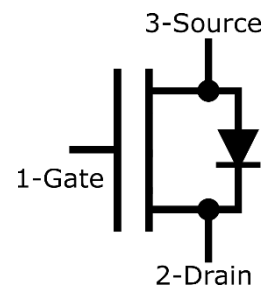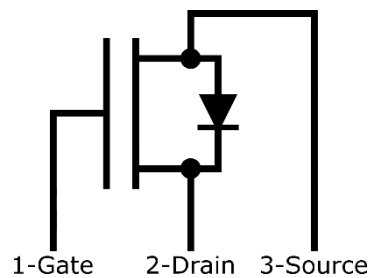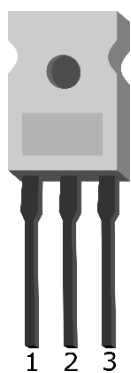# TO-247-3

SiC Power MOSFETs

CoolCAD Power MOSFETs exceed power, efficiency and portability capabilities of standard silicon devices and are available in a variety of breakdown voltages (650V, 1200V, 1700V & 3300V) and current ratings. They have low on-resistance and low leakage in the blocking state. Fabricated on high-quality SiC epitaxial layers, our proprietary fabrication process includes carefully chosen annealing procedures to ensure a high-quality $SiC\text{-}SiO_2$ gate oxide dielectric layer. Doping profile, neck region, and edge termination ensure extremely low R_{on} and high breakdown voltage.

BENEFITS

- ☑ Higher efficiency
- ☑ Reduced cooling
- ☑ Increased power
- ☑ Reduced system volume

APPLICATIONS INCLUDE

Electromechanical power converters, DC to DC, AC to DC and DC to AC converters, switching power supplies, electric vehicles, hybrid vehicles, solar and wind energy power converters.

1 2 3

1-Gate   2-Drain   3-Source

3-Source

1-Gate

2-Drain

Part Number	Package	Marking
CC650B2M22	TO-247-3	CoolCADElectronics

contact@coolcadelectronics.com   College Park, Maryland   https://coolcadelectronics.com

Maximum Ratings

*Characteristics	Symbol	Comments	Min	Typ	Max	Units
DC blocking voltage	VDSmax	TJ=25°C		650		V
Gate input voltage range	VGS	Recommended range	-5		15	V
		Dynamic	-5		18	
Avalanche rating	VAVA	TJ=25°C		750		V
Pulsed drain current	IDpulsed	VGS=15V; VDS=2V; TJ=25°C		15		A
		VGS=15V; VDS=2V;TJ=175°C		12		
Continuous drain current	ID	VGS=15V; TJ=25°C		11		A
		VGS=15V; TJ=175°C		8		
Continuous drain power	P	VGS=15V; TJ=25°C		100		W
Maximum- junction temperature	TJmax	Normal operation			175	°C
		During processing / soldering			250	

Electrical and Thermal Characteristics

*Characteristics	Symbol	Comments	Min	Typ	Max	Units
Gate threshold voltage	V_{TH}	VGS=VDS; IDS=5mA; TJ=25°C		2.5		V
		VGS=VDS; IDS=5mA; TJ=175°C		1.4		
Gate leakage	I_{GSS}	VGS=15V; VDS=0; TJ=25°C		0.7		nA
		VGS=15V; VDS=0; TJ=175°C		113		nA
Drain leakage	I_{DSS}	VDS=600V; VGS=0; TJ=25°C		38.4		nA
		VDS=600V; VGS=0; TJ=175°C		147		
Drain-source on-resistance	R_{DSON}	VGS=15V; IDS=5A; TJ=25°C		118		mΩ
		VGS=15V; IDS=5A; TJ=175°C		163		
Transconductance	gm	VDS=10V; IDS=10A; TJ=25°C		4.8		S
		VDS=10V; IDS=10A; TJ=175°C		5.2		
Input capacitance	C_{ISS}	VGS=0V; VDS=200V; f=1MHz; TJ=25°C		968		pF
Output capacitance	C_{OSS}	VGS=0V; VDS=200V; f=1MHz; TJ=25°C		136		pF
Reverse transfer capacitance	C_{RSS}	VGS=0V; VDS=200V; f=1MHz; TJ=25°C		5.7		pF
Stored energy at output	E_{OSS}	VGS=-5/15V; VDS=200V; f=1MHz; TJ=25°C		5.4		μJ
Turn on switching energy	E_{ON}	VGS=-5/15V; VDS=200V; f=1MHz; TJ=25°C		19.5		μJ
Turn off switching energy	E_{OFF}	VGS=-5/15V; VDS=200V; f=1MHz; TJ=25°C		5.8		μJ
Rise time	tR	VGS=-5/15V; VDS=1kV; ID=10A; RG=0Ω; TJ=25°C		20		ns
Fall time	tF	VGS=-5/15V; VDS=1kV; ID=10A; RG=0Ω; TJ=25°C		15		ns
Turn off delay time	tD	VGS=-5/15V; VDS=200V; ID=10A; RG=0Ω; TJ=25°C		10		ns
Gate Charge	Q_{G}	VGS=-5/15V; VDS=200V; ID=10A; RG=0Ω; TJ=25°C		10		nC
Internal gate resistance	R_{G}	f=1Mz; VAC=25mV; TJ=25°C		5		Ω
Thermal resistance:Junction to Case	R_{JC}			1.5		°C/W

Body diode characteristics							
*Characteristics	Symbol	Comments	Min	Typ	Max	Units	
Diode forward voltage	VF	IF=3A; VGS=0V TJ=25°C		2.7		V	
		IF=3A; VGS=0V TJ=175°C		2.3			
Pulsed diode current	IS_pulsed	VGS=0V; VDS=-3V; TJ=25°C		5		A	
		VGS=0V; VDS=-3V; TJ=175°C		8			
Reverse recovery time	trr			2		ns	
Reverse recovery charge	Qrr	VDS=0-200V; VGS=0V; T=25°C		43		nC	

Figure 1: Output Characteristics TJ = 25 ºC
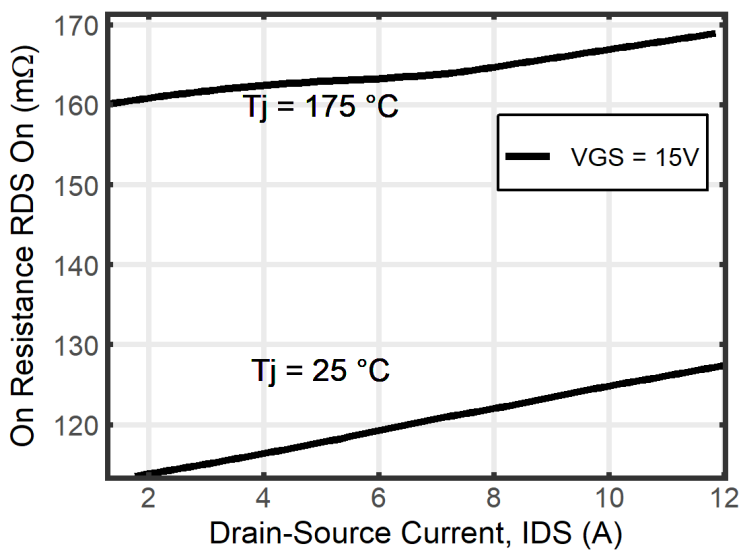

Figure 2: Output Characteristics TJ = 175 ºC

Figure 3: On-Resistance vs. Drain Current For Various Temperatures.
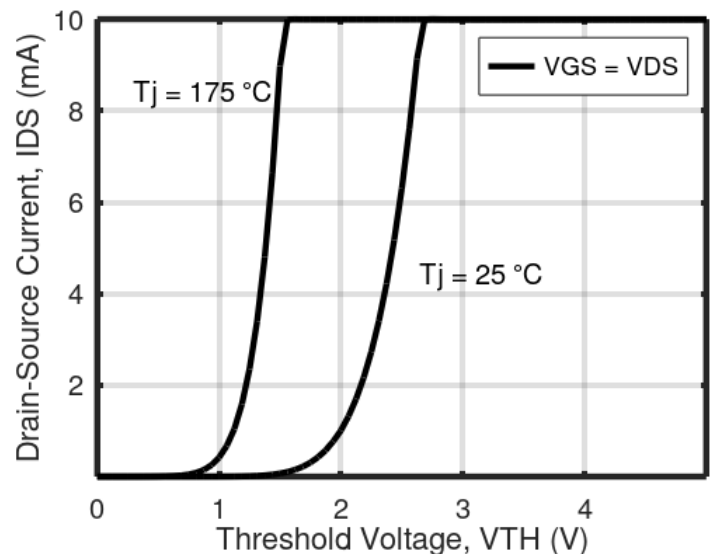

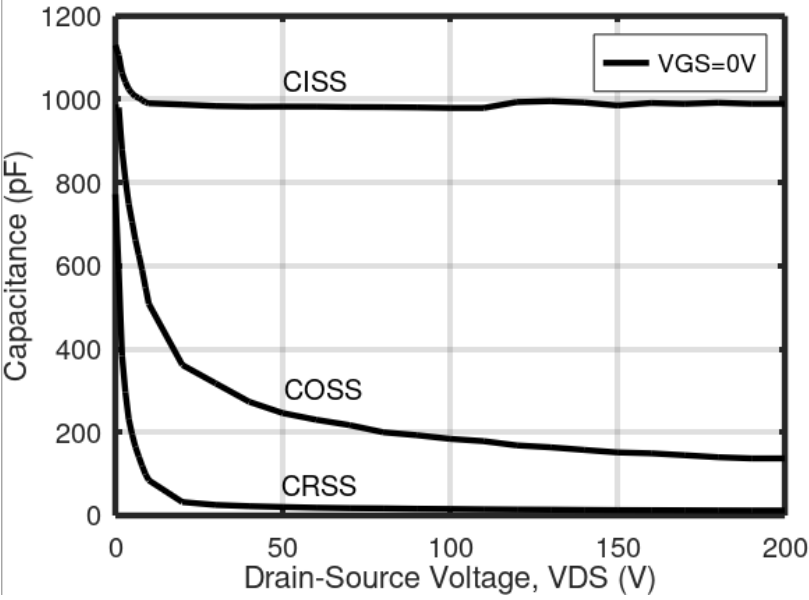Figure 4: Drain Current vs. Threshold Voltage For Various Temperatures

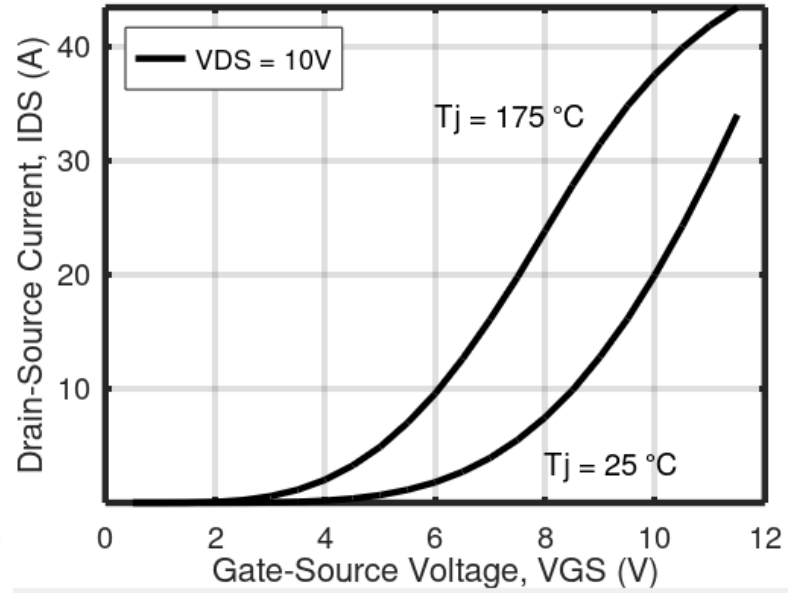Figure 5: Capacitances vs. Drain-Source Voltage (0 - 200V)
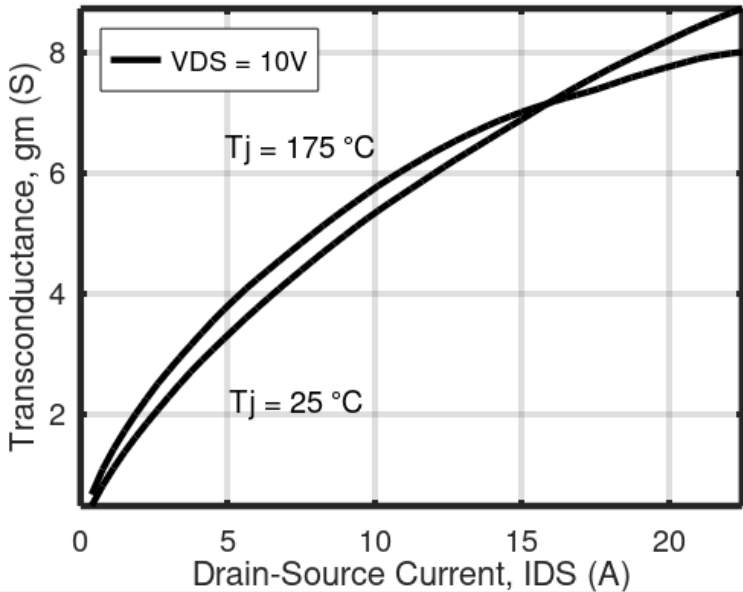

Figure 6: Transfer Characteristic
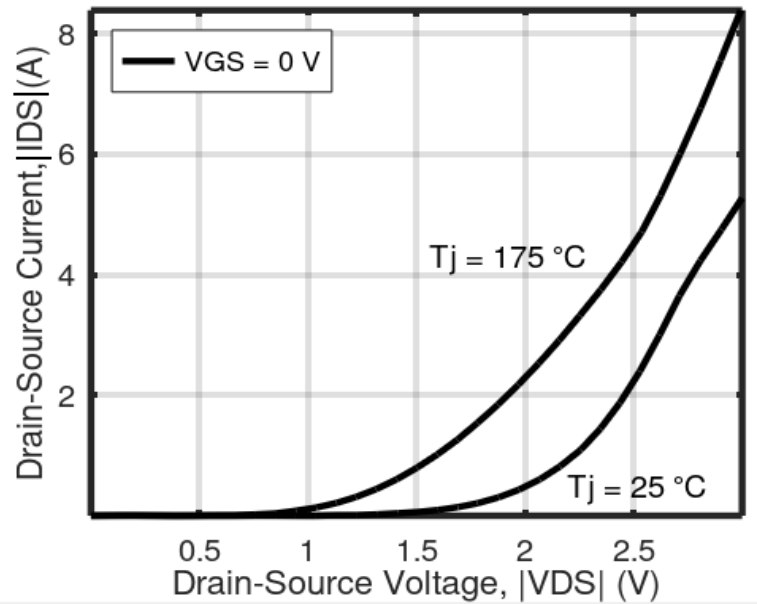

Figure 7: Transconductance vs. Drain Current

Figure 8: Body Diode Characteristic For Various Temperatures

CAUTION: These devices are ESD sensitive. Use proper handling procedures.

Disclaimer: These specifications may not be considered as a guarantee of components characteristics. Components have to be tested depending on intended application as adjustments may be necessary. The use of CoolCAD Electronics components in life support appliances and systems are subject to written approval of CoolCAD Electronics.

CoolCAD Electronics reserves the right to change without notice the specifications and information contained within.

contact@coolcadelectronics.com   College Park, Maryland   https://coolcadelectronics.com