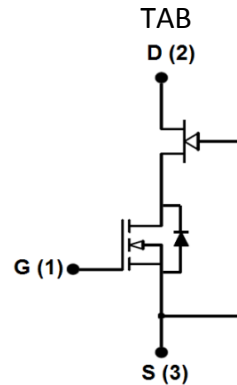
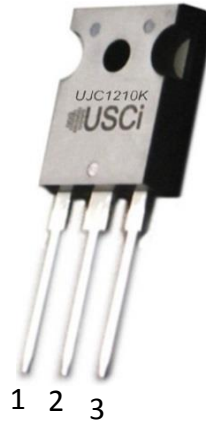


Features

- Low On-Resistance $R_{DS(on)max}$ of 0.1Ω
- Standard 12V gate drive
- Maximum operating temperature of 150°C
- Excellent reverse recovery
- Low gate charge
- Low intrinsic capacitance
- RoHS compliant



Typical Applications

- EV Charging
- PV Inverters
- Switch Mode Power Supplies
- Power Factor Correction Modules
- Motor Drives
- Induction Heating

Part Number	Package	Marking
UJC1210K	TO-247	UJC1210K

Descriptions

United Silicon Carbide's cascode products co-package its **xJ series** high-performance SiC JFETs with a cascode optimized MOSFET to produce the only standard gate drive SiC device in the market today. This series exhibits ultra-low on resistance and gate charge, but also the best reverse recovery characteristics of any device of similar ratings. These devices are excellent for switching inductive loads, and any application requiring standard gate drive.

Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Units
Drain-Source Voltage	V_{DS}		1200	V
Gate-Source Voltage	V_{GS}	DC	-20 to +20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	20.5	A
Continuous Drain Current	I_D	$T_C = 100^\circ\text{C}$	13.5	A
Pulsed Drain Current	I_{DM}	$T_j = 25^\circ\text{C}$	58	A
		$T_j = 150^\circ\text{C}$	38	
Short-Circuit Withstand Time ¹	t_{SC}	$V_{GS}=15\text{V}, V_{CC}<600\text{V}$	4	μs
Single Pulsed Avalanche Energy ¹	E_{AS}	$L=15\text{mH}, I_{AS}=2.8\text{A}$	64	mJ
Power Dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	113	W
Operating and Storage Temperature	T_J, T_{STG}		-55 to 150	°C
Max Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	T_L		250	°C

¹ Starting $T_j = 25^\circ\text{C}$

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}	$V_{GS}=0V, I_D=1mA$	1200			V
Total Drain Leakage Current	I_D	$V_{DS} = 1200V,$ $V_{GS} = 0V, T_J = 25^\circ\text{C}$		95	500	μA
		$V_{DS} = 1200V,$ $V_{GS} = 0V, T_J = 150^\circ\text{C}$		240		
Total Gate Leakage Current	I_G	$V_{DS}=0V, T_J=25^\circ\text{C}$ $V_{GS}=-20V/+20V$			100	nA
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=12V, I_F=10A,$ $T_J = 25^\circ\text{C}$		75	100	mΩ
		$V_{GS}=12V, I_F=10A,$ $T_J = 150^\circ\text{C}$		190	250	
Gate Threshold Voltage	$V_{G(th)}$	$V_{DS} = 5V, I_D = 250\mu\text{A}$		4.5		V
Gate Resistance	R_G	$V_{GS} = 0V, f = 1\text{MHz}$		1.2		Ω

Typical Performance - Reverse Diode

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Forward Voltage	V_{FSD}	$V_{GS} = 0V, I_F = 10A,$ $T_J = 25^\circ\text{C}$	-	1.5		V
		$V_{GS} = 0V, I_F = 10A,$ $T_J = 150^\circ\text{C}$	-	2.3		
Reverse Recovery Charge	Q_{rr}	$V_R = 800V, I_F = 10A,$ $di/dt = 1200A/\mu\text{s}$		96		nC

Typical Performance - Dynamic

Parameter	symbol	Test Conditions	Value			Units	
			Min	Typ	Max		
Input Capacitance	C_{iss}	$V_{DS} = 100V,$ $V_{GS} = 0V,$ $f = 100kHz$		2258		pF	
Output Capacitance	C_{oss}			105			
Reverse Transfer Capacitance	C_{rss}			3.8			
Effective Output Capacitance, Energy Related	$C_{oss(er)}$	$V_{DS} = 0V$ to 800V, $V_{GS} = 0V$		55		pF	
Total Gate Charge	Q_G	$V_{DS}=800V, I_D=10A,$ $V_{GS}=0V$ to 15V		62		nC	
Gate-Drain Charge	Q_{GD}			20			
Gate-Source Charge	Q_{GS}			14			
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=800V, I_D=10A,$ Gate Driver = -5V to +12V, Turn-on $R_{G,EXT} = 2.1\Omega,$ Turn-off $R_{G,EXT} = 20\Omega$ Inductive Load, FWD: UJ2D1210T $T_J = 25^\circ C$		58		ns	
Rise Time	t_r			10			
Turn-off Delay Time	$t_{d(off)}$			83			
Fall Time	t_f			15			
Turn-on Energy	E_{ON}			167			μJ
Turn-off Energy	E_{OFF}			46			
Total Switching Energy	E_{TOTAL}		213				
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=800V, I_D=10A,$ Gate Driver = -5V to +12V, Turn-on $R_{G,EXT} = 2.1\Omega,$ Turn-off $R_{G,EXT} = 20\Omega$ Inductive Load, FWD: UJ2D1210T $T_J = 150^\circ C$		56		ns	
Rise Time	t_r			13			
Turn-off Delay Time	$t_{d(off)}$			86			
Fall Time	t_f			17			
Turn-on Energy	E_{ON}			175			μJ
Turn-off Energy	E_{OFF}			53			
Total Switching Energy	E_{TOTAL}		228				

Thermal characteristics

Parameter	symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$				1.1	$^\circ C/W$

Typical Performance Diagrams

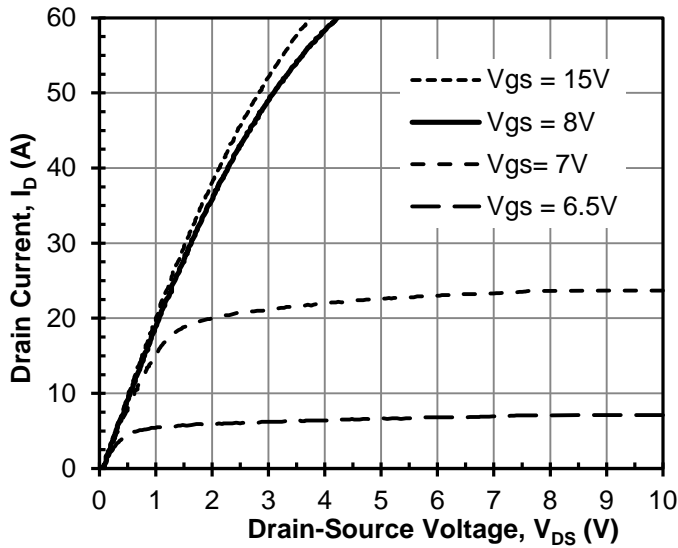


Figure 1 Typical output characteristics at $T_j = -55^\circ\text{C}$, $t_p < 250\mu\text{s}$

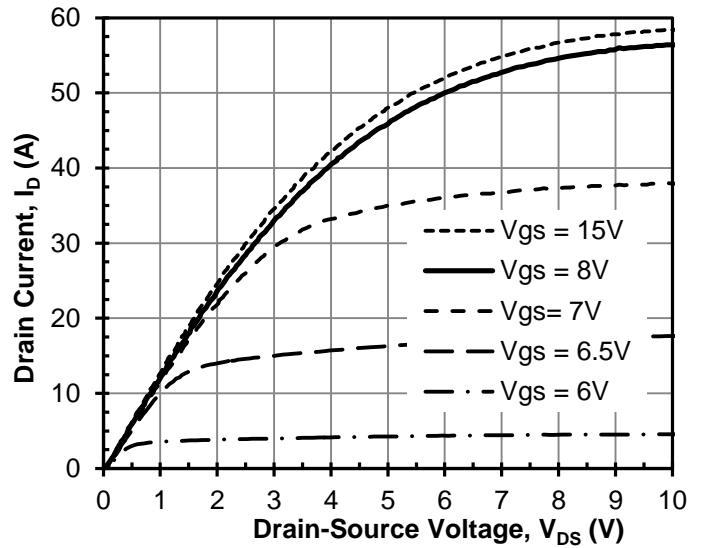


Figure 2 Typical output characteristics at $T_j = 25^\circ\text{C}$, $t_p < 250\mu\text{s}$

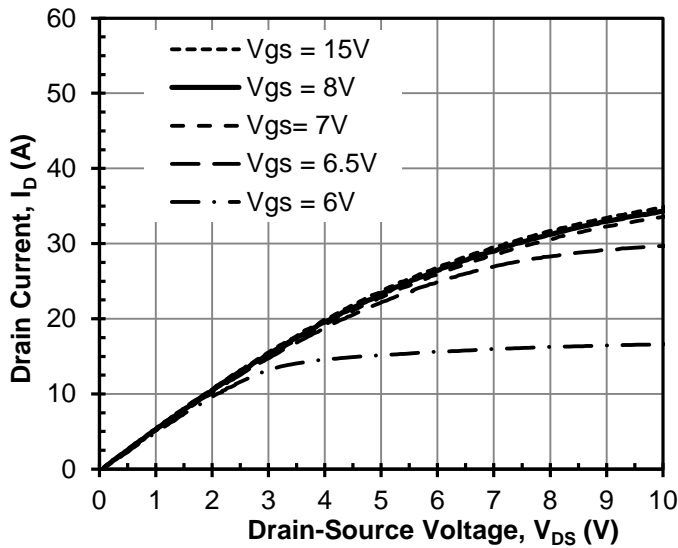


Figure 3 Typical output characteristics at $T_j = 150^\circ\text{C}$, $t_p < 250\mu\text{s}$

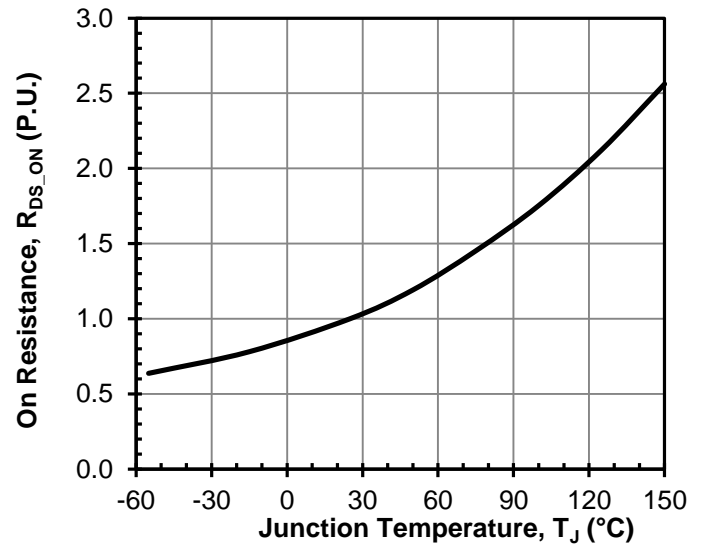


Figure 4 Normalized on-resistance vs. temperature at $V_{GS} = 15\text{V}$ and $I_D = 10\text{A}$

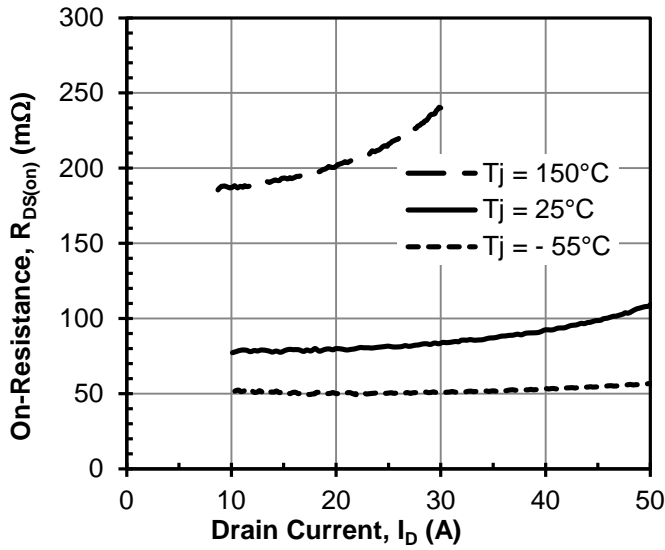


Figure 5 Typical drain-source on-resistance at $V_{GS} = 15V$

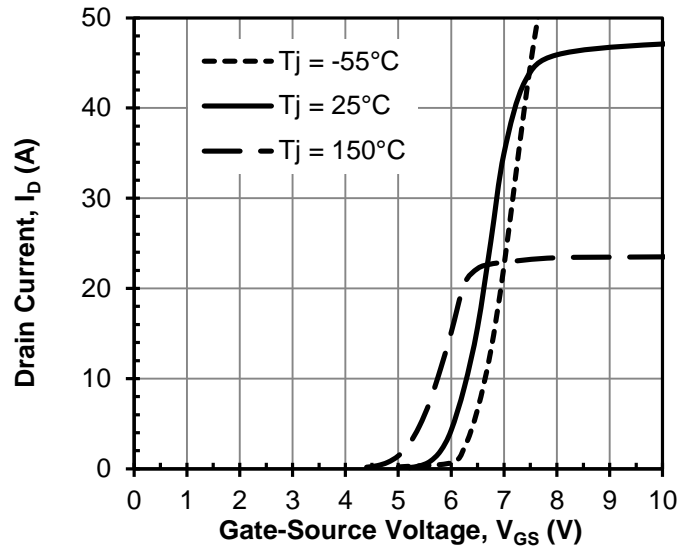


Figure 6 Typical transfer characteristics at $V_{DS} = 5V$

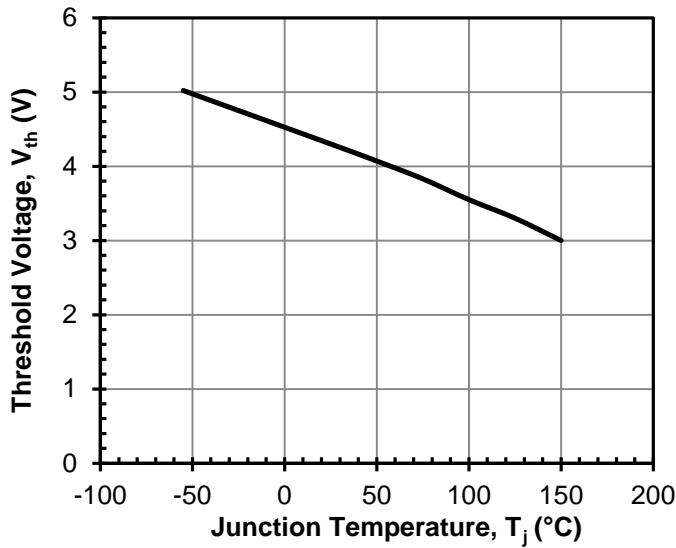


Figure 7 Threshold voltage vs. T_j at $V_{DS} = 5V$ and $I_D = 250\mu A$

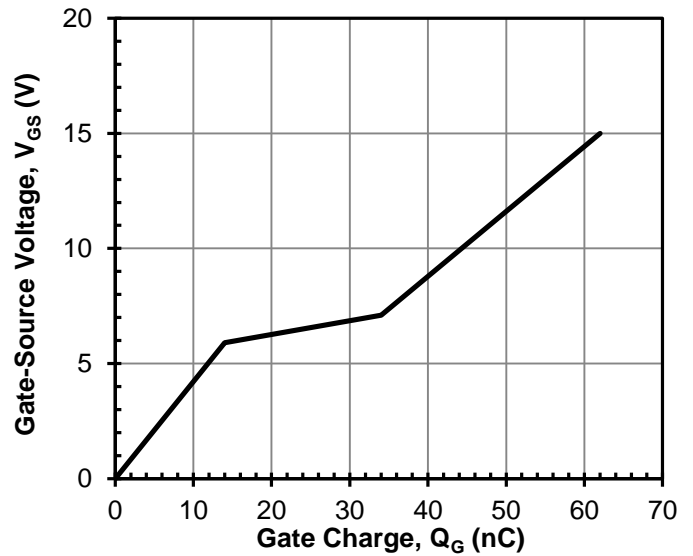


Figure 8 Typical gate charge at $V_{DS} = 800V$ and $I_D = 10A$

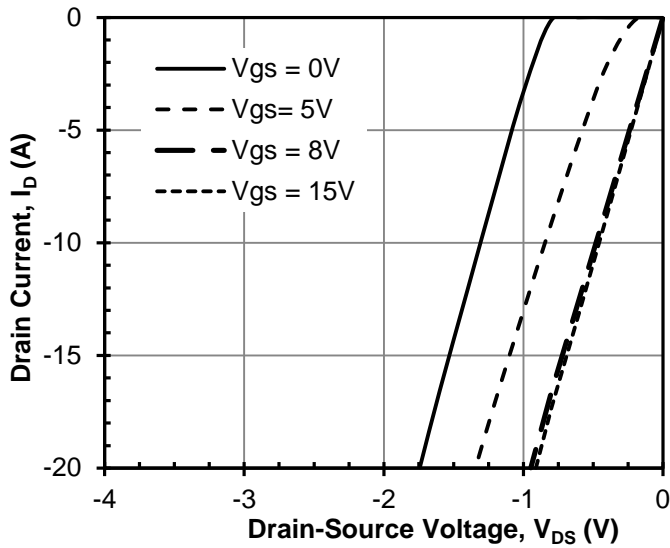


Figure 9 3rd quadrant characteristics at $T_J = -55^\circ\text{C}$

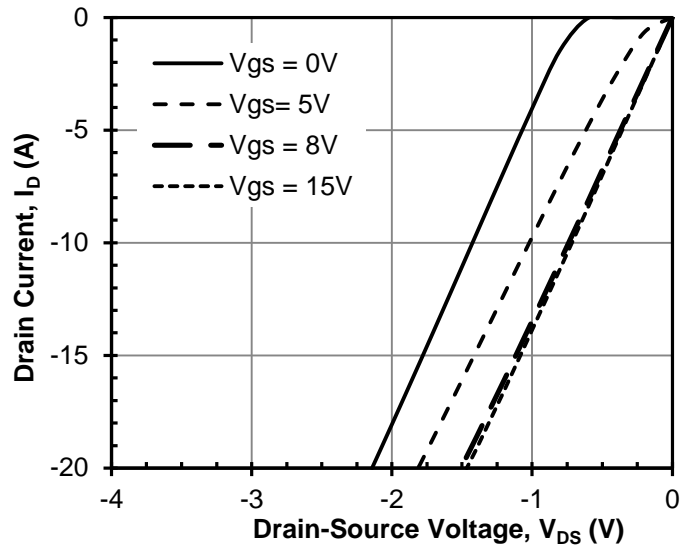


Figure 10 3rd quadrant characteristics at $T_J = 25^\circ\text{C}$

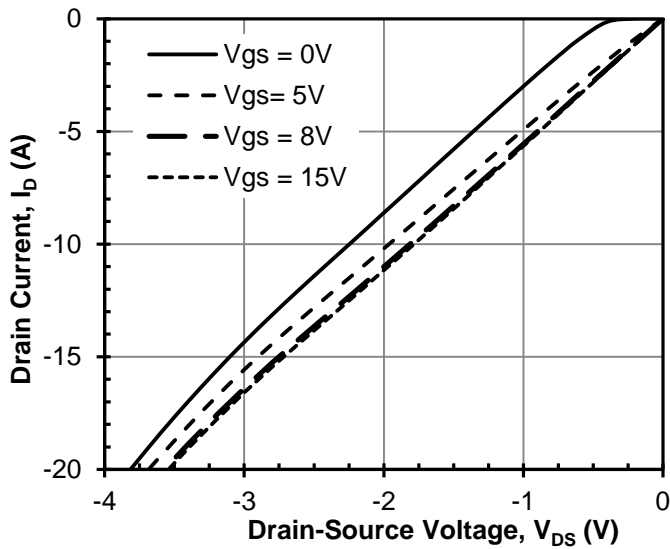


Figure 11 3rd quadrant characteristics at $T_J = 150^\circ\text{C}$

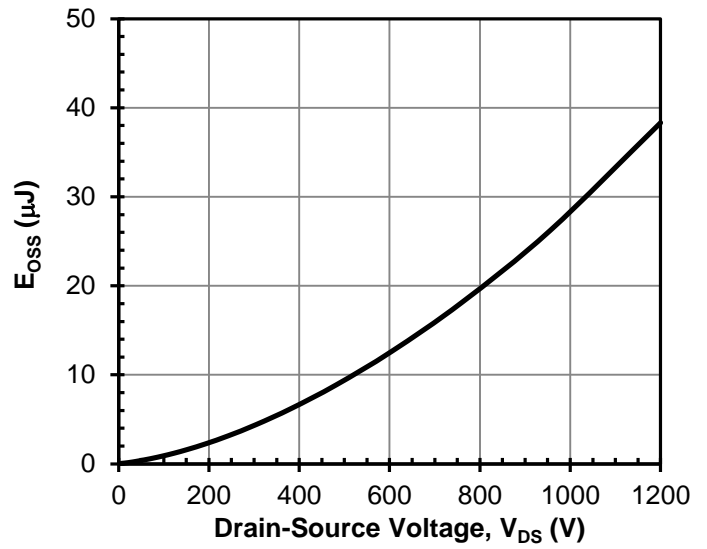


Figure 12 Typical stored energy in C_{OSS} at $V_{GS} = 0V$

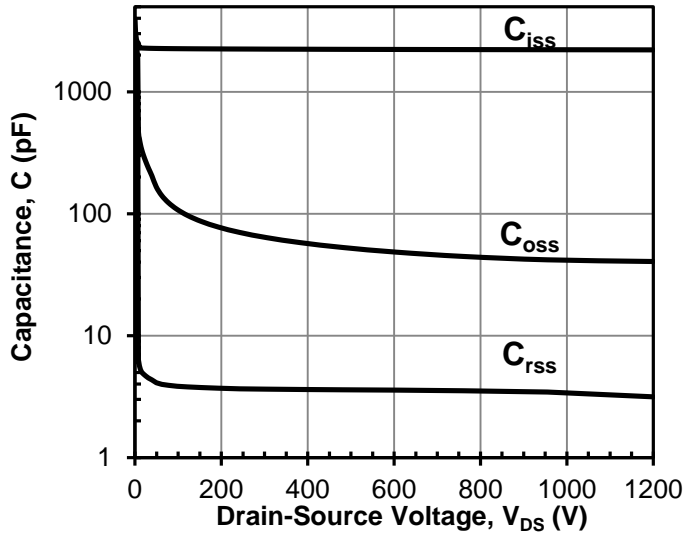


Figure 13 Typical capacitances at 100kHz and $V_{GS} = 0V$

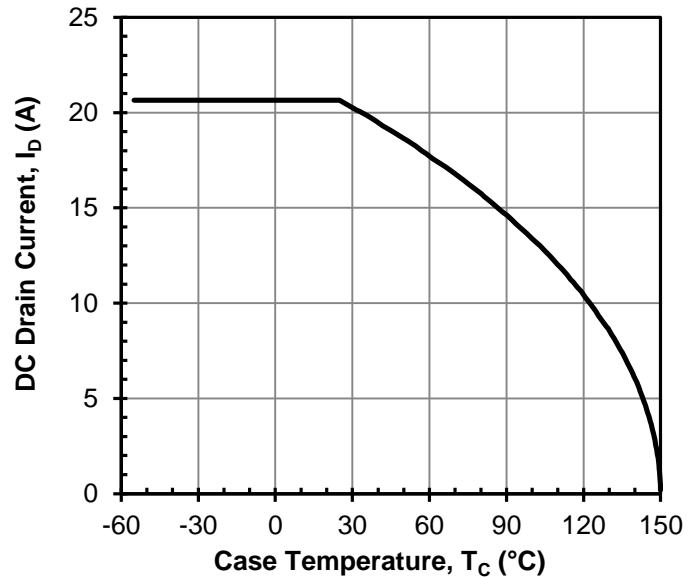


Figure 14 DC drain current derating

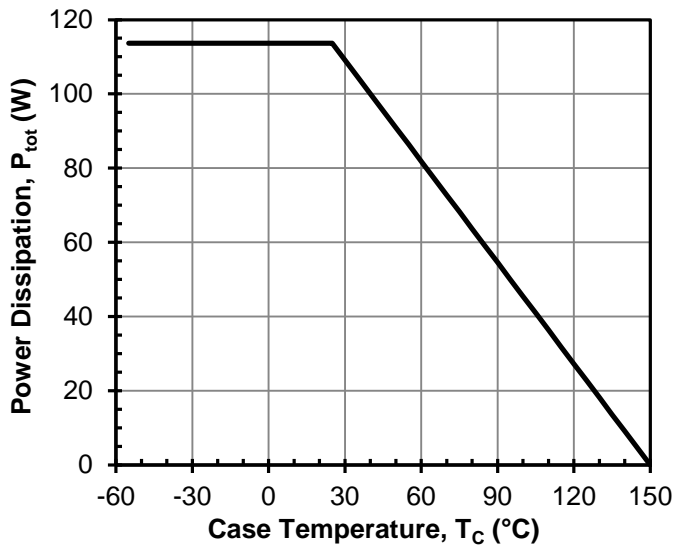


Figure 15 Total power Dissipation

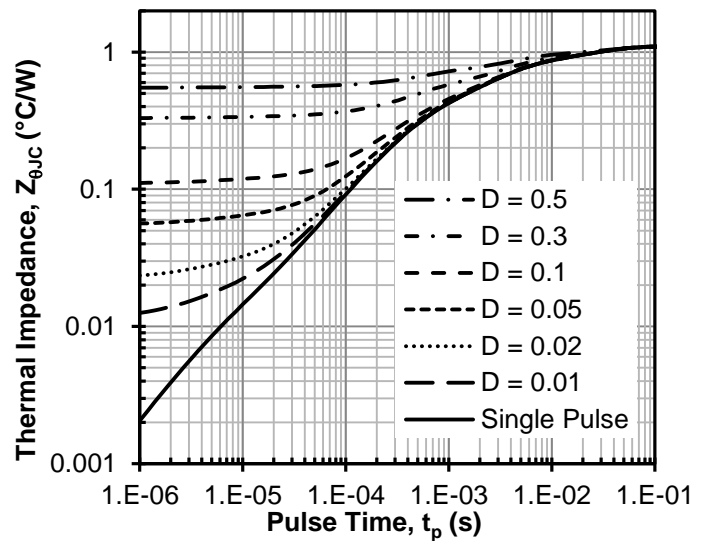


Figure 16 Maximum transient thermal impedance

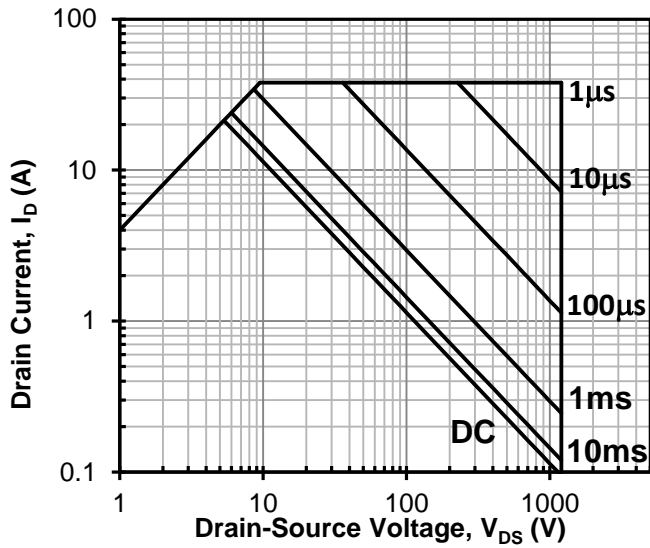


Figure 17 Safe operation area
 $T_c = 25^\circ\text{C}$, $D=0$, Parameter t_p

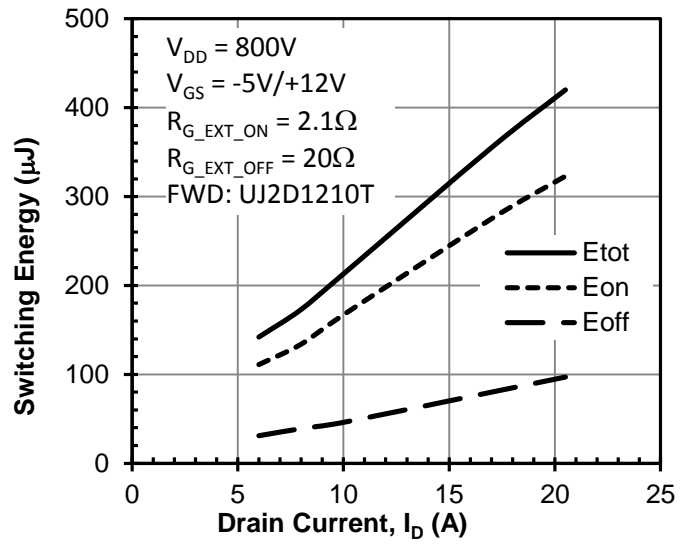


Figure 18 Clamped inductive switching energy vs. drain current at
 $T_J = 25^\circ\text{C}$

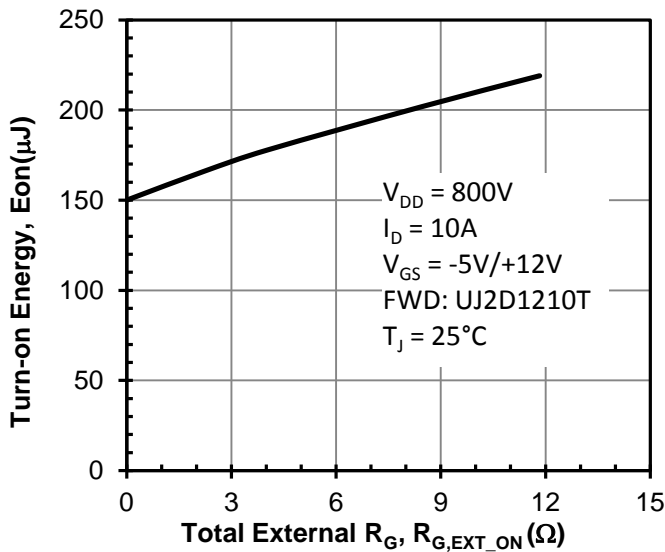


Figure 19 Clamped inductive switching turn-on energy vs. $R_{G_EXT_ON}$

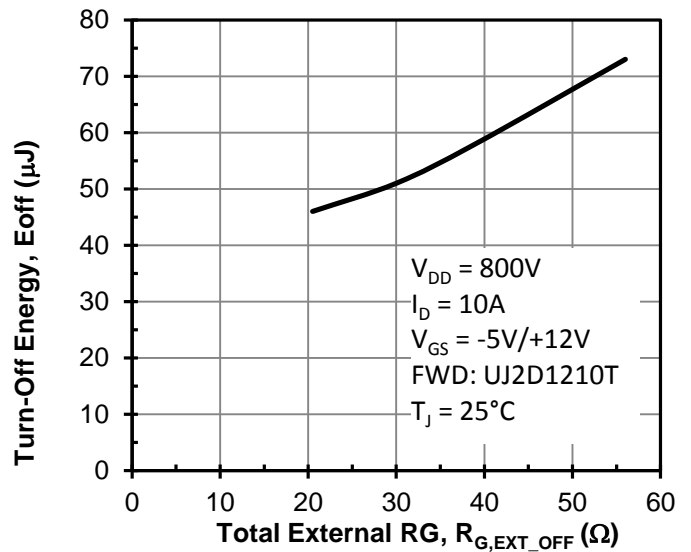


Figure 20 Clamped inductive switching turn-off energy vs. $R_{G_EXT_OFF}$

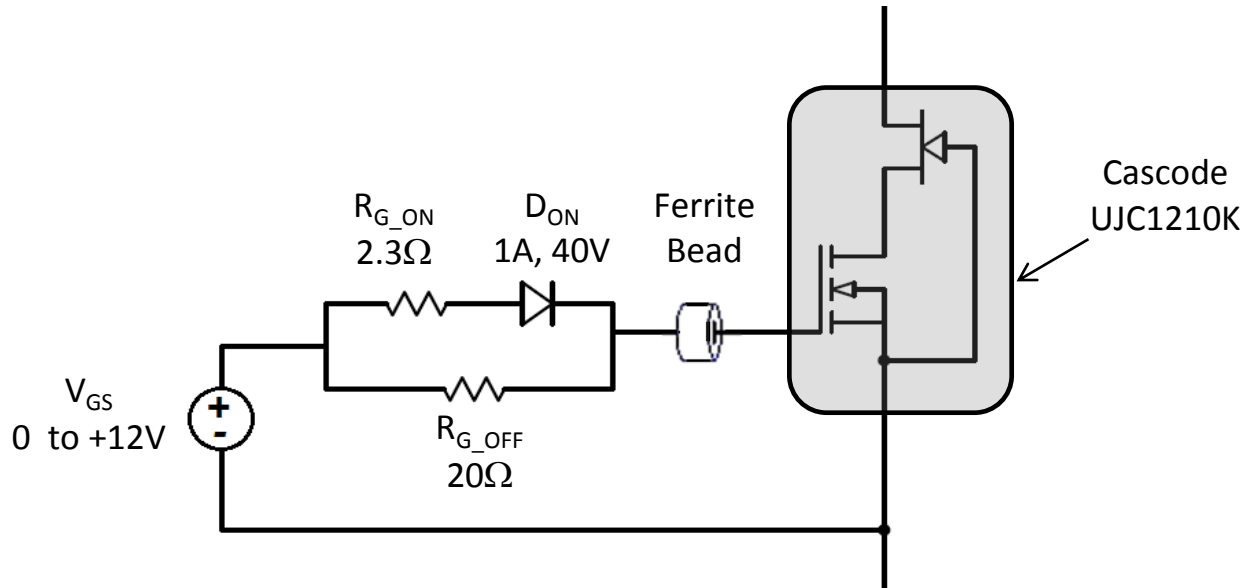
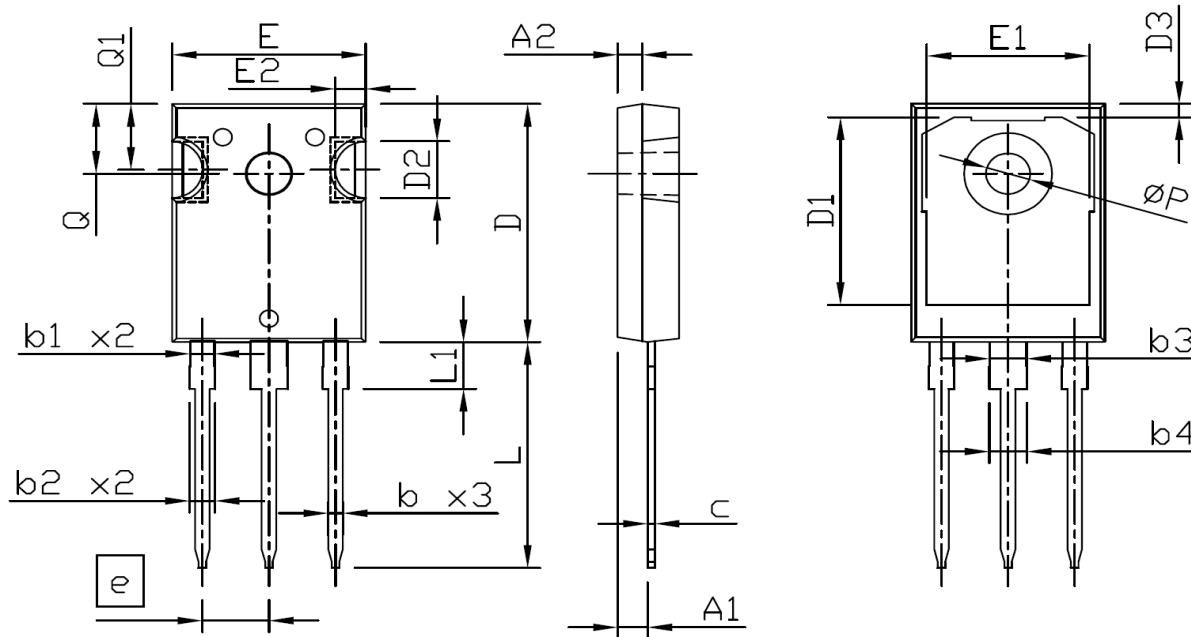
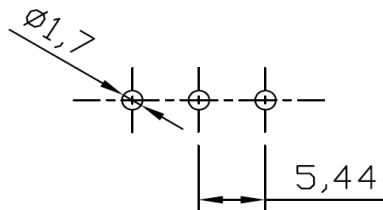


Figure 20 Recommended gate drive

Mechanical Characteristics



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4,90	5,00	5,10	0,193	0,197	0,201
A1	2,31	2,42	2,52	0,091	0,095	0,099
A2	1,90	2,00	2,10	0,075	0,079	0,083
b	1,16	1,22	1,27	0,046	0,048	0,050
b1	1,96	2,02	2,07	0,078	0,080	0,081
b2	2,00	2,10	2,20	0,079	0,083	0,087
b3	2,96	3,02	3,07	0,117	0,119	0,121
b4	3,00	3,10	3,20	0,118	0,122	0,126
c	0,59	0,62	0,66	0,023	0,024	0,026
D	20,90	21,00	21,10	0,823	0,827	0,831
D1	16,25	16,55	16,85	0,640	0,652	0,663
D2	5,00 TYP			0,197 TYP		
D3	1,05	1,20	1,35	0,041	0,047	0,053
e	5,44 BSC			0,214 BSC		
E	15,70	15,80	15,90	0,618	0,622	0,626
E1	13,06	13,26	13,50	0,514	0,522	0,530
E2	2,50 TYP			0,098 TYP		
L	19,72	19,92	20,12	0,776	0,784	0,792
L1	---	---	4,30	---	---	0,169
Q	6,15 BSC			0,242 BSC		
Q1	5,60	5,80	6,00	0,220	0,228	0,236
ØP	3,55	3,60	3,70	0,140	0,142	0,146

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