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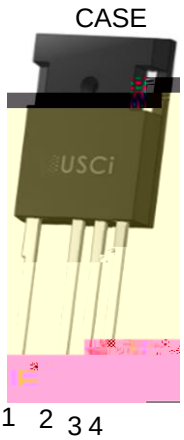
DATASHEET

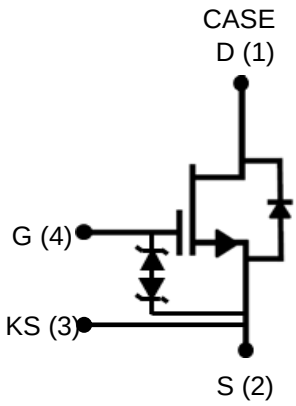
UF3C065040K4S

Rev. , January ‰ ‡ ‰ Œ

Description

United Silicon Carbide's cascode products co-package its high-performance F3 SiC fast JFETs with a cascode optimized MOSFET to produce the only standard gate drive SiC device in the market today. This series exhibits very fast switching using a 4-terminal TO-247-package and 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
UF3C065040K4S	TO-247-4L	UF3C065040K4S

Features

- Typical on-resistance $R_{DS(on),typ}$ of 42m :
-

Typical applications

- EV charging
- PV inverters
- Switch mode power supplies
- Power factor correction modules
- Motor drives
- Induction heating

Maximum Ratings

	Symbol		Value	Units
	V_{DS}		650	V
Gate-source voltage	V_{GS}	DC	-25 to +25	V
			54	A
			40	A
	I_{DM}		125	A
	E_{AS}		76	mJ
	P_{tot}		326	W
	$T_{J,max}$		175	°C
	T_J, T_{STG}		-55 to 175	°C
Max. lead temperature for soldering,	T_L		250	°C

1. Limited by $T_{J,max}$
2. Pulse width t_p limited by $T_{J,max}$
3. Starting T_J = 25°C

Thermal Characteristics

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal resistance, junction-to-case	R_T			0.35	0.46	°C/W

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

Typical Performance - Static

			Min	Typ	Max	
	BV_{DS}		650			V
				0.7	150	
				10		
	I_{GSS}			6	20	PA
Drain-source on-resistance				42	52	
				78		
	$V_{G(th)}$		4	5	6	V
	R_G			4.5		:

Typical Performance - Reverse Diode

			Min	Typ	Max	
	I_S				54	A
	$I_{S,pulse}$				125	A
				1.5	1.75	
				1.8		
Reverse recovery charge	Q_{rr}	V_R=400V, I_F=40A, V_{GS}=-5V, R_{G_EXT}=20 : di/dt=1100A/ PS, T_J=25°C		138		nC
Reverse recovery time	t_{rr}			38		ns
Reverse recovery charge	Q_{rr}	V_R=400V, I_F=40A, V_{GS}=-5V, R_{G_EXT}=20 : di/dt=1100A/ PS, T_J=150°C		137		nC
Reverse recovery time	t_{rr}			38		ns

Typical Performance - Dynamic

	Min	Typ	Max

Typical Performance Diagrams

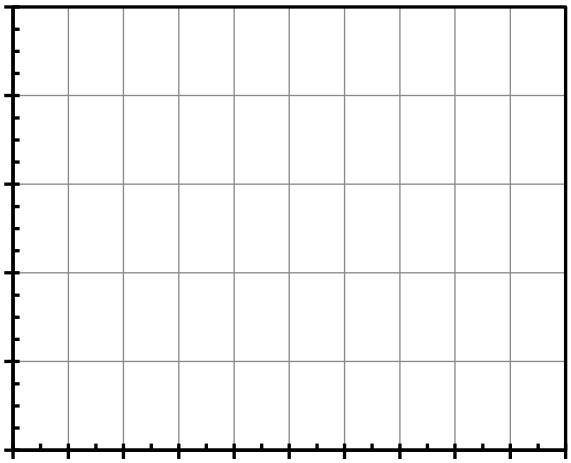


Figure 1. Typical output characteristics at T_J = -55°C, tp < 250 µs

Figure 2. Typical output characteristics at T_J = 25°C, tp < 250 µs

Figure 3. Typical output characteristics at T_J = 175°C, tp < 250 µs

Figure 4. Normalized on-resistance vs. temperature at V_{GS} = 12V and I_D = 40A

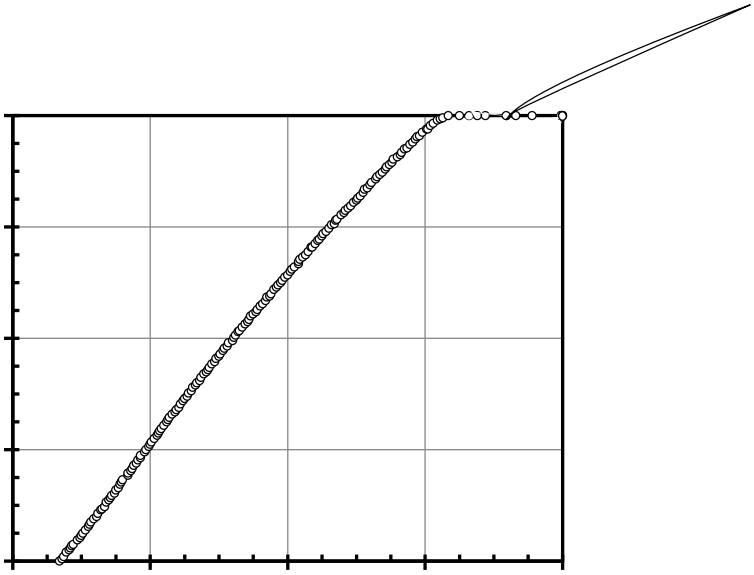


Figure 9. 3rd quadrant characteristics at T_J = -55°C

Figure 10. 3rd quadrant characteristics at T_J = 25°C

Figure 11. 3rd quadrant characteristics at T_J = 175°C

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

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

Figure 14. DC drain current derating

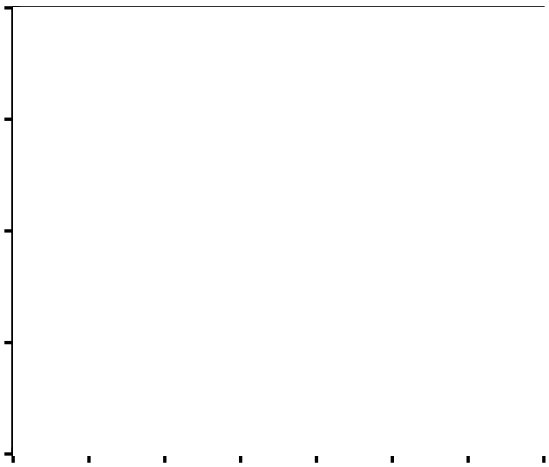


Figure 21. Clamped inductive switching energy vs. junction temperature at V_{DS} = 400V and I_D = 40A

Figure 22. Reverse recovery charge Qrr vs. junction temperature

Applications Information

SiC cascodes are enhancement-mode power switches formed by a high-voltage SiC depletion-mode JFET and a low-voltage silicon MOSFET connected in series. 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 ($R_{DS(on)}$), output capacitance (C_{oss}), gate charge (Q_G), 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. An external gate resistor is recommended when the cascode is working in the diode mode in order to achieve the optimum reverse recovery performance. For more information on cascode operation, see www.unitedsic.com.

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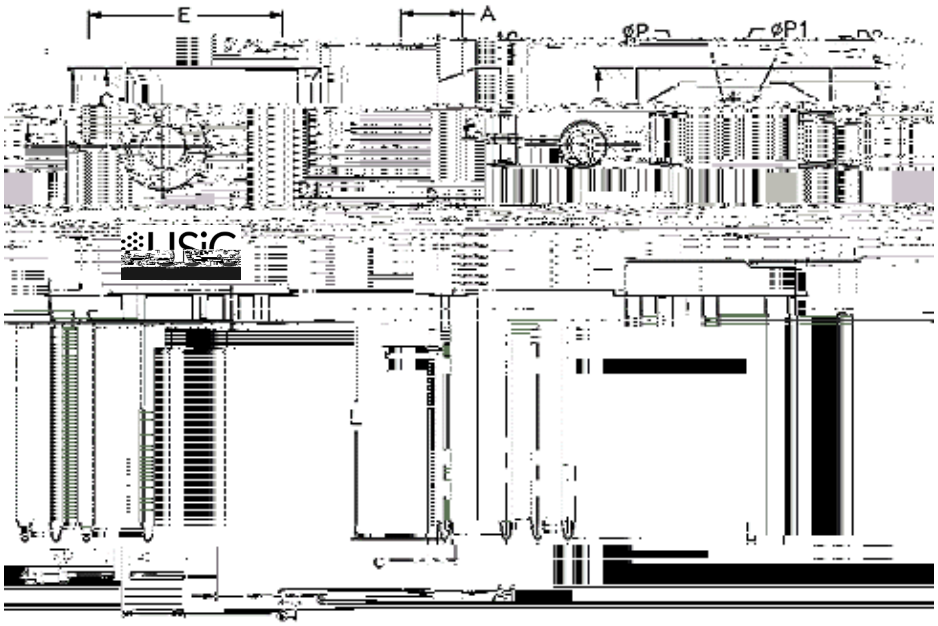
TO-247-4L PACKAGE OUTLINE, PART MARKING AND TUBE SPECIFICATIONS

PACKAGE OUTLINE



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
ΦP				
ΦP1				

TO-247-4L PACKAGE OUTLINE, PART MARKING AND TUBE SPECIFICATIONS

PART MARKING

PACKING TYPE