



APSEMI

AC3M0045065K

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

Parameter	Rating	Units
V_{DS}	650	V
I_D @ 25°C	50	A
$R_{DS(on)}$	45	m Ω



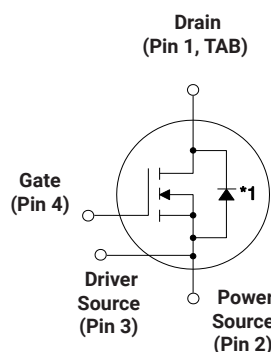
Applications

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



Inner circuit

TO-247-4
Package



- (1) Drain
- (2) Power Source
- (3) Driver Source
- (4) Gate

*1 Body Diode

Maximum Ratings

Symbol	Parameter	Value	Unit	Note
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, $V_{GS} = 15\text{ V}$, $T_C = 25^\circ\text{C}$	50	A	
	Continuous Drain Current, $V_{GS} = 15\text{ V}$, $T_C = 100^\circ\text{C}$	35		
$I_{D(pulse)}$	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	134	A	
P_D	Power Dissipation, $T_C = 25^\circ\text{C}$, $T_J = 175^\circ\text{C}$	178	W	
T_J, T_{stg}	Operating Junction and Storage Temperature	-40 to +175	$^\circ\text{C}$	
T_L	Solder Temperature, 1.6mm (0.063") from case for 10s	260	$^\circ\text{C}$	
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	Note
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	2.6	3.6	V	V _{DS} = V _{GS} , I _D = 4.84 mA	
			2.2		V	V _{DS} = V _{GS} , I _D = 4.84 mA, T _J = 175°C	
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		45	60	mΩ	V _{GS} = 15 V, I _D = 17.6 A	
			62			V _{GS} = 15 V, I _D = 17.6 A, T _J = 175°C	
g _{fs}	Transconductance		12		S	V _{DS} = 20 V, I _{DS} = 17.6 A	
			11			V _{DS} = 20 V, I _{DS} = 17.6 A, T _J = 175°C	
C _{iss}	Input Capacitance		1520		pF	V _{GS} = 0 V, V _{DS} = 0V to 600 V	
C _{oss}	Output Capacitance		105			F = 1 Mhz	
C _{rss}	Reverse Transfer Capacitance		8			V _{AC} = 25 mV	
C _{o(er)}	Effective Output Capacitance (Energy Related)		126			V _{GS} = 0 V, V _{DS} = 0V to 400 V	
C _{o(tr)}	Effective Output Capacitance (Time Related)		178				
E _{oss}	C _{oss} Stored Energy		20		μJ	V _{DS} = 600 V, F = 1 Mhz	
E _{ON}	Turn-On Switching Energy (Body Diode)		57		μJ	V _{DS} = 400 V, V _{GS} = -4 V/15 V, I _D = 17.6 A, R _{G(ext)} = 2.5 Ω, L= 99 μH, T _J = 175°C	
E _{OFF}	Turn Off Switching Energy (Body Diode)		14			FWD = Internal Body Diode of MOSFET	
E _{ON}	Turn-On Switching Energy (External Diode)		44		μJ	V _{DS} = 400 V, V _{GS} = -4 V/15 V, I _D = 17.6 A, R _{G(ext)} = 2.5 Ω, L= 99 μH, T _J = 175°C	
E _{OFF}	Turn Off Switching Energy (External Diode)		14			FWD = External SiC DIODE	
t _{d(on)}	Turn-On Delay Time		9		ns	V _{DD} = 400 V, V _{GS} = -4 V/15 V I _D = 17.6 A, R _{G(ext)} = 2.5 Ω, L= 99 μH Timing relative to V _{DS} Inductive load	
t _r	Rise Time		11				
t _{d(off)}	Turn-Off Delay Time		18				
t _f	Fall Time		6				
R _{G(int)}	Internal Gate Resistance		3		Ω	f = 1 MHz, V _{AC} = 25 mV	
Q _{gs}	Gate to Source Charge		21		nC	V _{DS} = 400 V, V _{GS} = -4 V/15 V I _D = 17.6 A Per IEC60747-8-4 pg 21	
Q _{gd}	Gate to Drain Charge		18				
Q _g	Total Gate Charge		61				

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	Note
V_{SD}	Diode Forward Voltage	4.8		V	$V_{GS} = -4\text{ V}, I_{SD} = 8.8\text{ A}, T_J = 25^\circ\text{C}$	
		4.2		V	$V_{GS} = -4\text{ V}, I_{SD} = 8.8\text{ A}, T_J = 175^\circ\text{C}$	
I_S	Continuous Diode Forward Current		29	A	$V_{GS} = -4\text{ V}, T_c = 25^\circ\text{C}$	
$I_{S, \text{pulse}}$	Diode pulse Current		132	A	$V_{GS} = -4\text{ V}$, pulse width t_p limited by T_{Jmax}	
t_{rr}	Reverse Recover time	13		ns	$V_{GS} = -4\text{ V}, I_{SD} = 17.6\text{ A}, V_R = 400\text{ V}$ $dif/dt = 5215\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	245		nC		
I_{rrm}	Peak Reverse Recovery Current	36		A		
t_{rr}	Reverse Recover time	18		ns	$V_{GS} = -4\text{ V}, I_{SD} = 17.6\text{ A}, V_R = 400\text{ V}$ $dif/dt = 1775\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	173		nC		
I_{rrm}	Peak Reverse Recovery Current	16		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.85	$^\circ\text{C}/\text{W}$		
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	40			

Package Dimensions

Unit: mm

