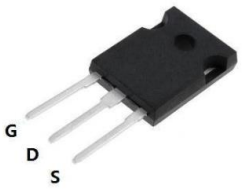
N-CHANNEL SiC POWER MOSFET

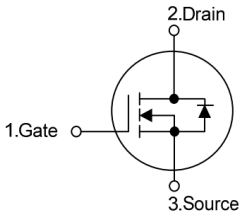
Features

- $R_{DS(on)}$=40mΩ(Typ.) @V_{GS}=20V,I_D=40A
- 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
XC040M120A1S3-A	1200V	55A	40mΩ	150˚C	C40M120A1A	TO247-3

Absolute Maximum Ratings (T_c= 25 ˚C unless otherwise specified.)

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSmax}	Absolute maximum Gate-Source Voltage	-10/+25	V
I_D	Continuous Drain Current (T_C=25 ˚C)	55	A
	Continuous Drain Current (T_C=100 ˚C)	36	A
$I_{DM(pulse)}$	Pulsed Drain Current,Pulse width t_p limted by T_{jmax}	160	A
P_D	Maximum Power Dissipation (T_C=25 ˚C)	278	W
T_J	Operating Junction Temperature Range	-55 to 150	˚C
T_{STG}	Storage Temperature Range	-55 to 150	˚C

Thermal Data

Symbol	Parameter	Conditions	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Steady State)	TO247	0.45	˚C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	TO247	40	˚C/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}= 0V, I_{DS}= 100uA	1200	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V	---	1	100	uA
I_{GSS}	Gate Leakage Current, Forward	V_{GS}=20V, V_{DS}= 0V	---	---	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_{DS}= 10mA	2.0	3.2	4.0	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=20V, I_{DS}=40A	---	40	52	mΩ
Q_g	Total Gate Charge	V_{DS}=800V	---	120	---	nC
Q_{gs}	Gate-Source Charge	V_{GS}=-5V/20V	---	34	---	nC
Q_{gd}	Gate-Drain Charge	I_{DS}=40A	---	42	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=800V	---	13	---	ns
t_r	Rise Time	V_{GS}=-5V/20V	---	61	--	ns
$t_{d(off)}$	Turn-off Delay Time	I_{DS}=40A, R_G=2.5Ω	---	25	---	ns
t_f	Fall Time		---	13	---	ns
C_{iss}	Input Capacitance	V_{DS}=1000V	---	2440	---	pF
C_{oss}	Output Capacitance	V_{GS}=0V	---	171	---	pF
C_{rss}	Reverse Transfer Capacitance	f = 1MHz	---	11	---	pF
E_{ON}	Turn-On Switching Energy (Body Diode)	V_{DS}= 800 V, V_{GS}= -5 /20 V, I_D= 40 A, R_G = 2.5 Ω L= 99 μH	---	1.7	---	mJ
E_{OFF}	Turn Off Switching Energy (Body Diode)		---	0.4	---	mJ
E_{ON}	Turn-On Switching Energy (External Diode)	V_{DS}= 800 V, V_{GS}= -5 /20 V, I_D= 40 A, R_G = 2.5 Ω L= 99 μH	---	1.3	---	mJ
E_{OFF}	Turn Off Switching Energy (External Diode)		---	0.4	---	mJ

Reverse Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	I_{SD}=20A, V_{GS}=-5V	---	4	---	V
I_S	Continuous Diode Forward Current	T_C= 25˚C	---	---	60	A
t_{rr}	Diode Reverse Recovery	V_R=800V,	---	54	---	ns

	Time	I_{SD}=40A, dI_F/dt=1000A/s				
Q_{rr}	Diode Reverse Recovery Charge		---	283	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	15	---	A

Typical Characteristics

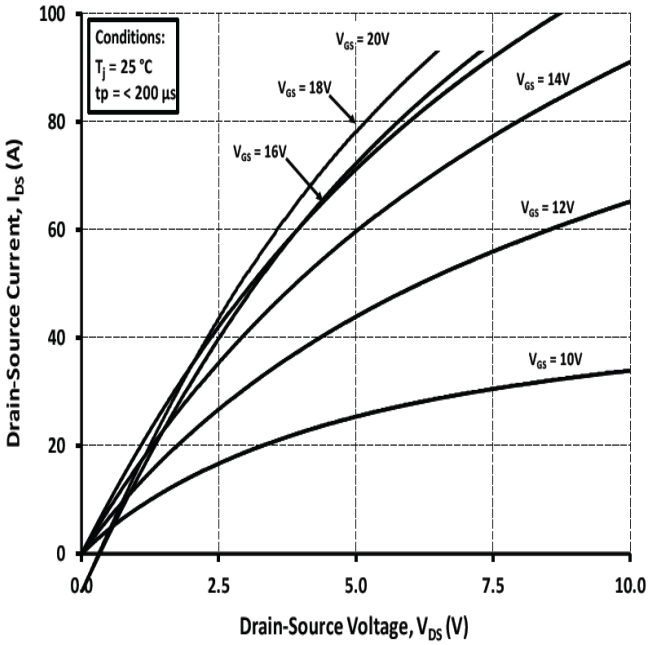


Fig.1 Output Characteristics

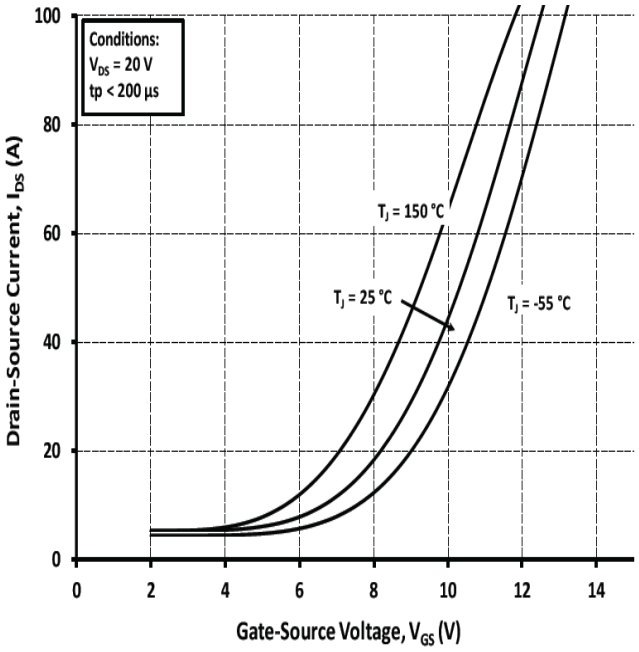


Fig.2 Output Characteristics

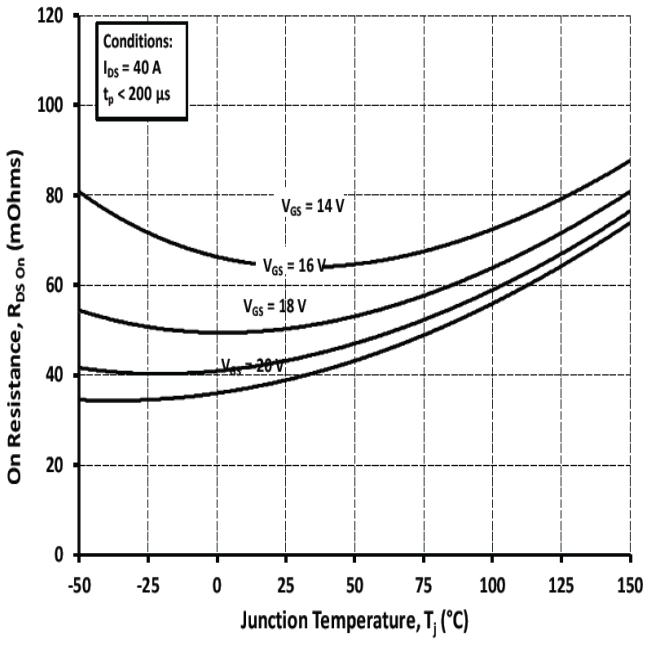


Fig.3 Drain-Source On Resistance

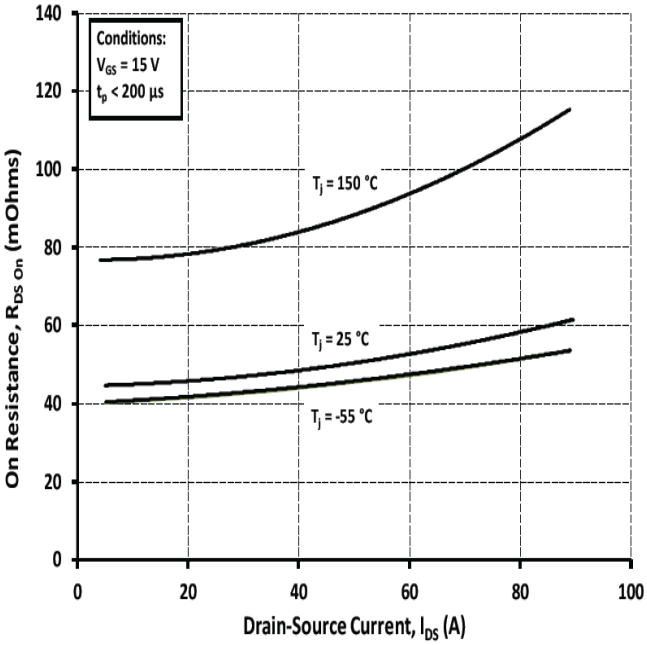


Fig.4 Drain-Source On Resistance

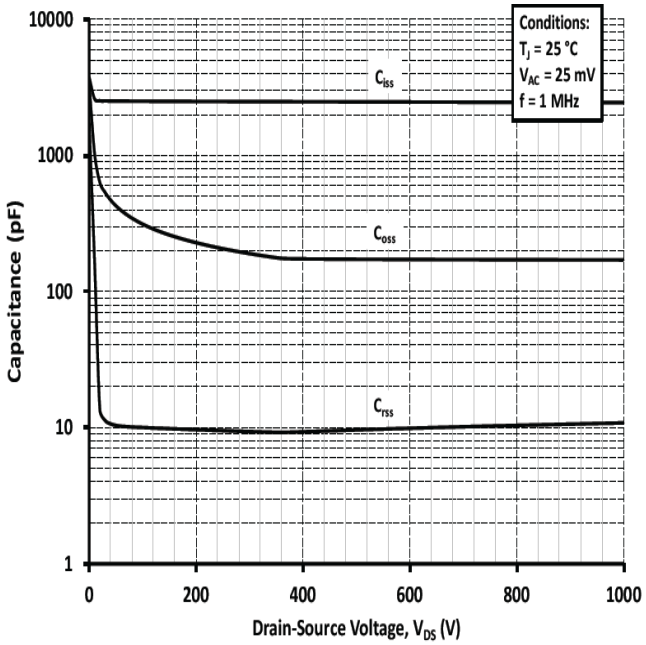


Fig.5 Capacitance

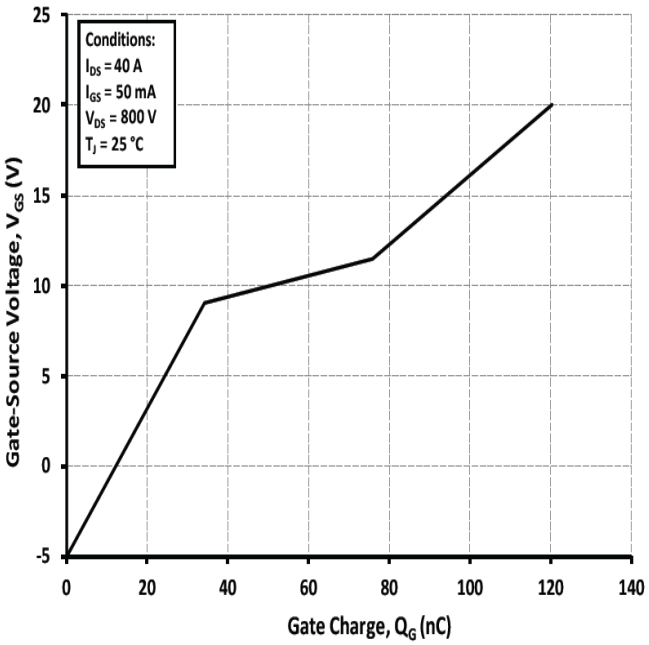
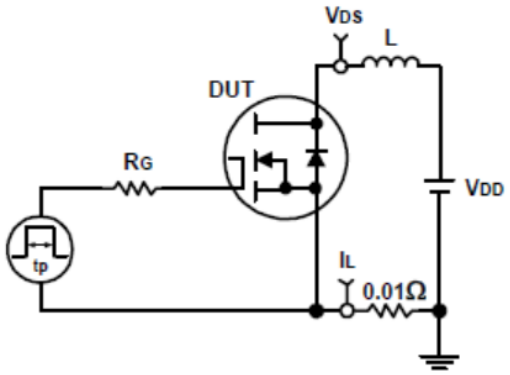
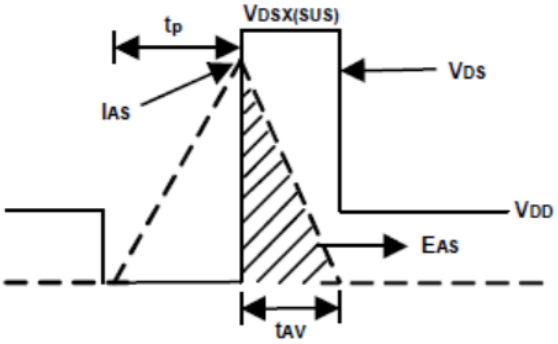


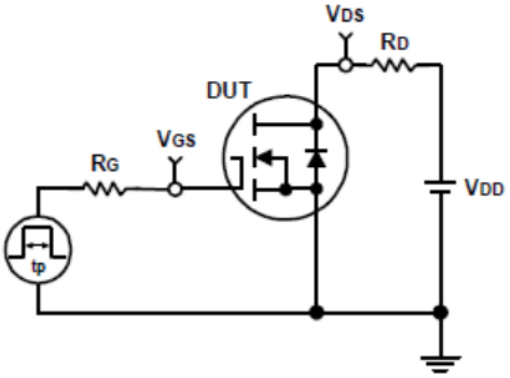
Fig.6 Gate Charge Characteristics

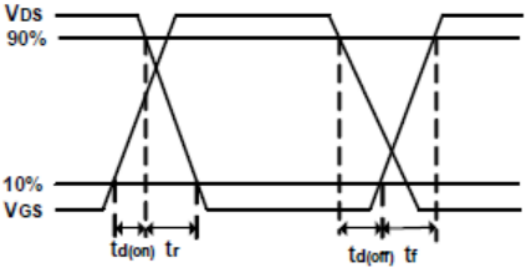
Avalanche Test Circuit and Waveforms





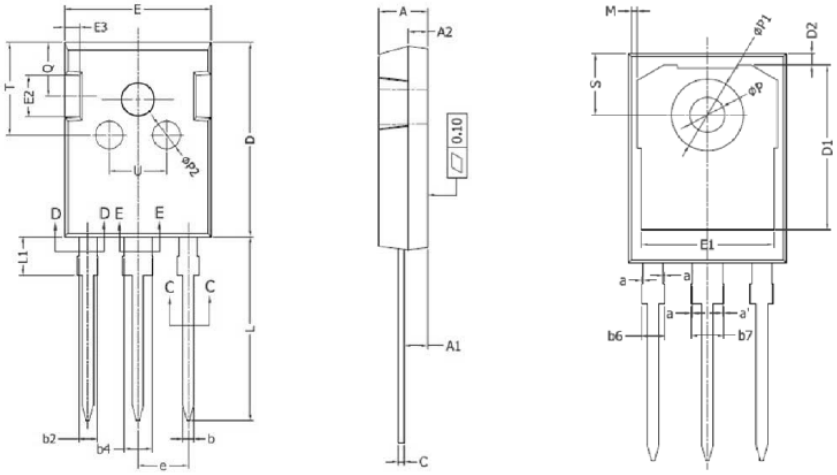
Switching Time Test Circuit and Waveforms





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 $0.10^{+0.15}_{-0.10}$