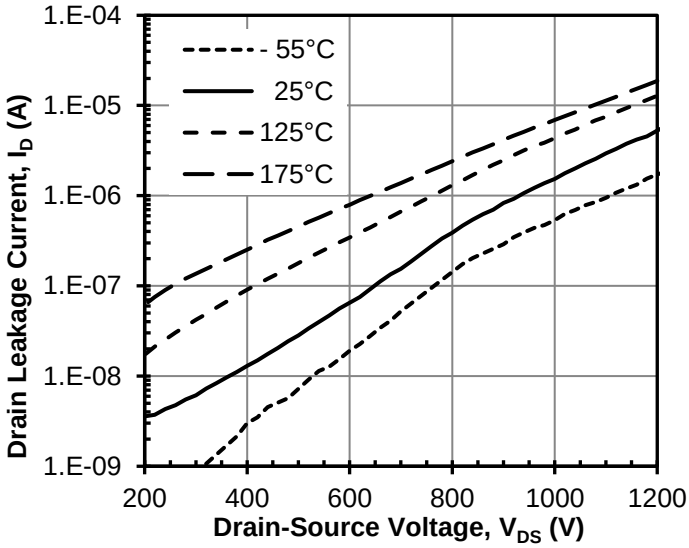


Figure 4 Typical drain-source leakage at V_{GS} = -20V

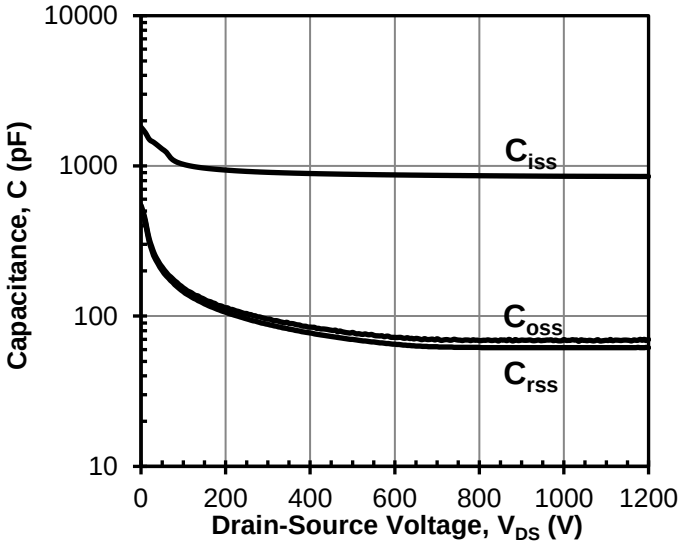


Figure 5 Typical capacitances at 100kHz at V_{GS} = -20V

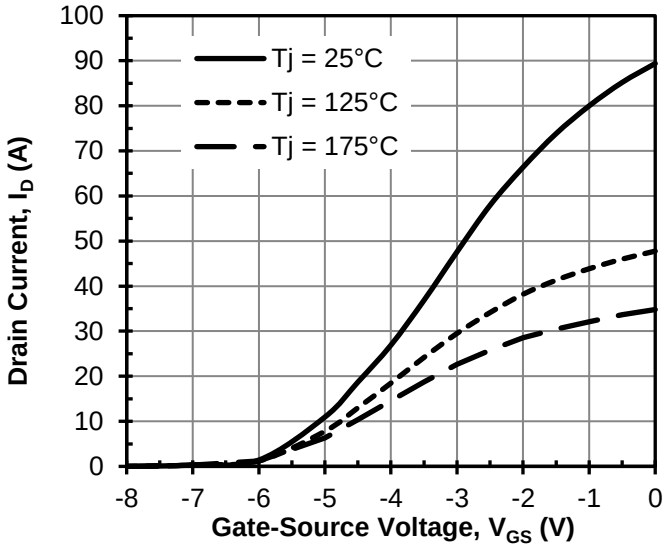


Figure 6 Typical transfer characteristics at V_{DS} = 5V

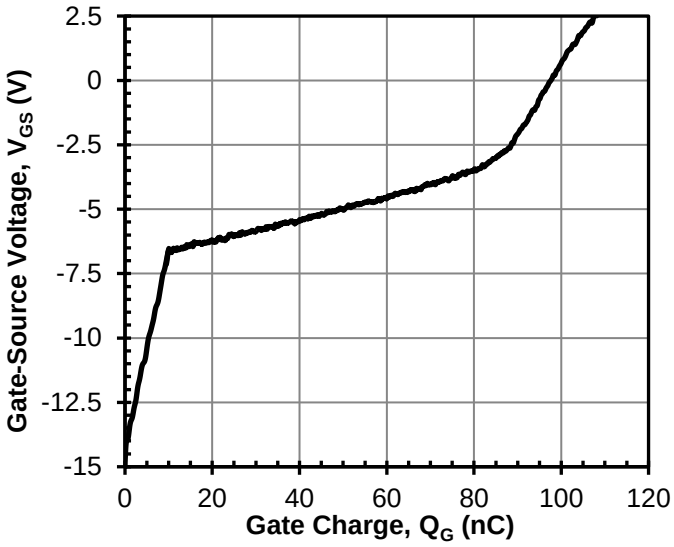


Figure 7 Typical gate charge at V_{DS} = 600V and I_D = 30A

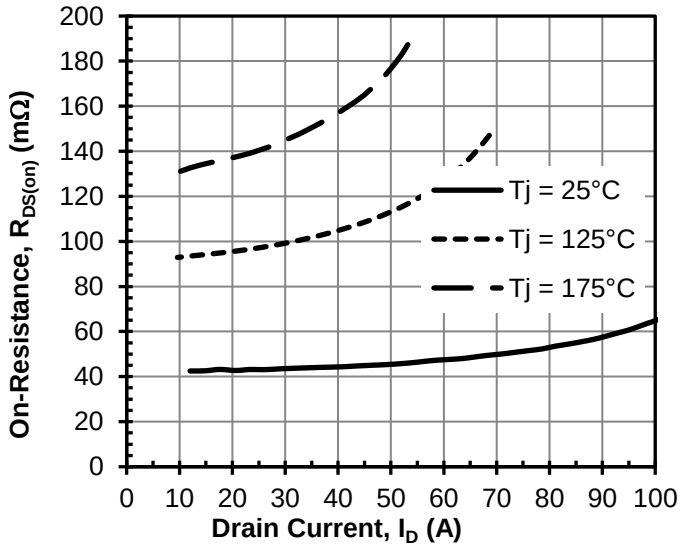


Figure 8 Typical drain-source on-resistance at V_{GS} = 0V

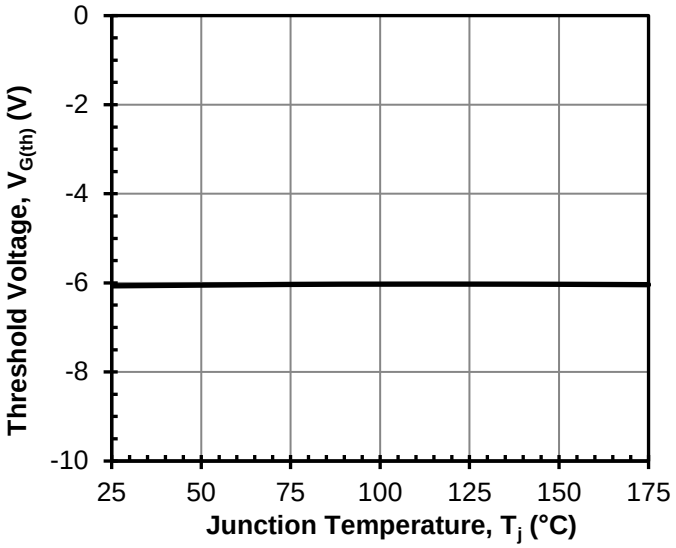


Figure 9 Threshold voltage vs. Tj at V_{DS} = 5V and I_D = 70mA

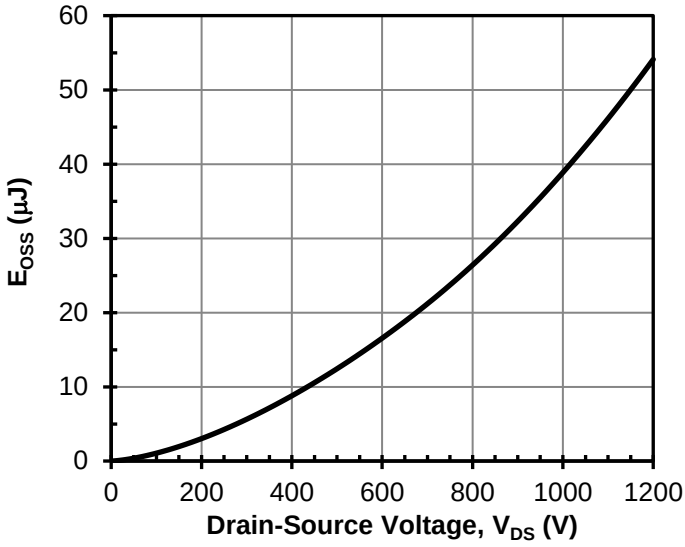


Figure 10 Typical stored energy in C_{OSS} at V_{GS} = -20V

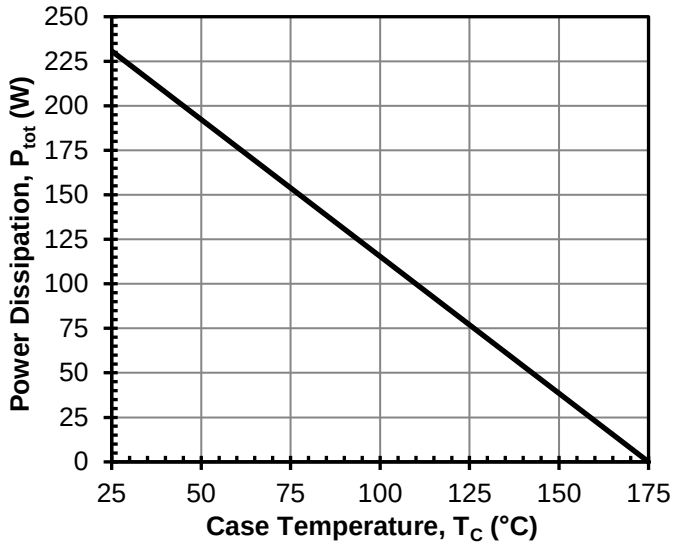


Figure 11 Total power Dissipation

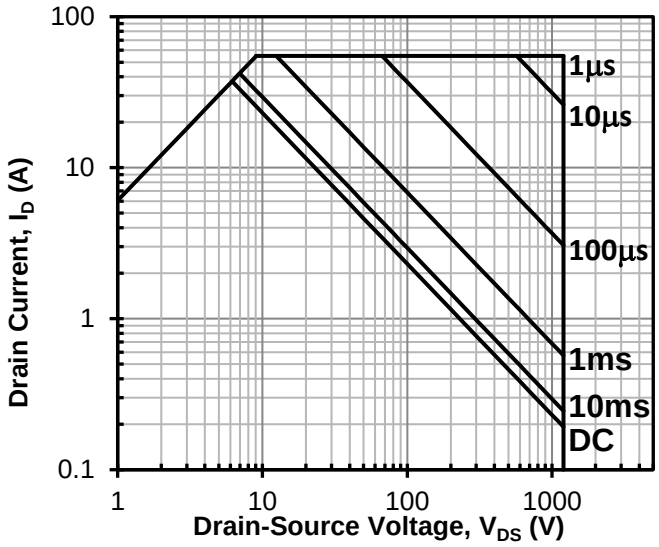


Figure 12 Safe operation area T_c = 25°C, Parameter t_p

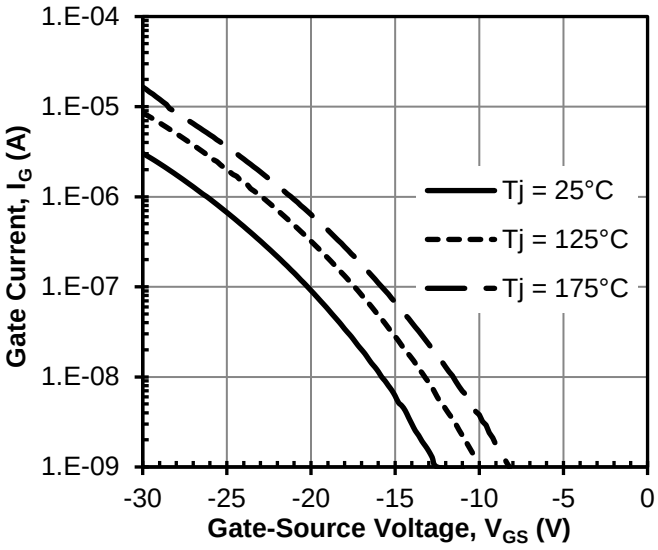


Figure 13 Typical gate leakage current at V_{DS} = 0V

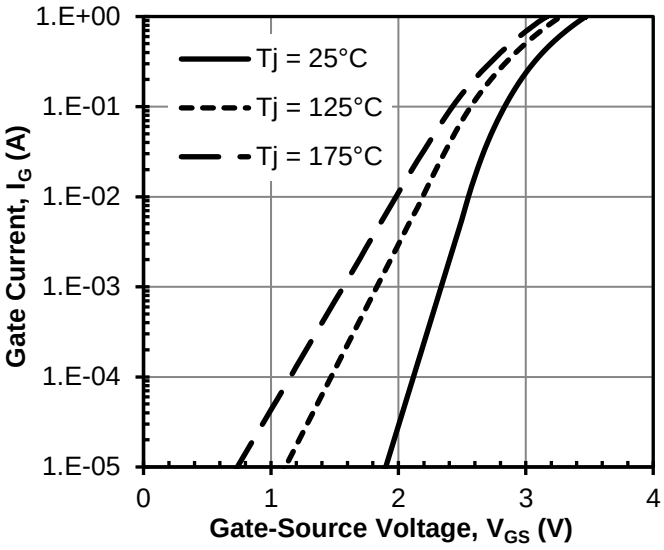


Figure 14 Typical gate forward current at V_{DS} = 0V

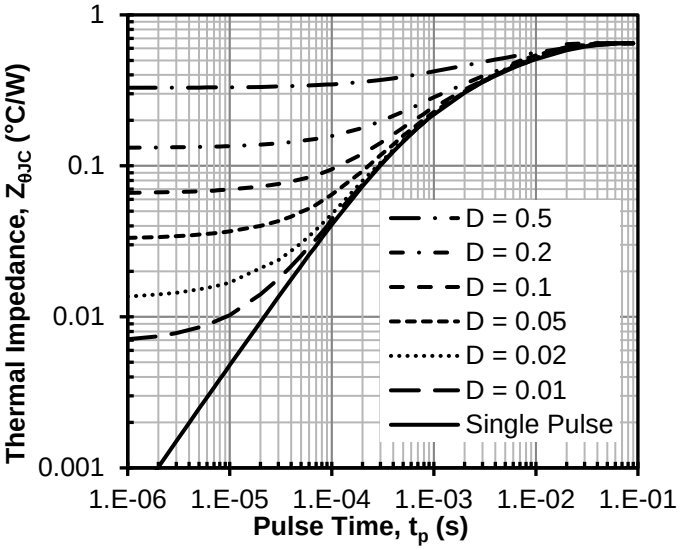


Figure 15 Maximum transient thermal impedance

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