

ASC90N1500MT4SX

1500V, 90A, 20mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T04-98A A/0



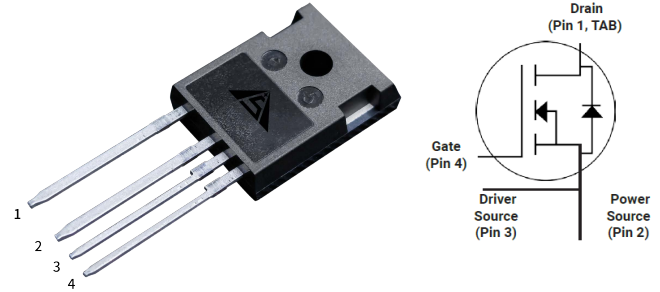
爱仕特科技
AST TECHNOLOGY

General Description

The AST-MT4 series SiC MOSFET in TO-247-4S 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
- Power Factor Correction Modules

Ordering Informations

Order Number	ASC90N1500MT4SX
Marking	ASC90N1500MT4S
Package Type	TO-247-4S
Packing Method	Tube

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V _{DS}	Drain-Source Voltage	1500			V	T _c =25°C
I _D	Drain Current (continuous)	90			A	T _c =25°C
P _D	Power Dissipation	350			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	-	24	30	mΩ	V _{GS} =15V; I _D =60A; T _J =25°C
		-	20	25		V _{GS} =18V; I _D =60A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	103	-	nC	V _{DS} =1000V; V _{GS} =-5V/+18V; I _D =60A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	28	-		
Source-Drain diode						
Q _{rr}	Reverse Recovery Charge	-	450	-	nC	V _{GS} =-5V; I _{SD} =60A; V _R =1000V; di/dt=2350A/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	1500	V
I_D	Drain Current (continuous; $T_c=25^\circ\text{C}$)	90	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	61	
I_{DM}	Drain Current (pulsed)	329	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	350	W
	Power Dissipation ($T_c=100^\circ\text{C}$)	175	
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	1500	-	-	V	V _{GS} =0V
I _{DSS}	Zero Gate Voltage Drain Current	-	1	50	μA	V _{DS} =1500V; V _{GS} =0V
I _{GSS}	Gate-Body Leakage Current	-	-	±100	nA	V _{GS} =-10/+22V; V _{DS} =0V
V _{GS(th)}	Gate Threshold Voltage	2	3.3	4	V	V _{DS} =V _{GS} ; I _D =16mA
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	-	24	30	mΩ	V _{GS} =15V; I _D =60A; T _J =25°C
		-	20	25		V _{GS} =18V; I _D =60A; T _J =25°C
		-	36.4	-		V _{GS} =18V; I _D =60A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	4133	-	pF	V _{GS} =0V; V _{DS} =1200V; f=100kHz; V _{AC} =30mV
C _{oss}	Output Capacitance	-	129	-		
C _{rss}	Reverse Transfer Capacitance	-	5.6	-		
E _{oss}	Coss Stored Energy	-	121	-	μJ	
g _{fs}	Transconductance	-	44	-	S	V _{DS} =20V; I _D =40A
E _{on}	Turn-on Energy (Body Diode)	-	881	-	μJ	V _{DS} =1000V; V _{GS} =-5/+18V; I _D =60A; R _{G(ext)} =2.5Ω; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	49.5	-		
Q _G	Total Gate Charge	-	103	-	nC	V _{DS} =1000V; V _{GS} =-5/+18V; I _D =60A
Q _{GS}	Gate-Source Charge	-	38	-		
Q _{GD}	Gate-Drain Charge	-	28	-		
R _G	Gate Resistance	-	1.8	-	Ω	f=1MHz; V _{AC} =30mV
t _{d(on)}	Turn-on Delay Time	-	35	-	ns	V _{DS} =1000V; V _{GS} =-5/+18V; I _D =60A; R _{G(ext)} =2.5Ω
t _r	Rise Time	-	18	-		
t _{d(off)}	Turn-off Delay Time	-	46	-		
t _f	Fall Time	-	11	-		

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	-	V	$V_{GS}=-5\text{V}; I_F=30\text{A}; T_J=25^{\circ}\text{C}$
		-	3.4	-		$V_{GS}=-5\text{V}; I_F=30\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	87	-	A	$V_{GS}=-5\text{V}$
T_{rr}	Reverse Recovery Time	-	25	-	ns	$V_{GS}=-5\text{V}; I_{SD}=60\text{A}; V_R=1000\text{V};$ $di/dt=2350\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	450	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	28	-	A	

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.428	$^{\circ}\text{C}/\text{W}$

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

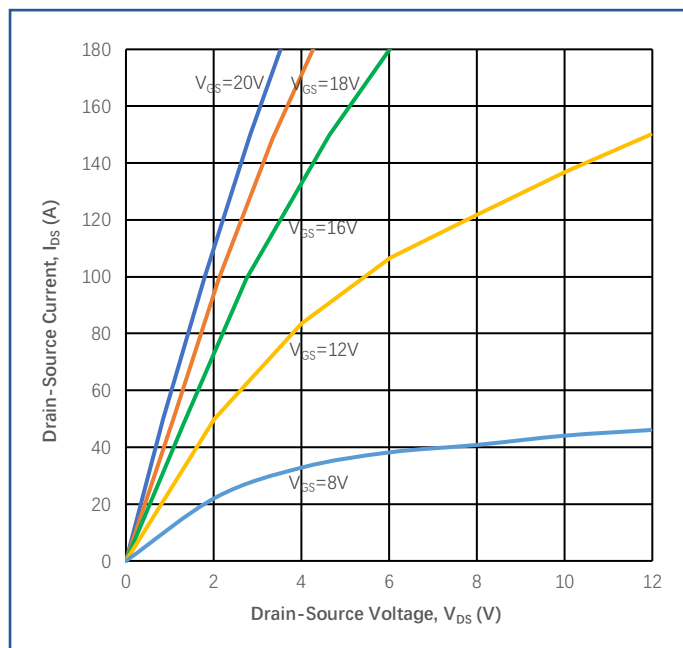


Figure 1
 Output Characteristics ($T_J = 25^\circ\text{C}$)

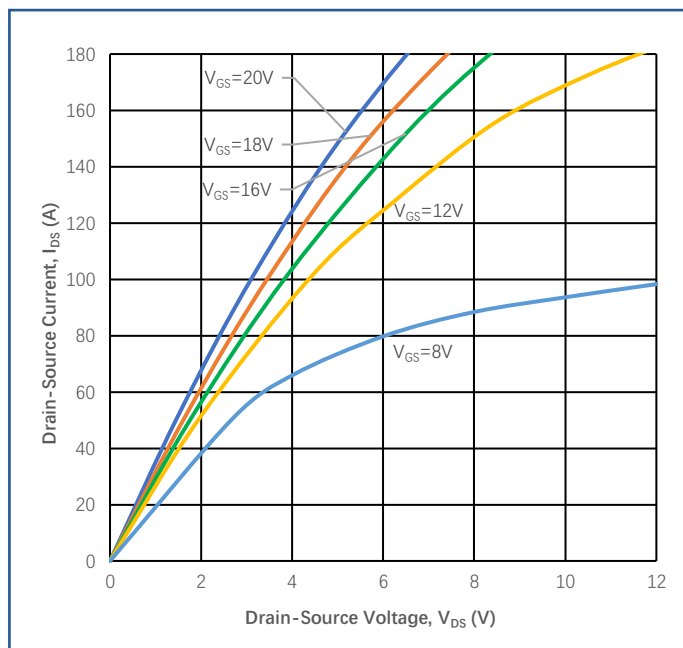


Figure 2
 Output Characteristics ($T_J = 175^\circ\text{C}$)

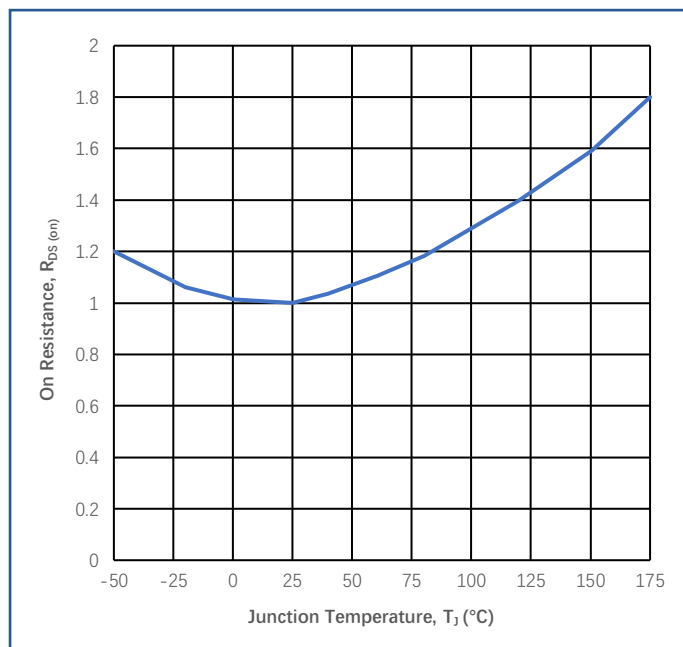


Figure 3
 Normalized On-Resistance vs. Temperature

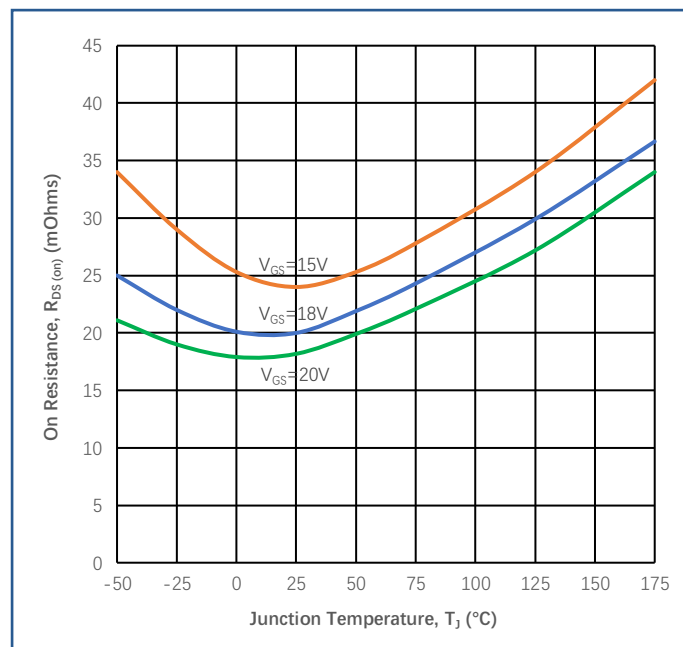


Figure 4
 On-Resistance vs. Temperature

Typical Performance

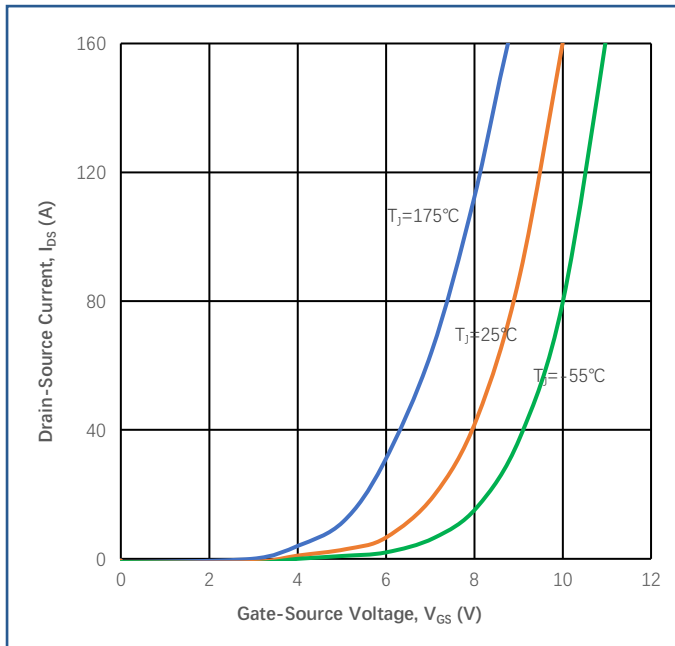


Figure 5
Transfer Characteristic

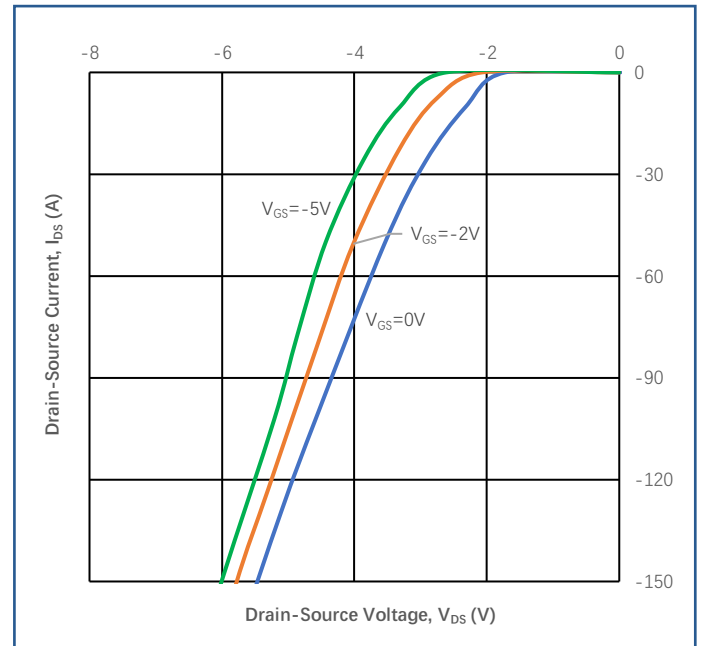


Figure 6
Body Diode Characteristic at 25°C

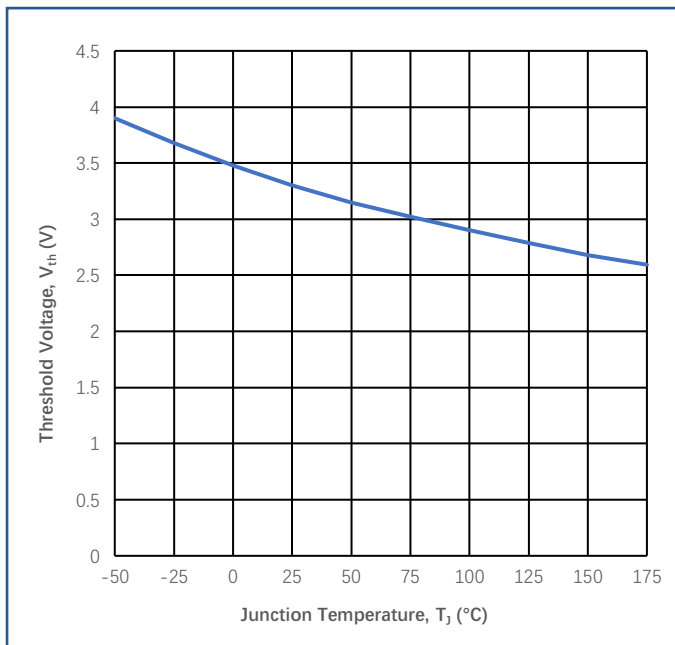


Figure 7
Threshold Voltage vs. Temperature

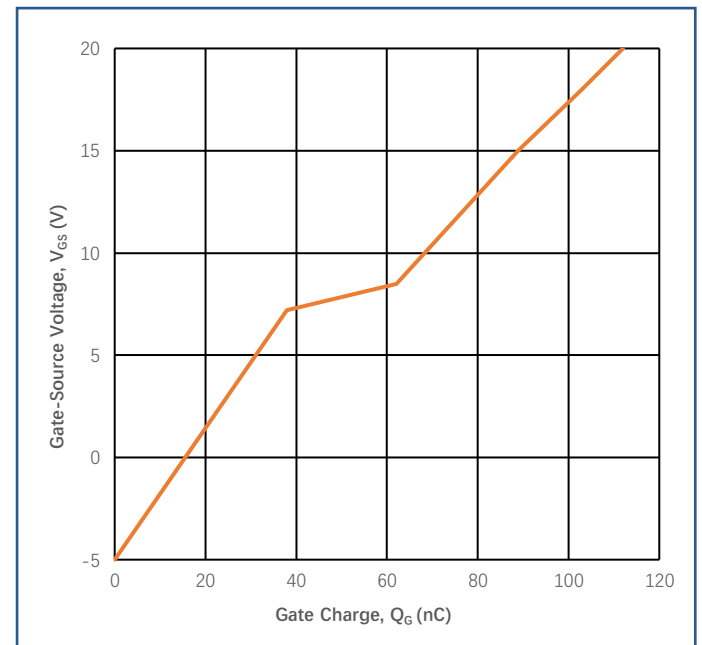


Figure 8
Gate Charge Characteristics

Typical Performance

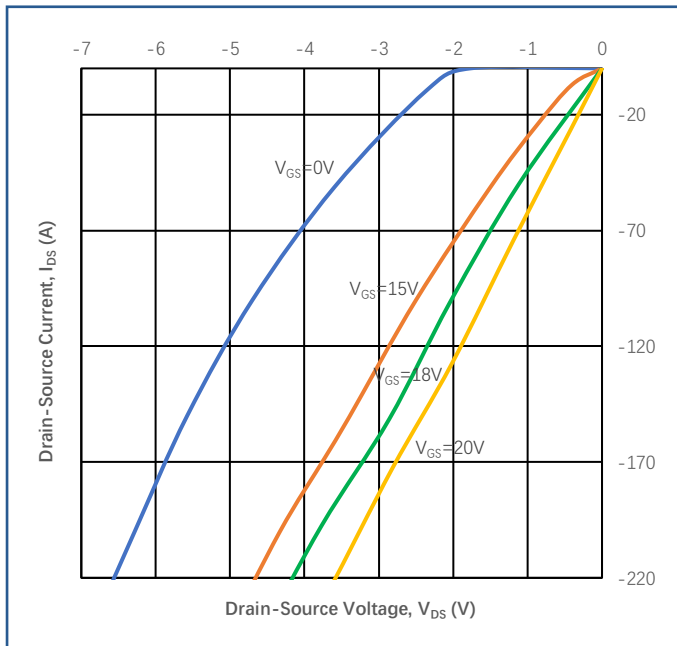


Figure 9
3rd Quadrant Characteristic at 25°C

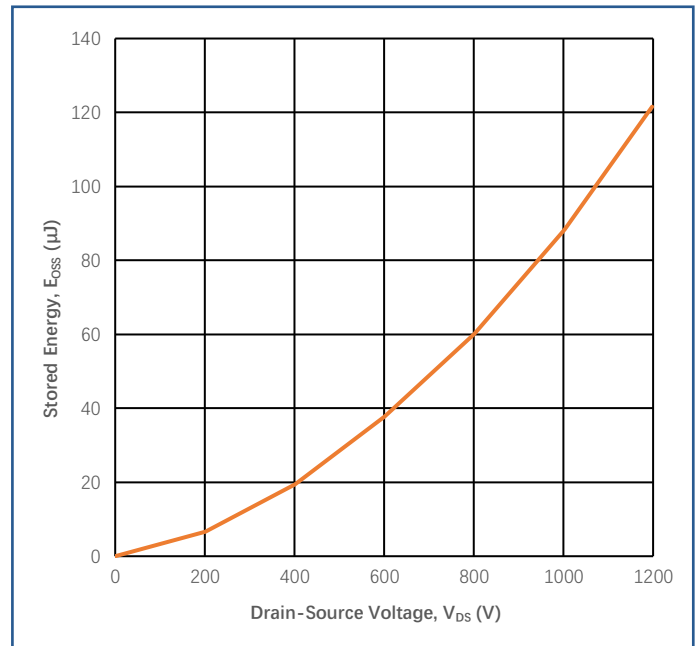


Figure 10
Output Capacitor Stored Energy

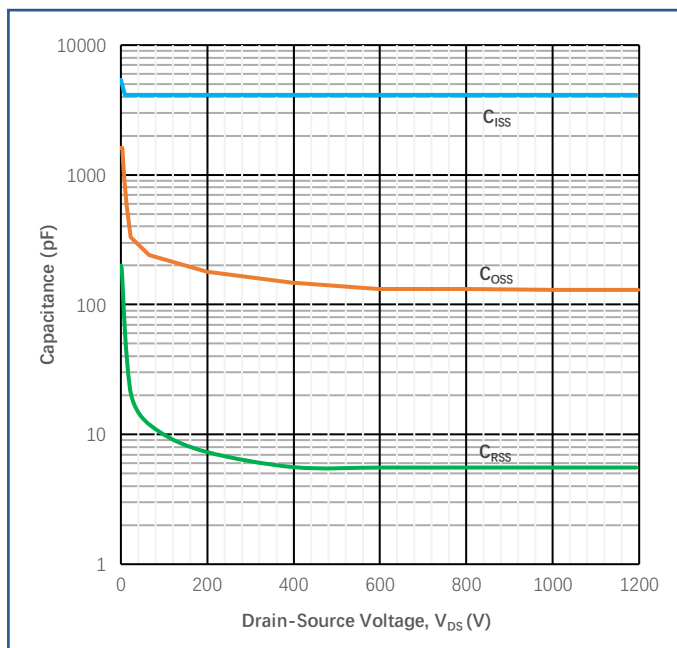


Figure 11
Capacitances vs. Drain-Source

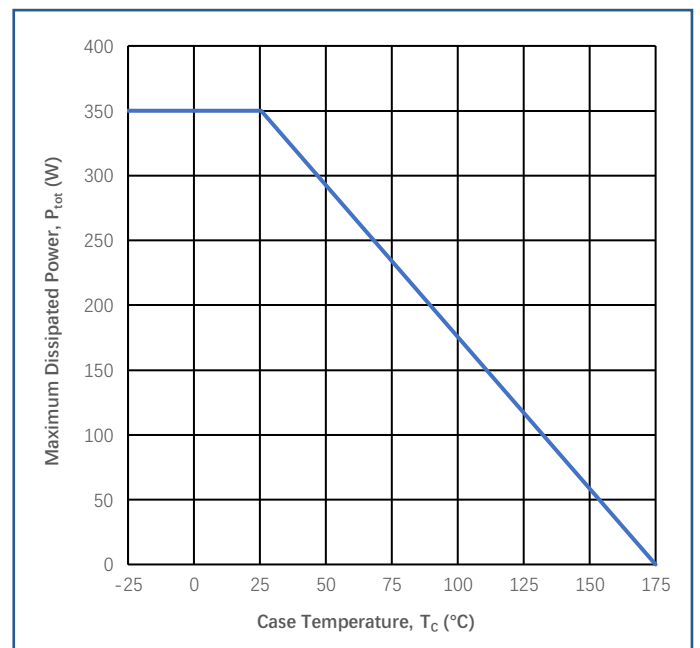


Figure 12
Max Power Dissipation Derating vs T_C

Typical Performance

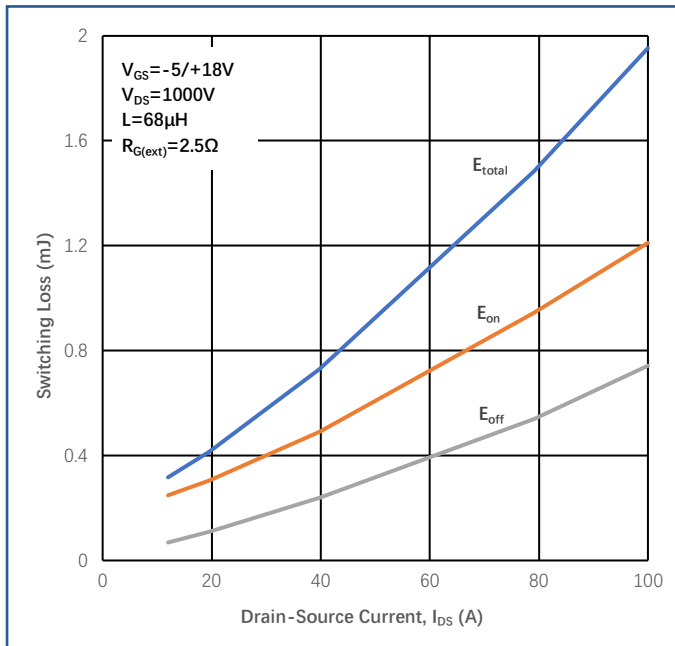


Figure 13
Switching Energy vs. Drain Current

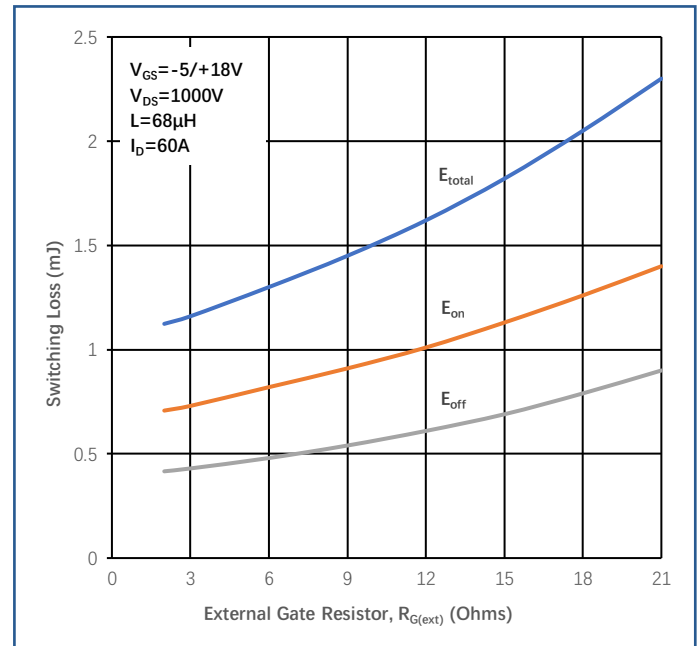


Figure 14
Switching Energy vs. $R_{G(ext)}$

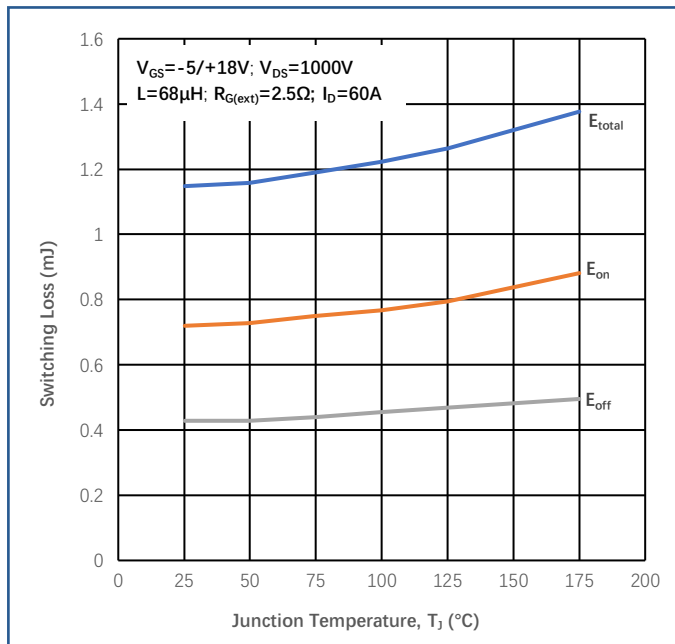


Figure 15
Switching Energy vs. Temperature

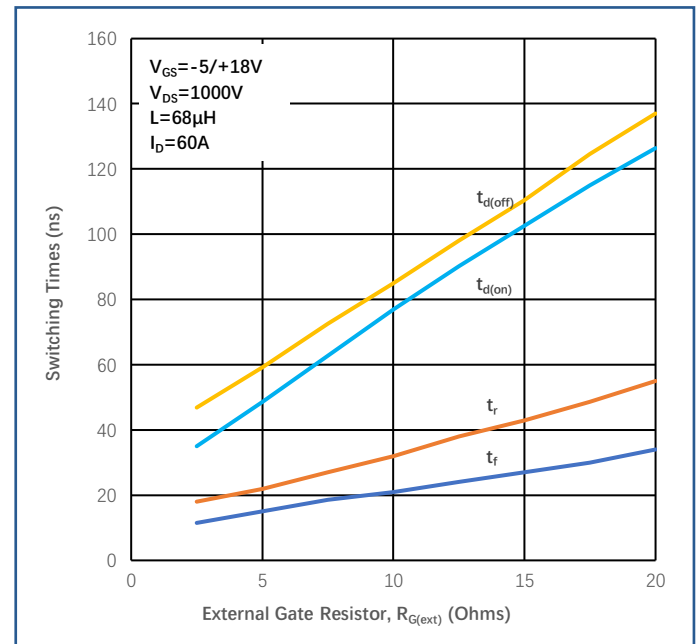


Figure 16
Switching Times vs. $R_{G(ext)}$

Typical Performance

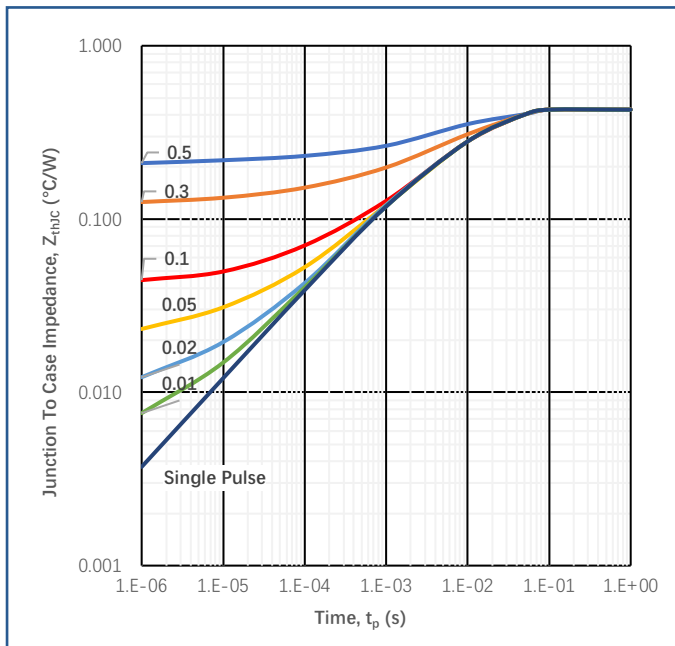


Figure 17
Transient Thermal Impedance

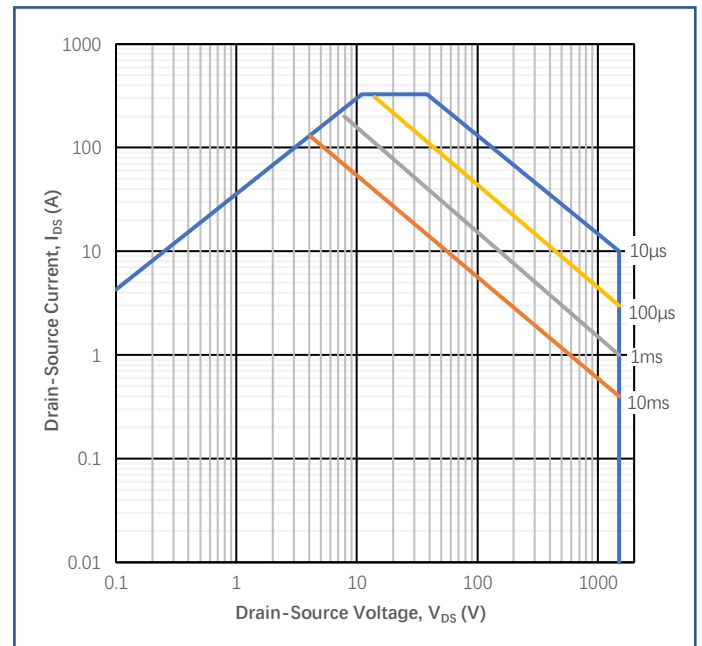
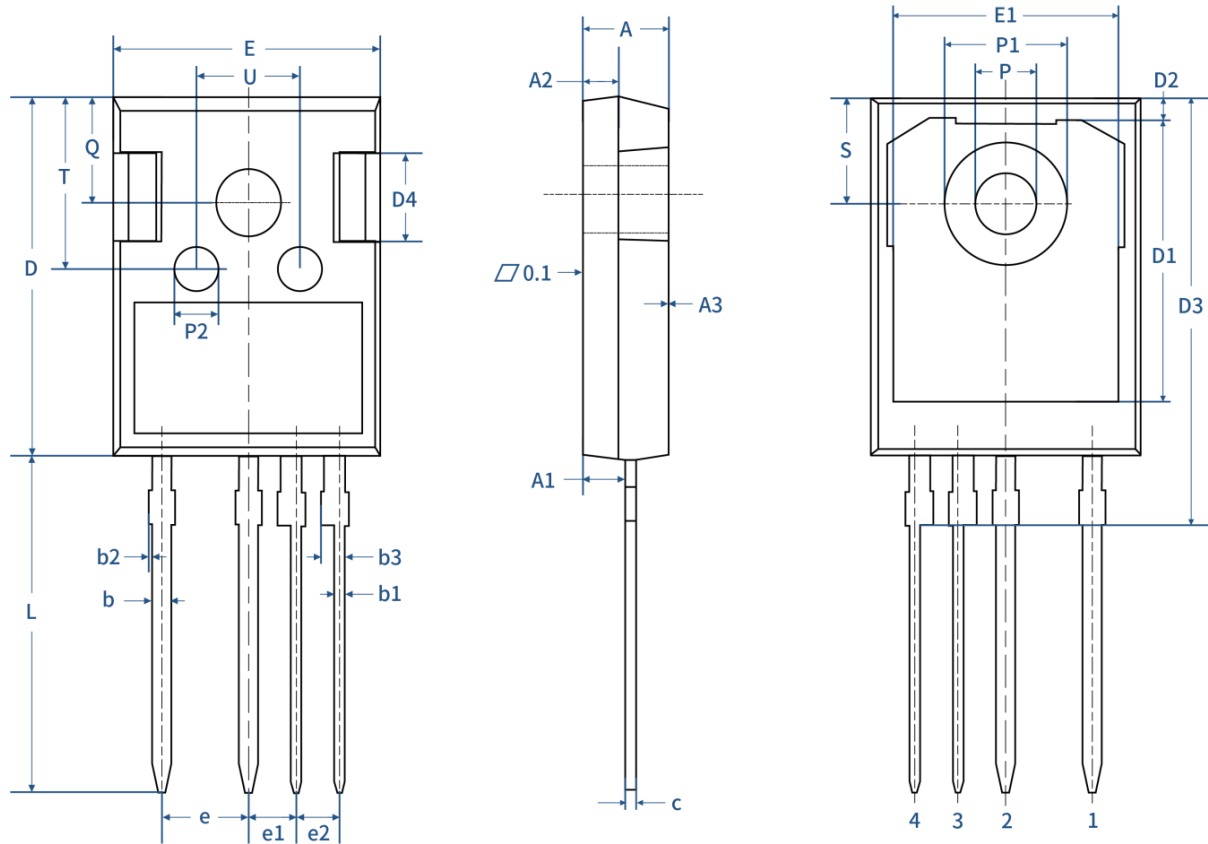


Figure 18
Safe Operating Area

Package Dimensions (mm)

Package Type: TO-247-4S



Symbol	Millimeters		Symbol	Millimeters	
	Min.	Max.		Min.	Max.
A	4.9	5.1	E	15.7	15.9
A1	2.31	2.51	E1	13.1	13.5
A2	1.9	2.1	e	5.08	
A3	0.05	0.25	e1	2.79	
b	1.1	1.3	e2	2.54	
b1	0.65	0.79	L	19.8	20.1
b2	-	0.2	P	3.5	3.7
b3	1.34	1.44	P1	7	7.4
c	0.58	0.66	P2	2.4	2.6
D	20.9	21.1	Q	5.6	6
D1	16.25	16.85	S	6.15	-
D2	1.05	1.35	T	9.8	10.2
D3	24.97	25.27	U	6	6.4
D4	4.9	5.1			

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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