

ASC40N1700MT4L

1700V, 40A, 72mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

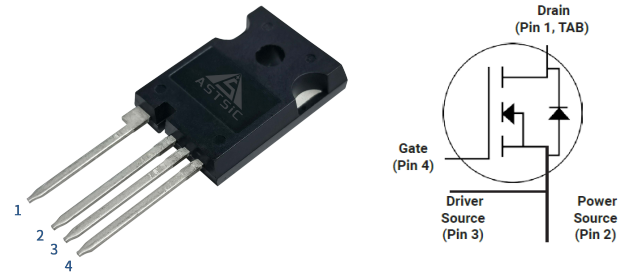
ASTC-3T04-99A A/1



爱仕特科技
AST TECHNOLOGY

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

- 3rd 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
- Solar Inverters
- EV Motor Drive

Ordering Informations

Order Number	ASC40N1700MT4L
Marking	ASC40N1700MT4L
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)	40			A	T _c =25°C
P _D	Power Dissipation	242			W	T _c =25°C
T _J	Junction Temperature	-55 to +175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Static Drain-Source on Resistance	-	72	88	mΩ	V _{GS} =18V; I _D =20A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	100	-	nC	V _{DS} =1000V; V _{GS} =-5V/18V; I _D =25A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	22	-		
Source-drain diode						
Q _{rr}	Reverse Recovery Charge	-	360	-	nC	V _{GS} =-5V; I _F =20A; V _R =1000V; di/dt=900A/μs; T _J =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; $T_c=25^\circ\text{C}$)	40	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	32	
I_{DM}	Drain Current (pulsed)	118	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	242	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	-	5	100	μA	V _{DS} =1700V; V _{GS} =0V
I _{GSS}	Gate-Body Leakage Current	-	10	250	nA	V _{DS} =0V; V _{GS} =-10 to 20V
V _{GS(th)}	Gate Threshold Voltage	2	3	4	V	V _{DS} =V _{GS} ; I _D =10mA
V _{GS(on)}	Recommended Turn-on Voltage	-	18	-	V	Static
V _{GS(off)}	Recommended Turn-off Voltage	-	-5	-		
R _{DS(on)}	Static Drain-Source on Resistance	-	72	88	mΩ	V _{GS} =18V; I _D =20A; T _J =25°C
		-	130	-		V _{GS} =18V; I _D =20A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	2405	-	pF	V _{DS} =1000V; f=1MHz; V _{AC} =25mV
C _{oss}	Output Capacitance	-	90	-		
C _{rss}	Reverse Transfer Capacitance	-	3	-		
g _{fs}	Transconductance	-	16	-	S	V _{DS} =20V; I _D =20A
E _{oss}	Coss Stored Energy	-	60	-	μJ	V _{DS} =1000V; f=1MHz
E _{on}	Turn-on Energy (Body Diode)	-	650	-	μJ	V _{DS} =1000V; V _{GS} =-5/18V; I _D =25A; L=150μH; R _{G(ext)} =4.7Ω; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	162	-		
Q _G	Total Gate Charge	-	100	-	nC	V _{DS} =1000V; V _{GS} =-5V/18V; I _D =25A
Q _{GS}	Gate-Source Charge	-	45	-		
Q _{GD}	Gate-Drain Charge	-	22	-		
R _{G(int)}	Internal Gate Resistance	-	5.6	-	Ω	f=1MHz; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	16	-	ns	V _{DS} =1000V; V _{GS} =-5V/18V; I _D =25A; L=150μH; R _{G(ext)} =4.7Ω
t _r	Rise Time	-	21	-		
t _{d(off)}	Turn-off Delay Time	-	38	-		
t _f	Fall Time	-	15	-		

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	-	3.9	6	V	$V_{GS}=0\text{V}; I_F=20\text{A}; T_J=25^{\circ}\text{C}$
		-	3.6	6		$V_{GS}=0\text{V}; I_F=20\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	36	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$
T_{rr}	Reverse Recovery Time	-	38	-	ns	$V_{GS}=-5\text{V}; I_F=20\text{A}; V_R=1000\text{V};$ $di/dt=900\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	360	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	10.5	-	A	

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	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

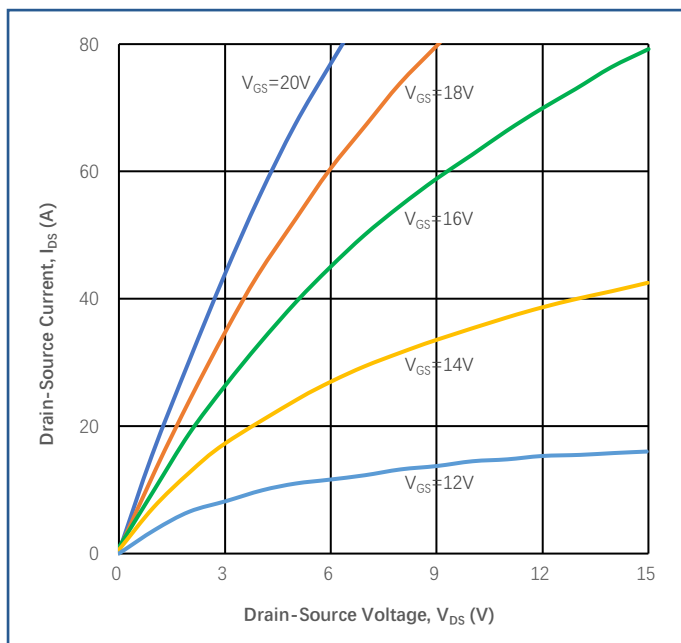


Figure 1
Output Characteristics ($T_j = 25^\circ\text{C}$)

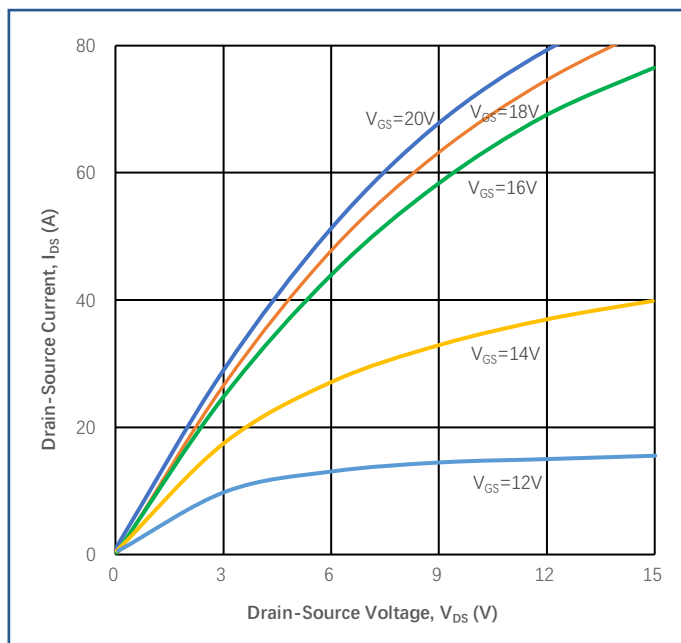


Figure 2
Output Characteristics ($T_j = 175^\circ\text{C}$)

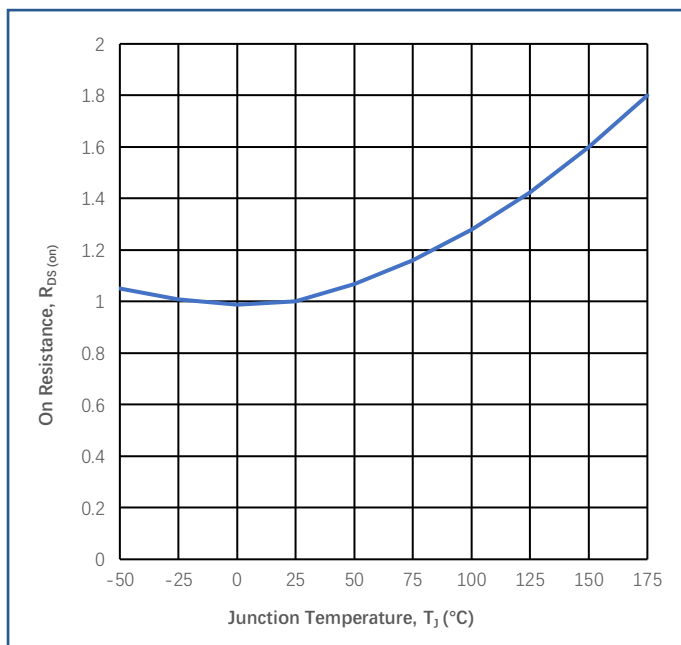


Figure 3
Normalized On-Resistance vs. Temperature

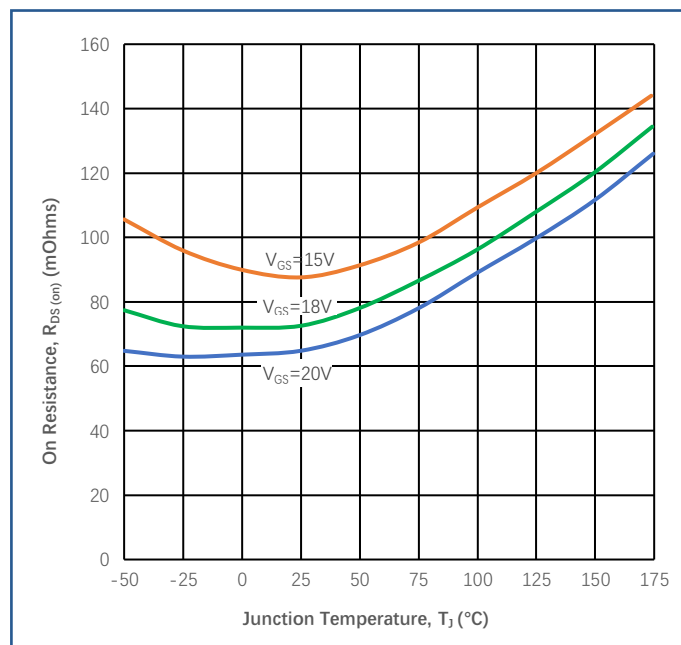


Figure 4
On-Resistance vs. Temperature

Typical Performance

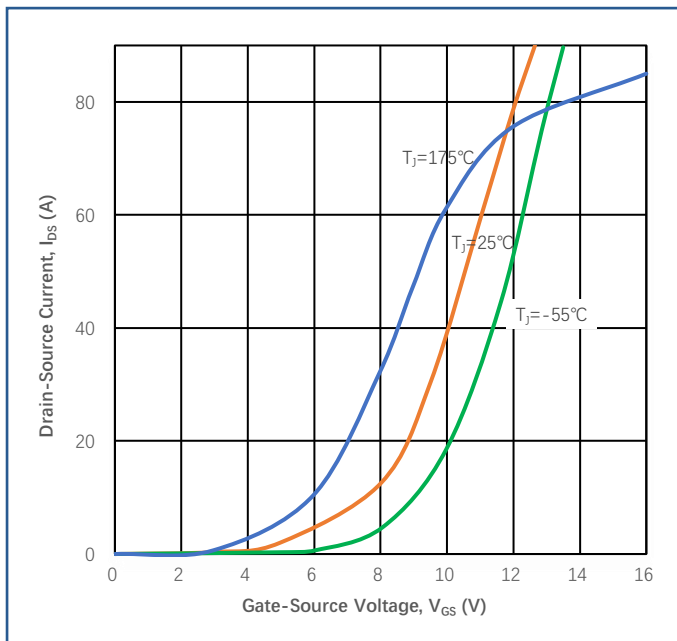


Figure 5
Transfer Characteristic

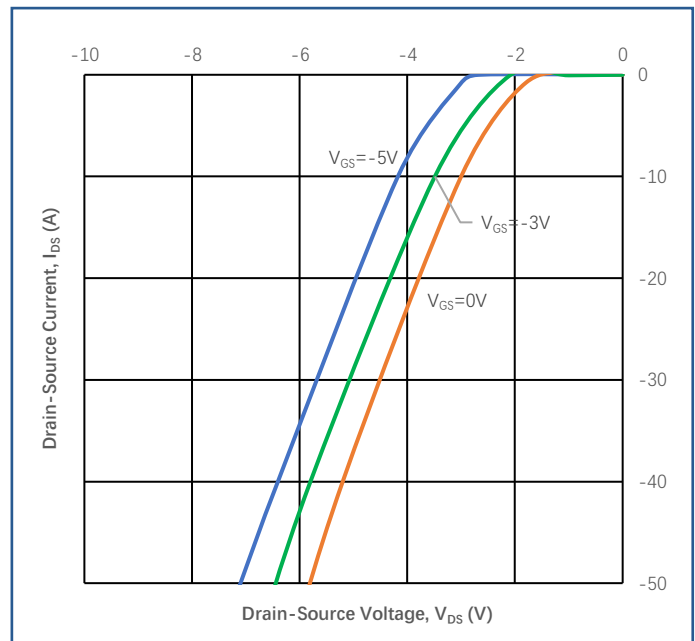


Figure 6
Body Diode Characteristic at 25°C

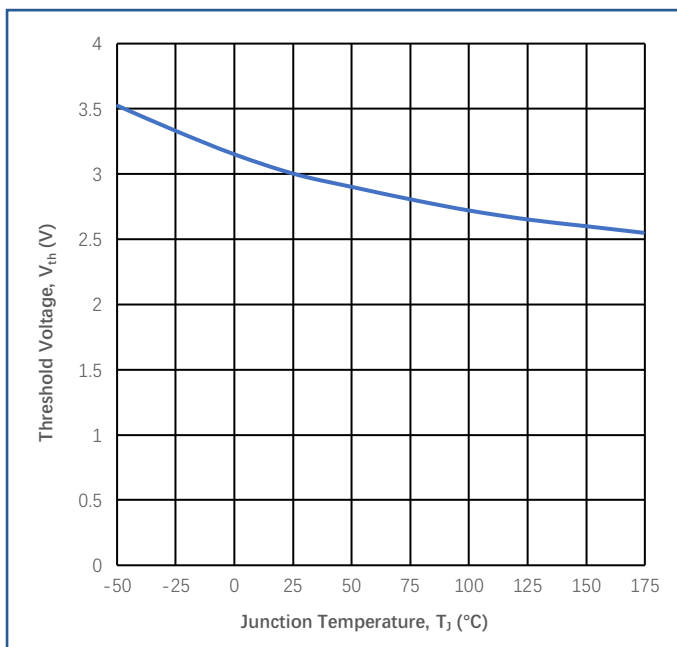


Figure 7
Threshold Voltage vs. Temperature

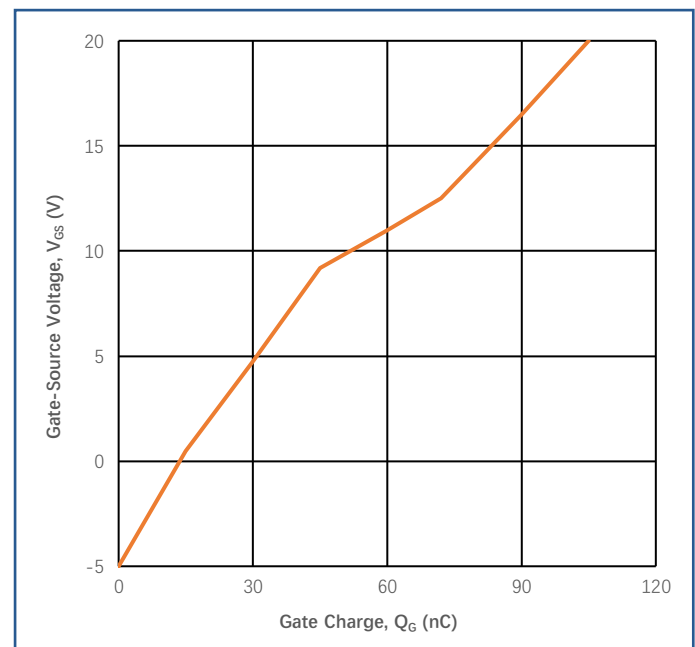


Figure 8
Gate Charge Characteristics

Typical Performance

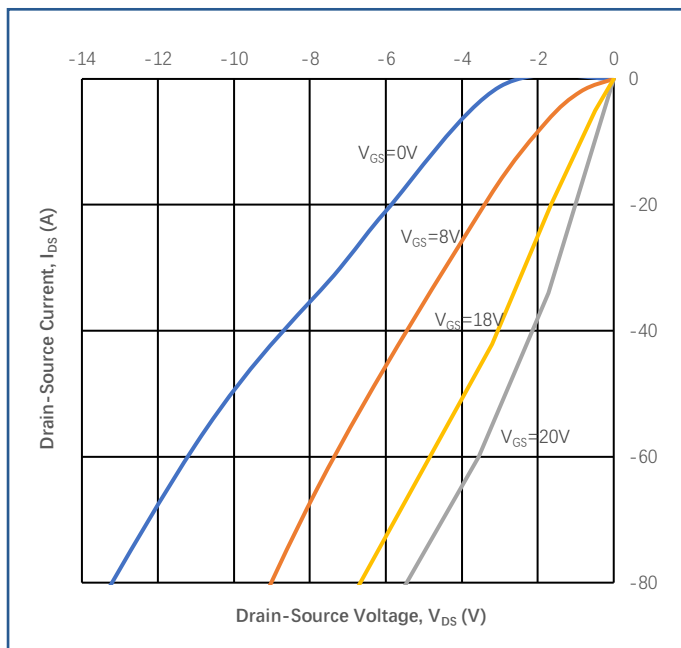


Figure 9
3rd Quadrant Characteristic at 25°C

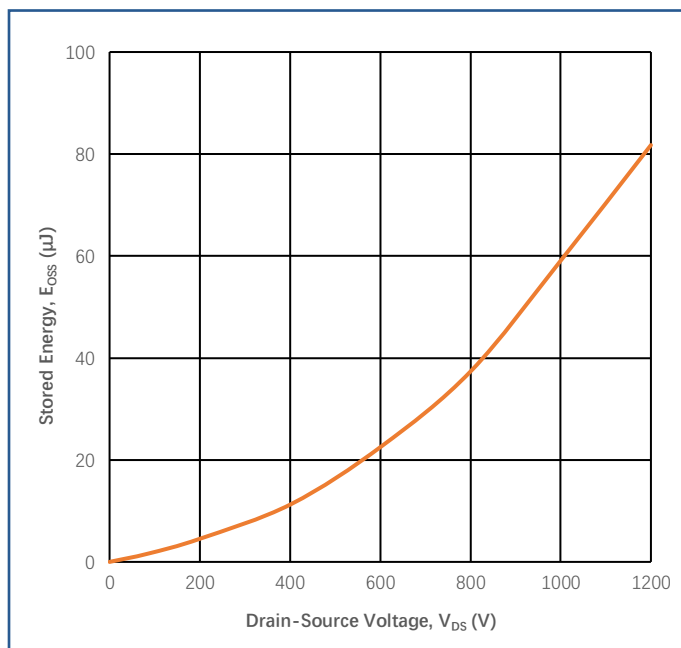


Figure 10
Output Capacitor Stored Energy

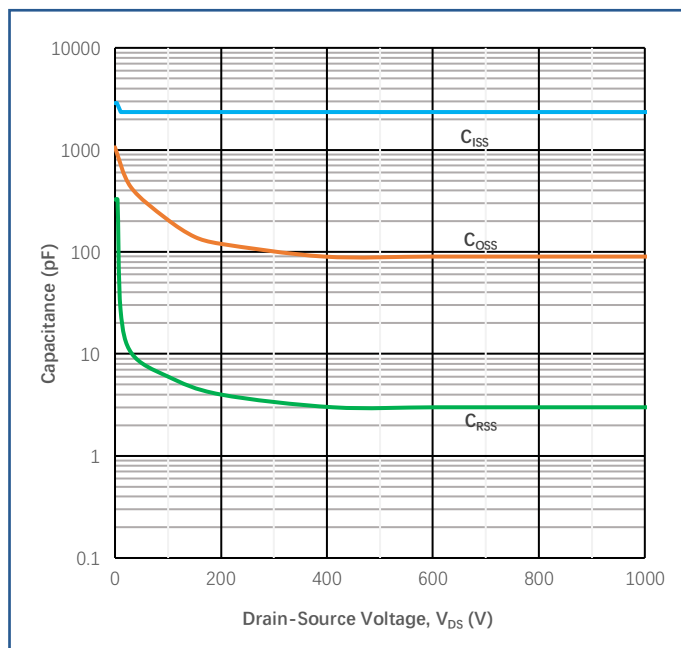


Figure 11
Capacitances vs. Drain-Source

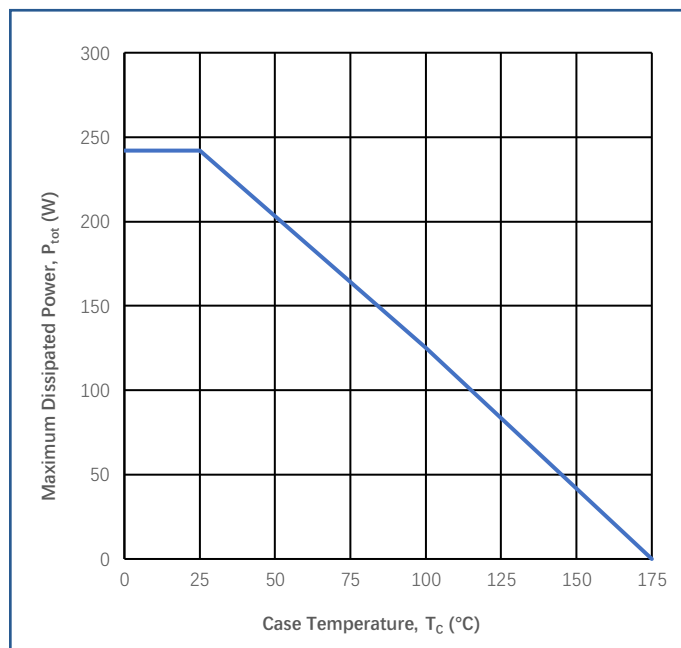


Figure 12
Max Power Dissipation Derating vs T_C

Typical Performance

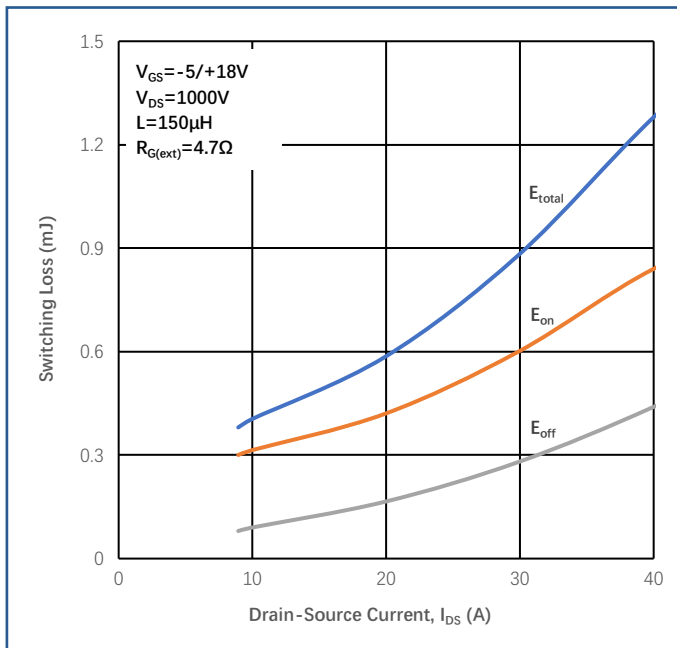


Figure 13
Switching Energy vs. Drain Current

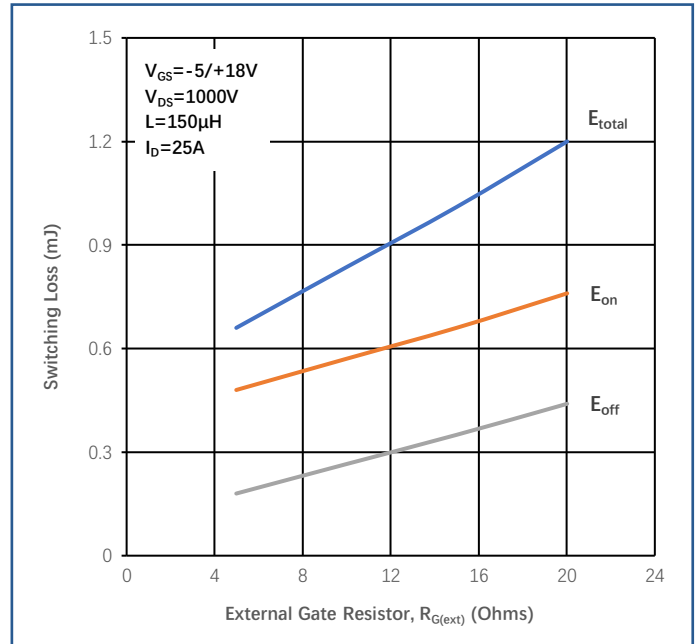


Figure 14
Switching Energy vs. $R_{G(ext)}$

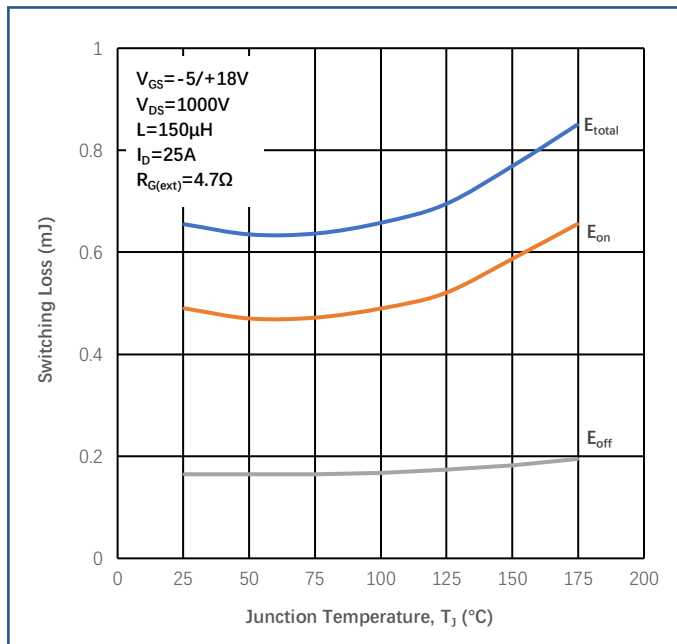


Figure 15
Switching Energy vs. Temperature

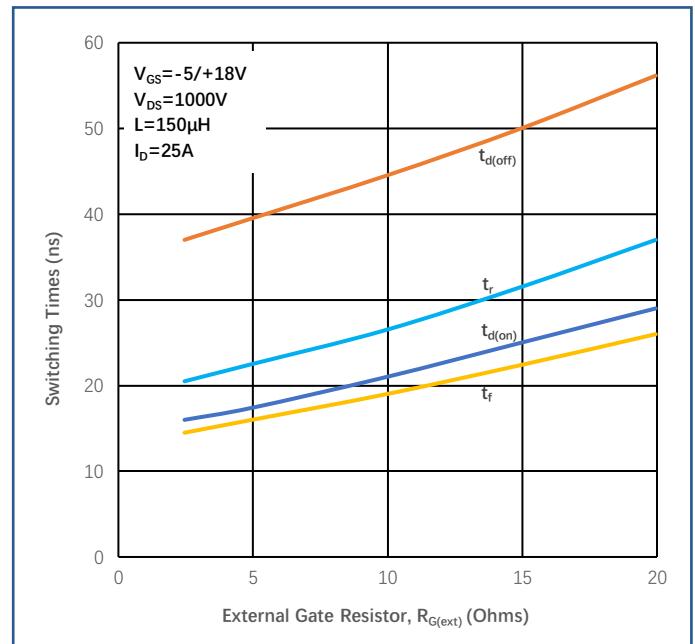


Figure 16
Switching Times vs. $R_{G(ext)}$

Typical Performance

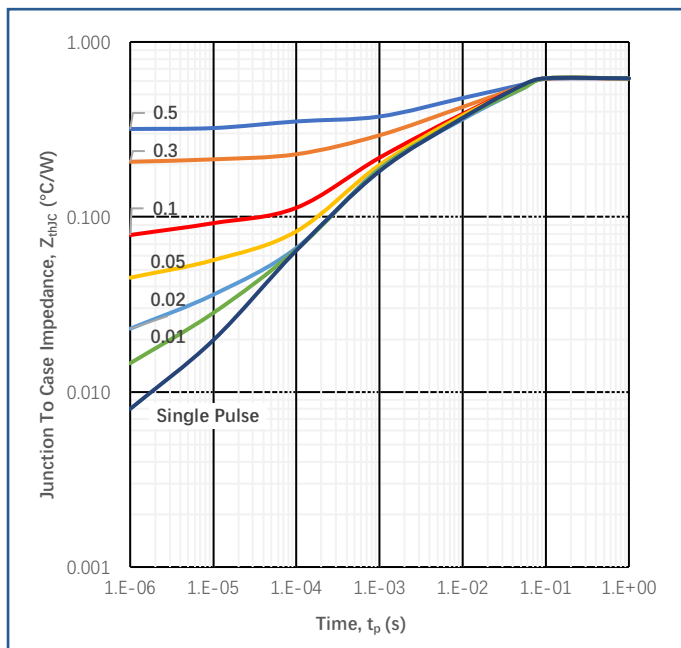


Figure 17

Transient Thermal Impedance

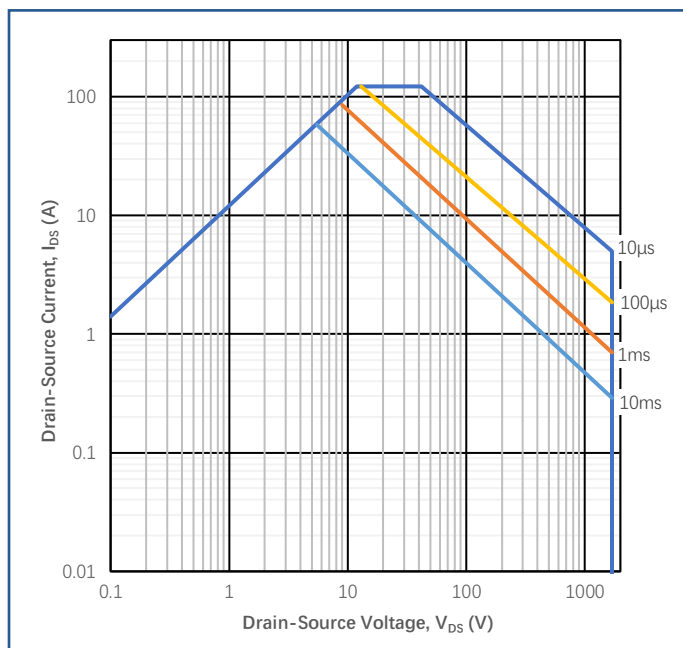
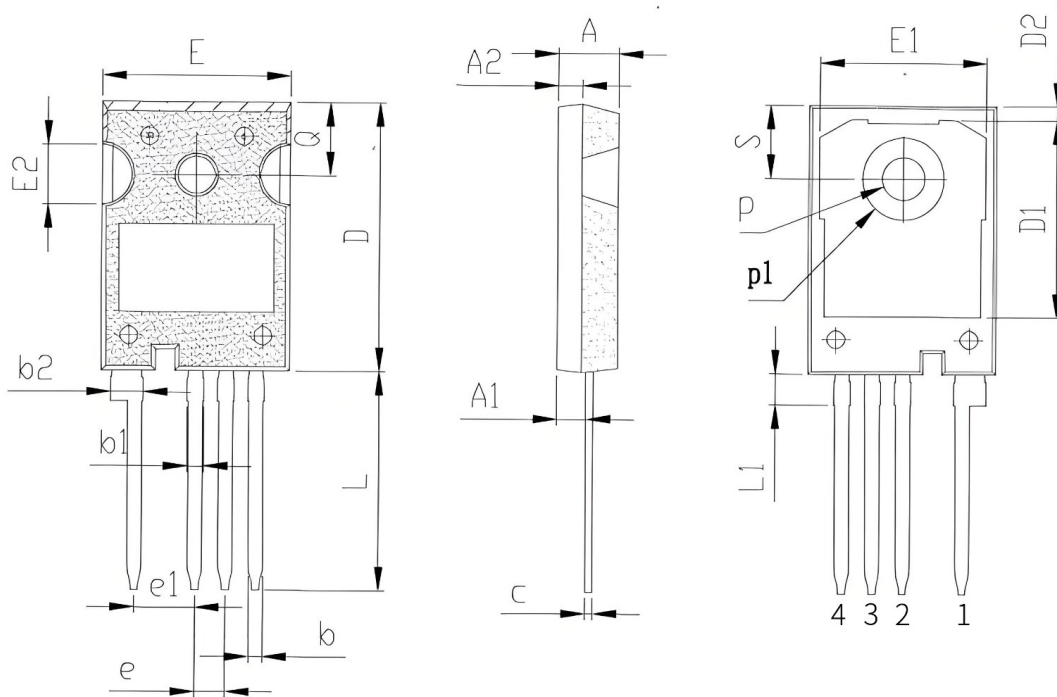


Figure 18

Safe Operating Area

Package Dimensions (mm)

Package Type: TO-247-4L



Symbol	Millimeters		
	Min.	Type.	Max.
A	4.90	5.00	5.10
A1	2.30	2.40	2.50
A2	1.90	2.00	2.10
b	1.15	1.20	1.25
b1	1.15	1.30	1.45
b2	2.45	2.65	2.80
c	0.55	0.60	0.65
D	22.30	22.54	22.69
D1	16.20	16.50	16.80
D2	1.02	1.17	1.32
e	2.54 BSC		
e1	5.08 BSC		
E	15.70	15.80	15.90
E1	13.80	14.0	14.20
E2	4.90	5.00	5.10
L	18.20	18.38	18.55
L1	2.23	2.58	2.73
P	3.50	3.60	3.70
p1	7.04	7.19	7.34
Q	6.00	6.15	6.30
S	6.05	6.15	6.25

Pin	Symbol	Description
1, Tab	D	Drain
2	S	Power Source
3	S	Driver Source
4	G	Gate

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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