

Features

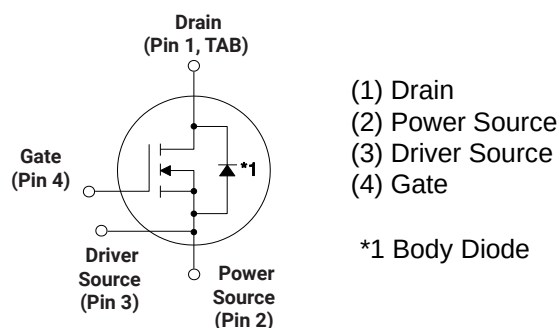
- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

Applications

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



Inner circuit



Part Number	Marking	Package	V_{DS}	I_D @ 25°C	$R_{DS(on)}$
GC3M0060065K	GC3M0060065	TO 247-4	650	37 A	60 mΩ

Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain - Source Voltage, $T_C = 25^\circ\text{C}$	650	V
V_{GS}	Gate - Source voltage (Under transient events < 100 ns)	-8/+19	V
I_D	Continuous Drain Current, $V_{GS} = 15\text{ V}$, $T_C = 25^\circ\text{C}$	37	A
	Continuous Drain Current, $V_{GS} = 15\text{ V}$, $T_C = 100^\circ\text{C}$	27	
$I_{D(pulse)}$	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	99	A
P_D	Power Dissipation, $T_C=25^\circ\text{C}$, $T_J = 175^\circ\text{C}$	150	W
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	Nm
		8.8	lbf-in

Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650			V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$
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	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$
			1.9		V	$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 175^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$
I_{GSS}	Gate-Source Leakage Current		10	250	nA	$V_{GS} = 15\text{ V}, V_{DS} = 0\text{ V}$
$R_{DS(on)}$	Drain-Source On-State Resistance	42	60	79	m Ω	$V_{GS} = 15\text{ V}, I_D = 13.2\text{ A}$
			80			$V_{GS} = 15\text{ V}, I_D = 13.2\text{ A}, T_J = 175^\circ\text{C}$
g_{fs}	Transconductance		10		S	$V_{DS} = 20\text{ V}, I_{DS} = 13.2\text{ A}$
			9			$V_{DS} = 20\text{ V}, I_{DS} = 13.2\text{ A}, T_J = 175^\circ\text{C}$
C_{iss}	Input Capacitance		1020		pF	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}$
C_{oss}	Output Capacitance		80			$f = 1\text{ MHz}$
C_{rss}	Reverse Transfer Capacitance		9			$V_{AC} = 25\text{ mV}$
$C_{o(er)}$	Effective Output Capacitance (Energy Related)		95		pF	$V_{GS} = 0\text{ V}, V_{DS} = 0\text{ V to } 400\text{ V}$
$C_{o(tr)}$	Effective Output Capacitance (Time Related)		132			
E_{oss}	C_{oss} Stored Energy		15		μJ	$V_{DS} = 600\text{ V}, 1\text{ MHz}$
E_{ON}	Turn-On Switching Energy (Body Diode)		70		μJ	$V_{DS} = 400\text{ V}, V_{GS} = -4\text{ V/15 V}, I_D = 13.2\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 135\text{ }\mu\text{H}, T_J = 175^\circ\text{C}$
E_{OFF}	Turn Off Switching Energy (Body Diode)		5			FWD = Internal Body Diode of MOSFET
E_{ON}	Turn-On Switching Energy (External SiC Diode)		67		μJ	$V_{DS} = 400\text{ V}, V_{GS} = -4\text{ V/15 V}, I_D = 13.2\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 135\text{ }\mu\text{H}, T_J = 175^\circ\text{C}$
E_{OFF}	Turn Off Switching Energy (External SiC Diode)		6			FWD = External SiC Diode
$t_{d(on)}$	Turn-On Delay Time		8		ns	$V_{DD} = 400\text{ V}, V_{GS} = -4\text{ V/15 V}$ $I_D = 13.2\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega, L = 135\text{ }\mu\text{H}$ Timing relative to V_{DS} Inductive load
t_r	Rise Time		11			
$t_{d(off)}$	Turn-Off Delay Time		17			
t_f	Fall Time		5			
$R_{G(int)}$	Internal Gate Resistance		3		Ω	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$
Q_{gs}	Gate to Source Charge		13		nC	$V_{DS} = 400\text{ V}, V_{GS} = -4\text{ V/15 V}$ $I_D = 13.2\text{ A}$ Per IEC60747-8-4 pg 21
Q_{gd}	Gate to Drain Charge		17			
Q_g	Total Gate Charge		46			

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

Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	5.1		V	$V_{GS} = -4\text{ V}, I_{SD} = 6.6\text{ A}, T_J = 25^\circ\text{C}$
		4.8		V	$V_{GS} = -4\text{ V}, I_{SD} = 6.6\text{ A}, T_J = 175^\circ\text{C}$
I_S	Continuous Diode Forward Current		23	A	$V_{GS} = -4\text{ V}, T_c = 25^\circ\text{C}$
$I_{S, pulse}$	Diode pulse Current		99	A	$V_{GS} = -4\text{ V}$, pulse width t_p limited by T_{Jmax}
t_{rr}	Reverse Recover time	11		ns	$V_{GS} = -4\text{ V}, I_{SD} = 13.2\text{ A}, V_R = 400\text{ V}$ $dif/dt = 4500\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	151		nC	
I_{rrm}	Peak Reverse Recovery Current	27		A	
t_{rr}	Reverse Recover time	16		ns	$V_{GS} = -4\text{ V}, I_{SD} = 13.2\text{ A}, V_R = 400\text{ V}$ $dif/dt = 2400\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	110		nC	
I_{rrm}	Peak Reverse Recovery Current	12		A	

Thermal Characteristics

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

Package Dimensions

Package TO-247-4L

Unit: mm

