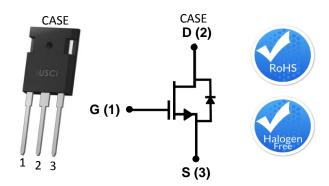
Datasheet

# Description

United Silicon Carbide's cascode products co-package its xJ series highperformance 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 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.



Part Number	Package	Marking
UJC1206K	TO-247-3L	UJC1206K

#### Features

- Max. on-resistance  $R_{DS(on)max}$  of  $60m\Omega$
- 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

## **Maximum Ratings**

Parameter	Symbol	Test Conditions	Value	Units
Drain-source voltage	V <sub>DS</sub>		1200	V
Gate-source voltage	V <sub>GS</sub>	DC	-20 to +20	V
Continuous drain current	1-	T <sub>C</sub> = 25°C	38	А
	Ι <sub>D</sub>	T <sub>C</sub> = 100°C	24.5	А
Pulsed drain current <sup>1</sup>		T <sub>j</sub> = 25°C	138	
	I <sub>DM</sub>	T <sub>j</sub> = 150°C	88	- A
Short-circuit withstand time <sup>2</sup>	t <sub>sc</sub>	V <sub>GS</sub> =15V, V <sub>CC</sub> <600V	4	μs
Single pulsed avalanche energy <sup>2</sup>	E <sub>AS</sub>	L=15mH, I <sub>AS</sub> =4.2A	143	mJ
Power dissipation	P <sub>tot</sub>	T <sub>C</sub> = 25°C	192	w
Maximum junction temperature	T <sub>J,max</sub>		150	°C
Operating and storage temperature	T <sub>J</sub> , T <sub>STG</sub>		-55 to 150	°C
Max. lead temperature for soldering, 1/8" from case for 5 Seconds	TL		250	°C

1 Pulse width t<sub>p</sub> limited by T<sub>j,max</sub>

2 Starting  $T_J = 25^{\circ}C$ 

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# Electrical Characteristics (T<sub>J</sub> = +25°C unless otherwise specified)

# **Typical Performance - Static**

Daramatar	Symbol	Test Conditions	Value			Units
Parameter			Min	Тур	Max	Units
Drain-source breakdown voltage	BV <sub>DS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =1mA	1200			V
Total drain leakage current	I <sub>DSS</sub>	V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C		110	800	- μΑ
		V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C		230		
Total gate leakage current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, T <sub>j</sub> =25°C, V <sub>GS</sub> = -20V / +20V		5	100	nA
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =12V, I <sub>D</sub> =20A, T <sub>J</sub> = 25°C		42	60	- mΩ
		V <sub>GS</sub> =12V, I <sub>D</sub> =20A, T <sub>J</sub> = 150°C		98		
Gate threshold voltage	V <sub>G(th)</sub>	V <sub>DS</sub> = 5V, I <sub>D</sub> = 10mA	4	4.9	6	V
Gate resistance	R <sub>G</sub>	f = 1MHz, open drain		1.1		Ω

## **Typical Performance - Reverse Diode**

Doromotor	Symbol	Test Conditions	Value			Linita
Parameter			Min	Тур	Max	Units
Diode continuous forward current	۱ <sub>s</sub>	T <sub>c</sub> = 25°C			38	А
Diode pulse current <sup>1</sup>	I <sub>S,pulse</sub>	T <sub>C</sub> = 25°C			138	А
<b>F</b> 1 1	V <sub>FSD</sub>	V <sub>GS</sub> = 0V, I <sub>F</sub> =20A, T <sub>J</sub> = 25°C		1.45	2	- v
Forward voltage		V <sub>GS</sub> = 0V, I <sub>F</sub> = 20A, T <sub>J</sub> =150°C		2.1		
Reverse recovery charge	Q <sub>rr</sub>	$V_{R}$ =800V, $I_{F}$ =24.5A, $V_{GS}$ =0V, $R_{G_{EXT}}$ = 22 $\Omega$		190		nC
Reverse recovery time	t <sub>rr</sub>	di/dt=1300A/µs, T」 = 25°C		34		ns
Reverse recovery charge	Q <sub>rr</sub>	$V_{R}$ =800V, $I_{F}$ =24.5A, $V_{GS}$ =0V, $R_{G_{EXT}}$ = 22 $\Omega$		227		nC
Reverse recovery time	t <sub>rr</sub>	di/dt=1300A/µs, T <sub>J</sub> = 150°C		36		ns

Datasheet

# **Typical Performance - Dynamic**

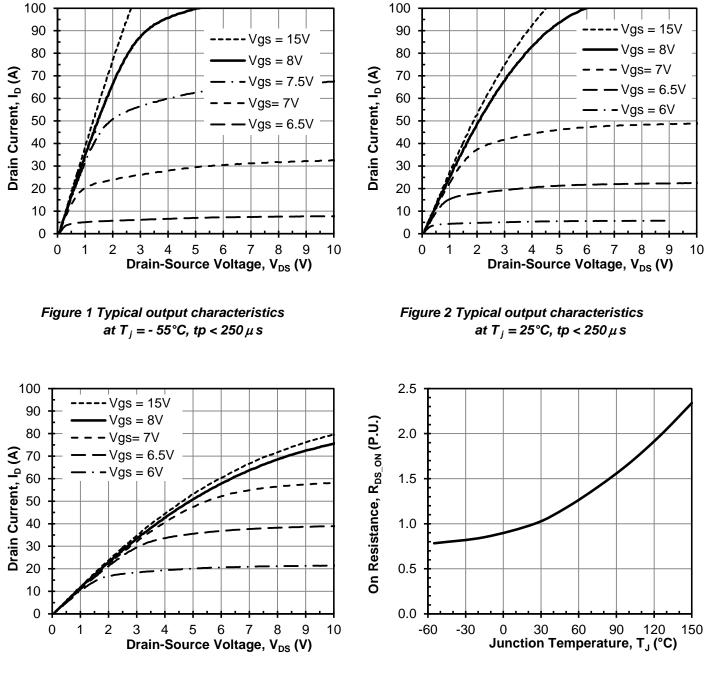
ViscViscMinTypMaxInput capacitance $C_{0ss}$ $C_{0ss}$ $V_{0s} = 100V,$ $2214$ $PF$ Reverse transfer capacitance $C_{rss}$ $f = 100kHz$ $3.5$ $PF$ Effective output capacitance, energy related $C_{oss(rr)}$ $V_{0s} = 0V$ to $800V,$ $V_{cs} = 0V$ $98$ $PF$ Effective output capacitance, time related $C_{oss(rr)}$ $V_{0s} = 0V$ to $800V,$ $V_{cs} = 0V$ $174$ $PF$ Effective output capacitance, time related $C_{oss(rr)}$ $V_{0s} = 0V$ to $800V,$ $V_{cs} = 0V$ $311$ $\mu$ Total gate charge $Q_{cs}$ $V_{0s} = 800V, V_{0s} = 24.5A,$ $V_{0s} = 800V, I_0 = 24.5A,$ $V_{0s} = 800V, I_0 = 24.5A,$ $15$ $nC$ Gate-drain charge $Q_{cs}$ $V_{0s} = 800V, I_0 = 24.5A,$ $V_{0s} = 800V, I_0 = 24.5A,$ $41$ $Pf$ Turn-on delay time $t_{d(ori)}$ $V_{0s} = 800V, I_0 = 24.5A,$ $V_{0s} = 800V, I_0 = 24.5A,$ $41$ $Pf$ Turn-off delay time $t_{d(ori)}$ $V_{0s} = 800V, I_0 = 24.5A,$ $Gate Driver = 0V to12V41PfTurn-off delay timet_{d(ori)}V_{0s} = 800V, I_0 = 24.5A,Gate Driver = 0V to12V411PfTurn-off delay timet_{d(ori)}V_{0s} = 800V, I_0 = 24.5A,Gate Driver = 0V to12V411PfTurn-off delay timet_{d(ori)}V_{0s} = 800V, I_0 = 24.5A,Gate Driver = 0V to12V41294PfTurn-off delay timet_{12}V_{0s} = 800V, I_0 = 24.5A,Gate Driver = 0V to1$	Parameter	symbol	Test Conditions	Value			Units	
Output capacitance $C_{oss}$ $V_{cs} = 0V$ , f = 100kHz178 $pF$ Reverse transfer capacitance $C_{rss}$ $f = 100kHz$ 3.5 $pF$ Effective output capacitance, energy related $C_{oss(er)}$ $V_{ps} = 0V$ to 800V, $V_{cs} = 0V$ $98$ $pF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{ps} = 0V$ to 800V, $V_{cs} = 0V$ $174$ $pF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{ps} = 0V$ to 800V, $V_{cs} = 0V$ $174$ $pF$ Coss stored energy $E_{oss}$ $V_{ps} = 800V$ , $V_{ps} = 0V$ $31$ $\mu$ Total gate charge $Q_{G}$ $V_{ps} = 800V$ , $V_{ps} = 24.5A$ , $V_{0s} = 0V$ to 12V $47.5$ $nC$ Gate-drain charge $Q_{G_{D}}$ $V_{ps} = 800V$ , $V_{p} = 24.5A$ , $V_{0s} = 0V$ to 12V $41$ $pF$ Turn-ondelay time $t_{d(on)}$ $V_{ps} = 800V$ , $V_{p} = 24.5A$ , $V_{0s} = 0V$ to 12V $41$ $pF$ Turn-ond Regume $t_{q(off)}$ $Turn-on Regume2541pFTurn-ond fielay timet_{q(off)}T_{p} = 24.5A,Turn-onf R_{egem} = 22\OmegaInductive Load,657pFTurn-ond delay timet_{q(off)}T_{p} = 24.5A,T_{p} = 25^{\circ}C411pFTurn-ond delay timet_{q(off)}T_{p} = 25^{\circ}C804411Turn-ond delay timet_{q(off)}T_{p} = 25^{\circ}C804411Turn-ond fielay timet_{q(off)}T_{p} = 25^{\circ}C804411Turn-ond fielay tim$				Min	Тур	Max	Units	
Reverse transfer capacitance $C_{rss}$ $f = 100 \text{ KHz}$ $3.5$ Effective output capacitance, energy related $C_{oss(er)}$ $V_{05} = 0V$ to $800V$ , $V_{cs} = 0V$ $98$ $pF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{05} = 0V$ to $800V$ , $V_{cs} = 0V$ $174$ $pF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{05} = 0V to 800V,V_{cs} = 0V311\muTotal gate chargeQ_{G}V_{05} = 800V, V_{05} = 24.5A,V_{05} = 800V, I_0 = 24.5A,$	Input capacitance	C <sub>iss</sub>			2214			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Output capacitance				178		pF	
Effective output capacitance, energy related $C_{oss(er)}$ $V_{GS} = 0V$ 98 $\rhoF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{DS} = 0V to 800V, V_{GS} = 0V$ 174 $\rhoF$ Effective output capacitance, time related $C_{oss(tr)}$ $V_{DS} = 0V to 800V, V_{GS} = 0V$ 31 $\muJ$ Total gate charge $Q_{G}$ $Q_{G}$ $V_{DS} = 800V, V_{DS} = 0V$ 31 $\muJ$ Total gate charge $Q_{G}$ $V_{DS} = 800V, V_{D} = 24.5A, V_{DS} = 800V, I_{D} = 24.5A, V_{DS} = 0V to 12V$ 15nCGate-drain charge $Q_{GS}$ $V_{DS} = 800V, I_{D} = 24.5A, V_{DS} = 0V to 12V$ 15nCTurn- of delay time $t_{d(on)}$ $V_{DS} = 800V, I_{D} = 24.5A, Gate Driver = 0V to 12V$ 25nrFall time $t_r$ Gate Driver = 0V to 12V251515Turn-off delay time $t_{d(orf)}$ $T_{12} = 25^{\circ}C$ 80415Turn-off R_{G,EXT} = 2Q, Turn-off R_{G,EXT} =	Reverse transfer capacitance	C <sub>rss</sub>	f = 100kHz		3.5			
Effective output capacitance, time related $C_{oss(tr)}$ $V_{GS} = 0V$ $174$ $pF$ $V_{GS} = 0V$ $E_{oss}$ $V_{GS} = 0V$ $31$ $\mu$ $Total gate chargeQ_GQ_GV_{GS} = 800V, V_{GS} = 0V31\muTotal gate chargeQ_GV_{GS} = 800V, V_G = 0V1547.5Gate-drain chargeQ_{GS}V_{GS} = 800V, I_D = 24.5A, V_{GS} = 0V to 12V15nCGate-drain chargeQ_{GS}V_{DS} = 800V, I_D = 24.5A, V_{GS} = 0V to 12V15nCTurn-on delay timet_d(on)V_{DS} = 800V, I_D = 24.5A, Gate Driver = 0V to + 12V, Turn-on R_{G,EXT} = 2\Omega, Turn-off delay timef_HV_{DS} = 800V, I_D = 24.5A, Gate Driver = 0V to + 12V, Turn-on R_{G,EXT} = 2\Omega, Turn-off R_{G,EXT} $	Effective output capacitance, energy related	C <sub>oss(er)</sub>	55		98		pF	
International data chargeOrderInternational data chargeInternational data chargeGate-drain charge $Q_G$ $V_{DS}$ =800V, $I_D$ = 24.5A, $V_{SS}$ =0V to 12V47.5nCGate-source charge $Q_{GS}$ $V_{DS}$ =800V, $I_D$ = 24.5A, $V_{SS}$ =0V to 12V15nCTurn-on delay time $t_{d(on)}$ $V_{DS}$ =800V, $I_D$ = 24.5A, Gate Driver =0V to $+12V$ , Turn-on R_{G,EXT} = 2Q, Inductive Load, FWD: UJ2D121ST41	Effective output capacitance, time related	C <sub>oss(tr)</sub>			174		pF	
Gate-drain charge $Q_{GD}$ $V_{DS}$ =800V, $I_D = 24.5A,$ 15         nC           Gate-source charge $Q_{GS}$ $V_{DS}$ =800V, $I_D = 24.5A,$ 41         15         nC           Turn-on delay time $t_{d(on)}$ $V_{DS}$ =800V, $I_D = 24.5A,$ 41         15         nC           Rise time $t_r$ Gate Driver =0V to +12V,         41         15         nS           Turn-off delay time $t_{d(off)}$ Turn-on $R_{G,EXT} = 2\Omega,$ 115         nS           Turn-off energy $E_{ON}$ FWD: UJ2D121ST         147 $\mu$ J           Turn-on delay time $t_{d(on)}$ $V_{DS}$ =800V, $I_D$ =24.5A,         657 $\mu$ J           Turn-off energy $E_{ON}$ Inductive Load,         657 $\mu$ J           Turn-off delay time $t_{d(on)}$ $V_{DS}$ =800V, $I_D$ =24.5A,         641 $\mu$ J           Rise time $t_r$ $T_J = 25^{\circ}C$ 804 $\mu$ J $\mu$ J           Turn-off delay time $t_d(off)$ $V_{DS}$ =800V, $I_D$ =24.5A,         41 $I_S$ Fall time $t_r$ $I_S$ $I_S$ $I_S$ $I_S$ $I$	C <sub>oss</sub> stored energy	E <sub>oss</sub>	$V_{DS} = 800V, V_{GS} = 0V$		31		μ	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Total gate charge	Q <sub>G</sub>	N/ 000X/ 1 24 54		47.5		nC	
Gate-source charge $Q_{GS}$ $M$ 15Turn-on delay time $t_{d(on)}$ $V_{DS}$ =800V, $I_D$ =24.5A, Gate Driver =0V to +12V,41	Gate-drain charge	Q <sub>GD</sub>			15			
A stateA state<	Gate-source charge	Q <sub>GS</sub>	V <sub>GS</sub> =0V 10 12V		15			
Rise time $t_r$ $t_{d(off)}$ Gate Driver =0V to $\pm 12V$ , Turn-on $R_{G,EXT} = 2\Omega$ , Turn-on $R_{G,EXT} = 2\Omega$ , Inductive Load, FWD: UJ2D121ST Total switching energy $25$ $ns$ Turn-on delay time $t_f$ $Turn-on R_{G,EXT} = 2\Omega$ , Inductive Load, FWD: UJ2D121ST T $_J = 25^{\circ}C$ $657$ $\mu$ Turn-on delay time $t_{d(on)}$ $V_{DS}=800V$ , $I_D=24.5A$ , Gate Driver =0V to $\pm 12V$ , $411$ $\mu$ Turn-off delay time $t_{d(off)}$ $\tau$ $Turn-on R_{G,EXT} = 2\Omega$ , Turn-on $R_{G,EXT} = 2\Omega$ , $Turn-on free regy102nsTurn-off delay timet_{d(off)}\tau\tau102nsTurn-off R_{G,EXT} = 2\Omega,Turn-off R_{G,E$	Turn-on delay time	t <sub>d(on)</sub>	Gate Driver =0V to +12V, Turn-on $R_{G,EXT} = 2\Omega$ , Turn-off $R_{G,EXT} = 22\Omega$ Inductive Load, FWD: UJ2D1215T		41		_	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Rise time	t <sub>r</sub>			25			
Fail time $t_f$ Turn-off $R_{G,EXT} = 22\Omega$ Inductive Load, FWD: UJ2D1215T $T_J = 25^{\circ}C$ 21Turn-off energy $E_{OFF}$ FWD: UJ2D1215T $T_J = 25^{\circ}C$ 657Total switching energy $E_{TOTAL}$ $T_J = 25^{\circ}C$ 804Turn-on delay time $t_{d(on)}$ $V_{DS}=800V, I_D=24.5A,$ Gate Driver =0V to $+12V,$ 41 $I_{M}$ Turn-off delay time $t_{d(off)}$ $Turn-on R_{G,EXT} = 2\Omega,$ Turn-on energy102 $I_{SS}$ Fail time $t_f$ $Turn-on R_{G,EXT} = 2\Omega,$ Turn-off $R_{G,EXT} = 2\Omega,$ 	Turn-off delay time	t <sub>d(off)</sub>			94			
Turn-on energy $E_{ON}$ Inductive Load, FWD: UJ2D121ST $T_J = 25^{\circ}C$ 657 $\mu$ Total switching energy $E_{OFF}$ $FWD: UJ2D121ST$ $T_J = 25^{\circ}C$ $147$ $\mu$ Turn-on delay time $t_{d(on)}$ $V_{DS}=800V, I_D=24.5A,$ Gate Driver =0V to $+12V,$ $41$ $ns$ Turn-off delay time $t_{d(off)}$ $+12V,$ Turn-on $R_{G,EXT} = 2\Omega,$ Inductive Load, $102$ $ns$ Fall time $t_f$ $Turn-off R_{G,EXT} = 2\Omega,$ Inductive Load, $22$ $102$ $ns$ Turn-off energy $E_{OFF}$ $FWD: UJ2D121ST$ Turn-off $R_{G,EXT} = 150^{\circ}C$ $186$ $\mu$	Fall time	t <sub>f</sub>			21			
Turn-on delay time $E_{TOTAL}$ $T_J = 25^{\circ}C$ $804$ $\mu$ Turn-on delay time $t_{d(on)}$ $V_{DS}=800V, I_D=24.5A,$ Gate Driver =0V to $+12V,$ $41$ $102$ $102$ Turn-off delay time $t_r$ $t_{d(off)}$ $112V,$ $102$ $102$ $102$ Fall time $t_f$ $t_f$ $1102$ $102$ $102$ $102$ $102$ Turn-on energy $E_{ON}$ $E_{OFF}$ $102$ $102$ $102$ $102$ $102$ Turn-off R_{G,EXT} = 22Q $102$ $102$ $102$ $102$ $102$ $102$ $102$ Turn-off R_{G,EXT} = 22Q $102$ $102$ $102$ $102$ $102$ $102$ $102$ Turn-off R_{G,EXT} = 22Q $102$	Turn-on energy	E <sub>ON</sub>			657			
Total switching energy $E_{TOTAL}$ 804Turn-on delay time $t_{d(on)}$ $V_{DS}=800V, I_D=24.5A,$ Gate Driver =0V to $\pm 12V,$ 41Rise time $t_r$ Gate Driver =0V to $\pm 12V,$ 33Turn-off delay time $t_{d(off)}$ Turn-on $R_{G,EXT} = 2\Omega,$ Turn-on freergy102Fall time $t_f$ Turn-off $R_{G,EXT} = 22\Omega,$ Inductive Load,735Turn-off energy $E_{OFF}$ FWD: UJ2D1215T $T_L = 150°C$ 186 $\mu$	Turn-off energy	E <sub>OFF</sub>			147			
Rise timetr $V_{DS}=800V, I_D=24.5A,$ Gate Driver =0V to +12V,33nsTurn-off delay time $t_{d(off)}$ Turn-on $R_{G,EXT} = 2\Omega,$ Turn-on energyTurn-on $R_{G,EXT} = 2\Omega,$ Turn-off $R_{G,EXT} = 22\Omega$ Inductive Load, FWD: UJ2D1215T102nsTurn-off energy $E_{OFF}$ FWD: UJ2D1215T Tur = 150°C186 $\mu$	Total switching energy	E <sub>TOTAL</sub>			804			
Rise time $t_r$ Gate Driver =0V to +12V,33nsTurn-off delay time $t_{d(off)}$ Turn-on $R_{G,EXT} = 2\Omega$ , Turn-on energyTurn-on $R_{G,EXT} = 22\Omega$ Inductive Load,22102Turn-off energy $E_{ON}$ Inductive Load, FWD: UJ2D1215T735 $\mu$	Turn-on delay time	t <sub>d(on)</sub>	Gate Driver =0V to +12V, Turn-on $R_{G,EXT} = 2\Omega$ , Turn-off $R_{G,EXT} = 22\Omega$ Inductive Load, FWD: UJ2D1215T		41			
Turn-off delay time $t_{d(off)}$ $+12V$ , Turn-on $R_{G,EXT} = 2\Omega$ , Turn-off $R_{G,EXT} = 22\Omega$ 102Fall time $t_f$ Turn-on $R_{G,EXT} = 2\Omega$ , Turn-off $R_{G,EXT} = 22\Omega$ 22Turn-on energy $E_{ON}$ Inductive Load, FWD: UJ2D1215T735Turn-off energy $E_{OFF}$ FWD: UJ2D1215T186Turn-off CTurn-off CTurn-off C	Rise time	t <sub>r</sub>			33		ns	
Fall time $t_f$ Turn-off $R_{G,EXT} = 22\Omega$ 22Turn-on energy $E_{ON}$ Inductive Load,735Turn-off energy $E_{OFF}$ FWD: UJ2D1215T186 $\mu J$	Turn-off delay time	t <sub>d(off)</sub>			102			
Turn-on energy $E_{ON}$ Inductive Load, FWD: UJ2D1215T735Turn-off energy $E_{OFF}$ FWD: UJ2D1215T186 $\mu J$	Fall time	t <sub>f</sub>			22			
Turn-off energy E <sub>OFF</sub> FWD: UJ2D1215T 186 μJ	Turn-on energy	E <sub>ON</sub>			735			
Total switching energy $E_{TOTAL}$ $T_J = 150^{\circ}C$ 921	Turn-off energy	E <sub>OFF</sub>			186		μ	
	Total switching energy	E <sub>TOTAL</sub>	T <sub>J</sub> = 150°C		921		1	

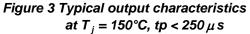
# **Thermal Characteristics**

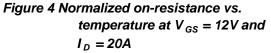
Parameter	symbol	Test Conditions	Value			Units
			Min	Тур	Max	Onits
Thermal resistance, junction-to-case	$R_{\theta JC}$			0.5	0.65	°C/W

Datasheet

# Typical Performance Diagrams



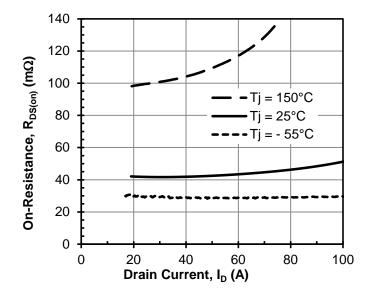


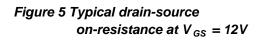


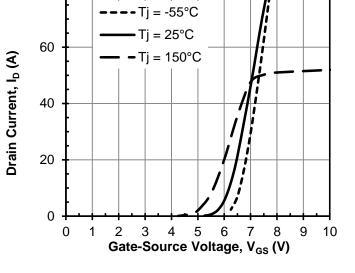
# USCi the power to do more with less

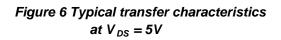
xJ SiC Series | 60m $\Omega$  - 1200V SiC Cascode | UJC1206K

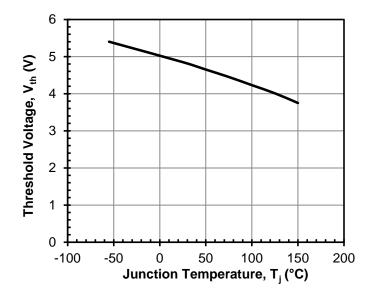
80

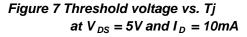












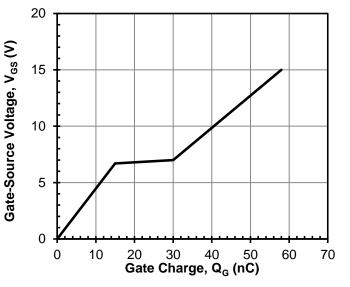
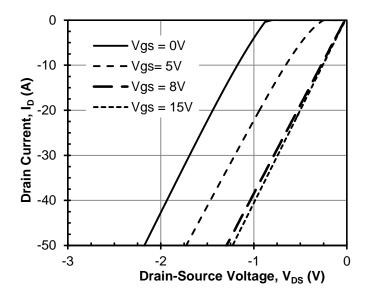
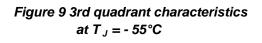
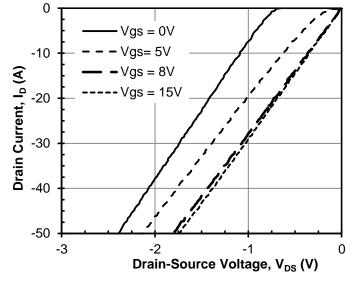


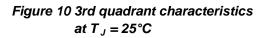
Figure 8 Typical gate charge at  $V_{DS}$  = 800V and  $I_D$  = 24.5A

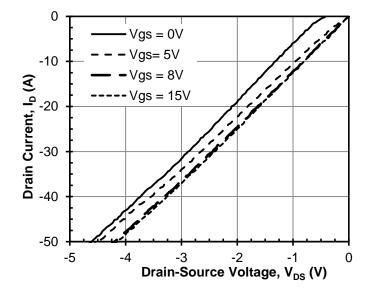


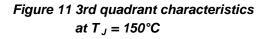


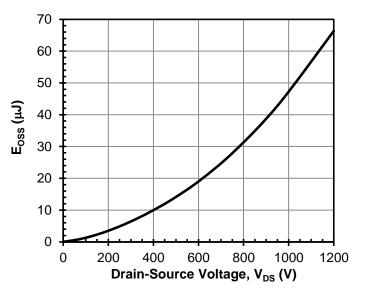


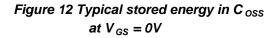




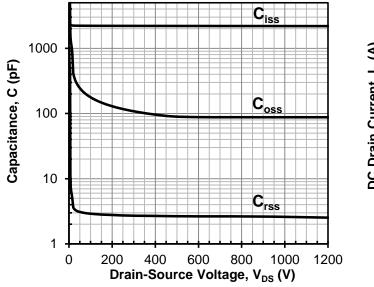


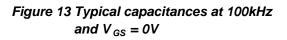












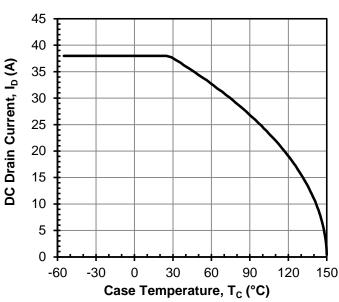


Figure 14 DC drain current derating

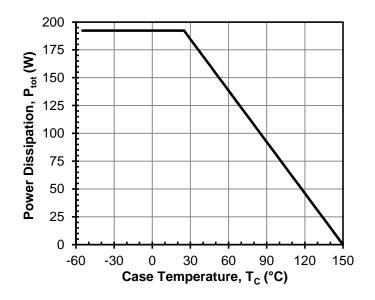


Figure 15 Total power dissipation

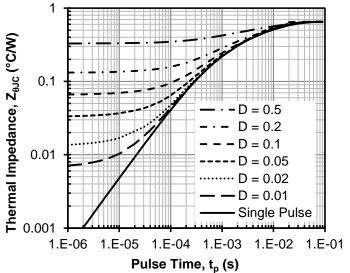
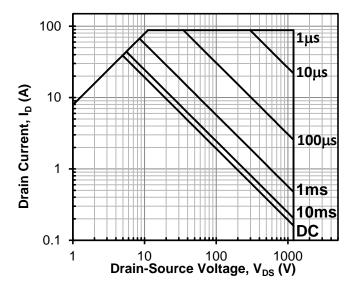
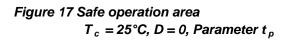


Figure 16 Maximum transient thermal impedance







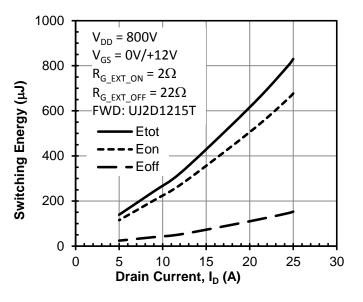
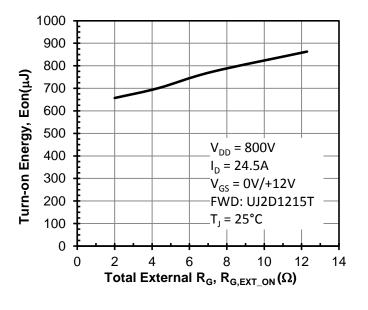
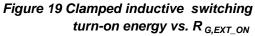


Figure 18 Clamped inductive switching energy vs. drain current at  $T_J = 25^{\circ}C$ 





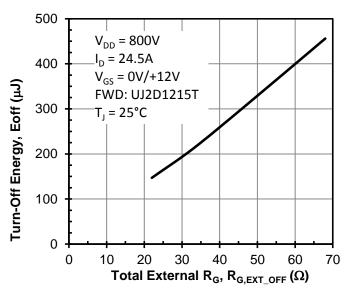
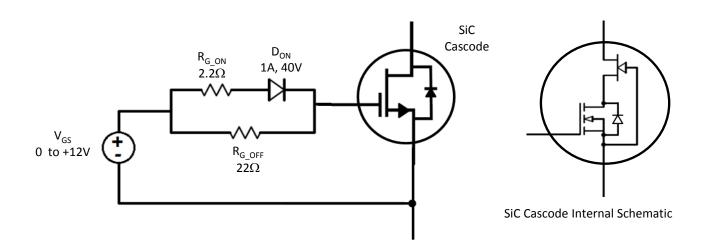


Figure 20 Clamped inductive switching turn-off energy vs. R<sub>G,EXT\_OFF</sub>

Datasheet



#### Figure 21 Recommended gate drive and internal circuit schematic of SiC cascode

## **Applications Information**

SiC cascodes are enhancement-mode power siwtches formed by a high-voltage SiC depletion-mode JFET and a low-voltage silicon MOSFET connected in series as shown in Figure 21. The silicon MOSFET serves as the control unit while the SiC JFET provides high voltage blocking in the off state. This combination of devices in a single package provides compatibility with standard gate drivers and offers superior performance in terms of low on-resistance (R<sub>DS(on)</sub>), output capacitance (Coss), gate charge (Qg), and reverse recovery charge (Qrr) leading to low conduction and switching losses. The SiC cascodes also provide excellent reverse conduction capability eliminating the need for an external anti-parallel diode.

Like other high performance power switches, proper PCB layout design to minimize circuit parasitics is strongly recommended due to the high dv/dt and di/dt rates. In particular, separate turn-on and turn-off gate resistors are recommended as shown in Figure 21. In addition, an external gate resistor is recommended when the cascode is working in the diode mode in order to achieve the optimum reverse recover performance. For more information on cascode operation, see www.unitedsic.com.

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