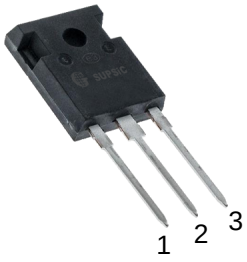
GC3M0060065D
Silicon Carbide Power MOSFET
N-Channel Enhancement Mode

Features

1) Low on-resistance
2) Fast switching speed
3) Fast reverse recovery
4) Easy to parallel
5) Simple to drive
6) Pb-free lead plating ; RoHS compliant



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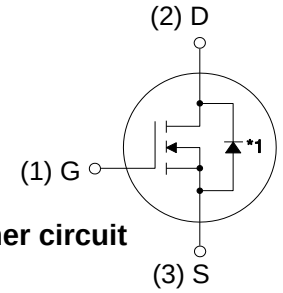
Package

Applications

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating



Inner circuit

(1) Gate
(2) Drain
(3) Source

*1 Body Diode

Part Number	Marking	Package	V_{DS}	$I_{D\ @\ 25^{\circ}C}$	$R_{DS(on)}$
GC3M0060065D	GC3M0060065	TO-247-3	650 V	29 A	60 mΩ

Maximum Ratings

Symbol	Parameter	Value	Unit	Note
V_{DSS}	Drain - Source Voltage, T_C = 25 ˚C	650	V	
V_{GS}	Gate - Source voltage (Under transient events < 100 ns)	-8/+19	V	Fig. 29
I_D	Continuous Drain Current, V_{GS} = 15 V, T_C = 25˚C	29	A	Fig. 19 Note 1
	Continuous Drain Current, V_{GS} = 15 V, T_C = 100˚C	20		
$I_{D(pulse)}$	Pulsed Drain Current, Pulse width t_P limited by T_{jmax}	99	A	
P_D	Power Dissipation, T_C=25˚C, T_J = 175 ˚C	150	W	Fig. 20
T_J , T_{stg}	Operating Junction and Storage Temperature	-40 to +175	˚C	
T_L	Solder Temperature, 1.6mm (0.063") from case for 10s	260	˚C	
M_d	Mounting Torque, (M3 or 6-32 screw)	1 8.8	Nm lbf-in	

Note (1): Die limits are 37A (25°C) and 27A (100°C)

Electrical Characteristics (T_C = 25˚C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650			V	V_{GS} = 0 V, I_D = 100 µA
V_{GSon}	Gate-Source Recommended Turn-On Voltage		15		V	Static
V_{GSoff}	Gate-Source Recommended Turn-Off Voltage		-4		V	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.3	3.6	V	V_{DS} = V_{GS}, I_D = 5 mA
			1.9		V	V_{DS} = V_{GS}, I_D = 5 mA, T_J = 175ºC
I_{DSS}	Zero Gate Voltage Drain Current		1	50	µA	V_{DS} = 650 V, V_{GS} = 0 V
I_{GSS}	Gate-Source Leakage Current		10	250	nA	V_{GS} = 15 V, V_{DS} = 0 V
$R_{DS(on)}$	Drain-Source On-State Resistance	42	60	79	mΩ	V_{GS} = 15 V, I_D = 13.2 A
			80			V_{GS} = 15 V, I_D = 13.2 A, T_J = 175ºC
g_{fs}	Transconductance		10		S	V_{DS}= 20 V, I_{DS}= 13.2 A
			9			V_{DS}= 20 V, I_{DS}= 13.2 A, T_J = 175ºC
C_{iss}	Input Capacitance		1020		pF	V_{GS} = 0 V, V_{DS} = 600 V f = 1 MHz V_{AC} = 25 mV
C_{oss}	Output Capacitance		80			
C_{rss}	Reverse Transfer Capacitance		9			
$C_{o(er)}$	Effective Output Capacitance (Energy Related)		95		pF	V_{GS} = 0 V, V_{DS} = 0V to 400 V
$C_{o(tr)}$	Effective Output Capacitance (Time Related)		132			
E_{oss}	C_{oss} Stored Energy		15		µJ	V_{DS} = 600 V, 1 MHz
E_{ON}	Turn-On Switching Energy (Body Diode)		110		µJ	V_{DS} = 400 V, V_{GS} = -4 V/15 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5Ω, L= 135 µH, T_J = 175ºC FWD = Internal Body Diode of MOSFET
E_{OFF}	Turn Off Switching Energy (Body Diode)		22			
E_{ON}	Turn-On Switching Energy (External SiC Diode)		63		µJ	V_{DS} = 400 V, V_{GS} = -4 V/15 V, I_D = 13.2 A, $R_{G(ext)}$ = 2.5Ω, L= 135 µH, T_J = 175ºC FWD = External SiC Diode
E_{OFF}	Turn Off Switching Energy (External SiC Diode)		28			
$t_{d(on)}$	Turn-On Delay Time		9		ns	V_{DD} = 400 V, V_{GS} = -4 V/15 V I_D = 13.2 A, $R_{G(ext)}$ = 2.5 Ω, L= 135 µH Timing relative to V_{DS} Inductive load
t_r	Rise Time		20			
$t_{d(off)}$	Turn-Off Delay Time		17			
t_f	Fall Time		8			
$R_{G(int)}$	Internal Gate Resistance		3		Ω	f = 1 MHz, V_{AC} = 25 mV
Q_{gs}	Gate to Source Charge		14		nC	V_{DS} = 400 V, V_{GS} = -4 V/15 V I_D = 13.2 A Per IEC60747-8-4 pg 21
Q_{gd}	Gate to Drain Charge		14			
Q_g	Total Gate Charge		46			

Note (1): $C_{o(er)}$, a lumped capacitance that gives same stored energy as Coss while Vds is rising from 0 to 400V
$C_{o(tr)}$, a lumped capacitance that gives same charging time as Coss while Vds is rising from 0 to 400V

Reverse Diode Characteristics (T_C = 25˚C unless otherwise specified)

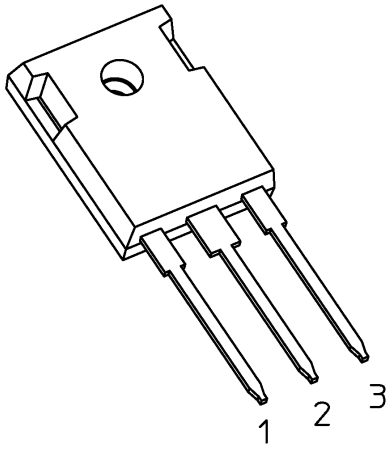
Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	5.1		V	V_{GS} = -4 V, I_{SD} = 6.6 A, T_J = 25 °C
		4.8		V	V_{GS} = -4 V, I_{SD} = 6.6 A, T_J = 175 °C
I_S	Continuous Diode Forward Current		23	A	V_{GS} = -4 V, T_C = 25˚C
$I_{S,\ pulse}$	Diode pulse Current		99	A	V_{GS} = -4 V, pulse width t_P limited by T_{jmax}
t_{rr}	Reverse Recover time	20		ns	V_{GS} = -4 V, I_{SD} = 13.2 A, V_R = 400 V dif/dt = 1200 A/µs, T_J = 175 °C
Q_{rr}	Reverse Recovery Charge	190		nC	
I_{rrm}	Peak Reverse Recovery Current	16		A	
t_{rr}	Reverse Recover time	29		ns	V_{GS} = -4 V, I_{SD} = 13.2 A, V_R = 400 V dif/dt = 750 A/µs, T_J = 175 °C
Q_{rr}	Reverse Recovery Charge	181		nC	
I_{rrm}	Peak Reverse Recovery Current	9		A	

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.99	°C/W	
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	40		

Package Dimensions

Unit: mm



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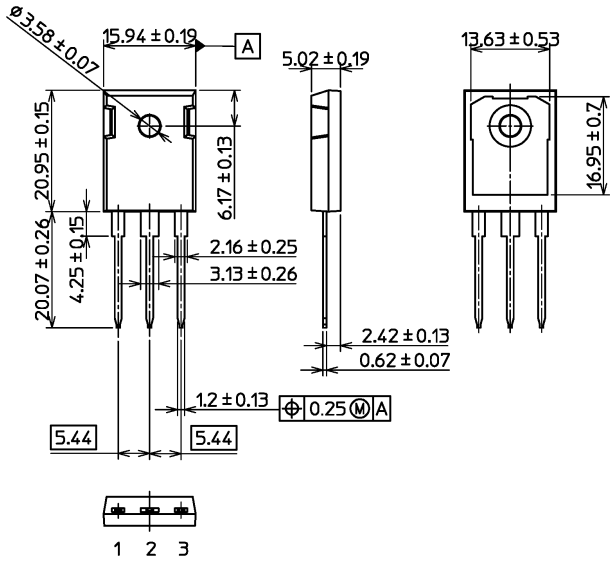
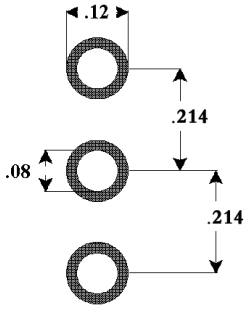


Recommended Solder Pad Layout



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