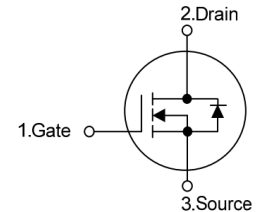
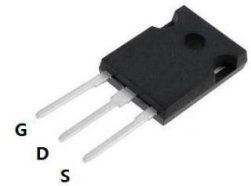


N-CHANNEL SiC POWER MOSFET

Features

- $R_{DS(on)}=60m\Omega$ (Typ.) @ $V_{GS}=15V, I_D=13.2A$
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast intrinsic diode with low reverse recovery



Applications

- Solar inverters
- DC/DC converters
- Motor drives
- Switch Mode Power Supplies

Key Performance and Package Parameters

Order codes	V_{DS}	I_D	$R_{DS(ON)}$, Typ	T_{vjmax}	Marking	Package
XC060M065A1S3-A	650V	29A	60m Ω	175 $^{\circ}C$	C60M65A1A	TO247-3

Absolute Maximum Ratings ($T_c= 25^{\circ}C$ unless otherwise specified.)

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
V_{GSmax}	Absolute maximum Gate-Source Voltage	-8/+19	V
I_D	Continuous Drain Current ($T_C=25^{\circ}C$)	29	A
	Continuous Drain Current ($T_C=100^{\circ}C$)	20	A
$I_{DM(pulse)}$	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	99	A
P_D	Maximum Power Dissipation ($T_C=25^{\circ}C$)	150	W
T_J	Operating Junction Temperature Range	-40 to 175	$^{\circ}C$
T_{STG}	Storage Temperature Range	-40 to 175	$^{\circ}C$

Thermal Data

Symbol	Parameter	Conditions	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Steady State)	TO247	0.99	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	TO247	40	$^{\circ}C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_{DS} = 100\mu A$	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	---	1	50	μA
I_{GSS}	Gate Leakage Current, Forward	$V_{GS} = 15V, V_{DS} = 0V$	---	10	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 5mA$	1.8	2.3	3.6	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS} = 15V, I_{DS} = 13.2A$	42	60	79	m Ω
Q_g	Total Gate Charge	$V_{DS} = 400V$	---	46	---	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = -4V/15V$	---	14	---	nC
Q_{gd}	Gate-Drain Charge	$I_{DS} = 13.2A$	---	14	---	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 400V,$	---	9	---	ns
t_r	Rise Time	$V_{GS} = -4V/15V$	---	20	--	ns
$t_{d(off)}$	Turn-off Delay Time	$I_{DS} = 13.2A, R_G = 2.5\Omega$	---	17	---	ns
t_f	Fall Time		---	8	---	ns
C_{iss}	Input Capacitance	$V_{DS} = 600V$	---	1020	---	pF
C_{oss}	Output Capacitance	$V_{GS} = 0V$	---	80	---	pF
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$	---	9	---	pF
E_{ON}	Turn-On Switching Energy (Body Diode)	$V_{DS} = 400V,$ $V_{GS} = -4/15V,$	---	110	---	μJ
E_{OFF}	Turn Off Switching Energy (Body Diode)	$I_{D} = 13.2A,$ $R_G = 2.5\Omega$ $L = 135\mu H$ $T_J = 175^\circ C$ FWD = Internal Body Diode of MOSFET	---	22	---	μJ
E_{ON}	Turn-On Switching Energy (External Diode)	$V_{DS} = 400V,$ $V_{GS} = -4/15V,$	---	63	---	μJ
E_{OFF}	Turn Off Switching Energy (External Diode)	$I_{D} = 13.2A,$ $R_G = 2.5\Omega$ $L = 135\mu H$ $T_J = 175^\circ C$ FWD = External SiC DIODE	---	28	---	μJ

Reverse Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	$I_{SD}=6.6A, V_{GS}=-4V$	---	5.1	---	V
I_S	Continuous Diode Forward Current	$V_{GS}=-4V, T_C=25^\circ C$	---	---	23	A
t_{rr}	Diode Reverse Recovery Time	$V_R=400V,$	---	20	---	ns
Q_{rr}	Diode Reverse Recovery Charge	$I_{SD}=13.2A,$ $di_F/dt=1200A/s$	---	190	---	nC
I_{rrm}	Peak Reverse Recovery Current	$T_J=175^\circ C$	---	16	---	A
t_{rr}	Diode Reverse Recovery Time	$V_R=400V,$	---	29	---	ns
Q_{rr}	Diode Reverse Recovery Charge	$I_{SD}=13.2A,$ $di_F/dt=750A/s$	---	181	---	nC
I_{rrm}	Peak Reverse Recovery Current	$T_J=175^\circ C$	---	9	---	A

Typical Characteristics

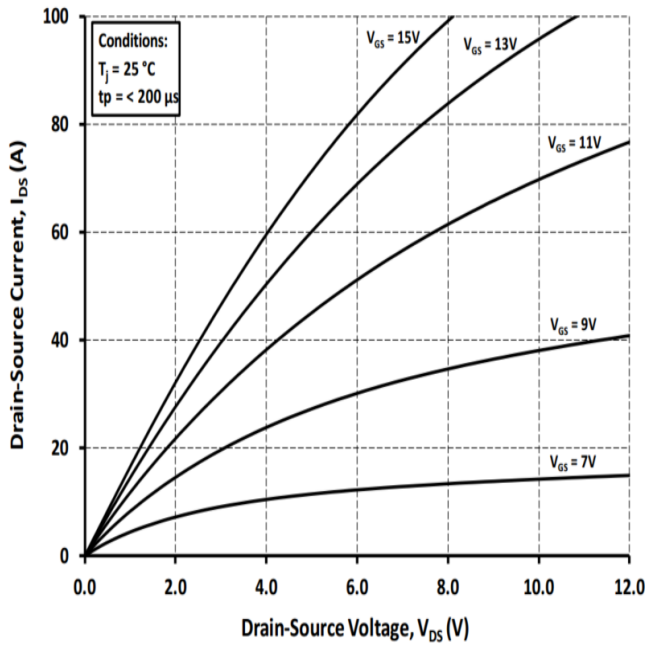


Fig.1 Output Characteristics

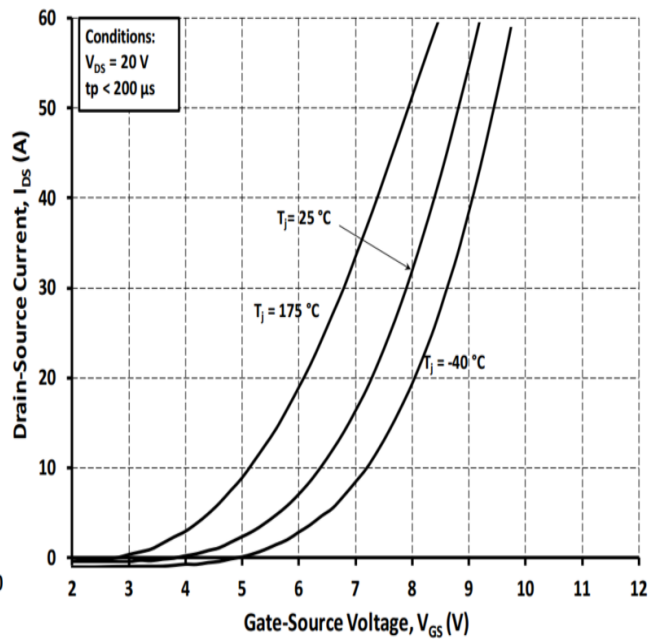


Fig.2 Output Characteristics

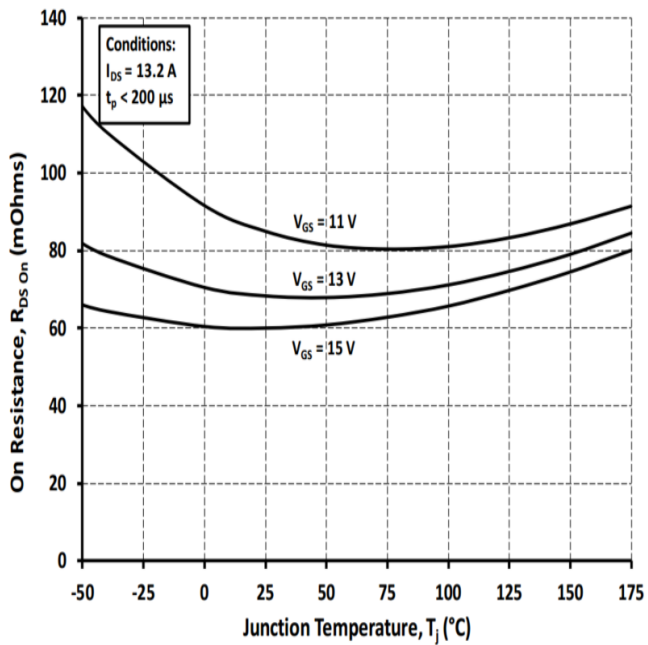


Fig.3 Drain-Source On Resistance

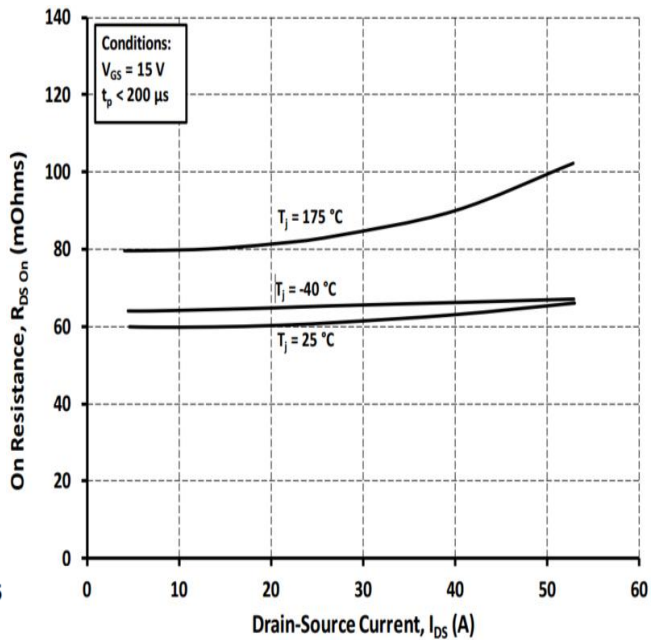


Fig.4 Drain-Source On Resistance

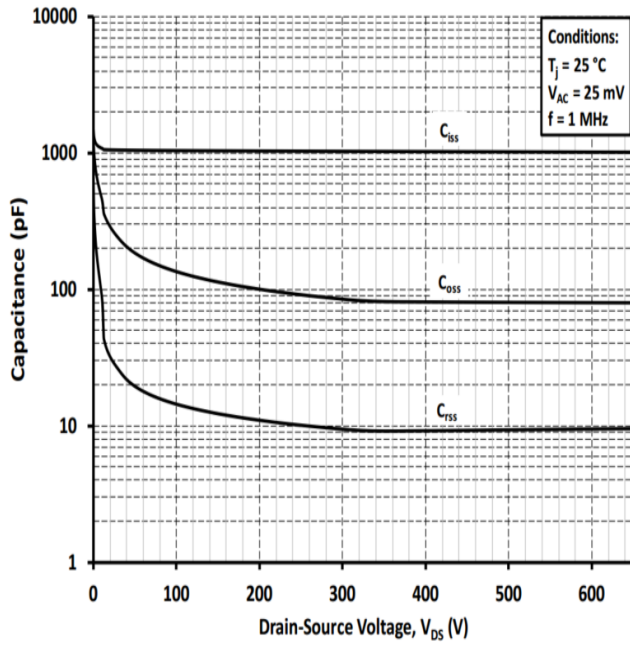


Fig.5 Capacitance

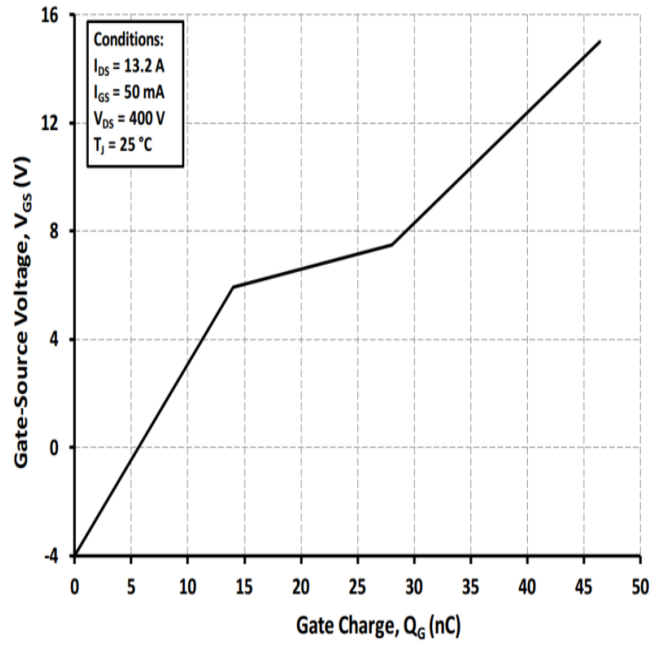
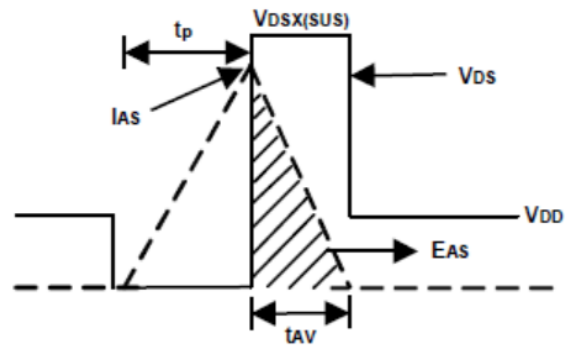
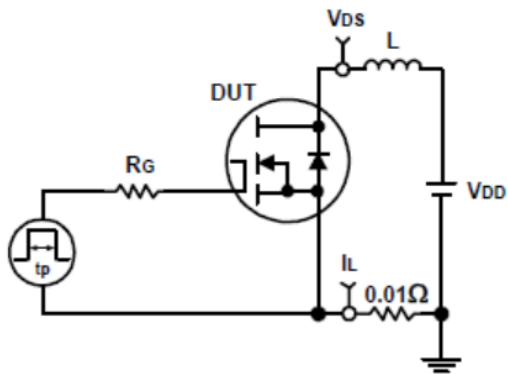
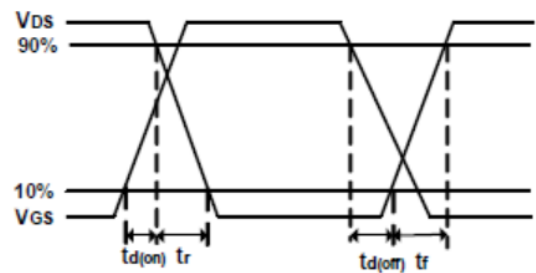
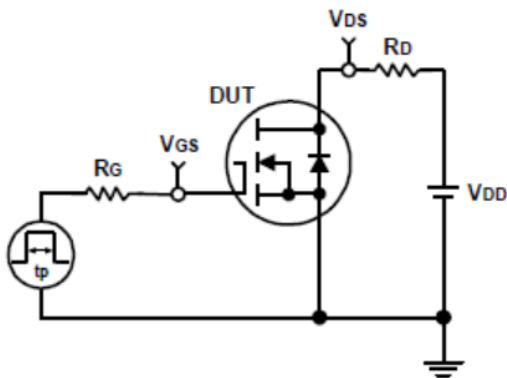


Fig.6 Gate Charge Characteristics

Avalanche Test Circuit and Waveforms

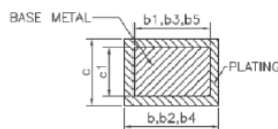
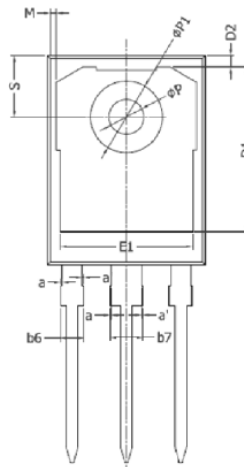
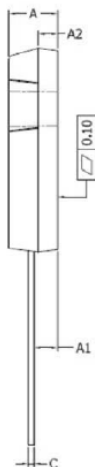
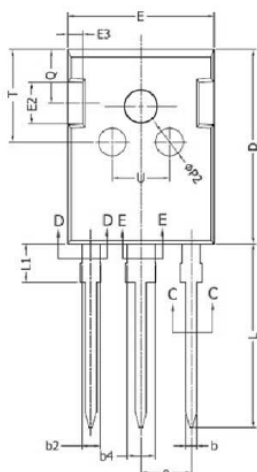


Switching Time Test Circuit and Waveforms



Package Information

TO-247



SECTION C-C, D-D & E-E

COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0	---	0.15
a'	0	---	0.15
b	1.16	---	1.26
b1	1.15	1.2	1.22
b2	1.96	---	2.06
b3	1.95	2.00	2.02
b4	2.96	---	3.06
b5	2.96	3.00	3.02
b6	---	---	2.25
b7	---	---	3.25
c	0.59	---	0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.17	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.40	4.50	4.60
E3	1.50	1.60	1.70
e	5,436 BSC		
L	19.80	19.92	20.10
L1	---	---	4.30
M	0.35	---	0.95
P	3.40	3.50	3.60
P1	7.00	---	7.40
P2	2.40	2.50	2.60
Q	5.60	---	6.00
S	6.05	6.15	6.25
T	9.80	---	10.20
U	6.00	---	6.40

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AND
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
EJECTION MARK DEPTH 0.10^{+0.15}_{-0.10}