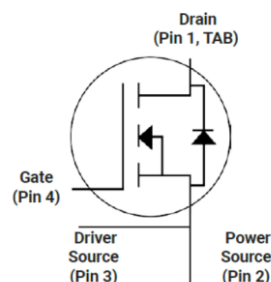
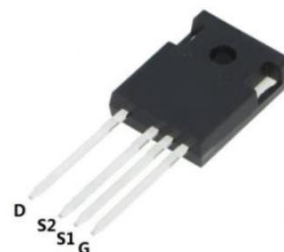


N-CHANNEL SiC POWER MOSFET

Features

- $R_{DS(on)}=40m\Omega$ (Typ.) @ $V_{GS}=15V, I_D=33.3A$
- 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
XC040M120A1S5-A	1200V	66A	40m Ω	175 $^{\circ}C$	C40M120A1A	TO247-4

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

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSmax}	Absolute maximum Gate-Source Voltage	-8/+19	V
I_D	Continuous Drain Current ($T_C=25^{\circ}C$)	66	A
	Continuous Drain Current ($T_C=100^{\circ}C$)	48	A
$I_{DM(pulse)}$	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	100	A
P_D	Maximum Power Dissipation ($T_C=25^{\circ}C$)	326	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)	TO247-4	0.46	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	TO247-4	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	$V_{GS} = 0V, I_{DS} = 100\mu A$	1200	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200V, V_{GS} = 0V$	---	1	50	μA
I_{GSS}	Gate Leakage Current, Forward	$V_{GS} = 15V, V_{DS} = 0V$	---	10	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 9.2mA$	1.8	2.7	3.6	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS} = 15V, I_{DS} = 33.3A$	---	40	53.5	m Ω
Q_g	Total Gate Charge	$V_{DS} = 800V$	---	99	---	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = -4V/15V$	---	34	---	nC
Q_{gd}	Gate-Drain Charge	$I_{DS} = 33.3A$	---	28	---	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DS} = 800V$	---	13	---	ns
t_r	Rise Time	$V_{GS} = -4V/15V$	---	17	--	ns
$t_{d(off)}$	Turn-off Delay Time	$I_{DS} = 33.3A, R_G = 2.5\Omega$	---	23	---	ns
t_f	Fall Time		---	9	---	ns
C_{iss}	Input Capacitance	$V_{DS} = 1000V$	---	2900	---	pF
C_{oss}	Output Capacitance	$V_{GS} = 0V$	---	103	---	pF
C_{rss}	Reverse Transfer Capacitance	$f = 100KHz$	---	5	---	pF
E_{ON}	Turn-On Switching Energy (Body Diode)	$V_{DS} = 800V,$ $V_{GS} = -4/15V,$	---	243	---	μJ
E_{OFF}	Turn Off Switching Energy (Body Diode)	$I_D = 33.3A,$ $R_G = 2.5\Omega$ $L = 99\mu H$ $T_J = 175^\circ C$	---	104	---	μJ
E_{ON}	Turn-On Switching Energy (External Diode)	$V_{DS} = 800V,$ $V_{GS} = -4/15V,$	---	611	---	μJ
E_{OFF}	Turn Off Switching Energy (External Diode)	$I_D = 33.3A,$ $R_G = 2.5\Omega$ $L = 99\mu H$ $T_J = 175^\circ C$	---	99	---	μJ

Reverse Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	$I_{SD}=20A, V_{GS}=-4V$	---	5.5	---	V
I_S	Continuous Diode Forward Current	$T_C=25^{\circ}C$	---	---	51	A
t_{rr}	Diode Reverse Recovery Time	$V_R=800V,$	---	17	---	ns
Q_{rr}	Diode Reverse Recovery Charge	$I_{SD}=33.3A,$ $dl_f/dt=7725A/us$	---	850	---	nC
I_{rrm}	Peak Reverse Recovery Current	$T_J=175^{\circ}C$	---	79	---	A
t_{rr}	Diode Reverse Recovery Time	$V_R=800V,$ $I_{SD}=33.3A,$	---	33	---	ns
Q_{rr}	Diode Reverse Recovery Charge	$dl_f/dt=2325A/us$ $T_J=175^{\circ}C$	---	691	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	30	---	A

Typical Characteristics

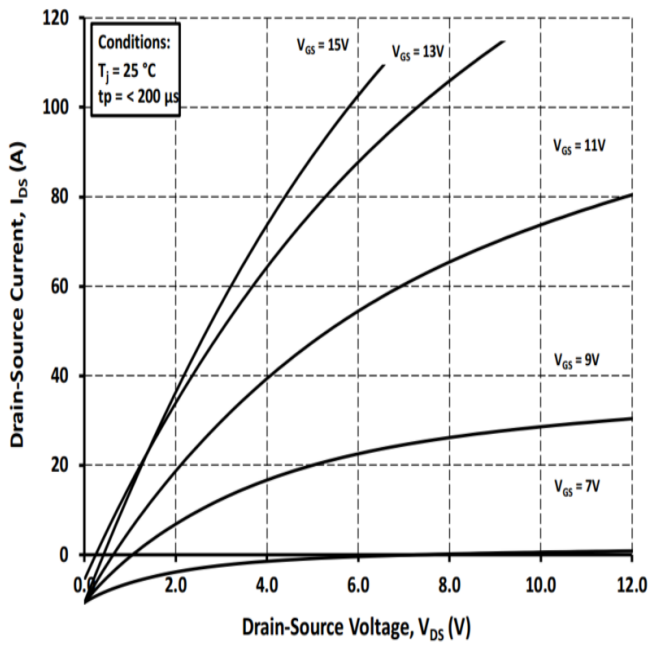


Fig. 1 Output Characteristics

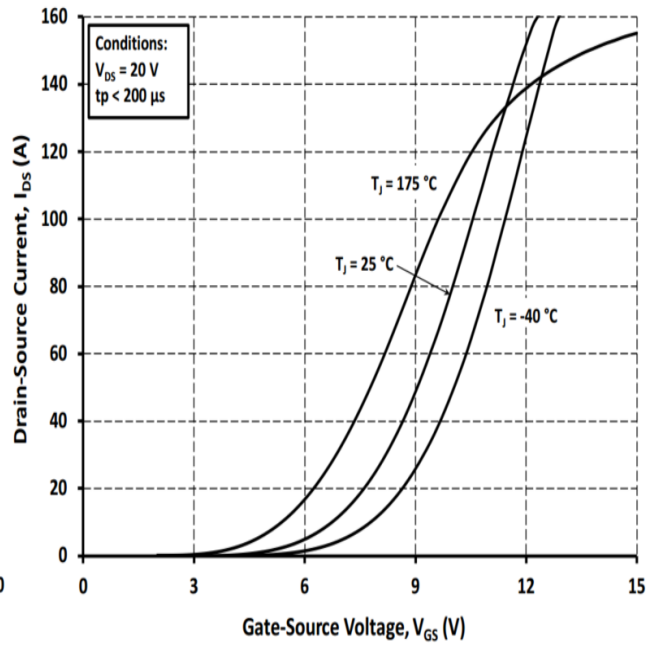


Fig.2 Transfer Characteristic for Various Junction Temperatures

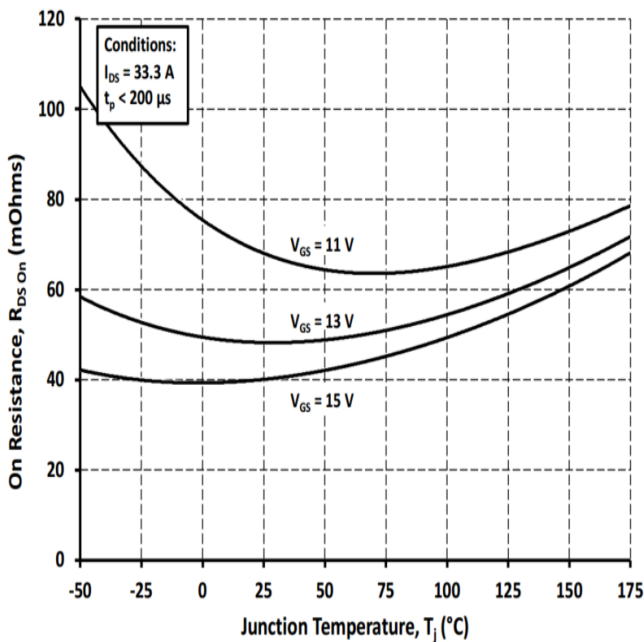


Fig.3 Drain-Source On Resistance

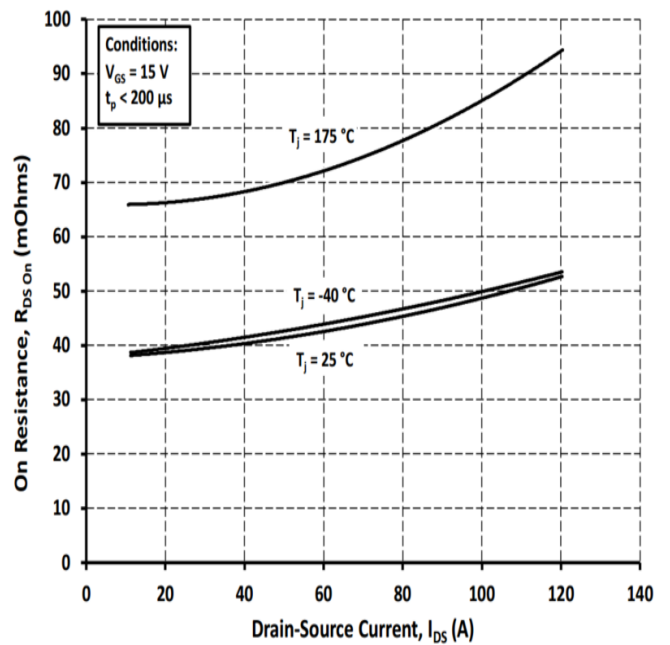


Fig.4 Drain-Source On Resistance

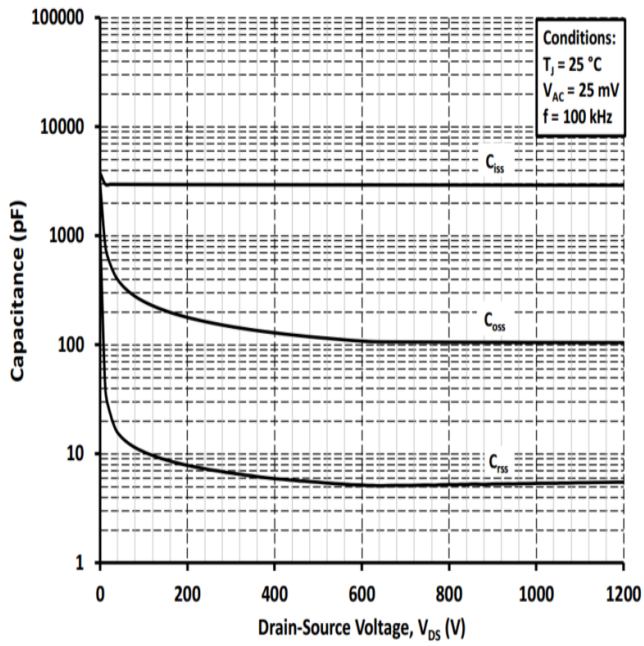


Fig.5 Capacitance

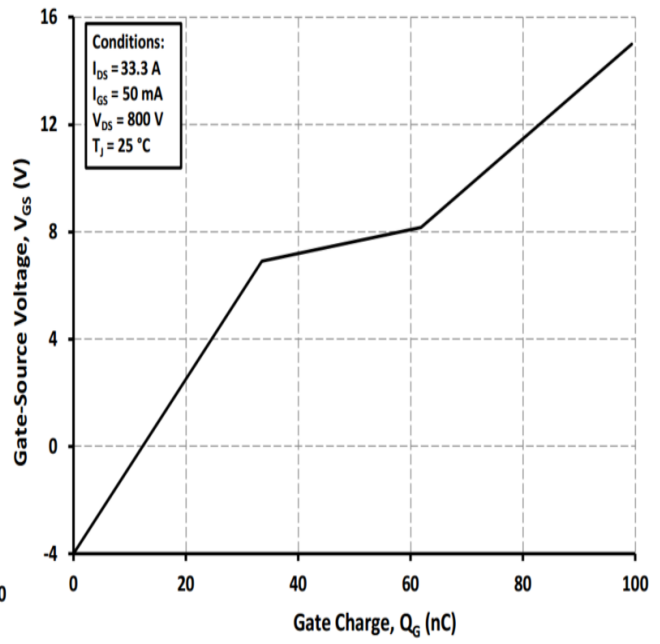
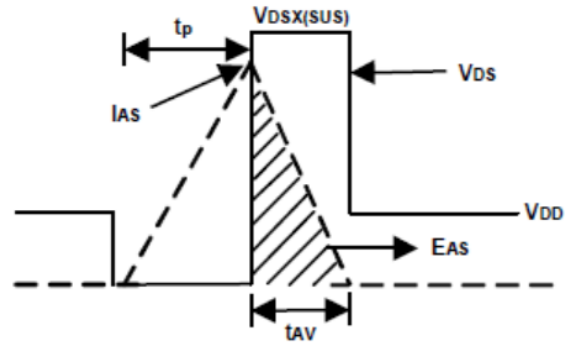
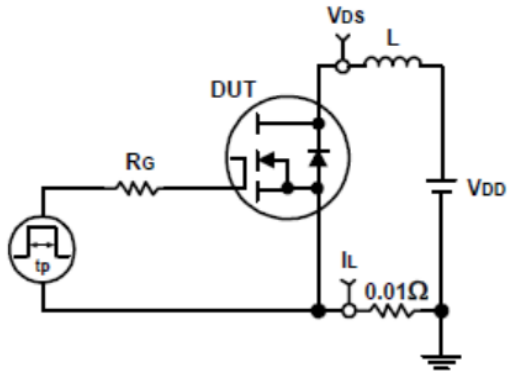
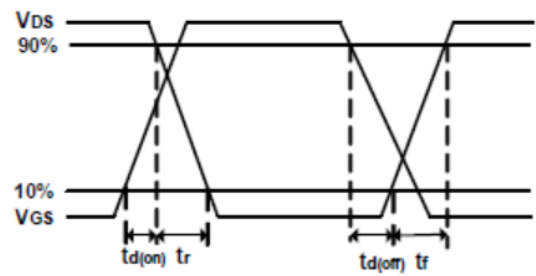
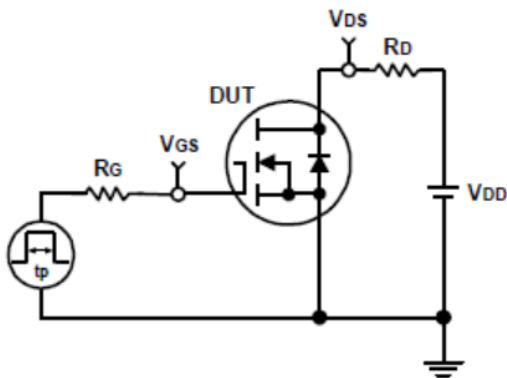


Fig.6 Gate Charge Characteristics

Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



SYM	MILLIMETERS		SYM	MILLIMETERS	
	MIN	MAX		MIN	MAX
A	4.83	5.21	E1	13.10	14.15
A1	2.29	2.54	E2	3.68	5.10
A2	1.91	2.16	E3	1.00	1.90
b'	1.07	1.28	E4	12.38	13.43
b	1.07	1.33	e	2.54 BSC	
b1	2.39	2.94	e1	5.08 BSC	
b2	2.39	2.84	N	4	
b3	1.07	1.60	L	17.31	17.82
b4	1.07	1.50	L1	3.97	4.37
b5	2.39	2.69	L2	2.35	2.65
b6	2.39	2.64	øP	3.51	3.65
c'	0.55	0.65	Q	5.49	6.00
c	0.55	0.68	S	6.04	6.30
D	23.30	23.60	T	17.5° REF.	
D1	16.25	17.65	W	3.5 ° REF.	
D2	0.95	1.25	X	4° REF.	
E	15.75	16.13			

Recommended Solder Pad Layout

