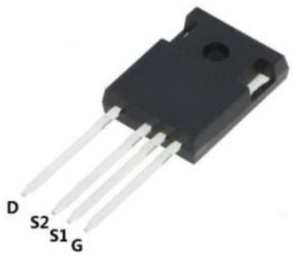
N-CHANNEL SiC POWER MOSFET

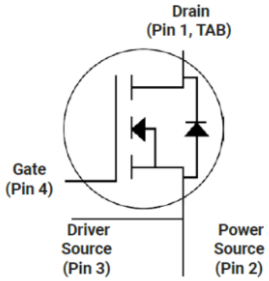
Features

- $R_{DS(on)}$=80mΩ(Typ.) @V_{GS}=15V,I_D=20A
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode With Low Reverse Recovery



Applications

- Solar inverters
- Higher Voltage DC/DC converters
- Motor drives
- Load Switch



Key Performance and Package Parameters

Order codes	V_{DS}	I_D	$R_{DS(ON)}$, Typ	T_{vjmax}	Marking	Package
XC080M120A1S5-B	1200V	32A	80mΩ	175˚C	C80M120A1B	TO247-4

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	-8/+19	V
V_{GSop}	Recommended operational Gate-Source Voltage	-4/+15	V
I_D	Continuous Drain Current (T_C=25 ˚C)	32	A
	Continuous Drain Current (T_C=100 ˚C)	23	A
I_{DM}	Pulsed Drain Current	80	A
P_D	Maximum Power Dissipation (T_C=25 ˚C)	136	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	1.1	˚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	1200	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, 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}= 5mA	1.8	2.5	3.6	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=15V, I_{DS}=20A	---	80	90	mΩ
Q_g	Total Gate Charge	V_{DS}=800V V_{GS}=-4V/15V I_{DS}=20A	---	53	---	nC
Q_{gs}	Gate-Source Charge		---	18	---	nC
Q_{gd}	Gate-Drain Charge		---	17	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=800V, V_{GS}=-4V/15V I_D=20A, R_G=0Ω	---	30	---	ns
t_r	Rise Time		---	14	--	ns
$t_{d(off)}$	Turn-off Delay Time		---	38	---	ns
t_f	Fall Time		---	10	---	ns
C_{iss}	Input Capacitance	V_{DS}=1000V V_{GS}=0V f = 1MHz V_{AC}=25mV	---	1390	---	pF
C_{oss}	Output Capacitance		---	58	---	pF
C_{rss}	Reverse Transfer Capacitance		---	2	---	pF
E_{oss}	C_{oss} Stored Energy		---	33	---	uJ
E_{ON}	Turn-On Switching Energy(Body Diode FWD)	V_{DS}=800V, V_{GS}=-4V/+15V, I_D=20A,R_G=0Ω, L=156uH,Tj=150℃	---	270	---	uJ
E_{OFF}	Turn-Off Switching Energy(Body Diode FWD)		---	77	---	uJ

Reverse Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	I_{SD}=10A, V_{GS}=-4V,Tj=25℃	---	4.5	---	V
		I_{SD}=10A, V_{GS}=-4V,Tj=175℃	---	4.0	---	V
I_S	Continuous Diode Forward Current	V_{GS}=-4V,Tj=25℃	---	---	26	A
$I_{S,pulse}$	Diode Pulse Current	V_{GS}=-4V,Pulse width t_p limited by T_{jmax}	---	80	---	A
t_{rr}	Diode Reverse Recovery Time	V_{GS}=-4V, I_{SD}=20A V_R=800V, T_J=150℃, dif/dt=3600A/us	---	20	---	ns
Q_{rr}	Diode Reverse Recovery Charge		---	254	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	18	---	A

Typical Characteristics

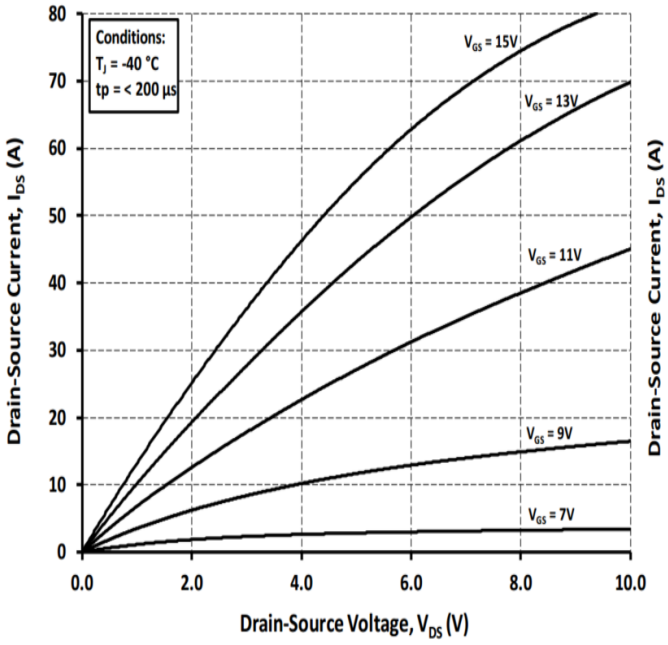


Fig.1 Output Characteristics T_j=-40℃

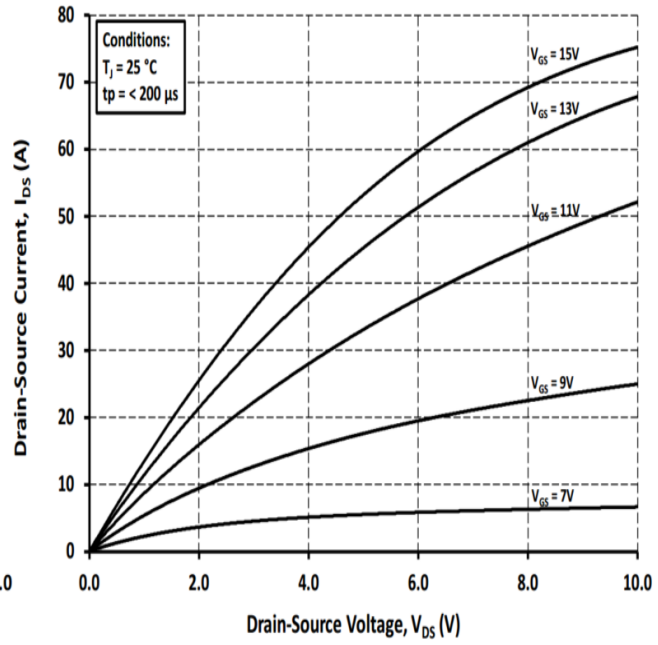


Fig.2 Output Characteristics T_j=25℃

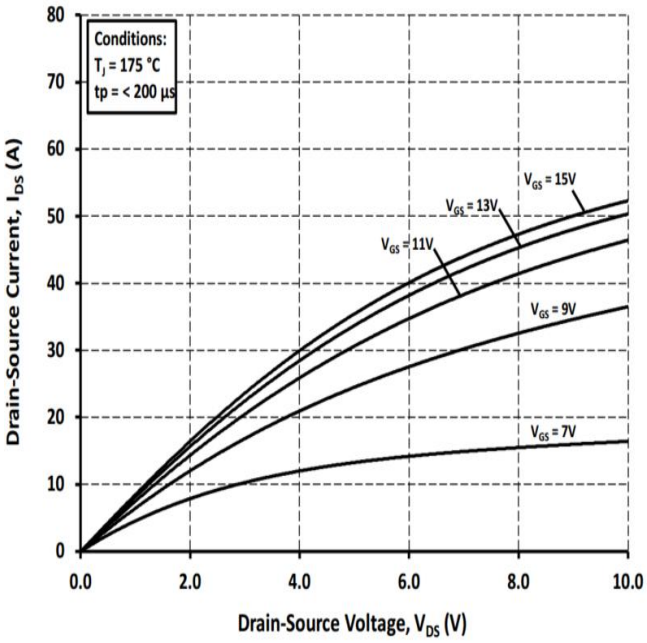


Fig.3 Output Characteristics T_j=175℃

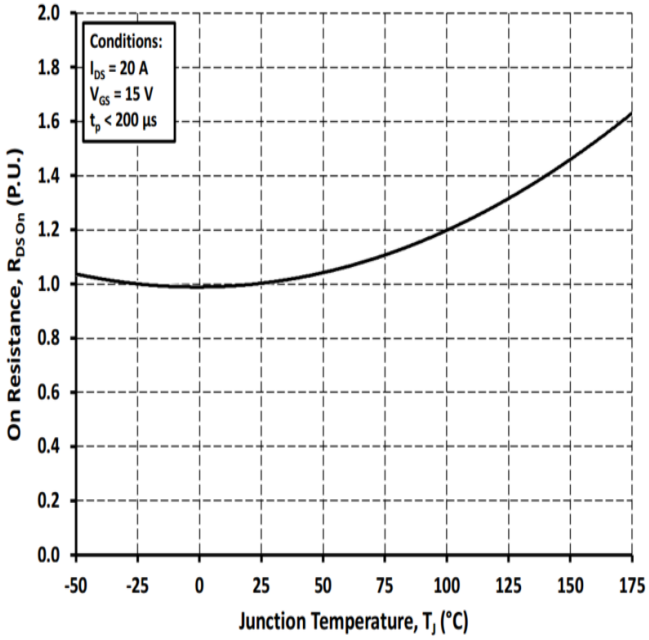


Fig.4 Normalized On Resistance vs. Temperatures

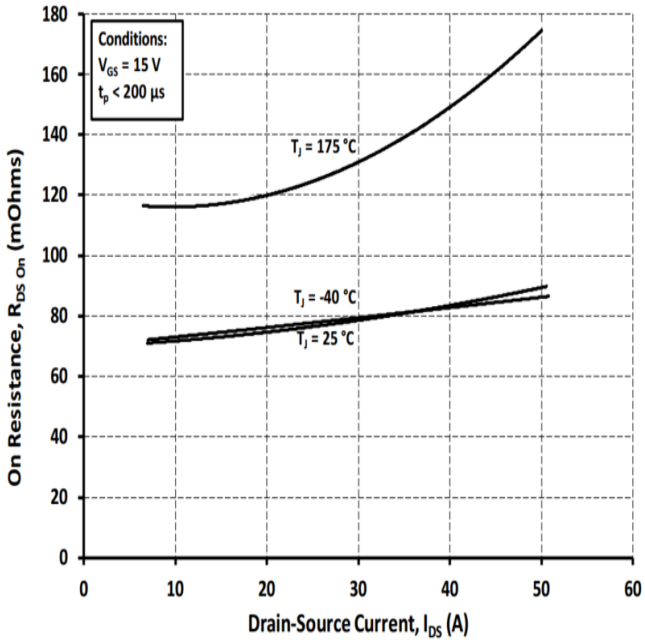


Fig.5 On-Resistance vs. Drain Current
For Various Temperatures

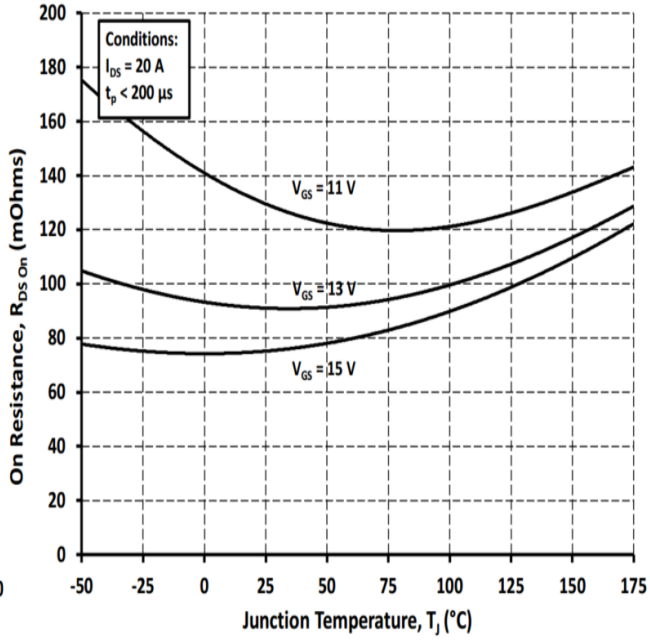


Fig.6 On-Resistance vs. Temperature
For Various Gate Voltage

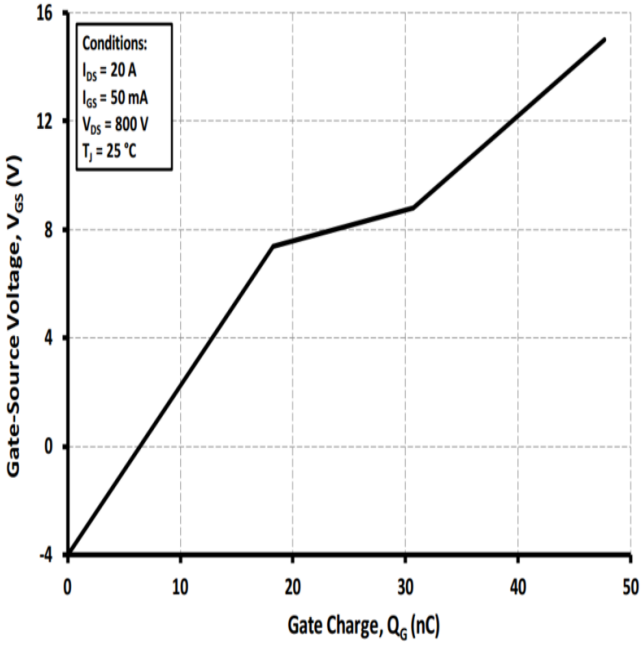


Fig.7 Gate Charge Characteritics
Junction Tmperatures

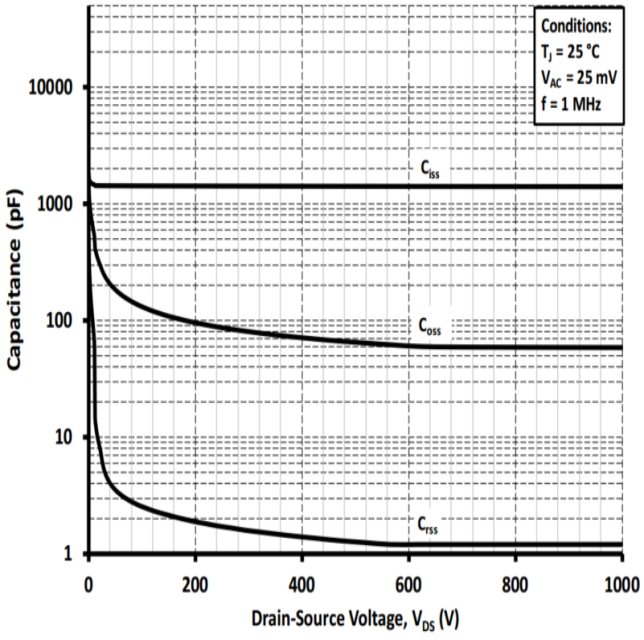


Fig.8 Capacitances

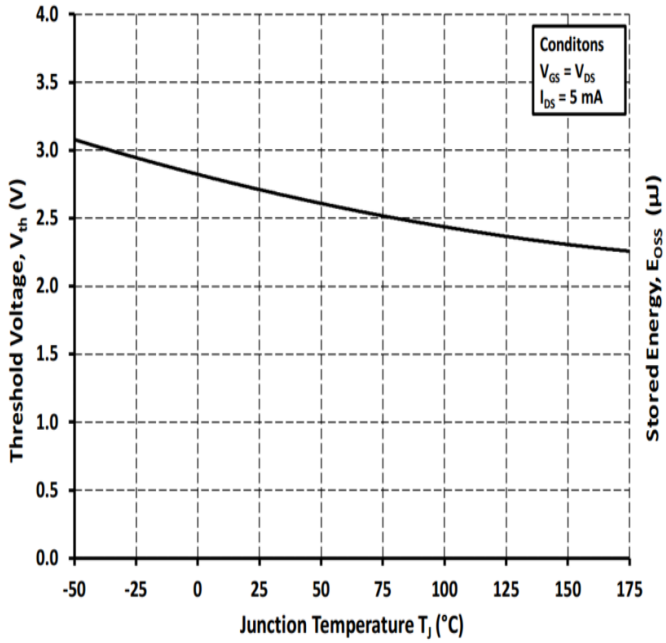


Fig.9 Threshold Voltage vs. Temperature

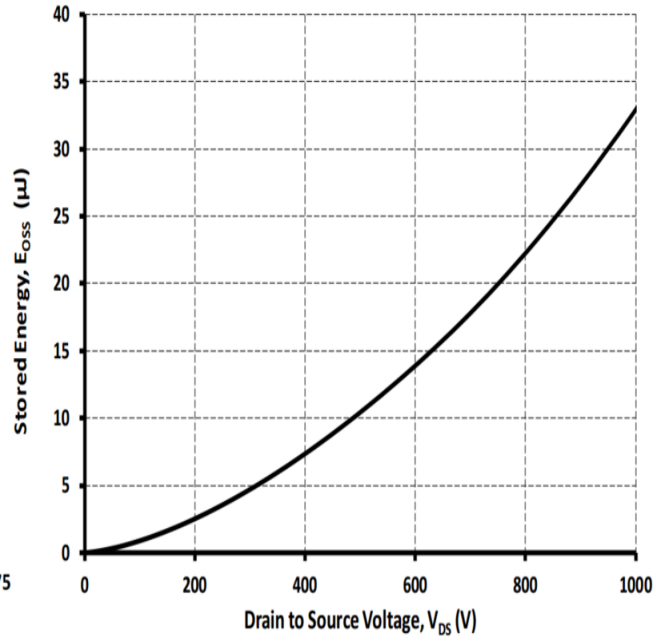


Fig.10 Output Capacitor Stored Energy

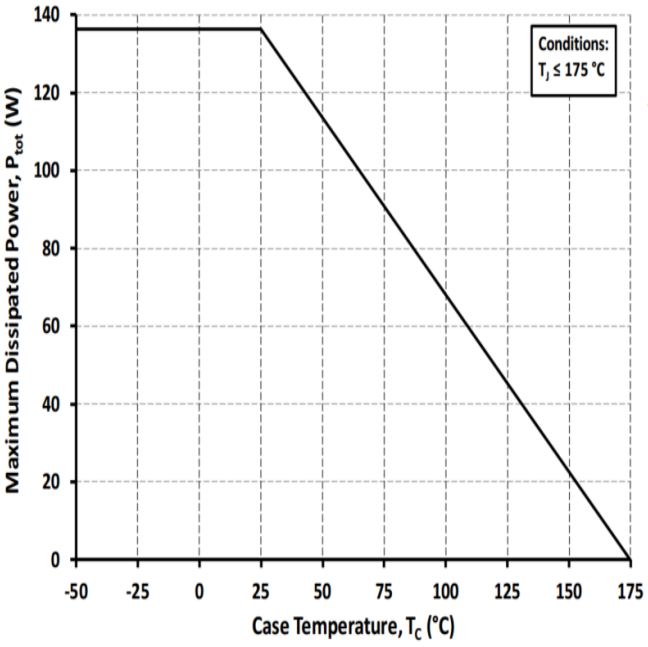


Fig.11 Maximum Power Dissipation Derating vs Case Tmperatures

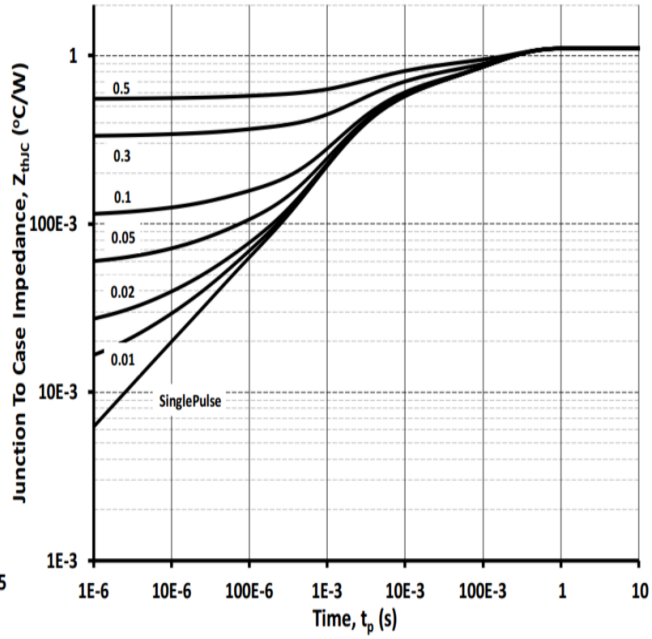
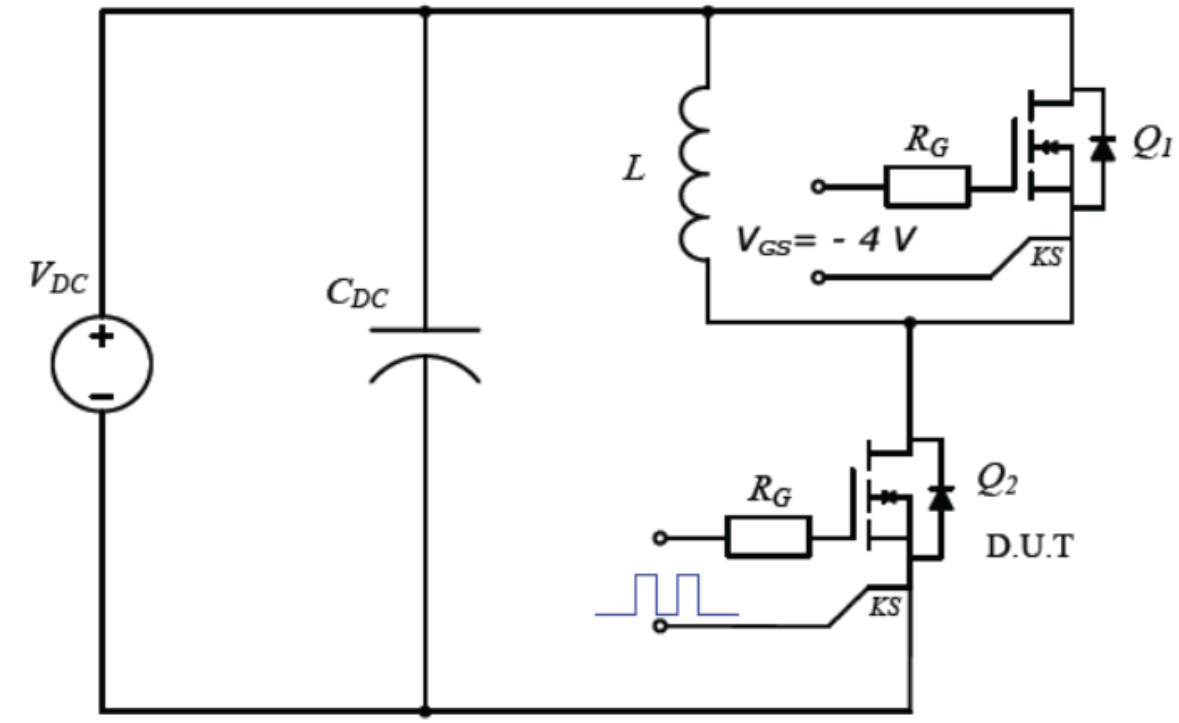
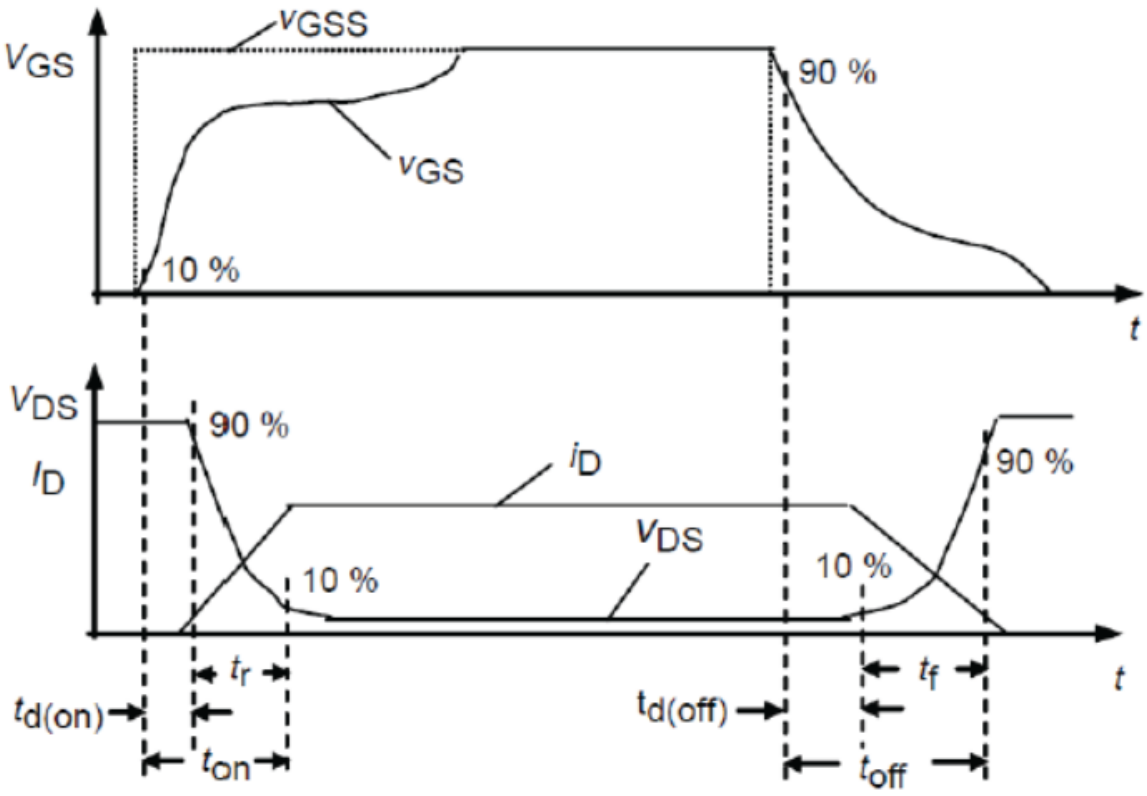


Fig.12 Transient Thermal Impedance

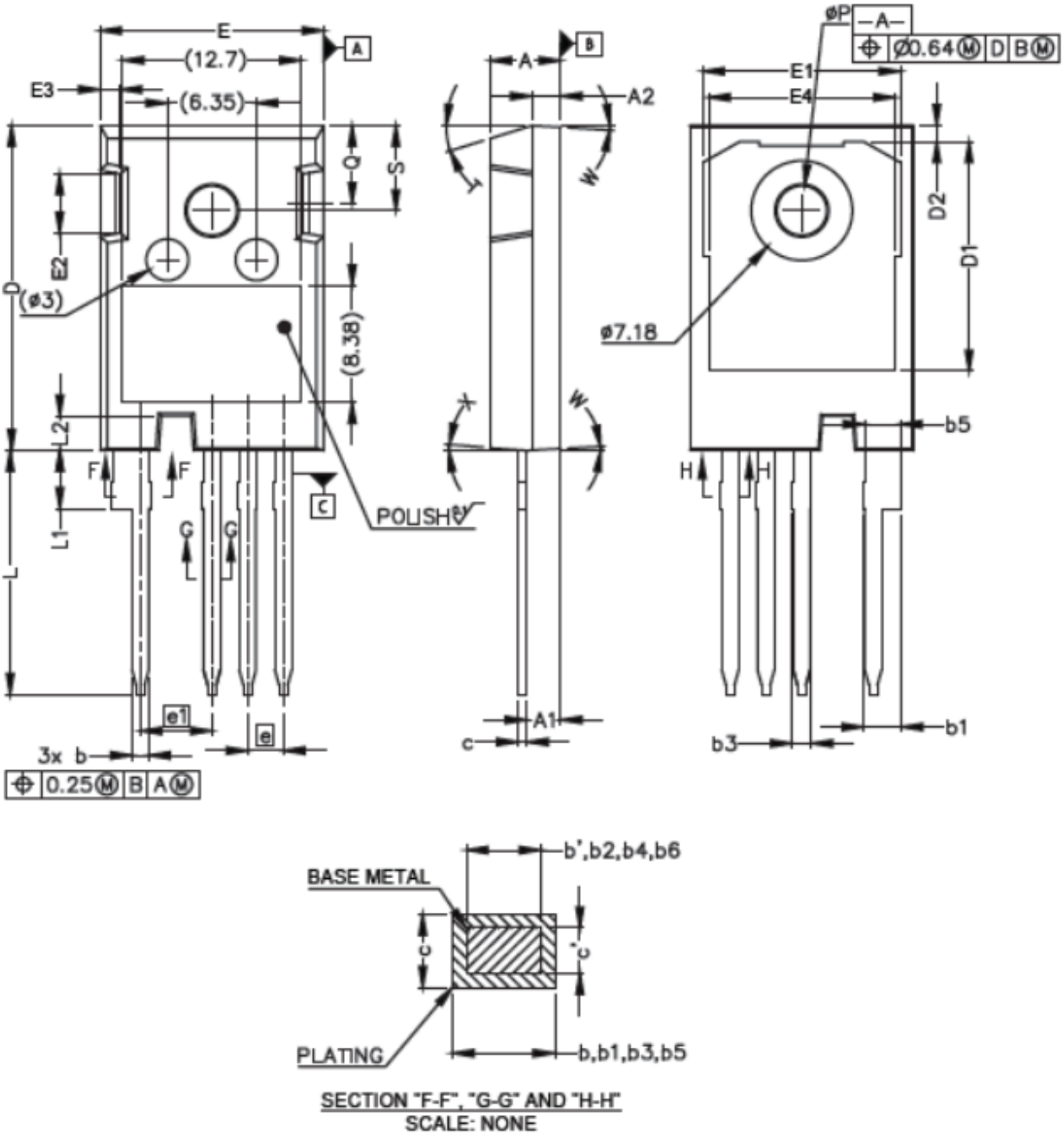
Switching Time Test Circuit and Waveforms





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