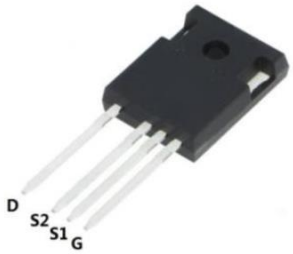
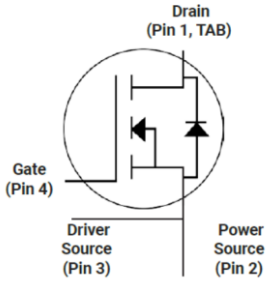
N-CHANNEL SiC POWER MOSFET

Features

- $R_{DS(on)}$=15mΩ(Typ.) @V_{GS}=15V,I_D=55.8A
- 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
XC015M065A1S5-A	650V	120A	15mΩ	175˚C	C15M65A1A	TO247-4

Absolute Maximum Ratings (T_c= 25 ˚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 ˚C)	120	A
	Continuous Drain Current (T_C=100 ˚C)	96	A
$I_{DM(pulse)}$	Pulsed Drain Current,Pulse width t_p limted by T_{jmax}	418	A
P_D	Maximum Power Dissipation (T_C=25 ˚C)	416	W
T_J	Operating Junction Temperature Range	-40 to 175	˚C
T_{STG}	Storage Temperature Range	-40 to 175	˚C

Thermal Data

Symbol	Parameter	Conditions	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Steady State)	TO247-4	0.35	˚C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	TO247-4	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	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V	---	1	50	uA
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}= 15.5mA	1.8	2.3	3.6	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=15V, I_{DS}=55.8A	10.5	15	21	mΩ
Q_g	Total Gate Charge	V_{DS}=400V	---	188	---	nC
Q_{gs}	Gate-Source Charge	V_{GS}=-4V/15V	---	54	---	nC
Q_{gd}	Gate-Drain Charge	I_{DS}=55.8A	---	62	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=400V,	---	22	---	ns
t_r	Rise Time	V_{GS}=-4V/15V	---	125	--	ns
$t_{d(off)}$	Turn-off Delay Time	I_{DS}=55.8A, R_G=5Ω	---	58	---	ns
t_f	Fall Time		---	25	---	ns
C_{iss}	Input Capacitance	V_{DS}=400V	---	5011	---	pF
C_{oss}	Output Capacitance	V_{GS}=0V	---	289	---	pF
C_{rss}	Reverse Transfer Capacitance	f = 100KHz	---	31	---	pF
E_{ON}	Turn-On Switching Energy (Body Diode)	V_{DS}= 400 V, V_{GS}= -4 /15 V, I_D= 55.8 A, R_G = 5 Ω L= 57.6 µH T_J= 175ºC FWD = Internal Body Diode of MOSFET	---	1500	---	uJ
E_{OFF}	Turn Off Switching Energy (Body Diode)		---	700	---	uJ
E_{ON}	Turn-On Switching Energy (External Diode)	V_{DS}= 400 V, V_{GS}= -4 /15 V, I_D= 55.8 A, R_G = 5 Ω L= 57.6 µH T_J= 175ºC FWD = External SiC DIODE	---	1200	---	uJ
E_{OFF}	Turn Off Switching Energy (External Diode)		---	1000	---	uJ

Reverse Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	I_{SD}=27.9A, V_{GS}=-4V	---	4.7	---	V
I_S	Continuous Diode Forward Current	V_{GS}=-4V,T_C= 25˚C	---	---	79	A
t_{rr}	Diode Reverse Recovery Time	V_R=400V, I_{SD}=55.8A, dI_F/dt=1500A/s	---	85	---	ns
Q_{rr}	Diode Reverse Recovery Charge		---	667	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	17	---	A
t_{rr}	Diode Reverse Recovery Time	V_R=400V, I_{SD}=55.8A, dI_F/dt=1000A/s	---	74	---	ns
Q_{rr}	Diode Reverse Recovery Charge		---	562	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	14	---	A

Typical Characteristics

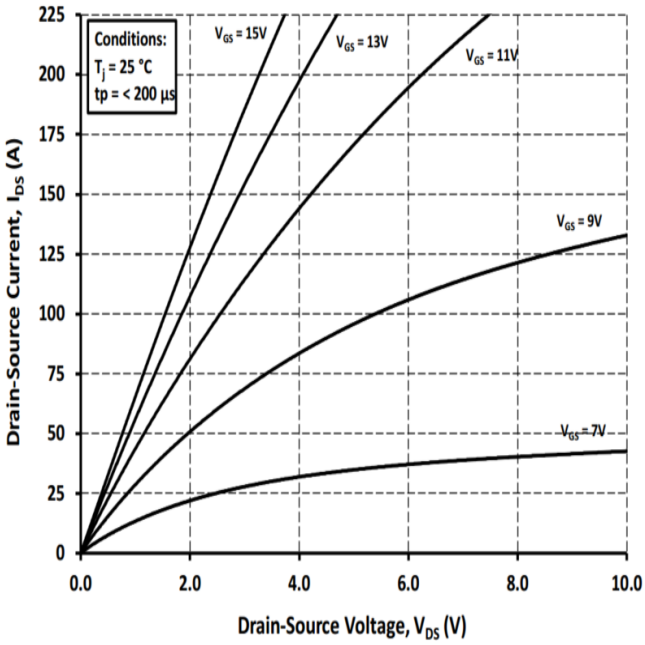


Fig.1 Output Characteristics

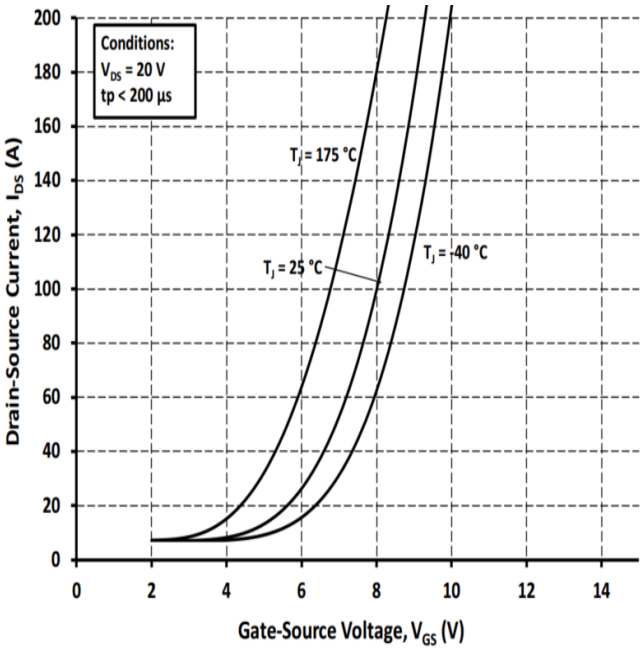


Fig.2 Output Characteristics

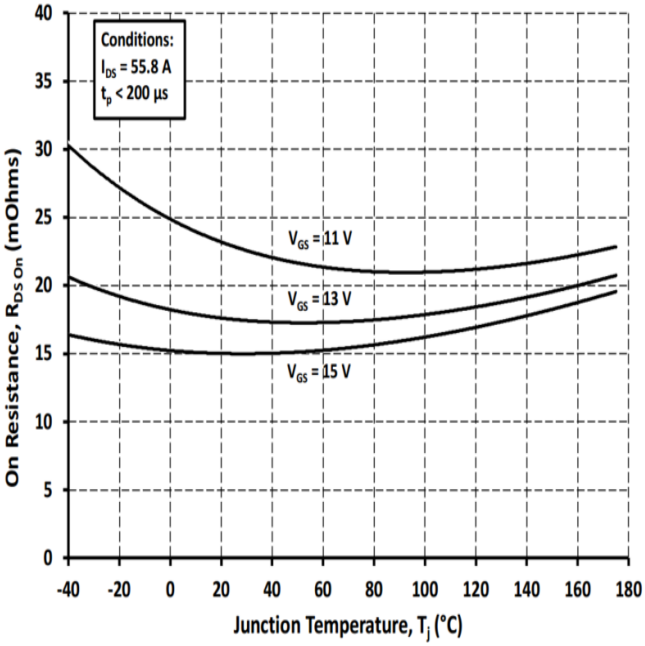


Fig.3 Drain-Source On Resistance

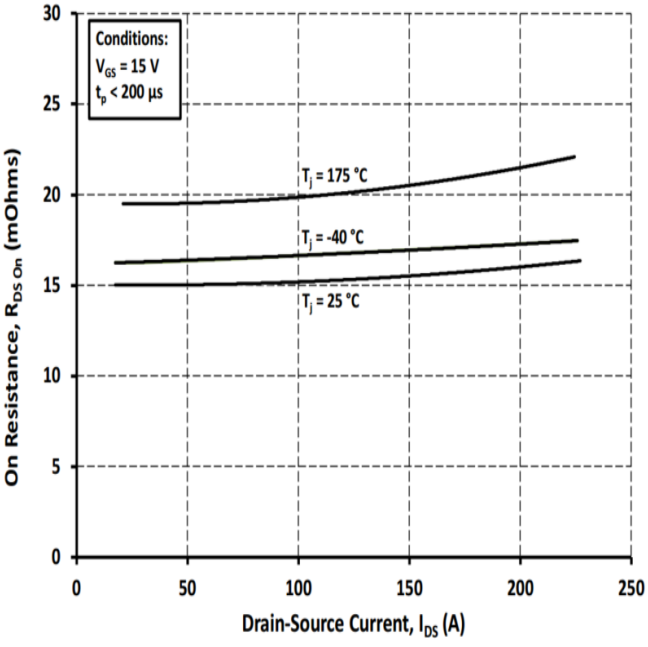


Fig.4 Drain-Source On Resistance

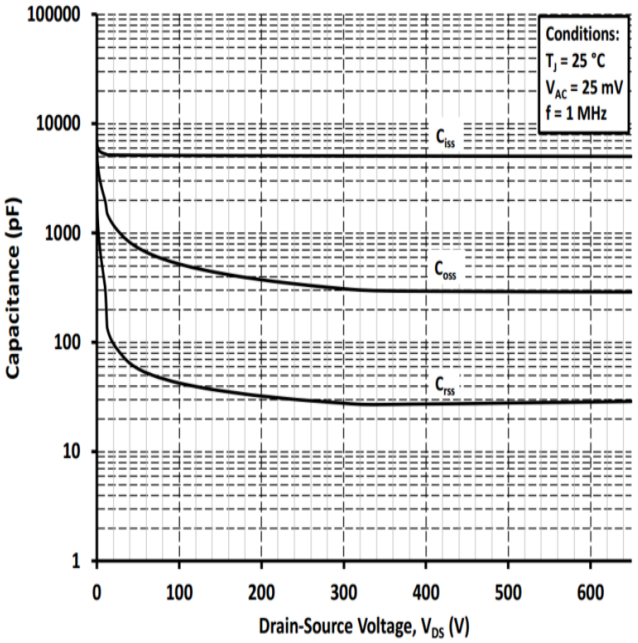


Fig.5 Capacitance

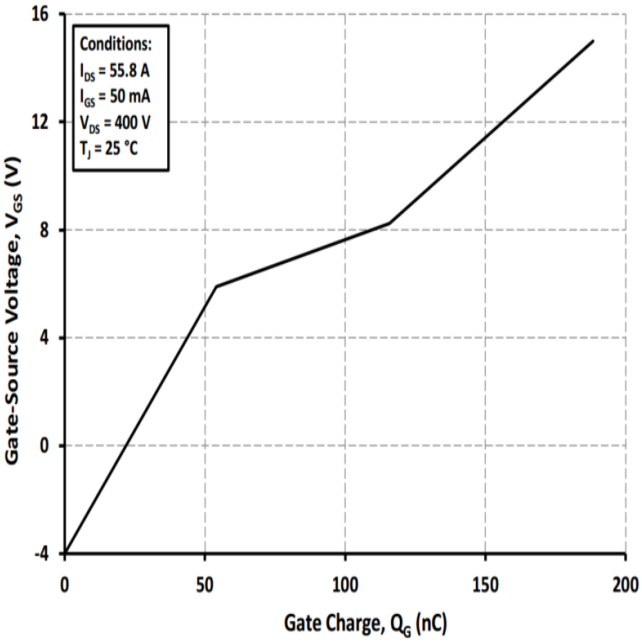
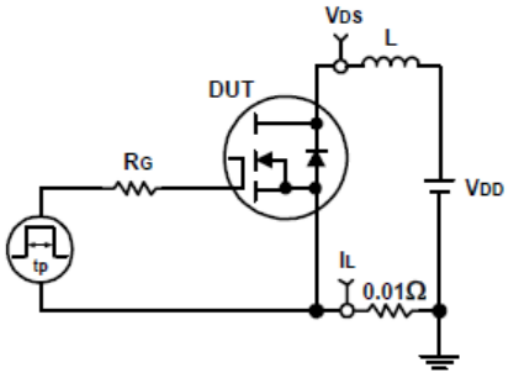
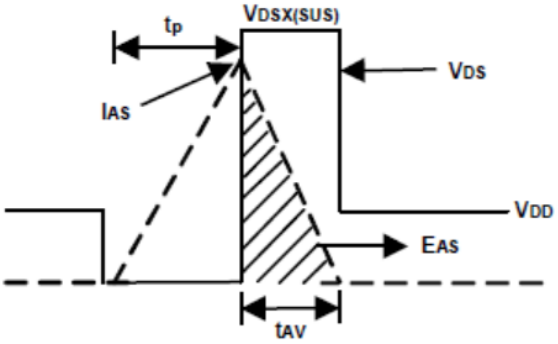


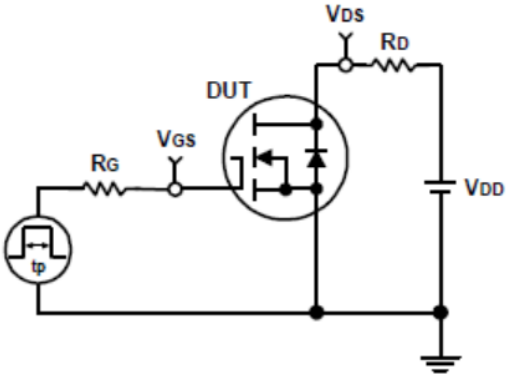
Fig.6 Gate Charge Characteristics

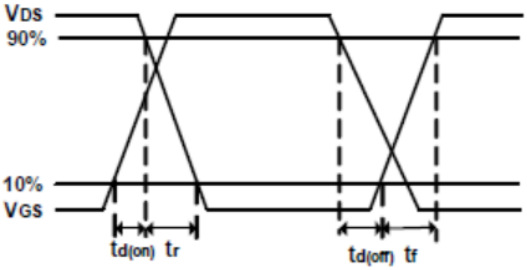
Avalanche Test Circuit and Waveforms





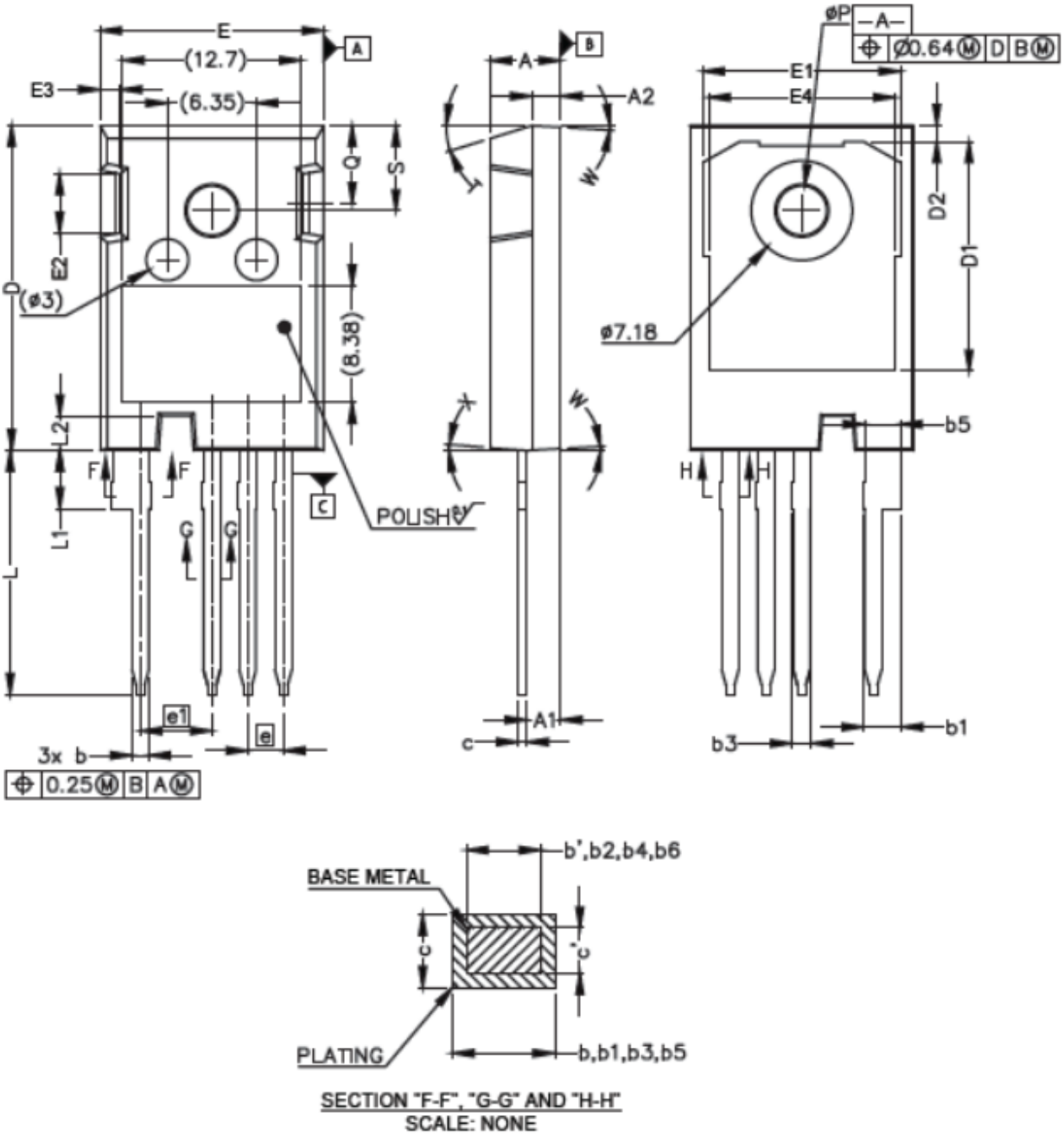
Switching Time Test Circuit and Waveforms





Package Information

TO-247-4



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