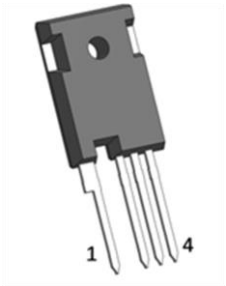
ASMC120T040I1

Gen3 1200V 40mΩ Automotive SiC MOSFET

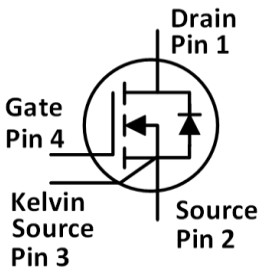
Features

- Low On-resistance& High Current Density
- Low Capacitance for High Frequency Operation
- Easy to Parallel & Simple to Drive
- High Avalanche Ruggedness
- Halogen Free&RoHS Compliant

Outline:



TO247-4



Applications

- Motor Control
- EV Battery Chargers
- High Voltage DC/DC Converters
- Solar/ESS
- UPS
- Enterprise PSU

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1200	V	V_{GS}=0V, I_D=100μA	
V_{GSmax} (Transient)	Maximum transient voltage	-12/+22	V	Duty cycle<1%, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	15 to 18	V		
V_{GSoff}	Recommended turn-off voltage	-5 to -2	V	Typical -3.5V	
I_D	Drain current (continuous)	70	A	V_{GS}=18V, T_C=25°C	Fig. 23
		50	A	V_{GS}=18V, T_C=100°C	
I_{DM}	Drain current (pulsed)	190	A	Pulse width limited by SOA	Fig. 25, 26
P_{TOT}	Total power dissipation	367	W	T_C=25°C	Fig. 24
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature	-55 to 175	°C		

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.41	°C/W	Fig. 25

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		1	50	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate leakage current		1	50	nA	V_{DS}=0V, V_{GS}=-5~20V	
V_{TH}	Gate threshold voltage	2.2	3.4	4.2	V	V_{GS}=V_{DS}, I_D=8mA	Fig. 8, 9
			2.4		V	V_{GS}=V_{DS}, I_D=8mA @ T_J=175°C	
R_{ON}	Static drain-source on-resistance		37	40	mΩ	V_{GS}=18V, I_D=30A @T_J=25°C	Fig. 4, 5, 6, 7
			73		mΩ	V_{GS}=18V, I_D=30A @T_J=175°C	
						V_{GS}=15V, I_D=30A @T_J=25°C	
						V_{GS}=15V, I_D=30A @T_J=175°C	
C_{iss}	Input capacitance		1916		pF	V_{DS}=800V, V_{GS}=0V, f=100kHz, V_{AC}=25mV	Fig. 16
C_{oss}	Output capacitance		100		pF		
C_{rss}	Reverse transfer capacitance		5		pF		
					μJ		Fig. 17
Q_g	Total gate charge		91		nC	V_{DS}=800V, I_D=30A, V_{GS}=-3 to 18V	Fig. 18
Q_{gs}	Gate-source charge		29		nC		
Q_{gd}	Gate-drain charge		12		nC		
R_g	Gate input resistance		1.0		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		182		μJ	V_{DS}=800V, I_D=40A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=2.0Ω, L=200μH T_J=25°C	Fig. 19, 20
E_{OFF}	Turn-off switching energy		62		μJ		
$t_{d(on)}$	Turn-on delay time		11		ns		
t_r	Rise time		8				
$t_{d(off)}$	Turn-off delay time		18				
t_f	Fall time		5				

Reverse Diode Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode forward voltage		3.3		V	I_{SD}=30A, V_{GS}=0V	Fig. 10, 11, 12
			3.0		V	I_{SD}=30A, V_{GS}=0V, T_J=175°C	
I_S	Diode forward current (continuous)			70	A	V_{GS}=-2V, T_C=25°C	
				50	A	V_{GS}=-2V, T_C=100°C	
t_{rr}	Reverse recovery time		43		ns	V_{GS}=-3.5V/+18V, I_{SD}=40A, V_R=800V, $R_{G(ext)}$=13.5Ω L=200μH di/dt=3000A/μs	
Q_{rr}	Reverse recovery charge		150		nC		
I_{RRM}	Peak reverse recovery current		12		A		

Typical Performance (curves)

Figure 1. Output Characteristics, T_J=-40°C

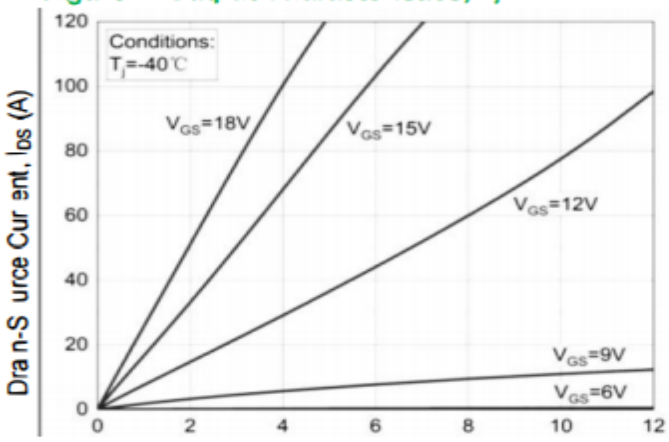


Figure 2. Output Characteristics, T_J=25°C

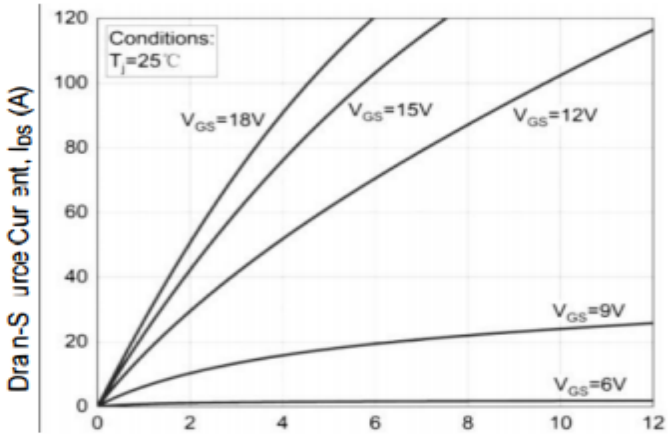


Figure 3. Output Characteristics, T_J=175°C

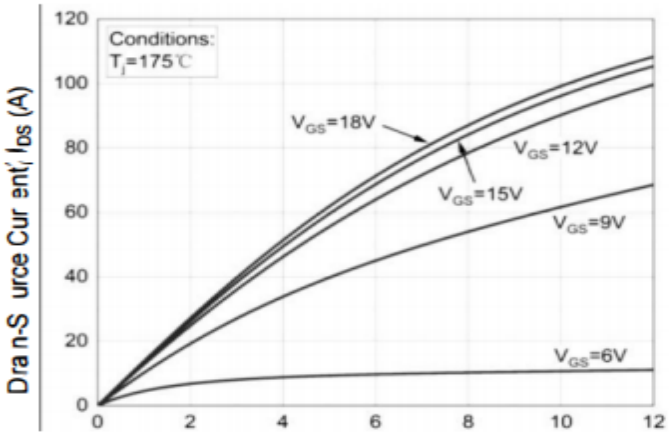


Figure 4. Transfer Characteristics

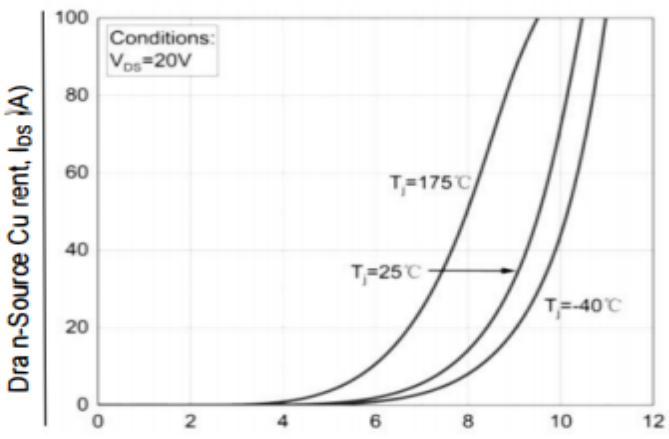


Figure 5. $R_{DS(on)}$ vs. Junction Temperature

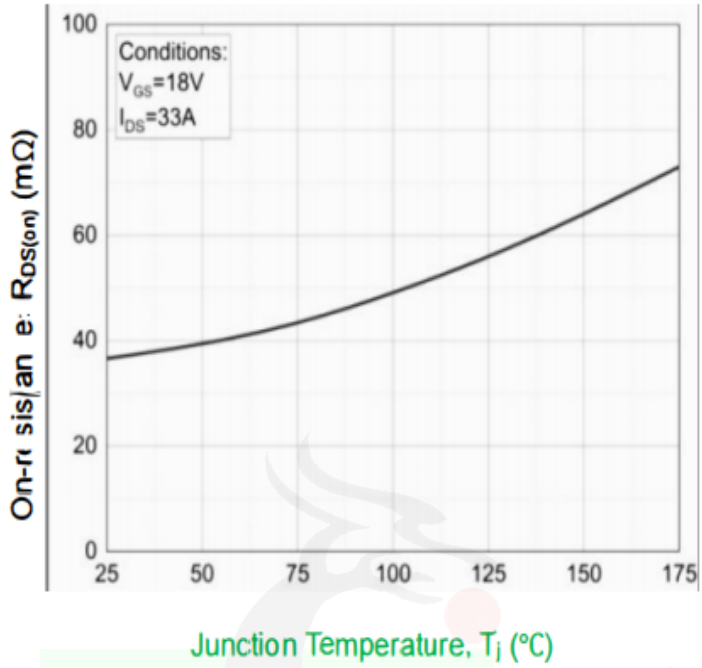


Figure 6. $V_{GS(th)}$ vs. Junction Temperature

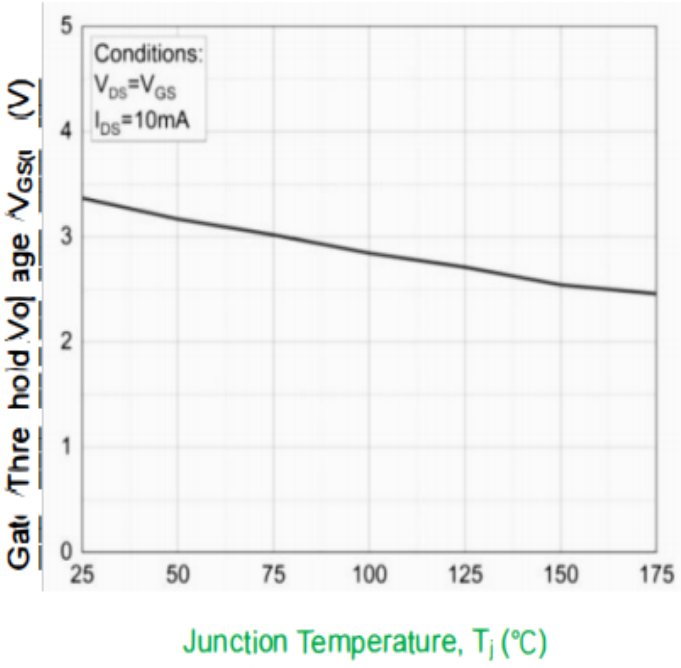


Figure 7. Body Diode Characteristics, T_j=-40°C

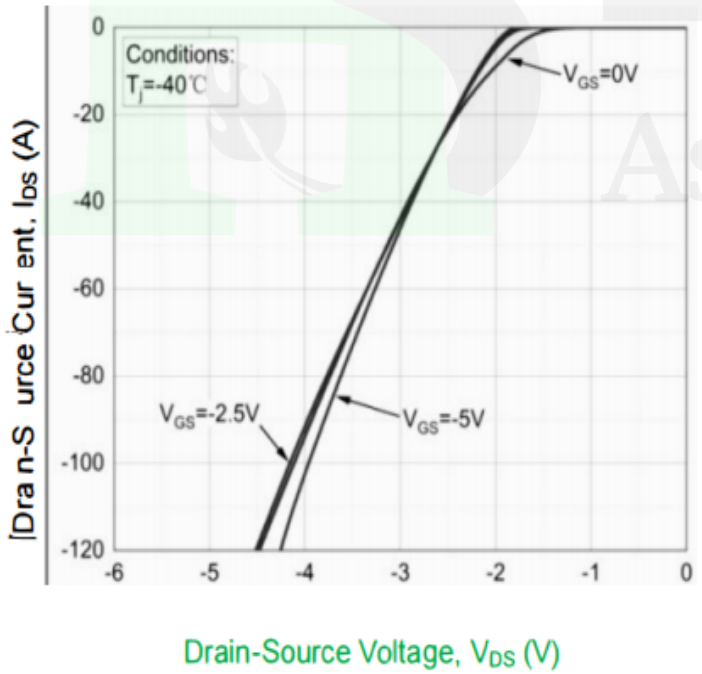


Figure 8. Body Diode Characteristics, T_j=25°C

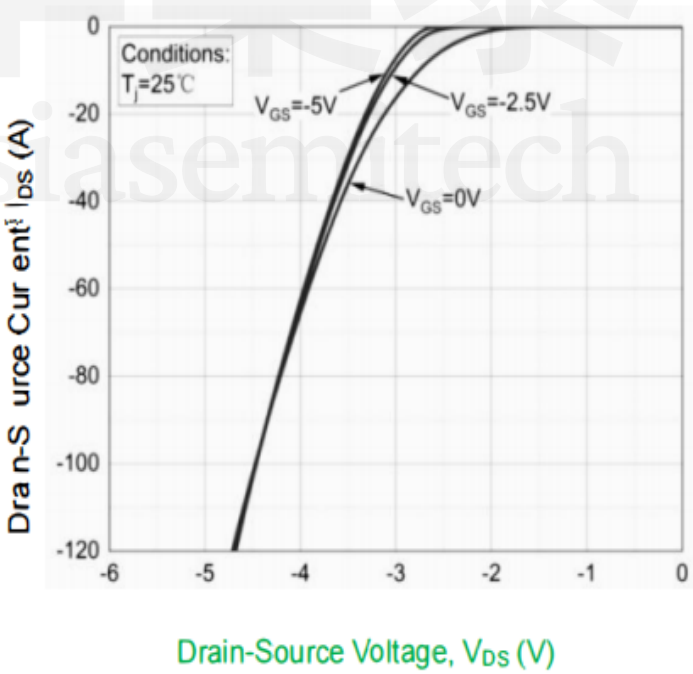
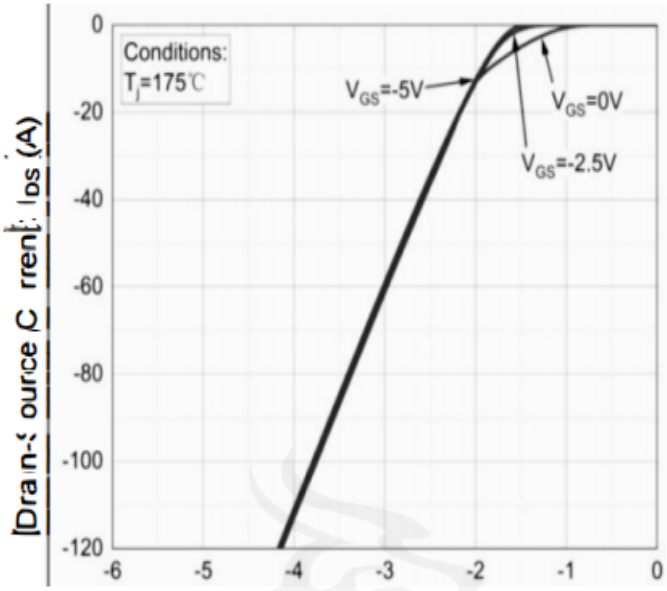
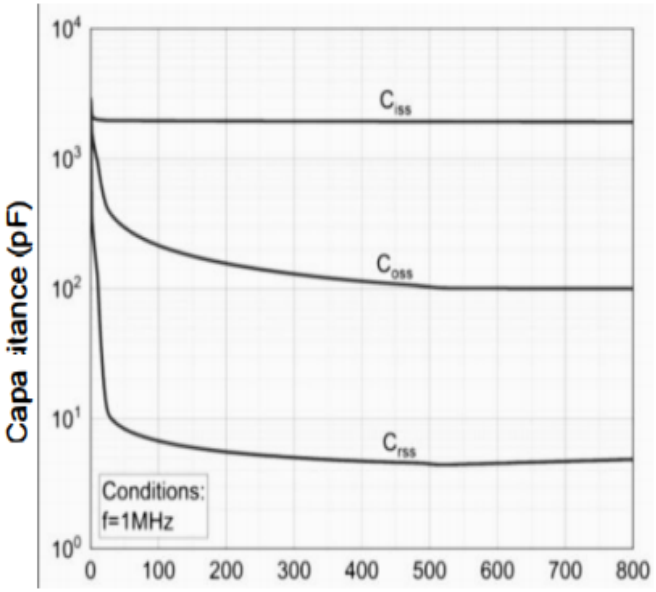


Figure 9. Body Diode Characteristics, T_j=175°C



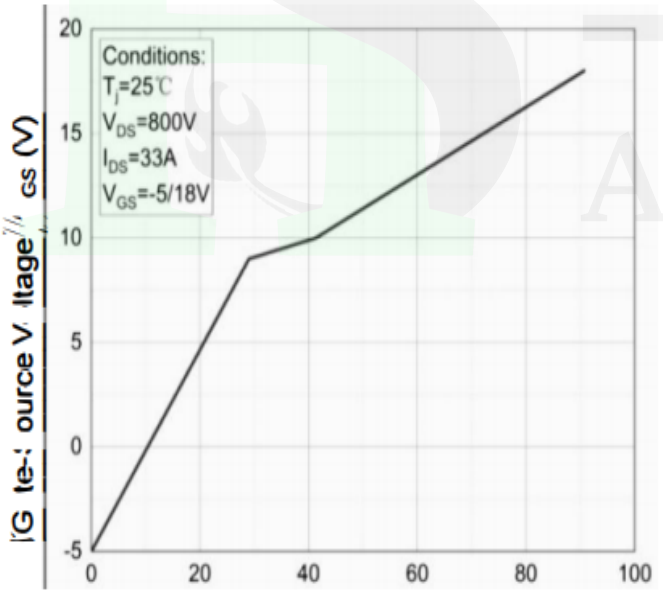
Drain-Source Voltage, V_{DS} (V)

Figure 10. Capacitance vs. Drain-Source Voltage



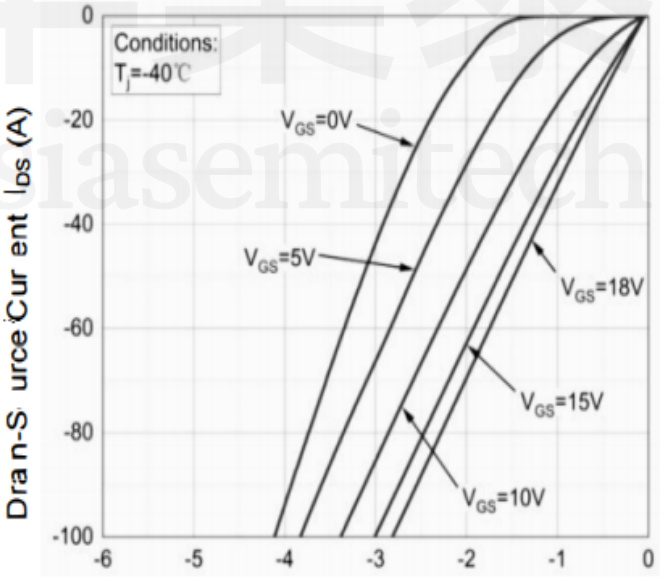
Drain-Source Voltage, V_{DS} (V)

Figure 11. Gate Charge Characteristics



Gate Charge, Q_G (nC)

Figure 12. 3 Quadrant Characteristic Tj=-40°C



Drain-Source Voltage, V_{DS} (V)

Figure 13. 3rd Quadrant Characteristic Tj=25°C

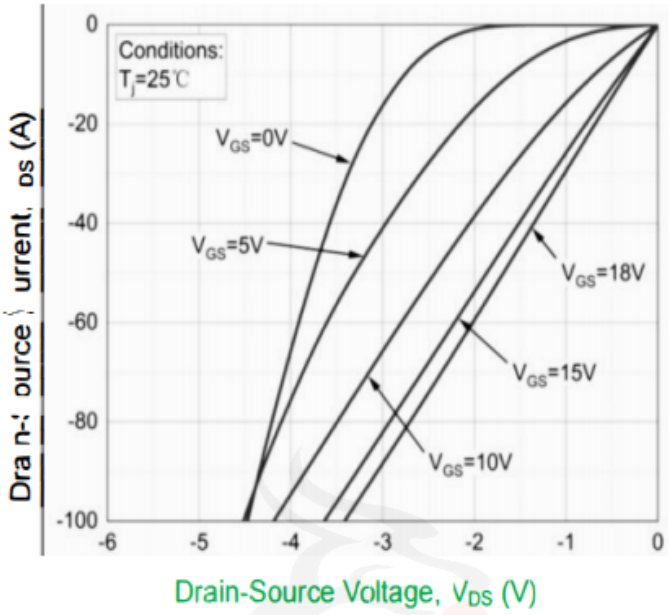


Figure 14. 3rd Quadrant Characteristic Tj=175°C

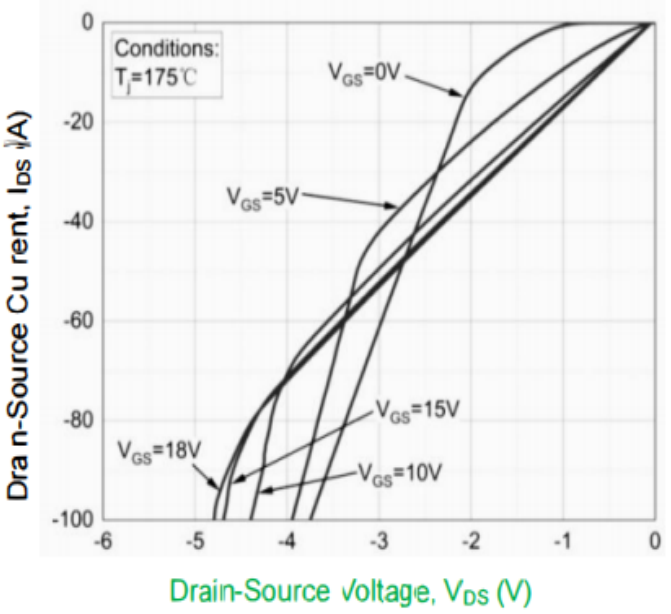


Figure 15. Continuous Drain Current Derating

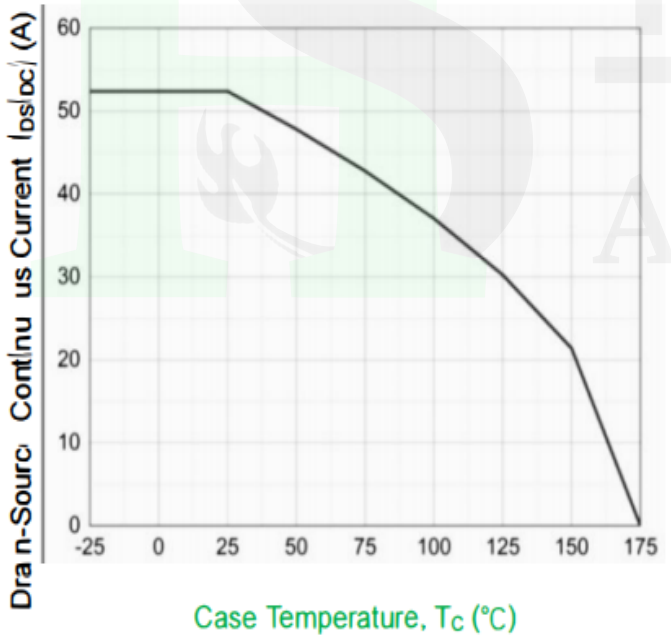


Figure 16. Power Dissipation Derating

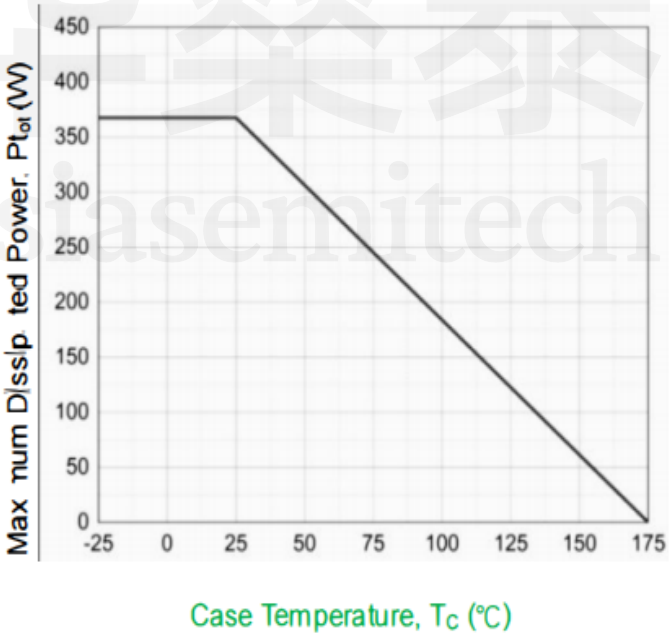


Figure 17. Transient Thermal Impedance

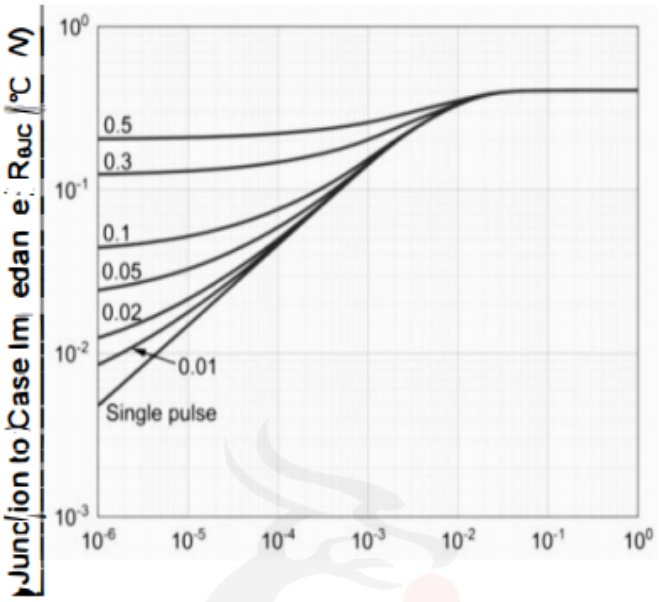


Figure 18. Switching Energy vs. Drain Current

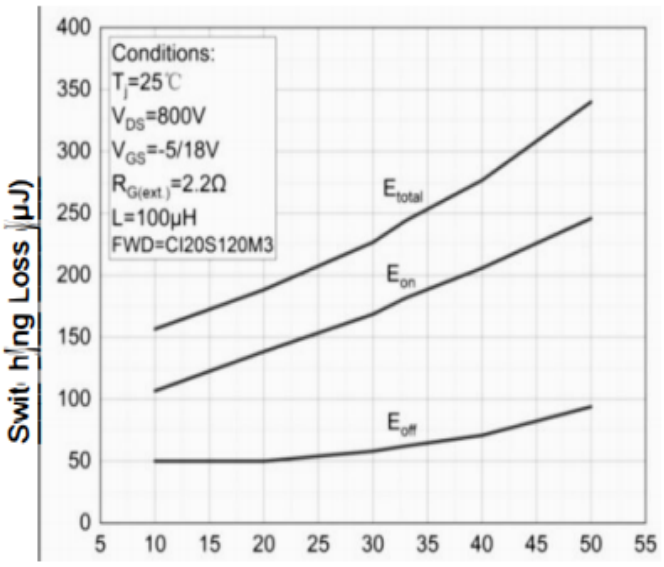


Figure 19. Switching Energy vs. $R_{G(ext)}$

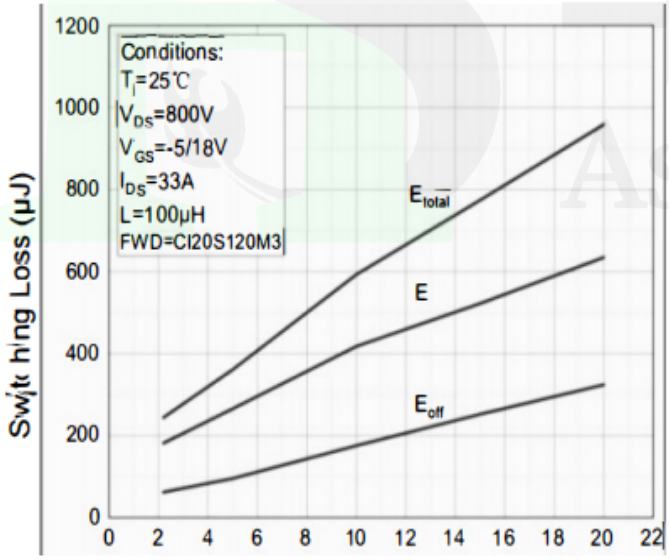
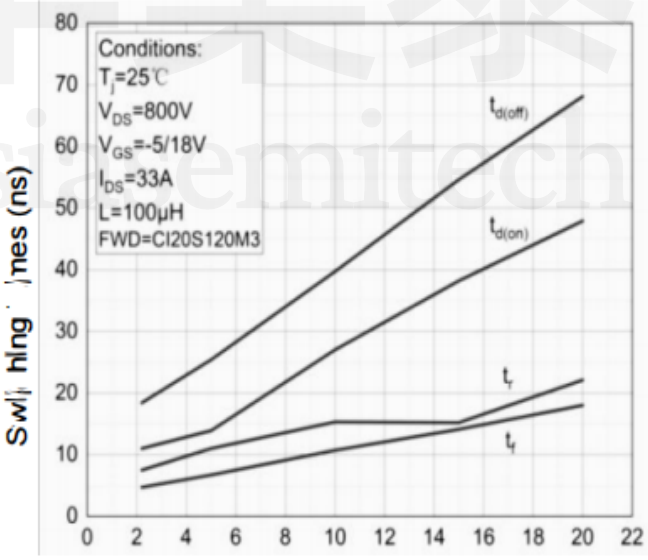
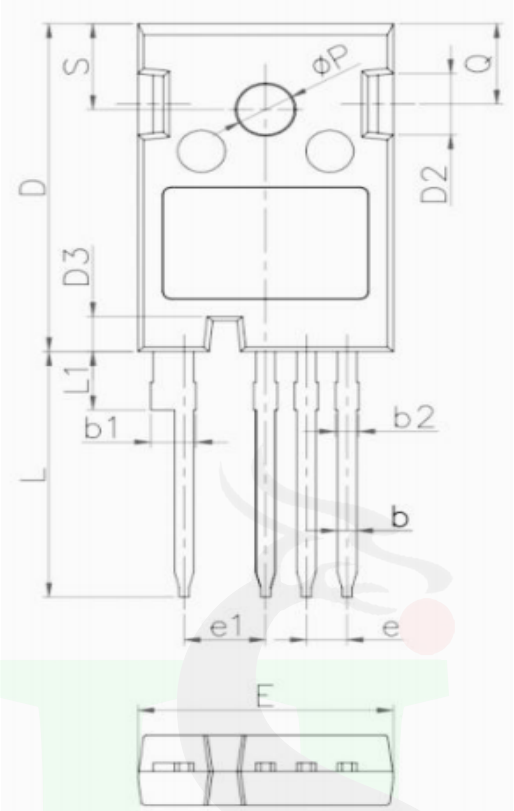
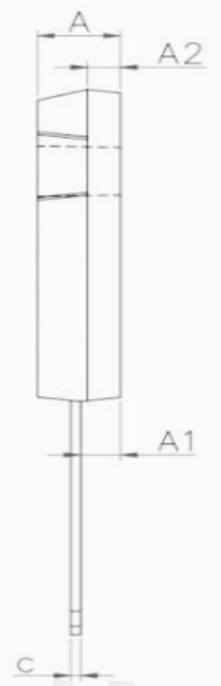


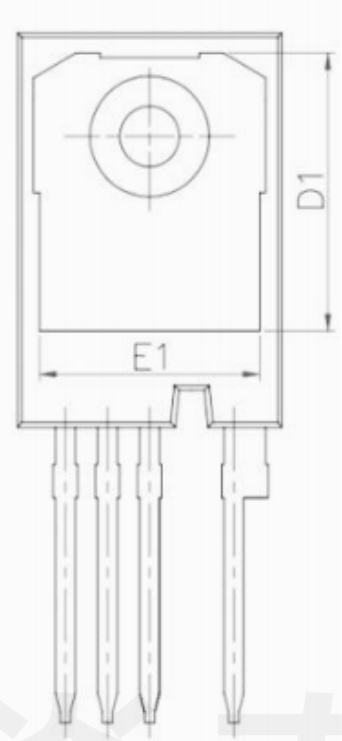
Figure 20. Switching Times vs. $R_{G(ext)}$

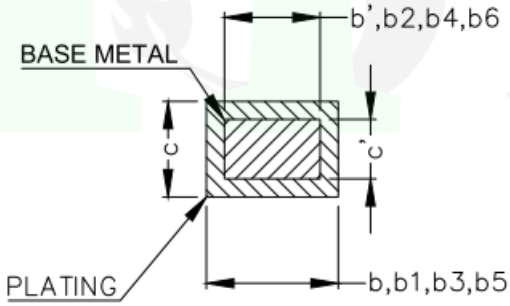


Package Dimensions









SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

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