



T0-247-3

SiC Power MOSFETs

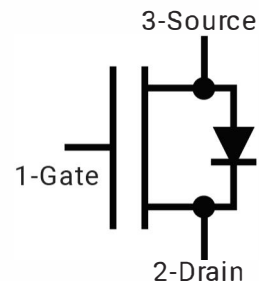
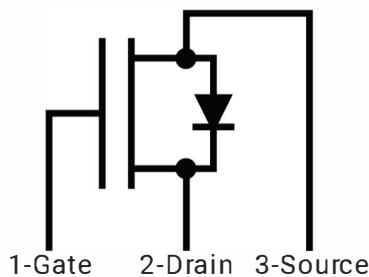
Cactus Materials Power MOSFETs exceed power, efficiency and portability capabilities of standard silicon devices and are available in a variety of breakdown voltages (650V, 1200V, 1700V & 3300V) and current ratings. They have low on-resistance and low leakage in the blocking state. Fabricated on high-quality SiC epitaxial layers, our proprietary fabrication process includes carefully chosen annealing procedures to ensure a high-quality SiC-SiO₂ 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.



Part Number	Package	Marking
C123SCM06514B	T0-247-3	Cactus Materials

Maximum Ratings						
*Characteristics	Symbol	Comments	Min	Typ	Max	Units
DC blocking voltage	V_{DSmax}	$T_J=25^{\circ}C$		650		V
Gate input voltage range	V_{GS}	Recommended range Dynamic	-5 -5		15 18	V
Avalanche rating	V_{AVA}	$T_J=25^{\circ}C$		750		V
Pulsed drain current	ID_{pulsed}	$V_{GS}=15V; V_{DS}=2V; T_J=25^{\circ}C$ $V_{GS}=15V; V_{DS}=2V; T_J=175^{\circ}C$		14 11		A
Continuous drain current	ID	$V_{GS}=15V; T_J=25^{\circ}C$ $V_{GS}=15V; T_J=175^{\circ}C$		10 8		A
Continuous drain power	P	$V_{GS}=15V; T_J=25^{\circ}C$		100		W
Maximum- junction temperature	T_{jmax}	Normal operation During processing / soldering			175 250	$^{\circ}C$

Electrical and Thermal Characteristics						
*Characteristics	Symbol	Comments	Min	Typ	Max	Units
Gate threshold voltage	V_{TH}	$V_{GS}=V_{DS}; I_{DS}=5mA; T_J=25^{\circ}C$ $V_{GS}=V_{DS}; I_{DS}=5mA; T_J=175^{\circ}C$		2.5 1.4		V
Gate leakage	I_{GSS}	$V_{GS}=15V; V_{DS}=0; T_J=25^{\circ}C$ $V_{GS}=15V; V_{DS}=0; T_J=175^{\circ}C$		7.2 47.1		pA
Drain leakage	I_{DSS}	$V_{DS}=600V; V_{GS}=0; T_J=25^{\circ}C$ $V_{DS}=600V; V_{GS}=0; T_J=175^{\circ}C$		2.4 359		nA
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS}=15V; I_{DS}=5A; T_J=25^{\circ}C$ $V_{GS}=15V; I_{DS}=5A; T_J=175^{\circ}C$		123 167		m Ω
Transconductance	G_m	$V_{DS}=10V; I_{DS}=10A; T_J=25^{\circ}C$ $V_{DS}=10V; I_{DS}=10A; T_J=175^{\circ}C$		5.3 5.8		S
Input capacitance	C_{ISS}			918		
Output capacitance	C_{OSS}	$V_{GS}=0V; V_{DS}=200V;$ $f=1MHz; T_J=25^{\circ}C$		142		pF
Reverse transfer capacitance	C_{RSS}			5.6		
Stored energy at output	E_{OSS}			5.7		
Turn on switching energy	E_{ON}	$V_{GS}=-5/15V; V_{DS}=200V;$ $f=1MHz; T_J=25^{\circ}C$		18.5		μJ
Turn off switching energy	E_{OFF}			5.8		
Rise time	t_R	$V_{GS}=-5/15V; V_{DS}=1kV; ID=10A;$ $RG=0\Omega; T_J=25^{\circ}C$		20		nS
Fall time	t_F	$V_{GS}=-5/15V; V_{DS}=1kV; ID=10A;$ $RG=0\Omega; T_J=25^{\circ}C$		15		nS
Turn off delay time	t_D	$V_{GS}=-5/15V; V_{DS}=200V; ID=10A;$ $RG=0\Omega; T_J=25^{\circ}C$		10		nS
Gate Charge	Q_G	$V_{GS}=-5/15V; V_{DS}=200V; ID=10A;$ $RG=0\Omega; T_J=25^{\circ}C$		10		nS
Internal gate resistance	R_G	$f=1MHz; V_{AC}=25mV; T_J=25^{\circ}C$		5		Ω
Thermal resistance: Junction to Case	R_{JC}			1.5		$^{\circ}C/W$

Body diode characteristics						
*Characteristics	Symbol	Comments	Min	Typ	Max	Units
Diode forward voltage	V_F	$I_F=3A; V_{GS}=0V; T_J=25^\circ C$ $I_F=3A; V_{GS}=0V; T_J=175^\circ C$		2.8 2.4		V
Pulsed diode current	$I_{s(pulsed)}$	$V_{GS}=0V; V_{DS}=-3V; T_J=25^\circ C$ $V_{GS}=0V; V_{DS}=-3V; T_J=175^\circ C$		5 8		A
Reverse recovery time	t_{rr}			2		ns
Reverse recovery charge	Q_{rr}	$V_{DS}=0-200V; V_{GS}=0V; T_J=25^\circ C$		44		nC

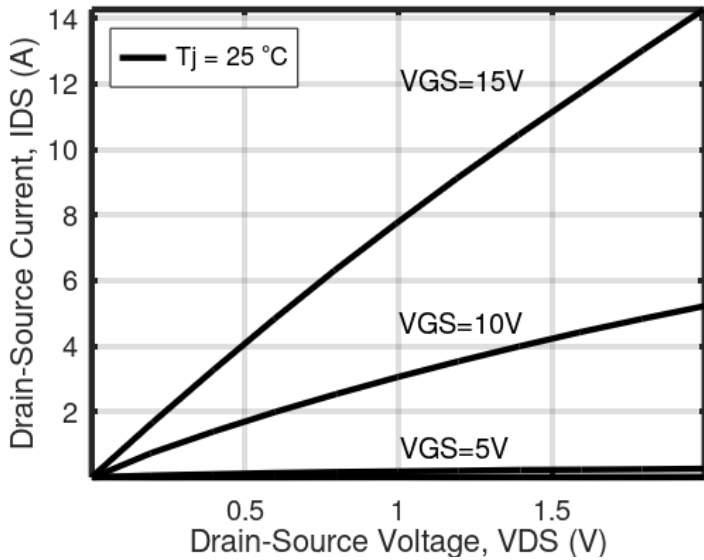


Figure 1: Output Characteristics $T_J = 25^\circ C$.

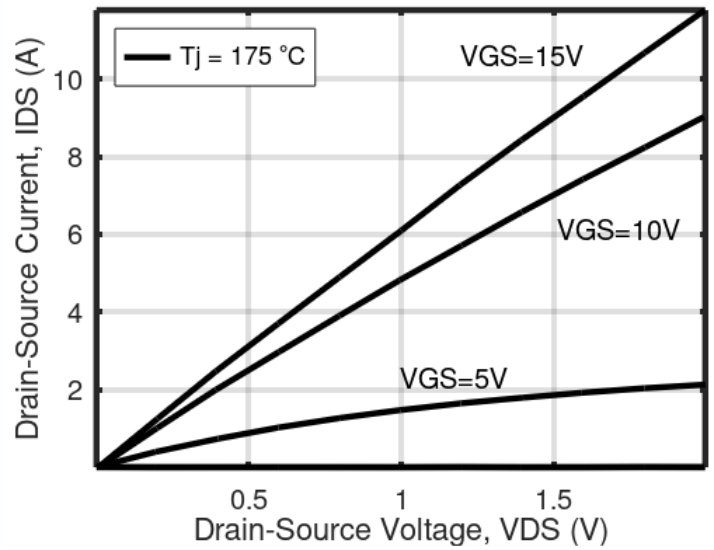


Figure 2: Output Characteristics $T_J = 175^\circ C$.

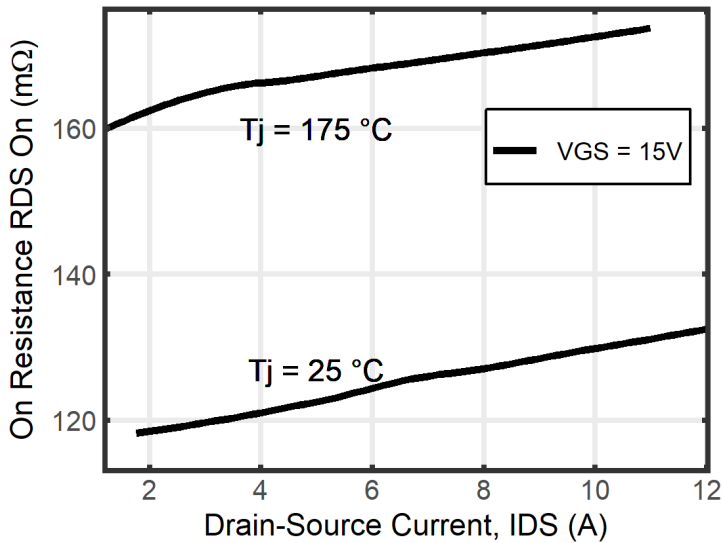


Figure 3: On-Resistance vs. Drain Current. For Various Temperatures

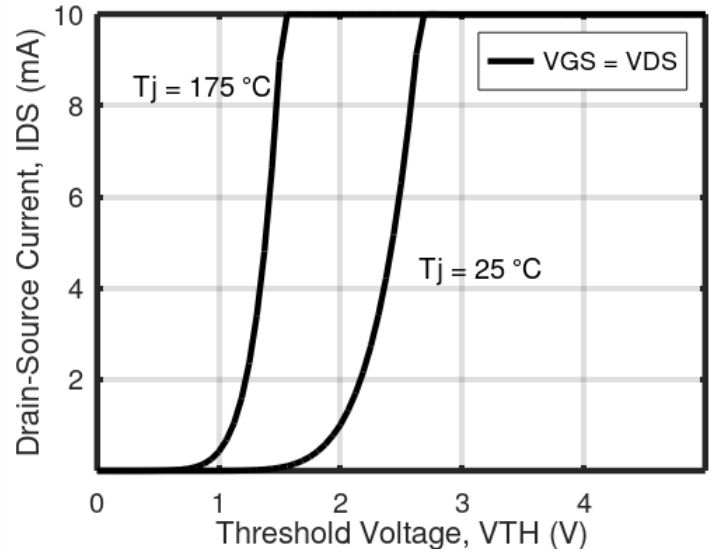


Figure 4: Drain Current vs. Threshold Voltage For Various Temperatures

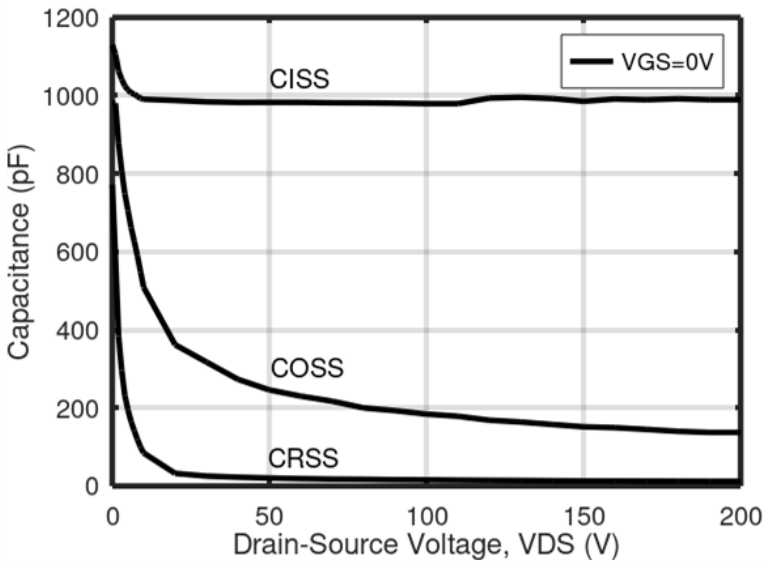


Figure 5: Capacitances vs. Drain-Source Voltage (0 - 200V)

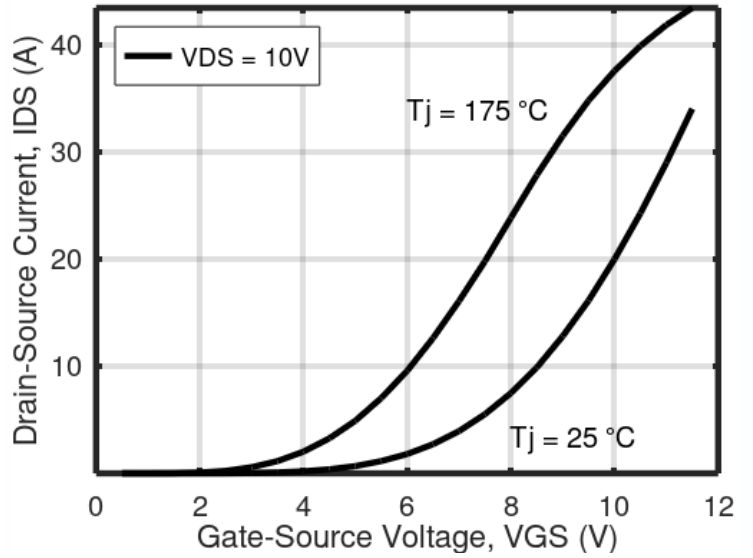


Figure 6: Transfer Characteristic

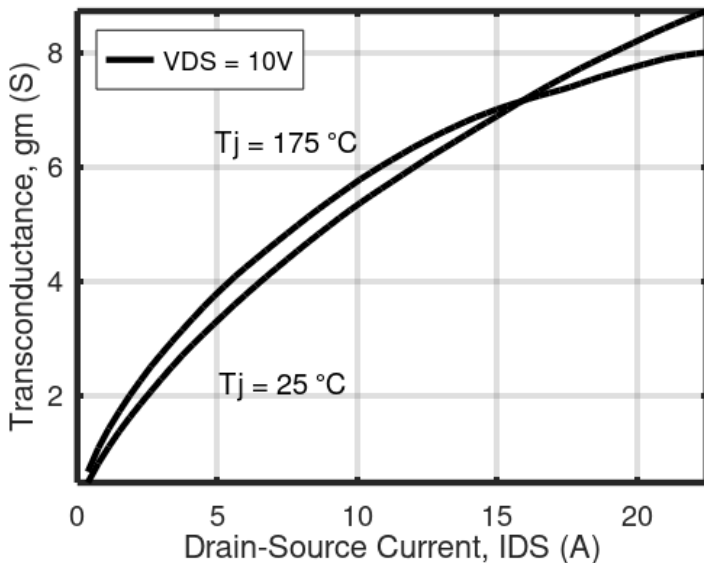


Figure 7: Transconductance vs. Drain Current

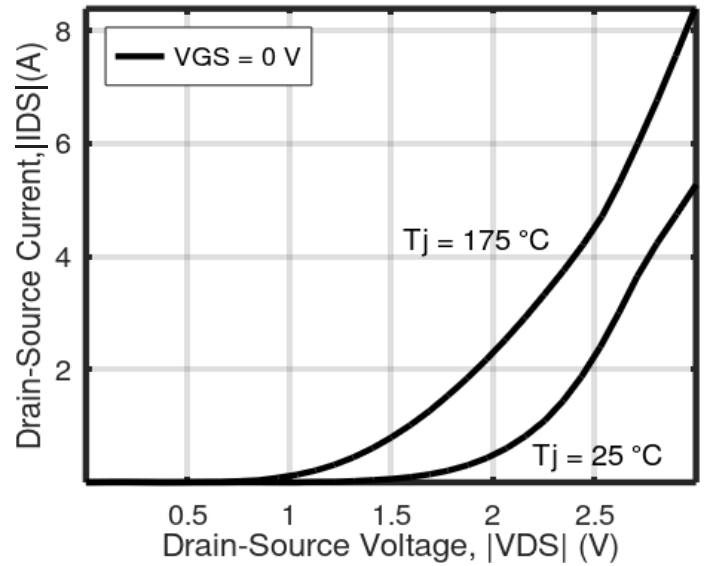


Figure 8: Body Diode Characteristic For Various Temperatures

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

Disclaimer: The specifications provided are not a guarantee of component performance. It is essential to test components for their specific applications, as modifications may be required. Use of Cactus Materials components in life support systems and devices necessitates prior written approval from Cactus Materials.

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