

ASC120N1700MT4L

1700V, 120A, 14mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T04-70A A/1

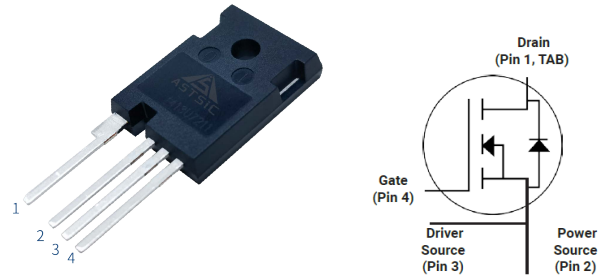


General Description

The AST-MT4 series SiC MOSFET in TO-247-4L package ensures stable high-temperature operation for power-dense and energy-critical systems, enabling compact designs with reduced EMI.

Features

- 4th Generation SiC MOSFET Technology
- High-Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Optimized package with Separate Driver Source Pin
- Easy to Parallel and Simple to Drive
- RoHS Compliant, Halogen Free



Applications

- EV Charging
- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Power Factor Correction Modules

Ordering Informations

Order Number	ASC120N1700MT4L
Marking	ASC120N1700MT4L
Package Type	TO-247-4L
Packing Method	Tube

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V _{DS}	Drain-Source Voltage	1700			V	T _c =25°C
I _D	Drain Current (continuous)	120			A	T _c =25°C
P _D	Power Dissipation	555			W	T _c =25°C
T _J	Junction Temperature	175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Static Drain-Source on Resistance	-	14	17.5	mΩ	V _{GS} =18V; I _D =50A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	278	-	nC	V _{DS} =1000V; V _{GS} =-5/+18V; I _D =50A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	92	-		
Source-drain diode						
Q _{rr}	Reverse Recovery Charge	-	728	-	nC	V _{GS} =-5V; I _F =38A; V _R =1200V; di/dt=1300A/us; T _i =175°C

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

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	1700	V
I_D	Drain Current (continuous; $T_c=25^{\circ}\text{C}$)	120	A
	Drain Current (continuous; $T_c=100^{\circ}\text{C}$)	85	
I_{DM}	Drain Current (pulsed)	280	A
V_{GS}	Gate-Source Voltage	-10/+22V	V
P_D	Power Dissipation ($T_c=25^{\circ}\text{C}$)	555	W
T_J, T_{stg}	Junction and Storage Temperature Range	-55 to +175	$^{\circ}\text{C}$

MOSFET Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics (at T _J =25°C unless otherwise specified)						
BV _{DS}	Drain-Source Breakdown Voltage	1700	-	-	V	I _D =250μA; V _{GS} =0V
I _{DSS}	Zero Gate Voltage Drain Current	-	-	100	μA	V _{DS} =1700V; V _{GS} =0V
I _{GSS}	Gate-Body Leakage Current	-	-	250	nA	V _{GS} =-10 to 20V; V _{DS} =0V
V _{GS(th)}	Gate Threshold Voltage	2	2.8	4	V	V _{DS} =V _{GS} ; I _D =20mA
V _{GS(on)}	Recommended Turn-on Voltage	-	15/18	-	V	Static
V _{GS(off)}	Recommended Turn-off Voltage	-	-5	-		
R _{DS(on)}	Static Drain-Source on Resistance	-	16	20	mΩ	V _{GS} =15V; I _D =50A
		-	26	-		V _{GS} =15V; I _D =50A; T _J =175°C
		-	14	17.5		V _{GS} =18V; I _D =50A
		-	22.6	-		V _{GS} =18V; I _D =50A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	7280	-	pF	V _{DS} =1000V; f=1MHz; V _{AC} =25mV
C _{oss}	Output Capacitance	-	288	-		
C _{rss}	Reverse Transfer Capacitance	-	15	-		
g _{fs}	Transconductance	-	52	-	S	V _{DS} =20V; I _D =50A
E _{oss}	Coss Stored Energy	-	168	-	μJ	V _{DS} =1000V; f=1MHz
E _{on}	Turn-on Energy (Body Diode)	-	1.41	-	mJ	V _{DS} =1200V; V _{GS} =-5/+18V; I _D =50A; Load=68μH; R _{G(ext)} =2.5Ω; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	1.12	-		
Q _G	Total Gate Charge	-	278	-	nC	V _{DS} =1000V; V _{GS} =-5/+18V; I _D =50A
Q _{GS}	Gate-Source Charge	-	80	-		
Q _{GD}	Gate-Drain Charge	-	92	-		
R _{G(int)}	Internal Gate Resistance	-	2.0	-	Ω	f=1MHz; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	39	-	ns	V _{DS} =1200V; V _{GS} =-5/+18V; I _D =50A; R _{G(ext)} =2.5Ω; Load=68μH
t _r	Rise Time	-	32	-		
t _{d(off)}	Turn-off Delay Time	-	85	-		
t _f	Fall Time	-	21	-		

Body Diode Characteristics (at $T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	-	3.2	6	V	$V_{GS}=0\text{V}; I_F=38\text{A}$
		-	3.0	6		$V_{GS}=0\text{V}; I_F=38\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	120	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$
T_{rr}	Reverse Recovery Time	-	98	-	ns	$V_{GS}=-5\text{V}; I_F=38\text{A}; V_R=1200\text{V};$ $di/dt=1300\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	728	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	18	-	A	

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.27	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	$^{\circ}\text{C}/\text{W}$

The values are based on Junction-to-Case Thermal Impedance measured with the device mounted to a large heat sink, assuming a maximum junction temperature of $T_{J(max)}=175^{\circ}\text{C}$.

Typical Performance

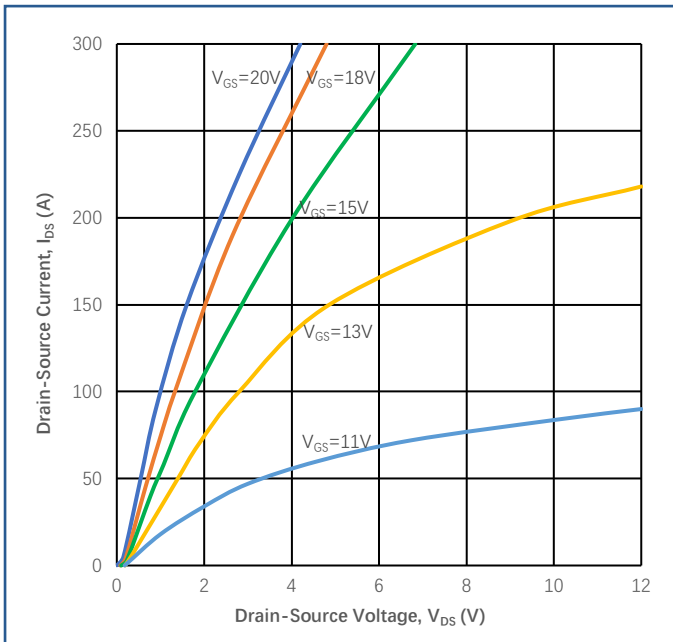


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

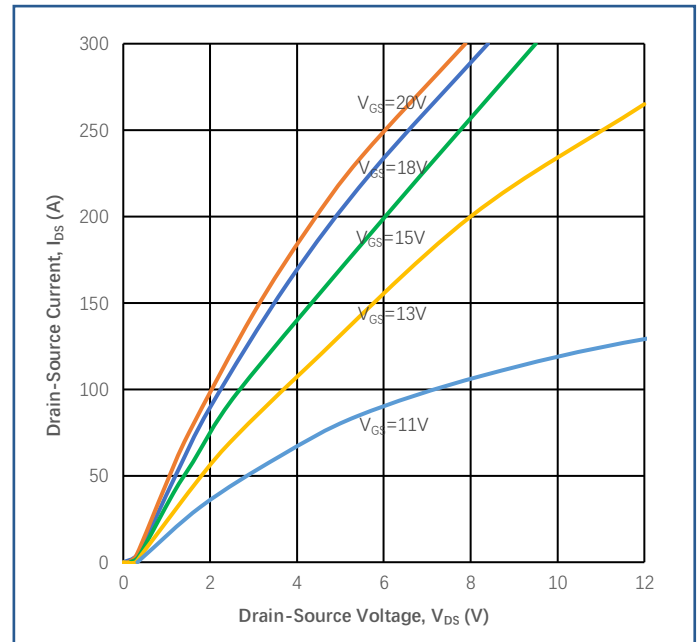


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

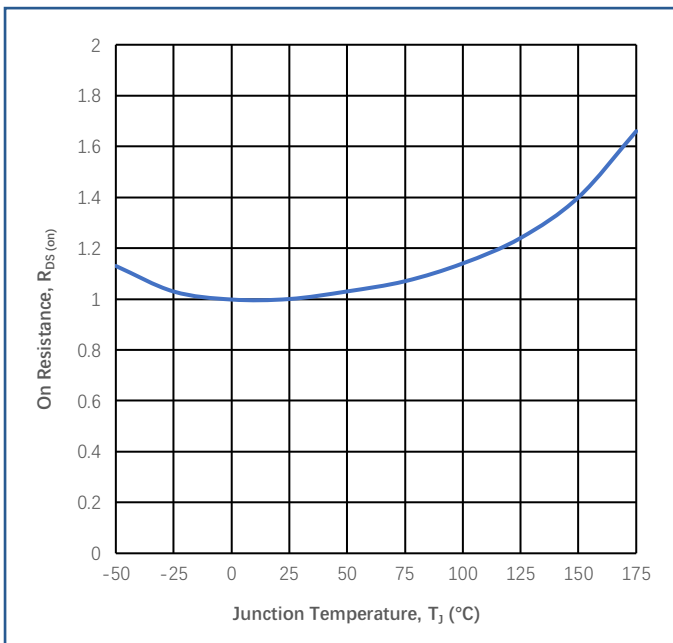


Figure 3
Normalized On-Resistance vs. Temperature

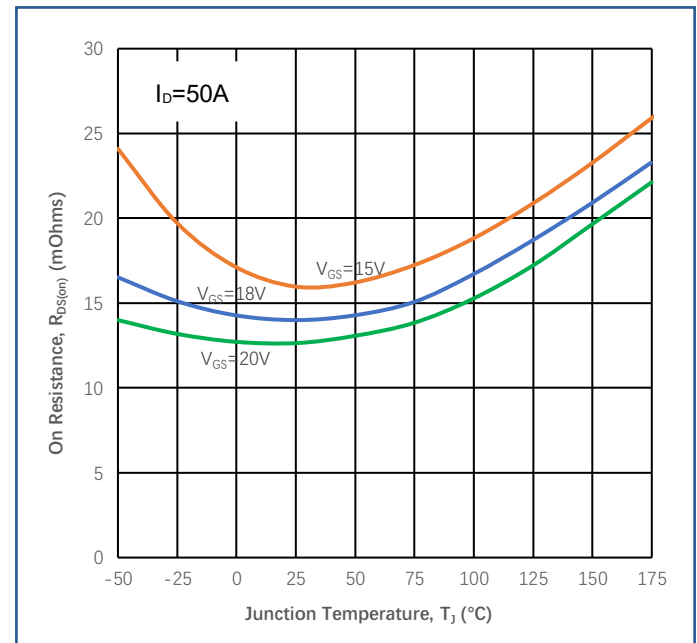


Figure 4
On-Resistance vs. Temperature

Typical Performance

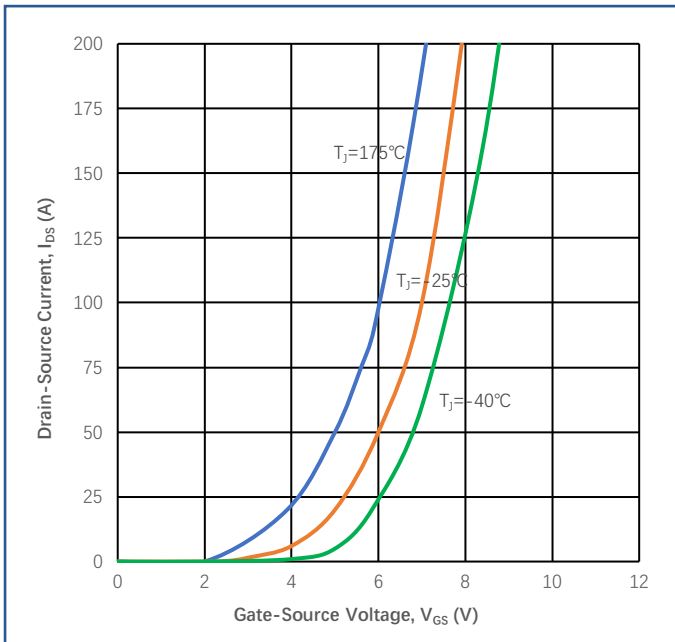


Figure 5
Transfer Characteristic

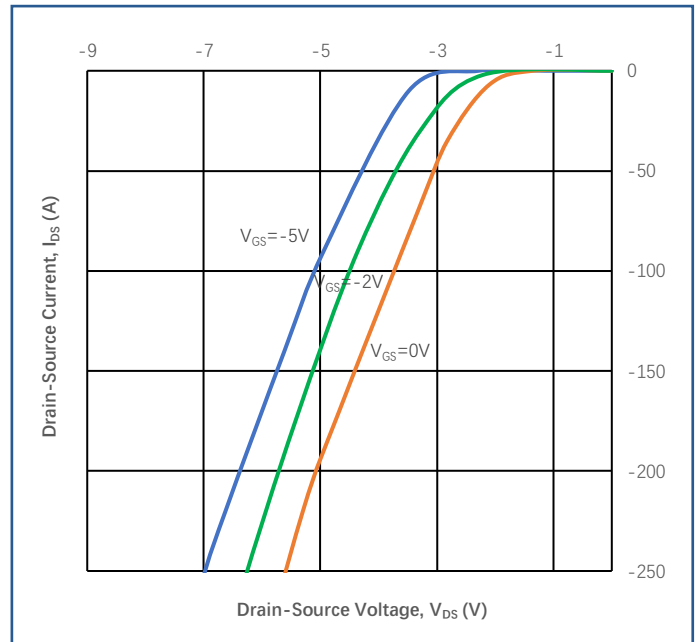


Figure 6
Body Diode Characteristic at 25°C

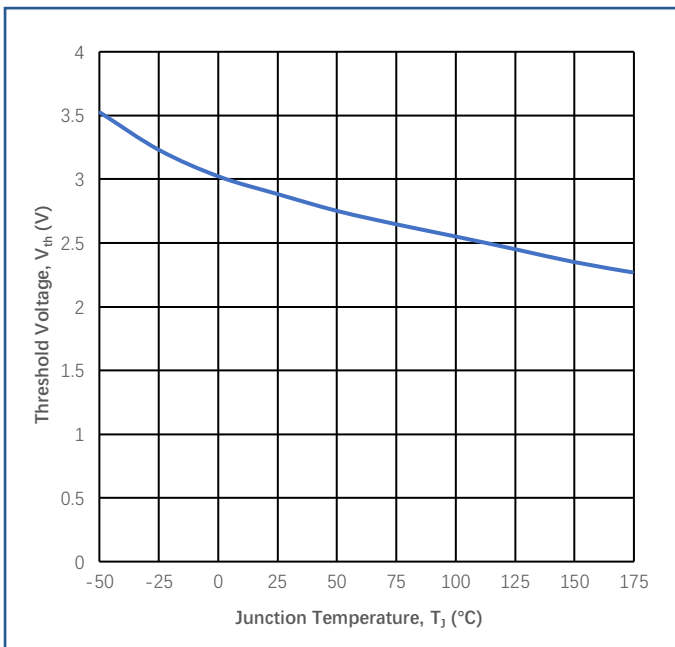


Figure 7
Threshold Voltage vs. Temperature

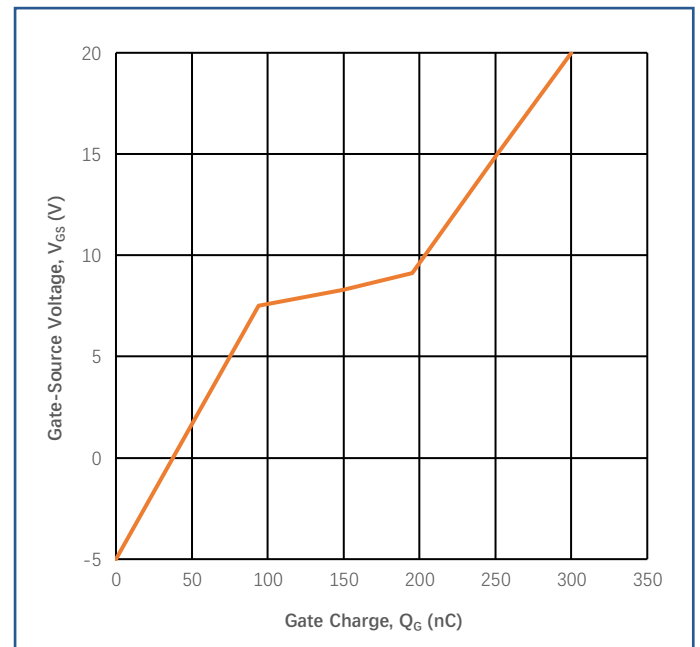


Figure 8
Gate Charge Characteristics

Typical Performance

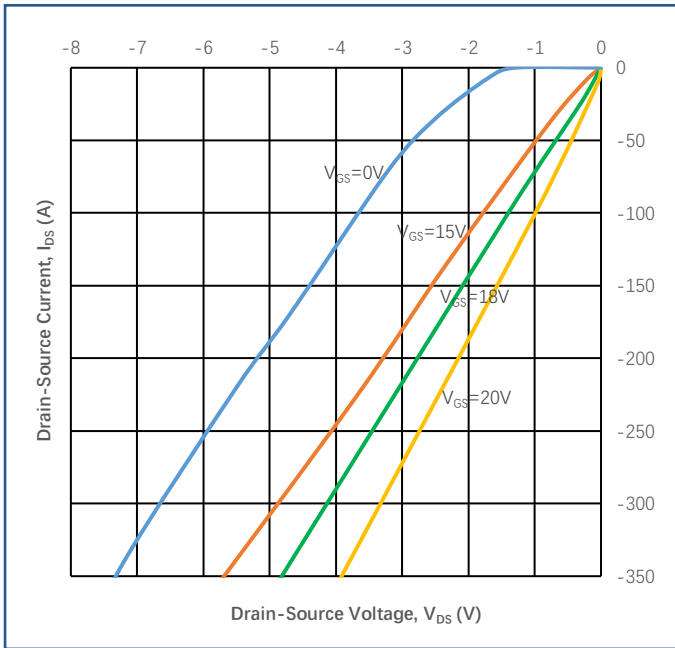


Figure 9
3rd Quadrant Characteristic at 25°C

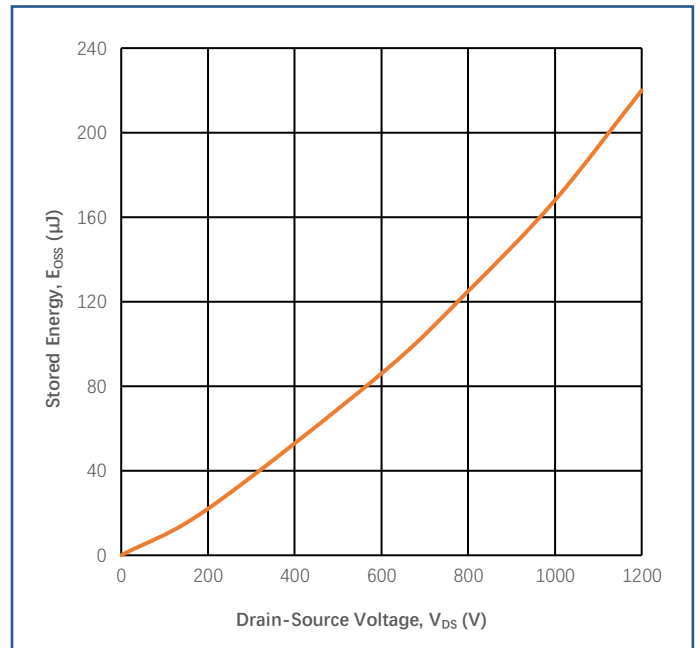


Figure 10
Output Capacitor Stored Energy

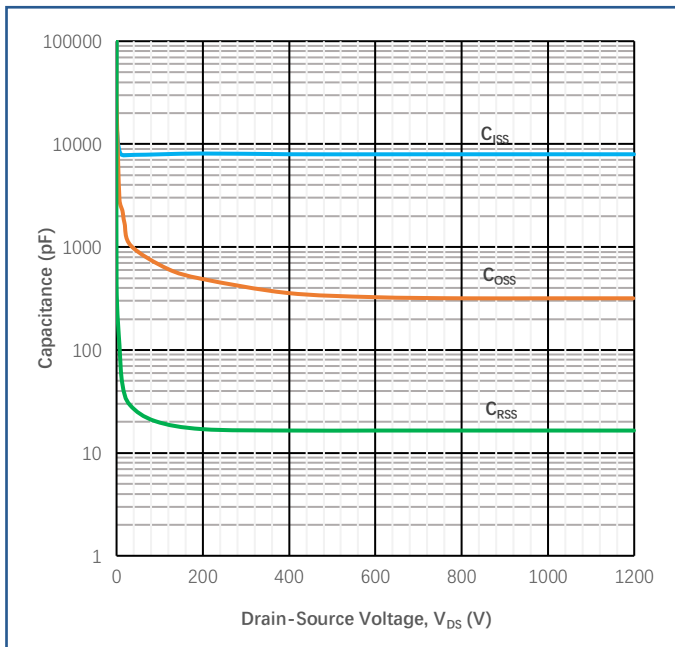


Figure 11
Capacitances vs. Drain-Source

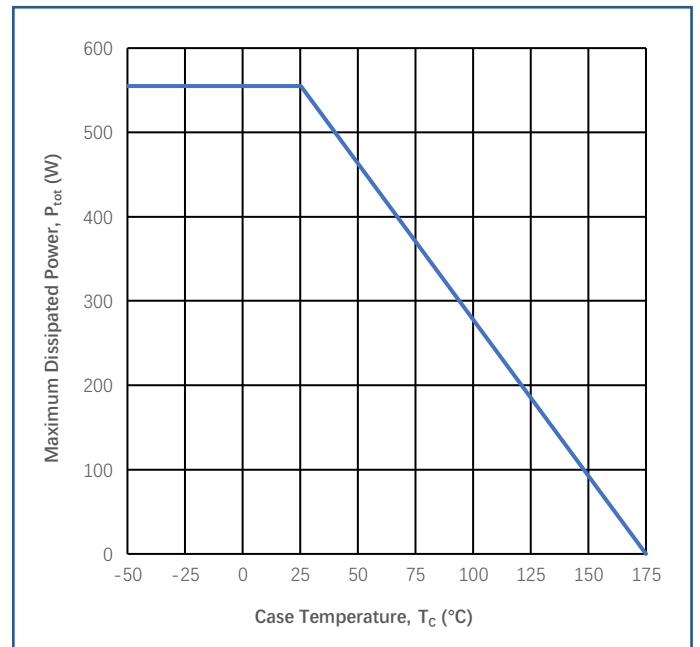


Figure 12
Max Power Dissipation Derating vs T_C

Typical Performance

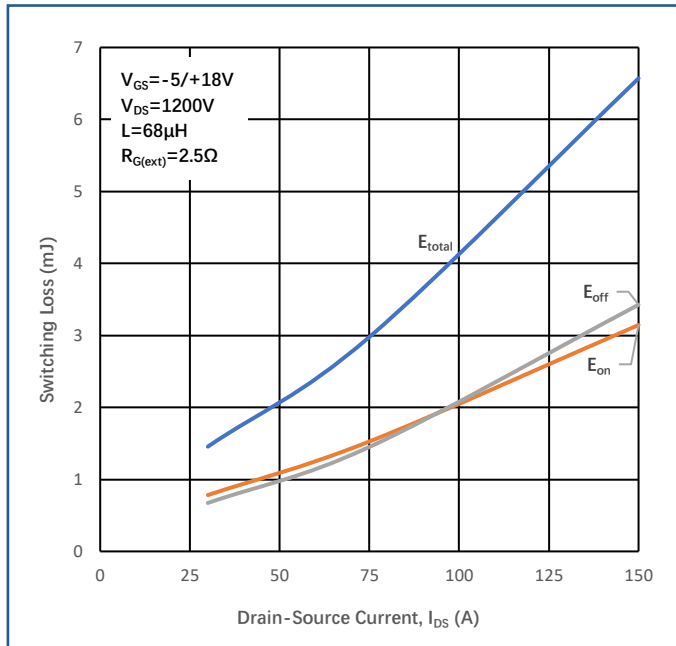


Figure 13

Switching Energy vs. Drain Current

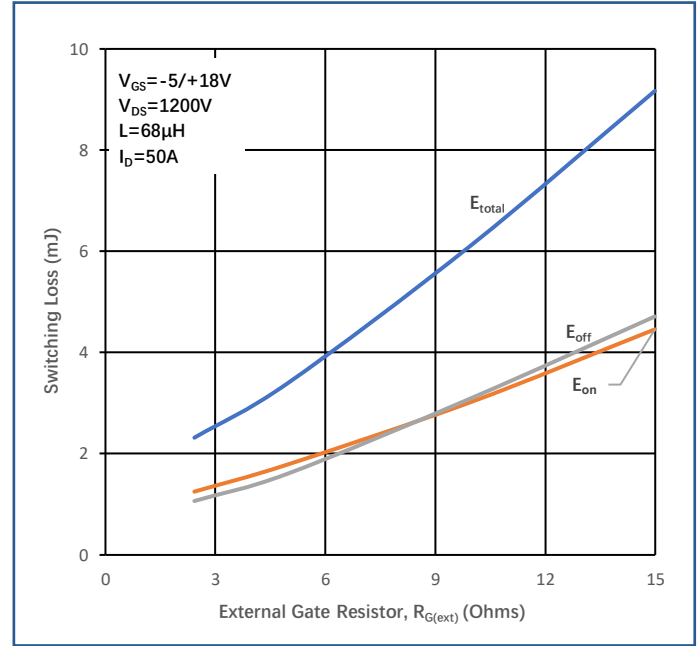


Figure 14

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

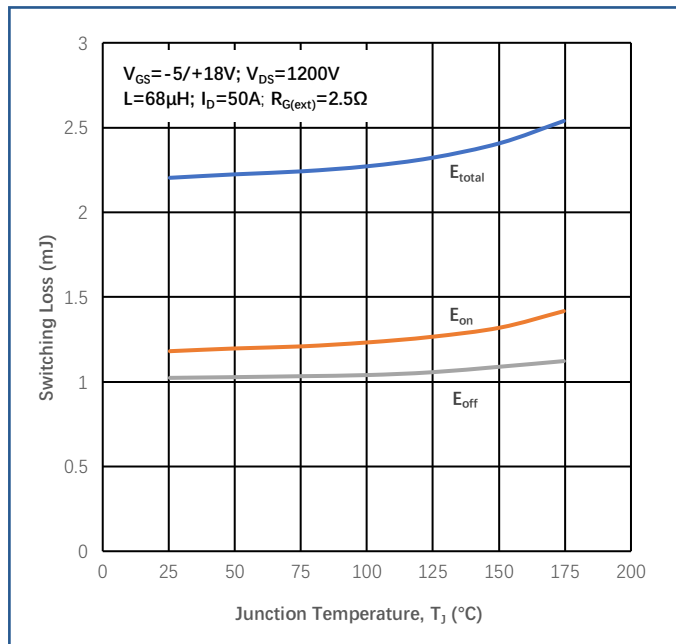


Figure 15

Switching Energy vs. Temperature

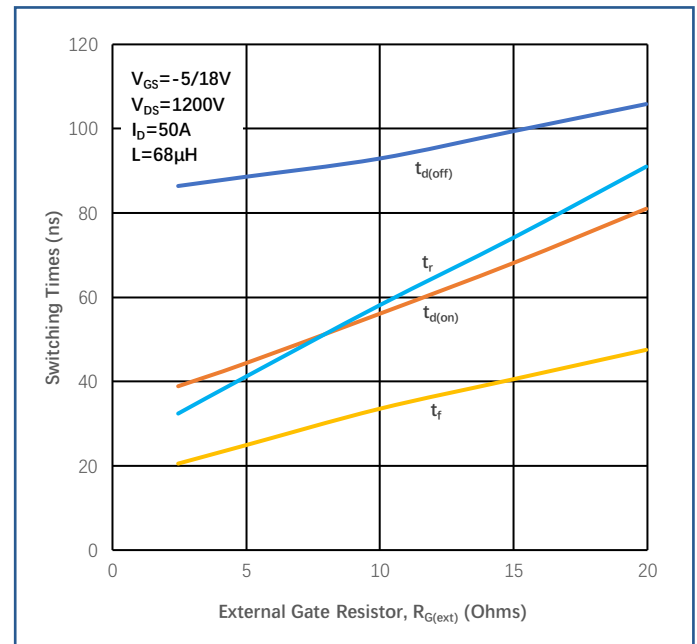


Figure 16

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

Typical Performance

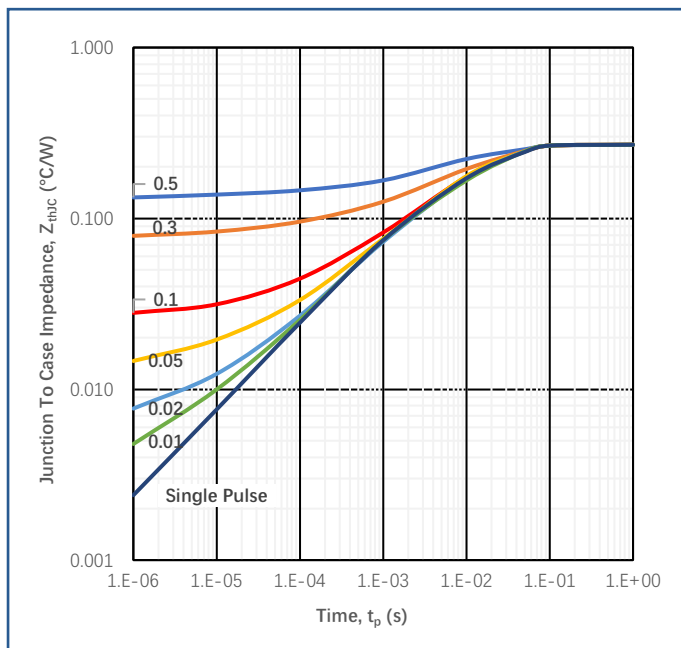


Figure 17

Transient Thermal Impedance

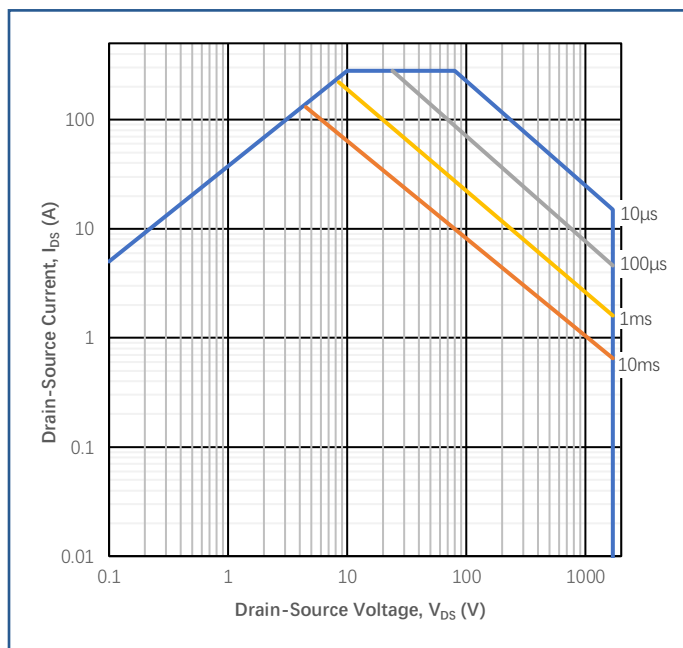
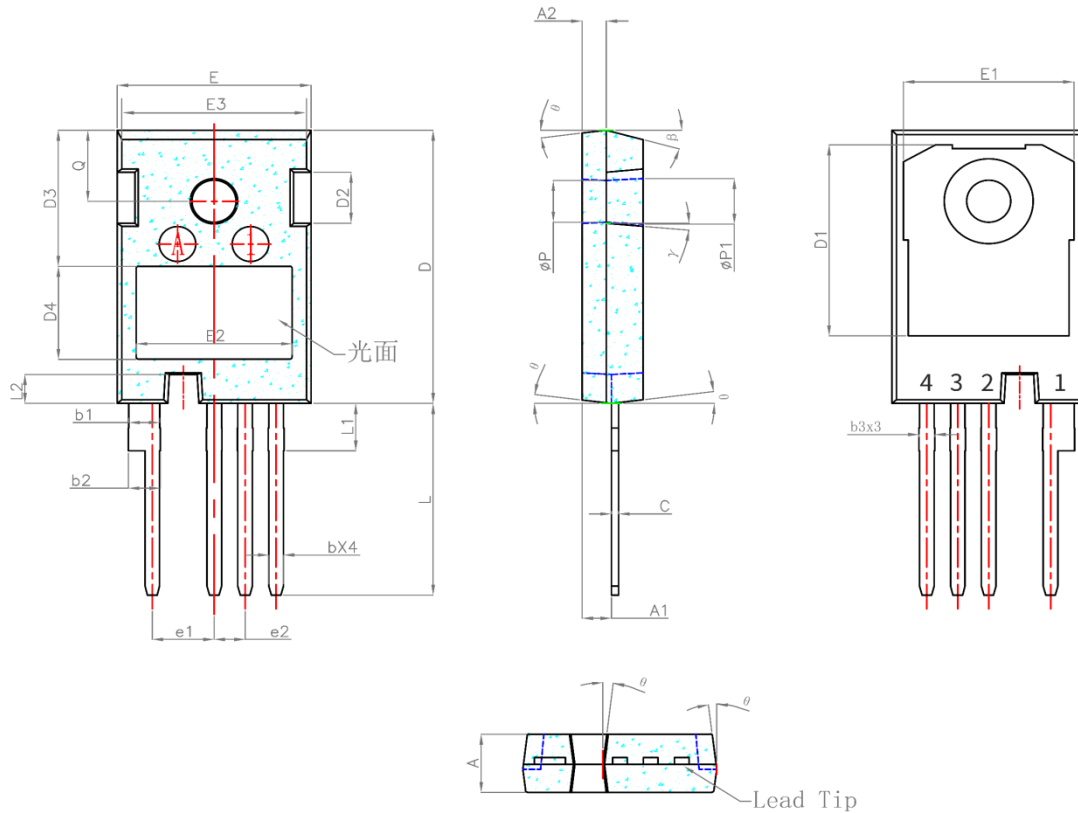


Figure 18

Safe Operating Area

Package Dimensions (mm)

Package Type: TO-247-4L



Symbol	Millimeters			Symbol	Millimeters		
	Min.	Type.	Max.		Min.	Type.	Max.
A	4.80	5.00	5.20	e2	2.39	2.54	2.69
A1	2.25	2.40	2.55	E	15.70	15.90	16.10
A2	1.85	2.00	2.15	E1	13.80	14.00	14.20
b	1.15	1.20	1.25	E2	12.80 Type.		
b1	2.40	2.55	2.70	E3	12.80	13.00	13.20
b2	2.48	2.63	2.78	L	16.32	16.52	16.72
b3	1.13	1.28	1.43	L1	3.87	4.07	4.27
c	0.55	0.60	0.65	L2	2.30	2.50	2.70
D	-	23.50	23.70	ϕP	3.45	3.60	-
D1	16.20	16.50	16.80	$\phi P1$	3.90 Type.		
D2	4.40 Type.			Q	6.01	6.11	6.21
D3	11.61	11.71	11.81	θ	7°		
D4	8.00 Type.			β	15°		
e1	4.93	5.08	5.23	γ	5°		

Pin	Symbol	Description
1	D	Drain
2	S	Power Source
3	S	Driver Source
4	G	Gate
mb	D	Mounting Base; Connected to Drain

Note:

1. All metal surfaces are Sn plated (matte), except area of cut.
2. Burr or mold flash size (0.5 mm) is not included in the dimensions.

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