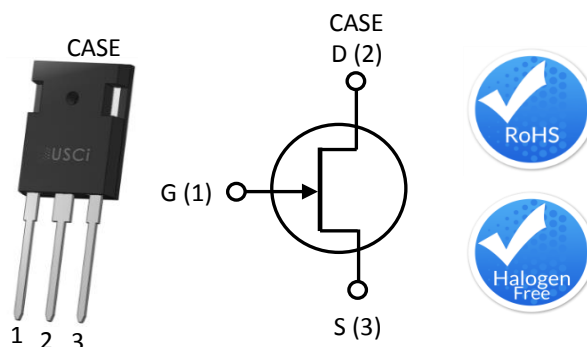


Description

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 $V_{GS} = 0\text{ V}$ 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	$T_C = 25^\circ\text{C}$	38	A
		$T_C = 125^\circ\text{C}$	23	A
Pulsed drain current	I_{DM}	$T_j = 125^\circ\text{C}$	80	A
		$T_j = 175^\circ\text{C}$	55	
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	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 $R_G > 1\Omega$.

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}	$V_{GS} = -20V, I_D = 1mA$	1200			V
Total drain leakage current	I_D	$V_{DS} = 1200V,$ $V_{GS} = -20V, T_J = 25^\circ\text{C}$		10	800	μA
		$V_{DS} = 1200V,$ $V_{GS} = -20V, T_J = 175^\circ\text{C}$		30	2400	
Total gate leakage current	I_G	$V_{GS} = -20V, T_J = 25^\circ\text{C}$		1	250	μA
		$V_{GS} = -20V, T_J = 175^\circ\text{C}$		10		
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = 2V, I_D = 20A,$ $T_J = 25^\circ\text{C}$		35	45	$\text{m}\Omega$
		$V_{GS} = 0V, I_D = 20A,$ $T_J = 25^\circ\text{C}$		42	55	
		$V_{GS} = 2V, I_D = 20A,$ $T_J = 175^\circ\text{C}$		105	135	
		$V_{GS} = 0V, I_D = 20A,$ $T_J = 175^\circ\text{C}$		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, $R_{G,EXT} = 2.5\Omega,$ Inductive Load, $T_J = 25^\circ C$		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, $R_{G,EXT} = 2.5\Omega,$ Inductive Load, $T_J = 150^\circ C$		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	$^\circ C/W$

Typical Performance Diagrams

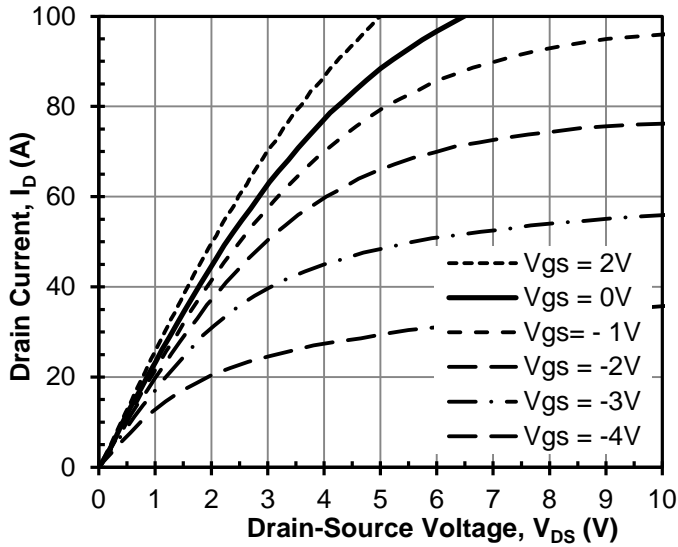


Figure 1 Typical output characteristics at $T_j = 25^\circ\text{C}$

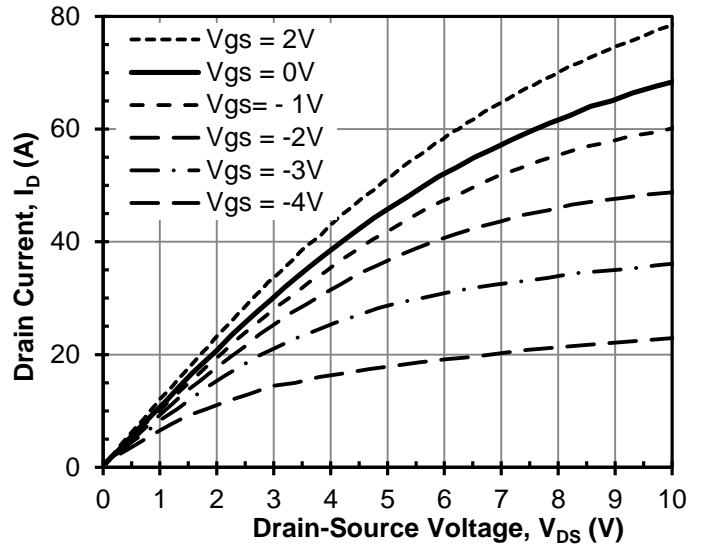


Figure 2 Typical output characteristics at $T_j = 125^\circ\text{C}$

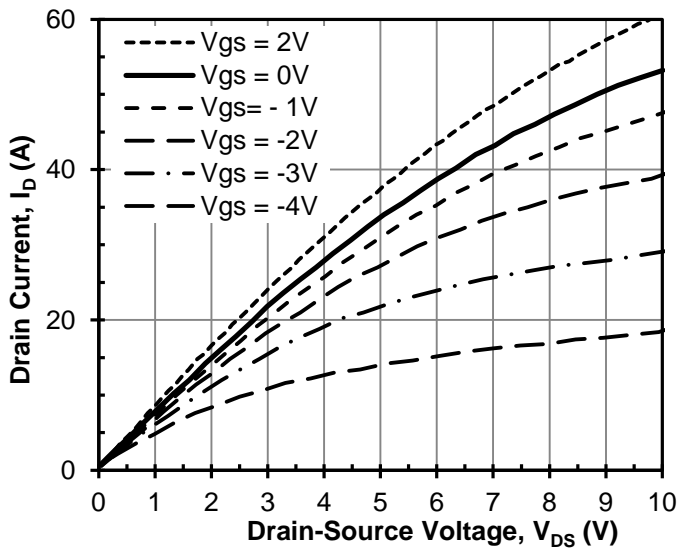


Figure 3 Typical output characteristics at $T_j = 175^\circ\text{C}$

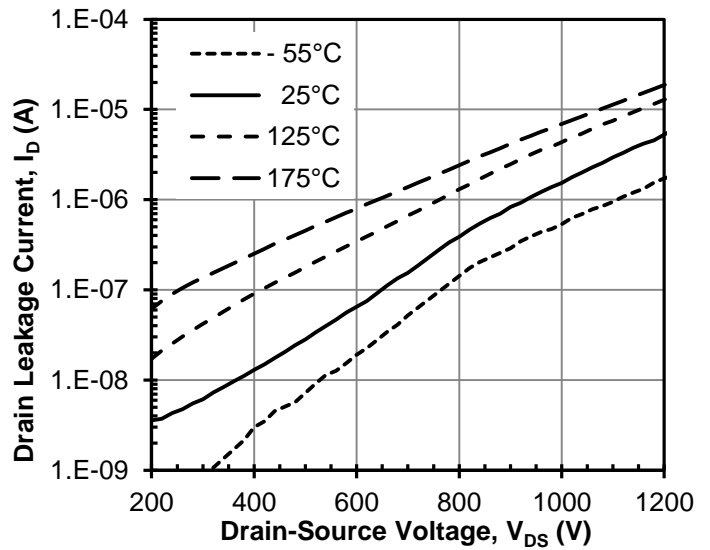


Figure 4 Typical drain-source leakage at $V_{GS} = -20\text{V}$

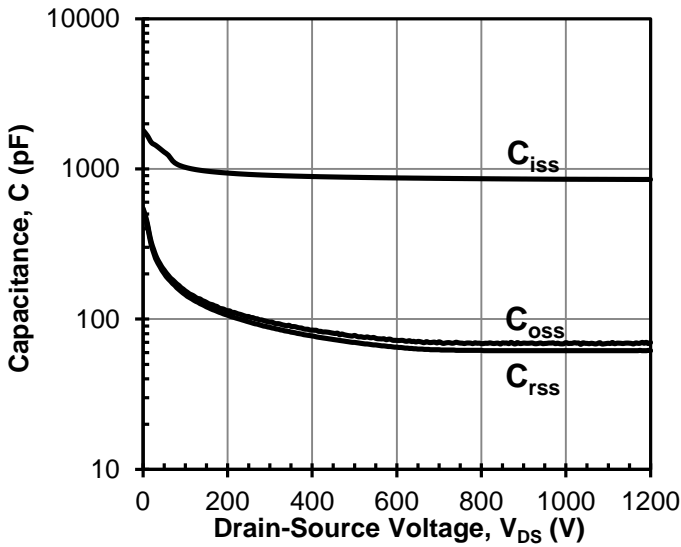


Figure 5 Typical capacitances at 100kHz at $V_{GS} = -20V$

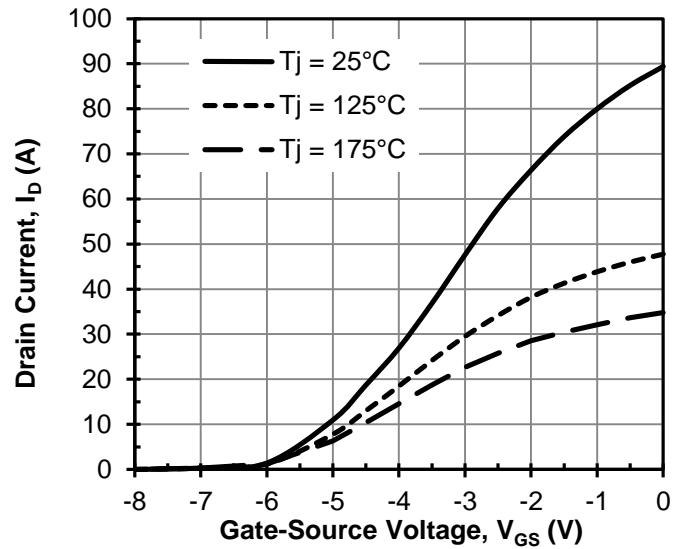


Figure 6 Typical transfer characteristics at $V_{DS} = 5V$

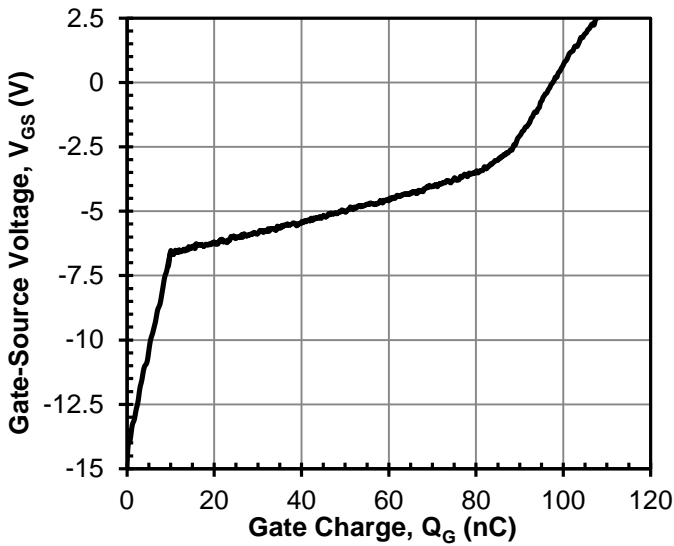


Figure 7 Typical gate charge at $V_{DS} = 600V$ and $I_D = 30A$

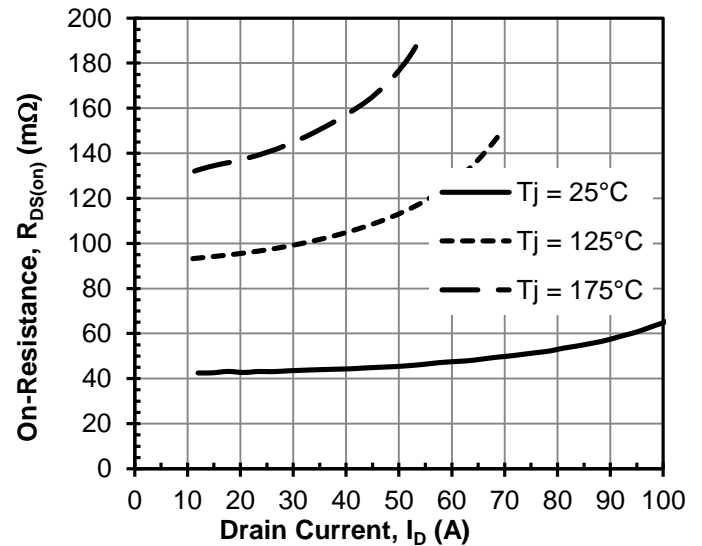


Figure 8 Typical drain-source on-resistance at $V_{GS} = 0V$

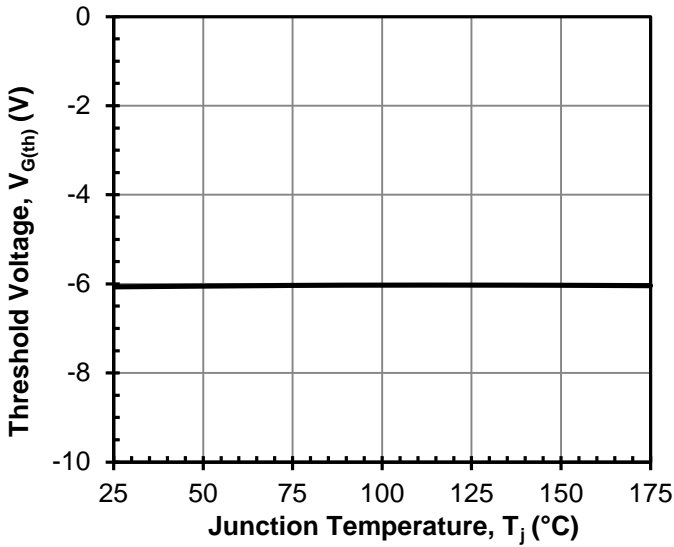


Figure 9 Threshold voltage vs. T_J
at $V_{DS} = 5V$ and $I_D = 70mA$

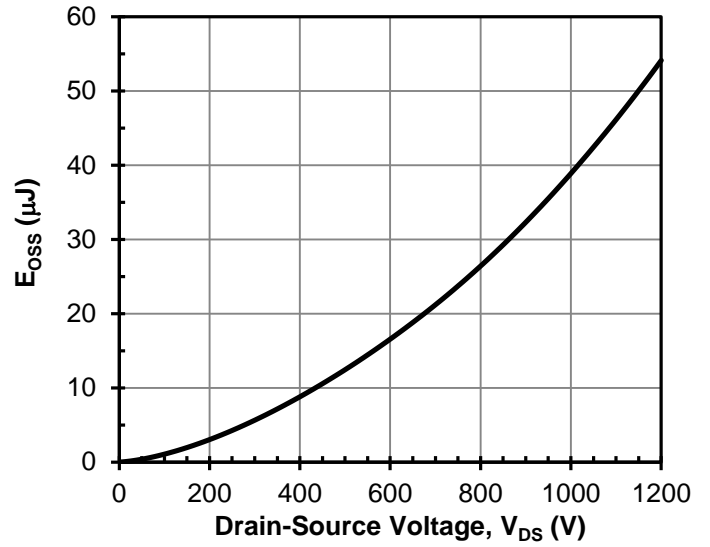


Figure 10 Typical stored energy in C_{oss}
at $V_{GS} = -20V$

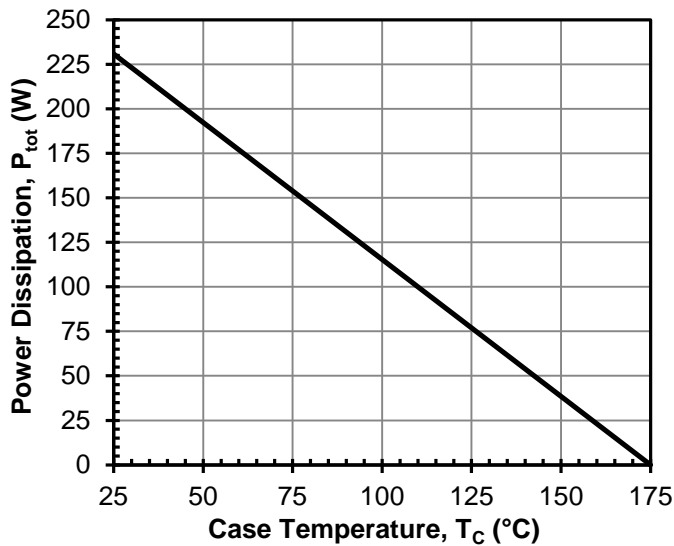


Figure 11 Total power Dissipation

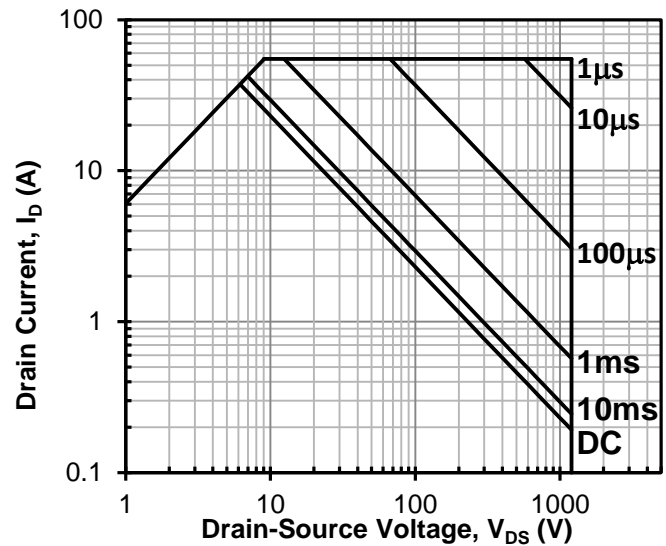


Figure 12 Safe operation area
 $T_c = 25^\circ C$, Parameter t_p

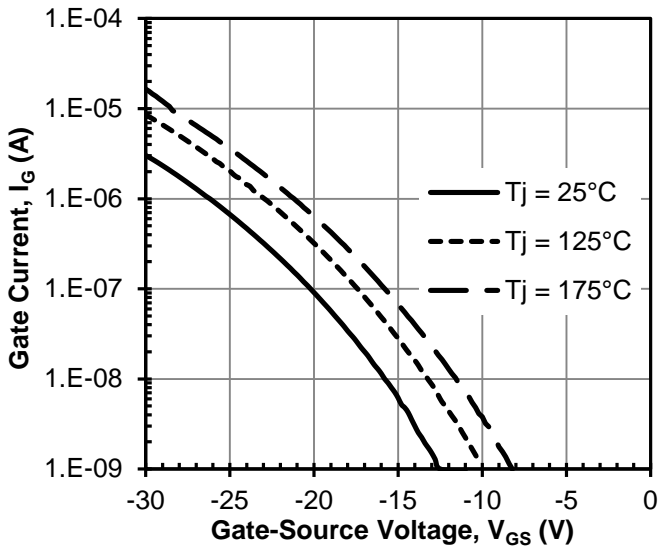


Figure 13 Typical gate leakage current at $V_{DS} = 0V$

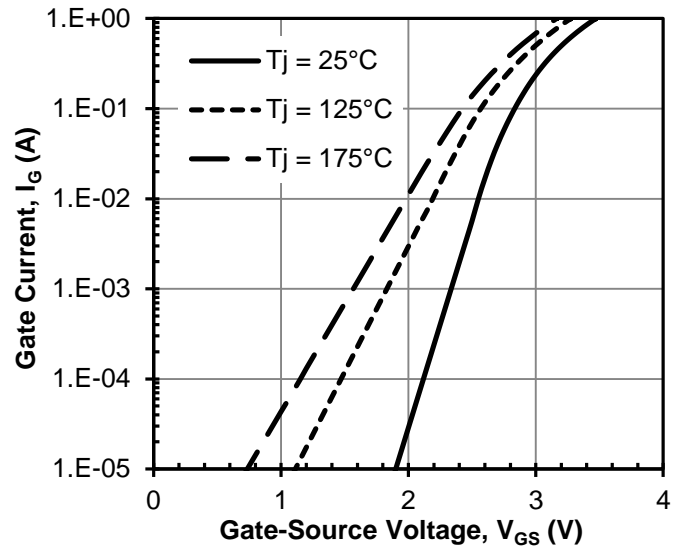


Figure 14 Typical gate forward current at $V_{DS} = 0V$

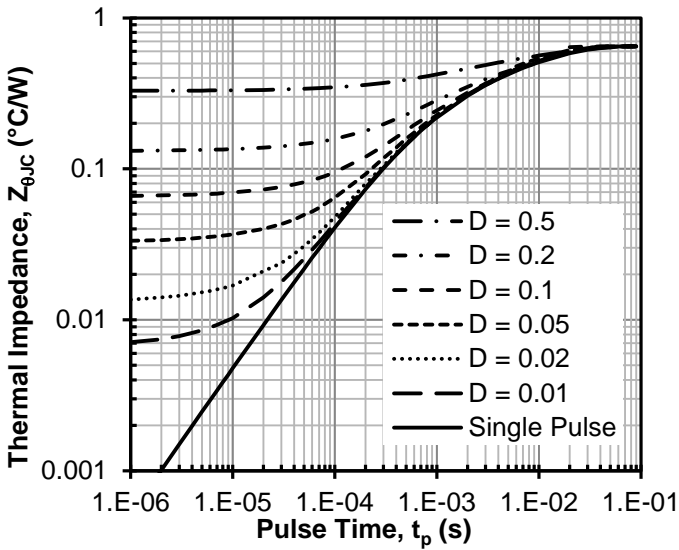


Figure 15 Maximum transient thermal impedance

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