

ASR320N650MD56R

650V, 8A, 320mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T04-68A A/1



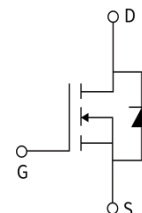
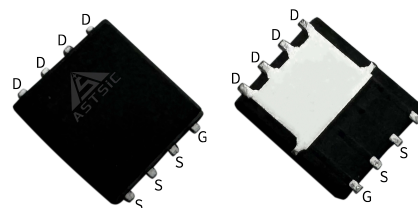
爱仕特科技
AST TECHNOLOGY

General Description

The AST-MD56 series SiC MOSFET in PDFN5*6 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
- Extremely Low Switching Loss
- High Blocking Voltage with Low $R_{DS(on)}$
- Excellent Stability and Uniformity
- Easy to parallel and Simple to Drive
- RoHS Compliant, Halogen Free



Applications

- PC Power
- EV Charging
- LED Lighting
- Server Power / Telecom Power
- Solar PV inverters / UPS

Ordering Informations

Order Number	ASR320N650MD56R
Marking	ASR320N650MD56R
Package Type	PDFN5*6
Packing Method	Reel

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V _{DS}	Drain-Source Voltage	650			V	T _C =25°C
I _D	Drain Current (continuous)	8			A	T _C =25°C
P _D	Power Dissipation	85			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	-	320	380	mΩ	V _{GS} =12V; I _D =2A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	9	-	nC	V _{DS} =400V; V _{GS} =-3V/12V; I _D =2A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	3	-		

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

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	650	V
I_D	Drain Current (continuous; $T_c=25^\circ\text{C}$)	8	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	6	
I_{DM}	Drain Current (pulsed)	28	A
V_{GS}	Gate-Source Voltage	-5/+15	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	85	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	650	-	-	V	I _D =250μA; V _{GS} =0V
I _{DSS}	Zero Gate Voltage Drain Current	-	-	50	μA	V _{DS} =650V; V _{GS} =0V; T _J =25°C
I _{GSS}	Gate-Body Leakage Current	-	10	100	nA	V _{DS} =0V; V _{GS} =-5 to 15V
V _{GS(th)}	Gate Threshold Voltage	1.5	1.9	2.5	V	V _{DS} = V _{GS} ; I _D =1mA
V _{GS(on)}	Recommended Turn-on Voltage	-	12	-	V	Static
V _{GS(off)}	Recommended Turn-off Voltage	-	-3	-		
R _{DS(on)}	Static Drain-Source on Resistance	-	320	380	mΩ	V _{GS} =12V; I _D =2A; T _J =25°C
		-	400	-		V _{GS} =12V; I _D =2A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	339	-	pF	V _{DS} =600V; f=1MHZ; V _{AC} =25mV
C _{oss}	Output Capacitance	-	20	-		
C _{rss}	Reverse Transfer Capacitance	-	3.5	-		
g _{fs}	Transconductance	-	2.8	-	S	V _{DS} =12V; I _D =2A
E _{oss}	Coss Stored Energy	-	5	-	μJ	V _{DS} =600V; f=1MHZ
E _{on}	Turn-on Energy (Body Diode)	-	47	-	μJ	V _{DS} =400V; V _{GS} =-3/12V; I _D =2A , L=1.5mH; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	8.5	-		
Q _G	Total Gate Charge	-	9	-	nC	V _{DS} =400V; V _{GS} =-3V/12V; I _D =2A
Q _{GS}	Gate-Source Charge	-	2	-		
Q _{GD}	Gate-Drain Charge	-	3	-		
R _{G(int)}	Internal Gate Resistance	-	8	-	Ω	f=1MHZ; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	5	-	ns	V _{DS} =400V; V _{GS} =-3V/12V; I _D =2A; L=1.5mH; R _{G(ext)} =2.5Ω
t _r	Rise Time	-	6	-		
t _{d(off)}	Turn-off Delay Time	-	7	-		
t _f	Fall Time	-	8.8	-		

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	-	3.5	6	V	$V_{GS}=0\text{V}; I_F=2\text{A}; T_J=25^{\circ}\text{C}$
		-	3	6		$V_{GS}=0\text{V}; I_F=2\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	4	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.76	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	$^{\circ}\text{C/W}$

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

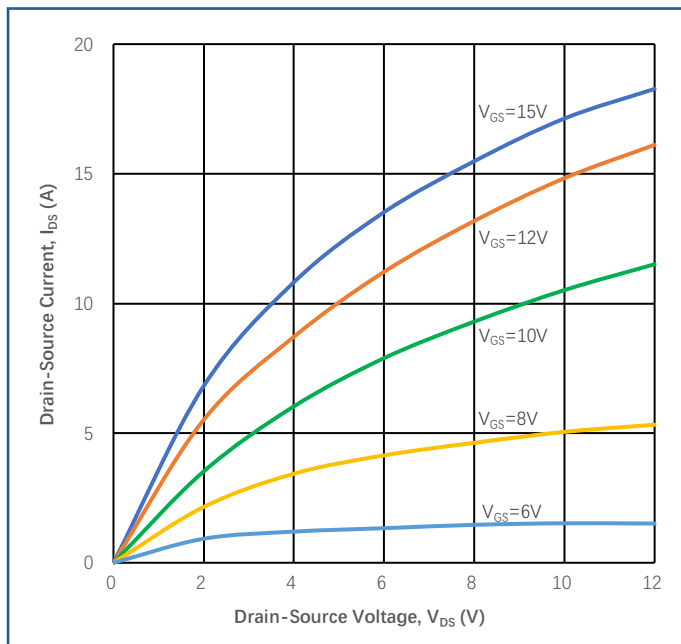


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

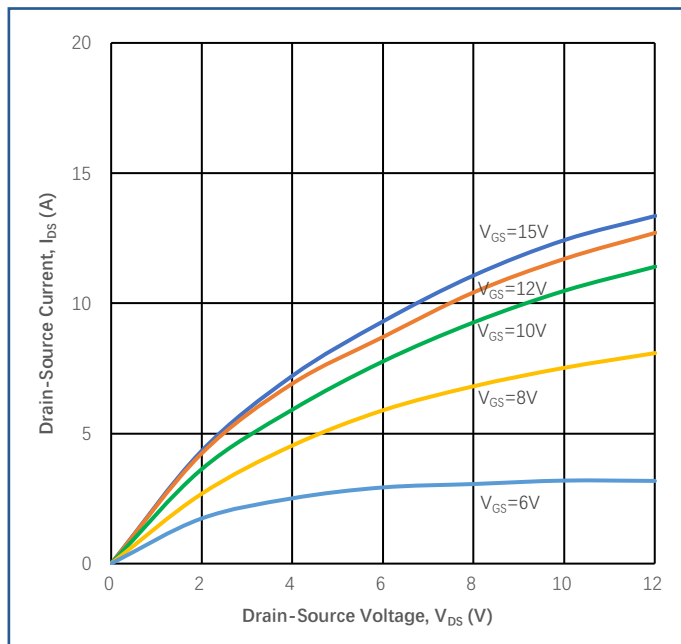


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

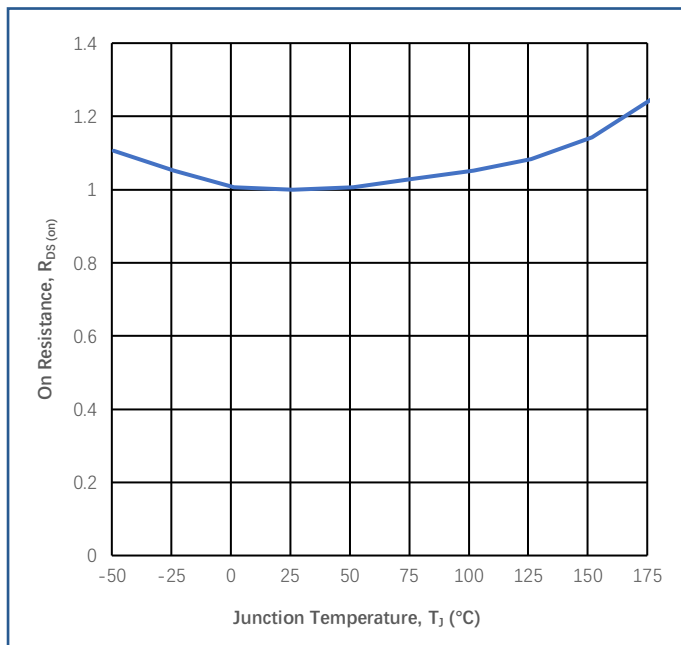


Figure 3
Normalized On-resistance vs. Temperature

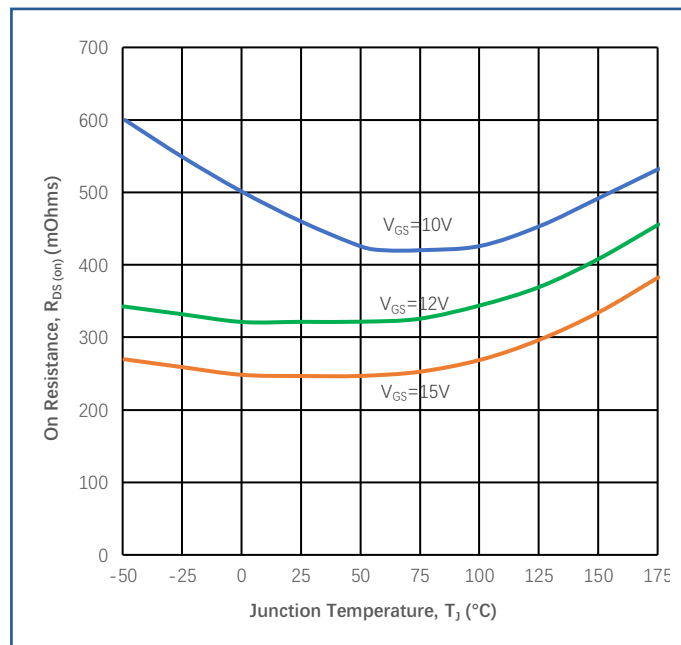


Figure 4
On-resistance vs. Temperature

Typical Performance

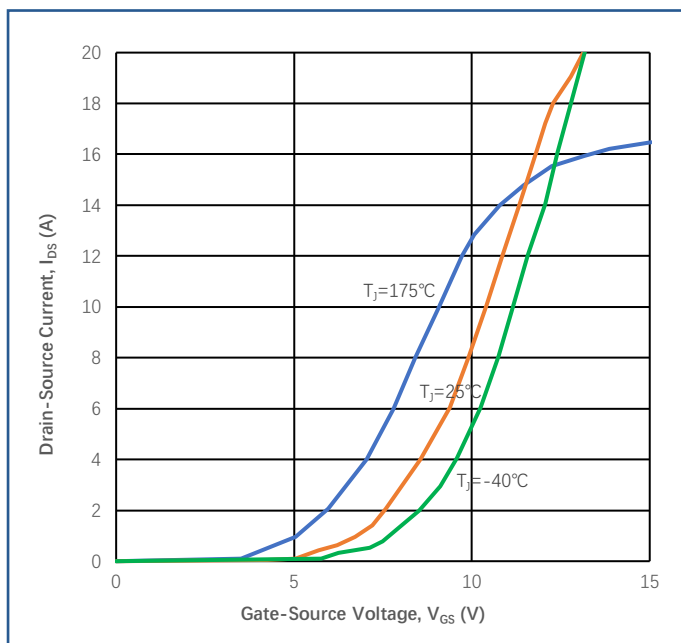


Figure 5
Transfer Characteristic

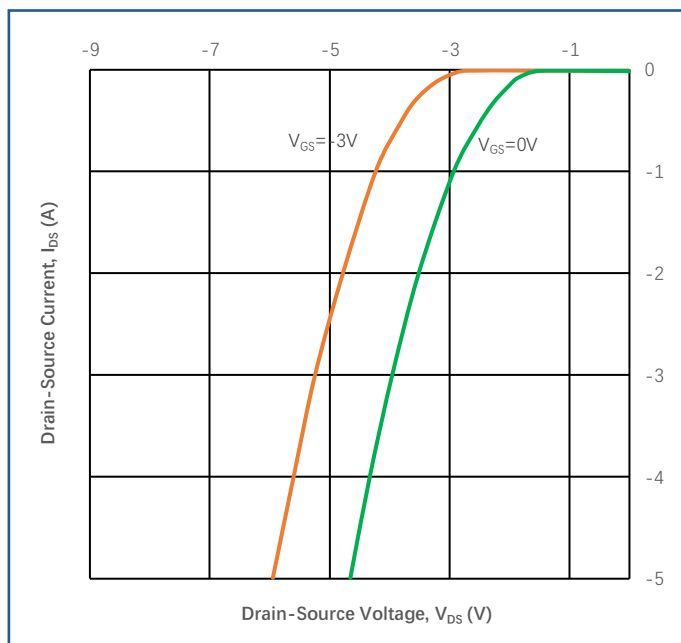


Figure 6
Body Diode Characteristic at 25°C

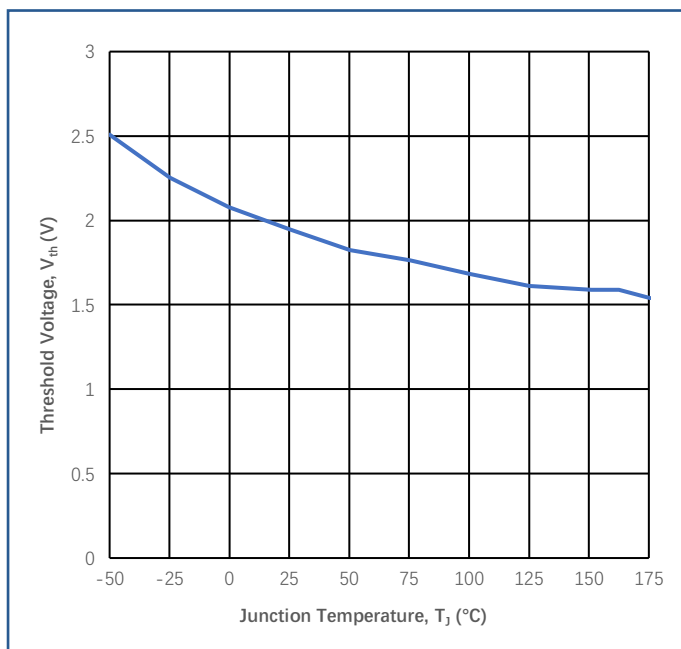


Figure 7
Threshold Voltage vs. Temperature

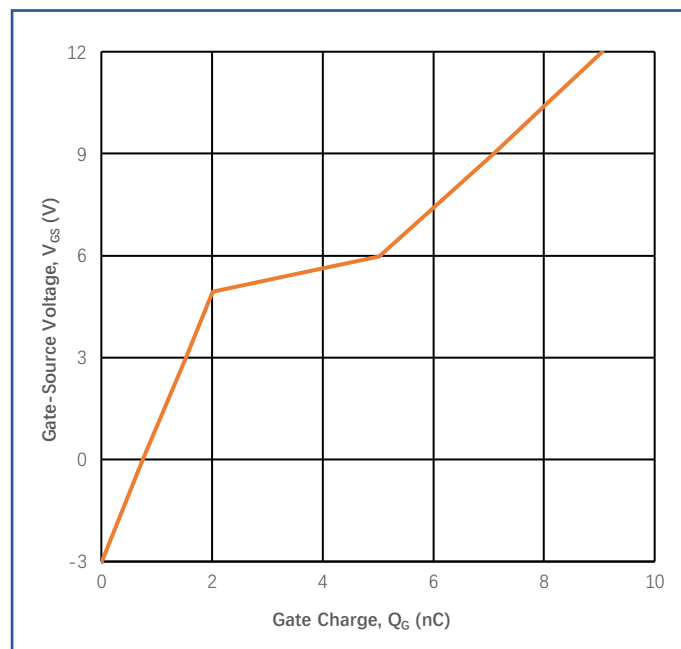


Figure 8
Gate Charge Characteristics

Typical Performance

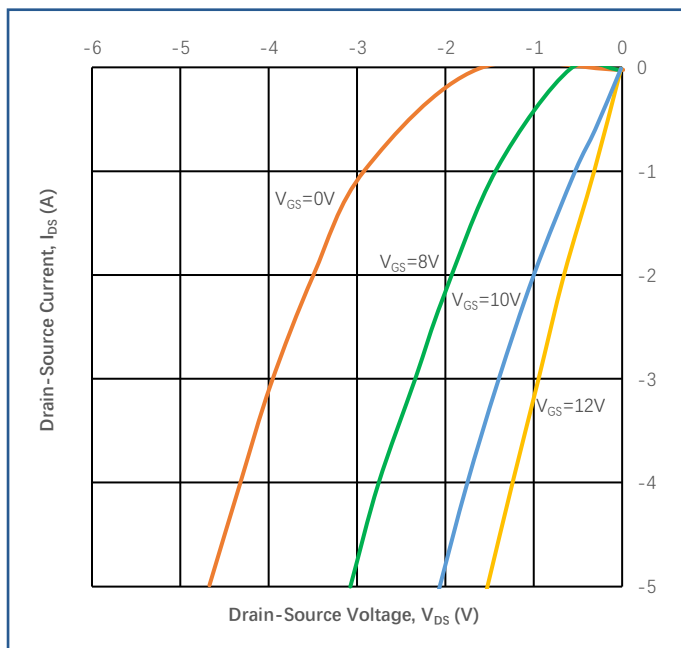


Figure 9
3rd Quadrant Characteristic at 25°C

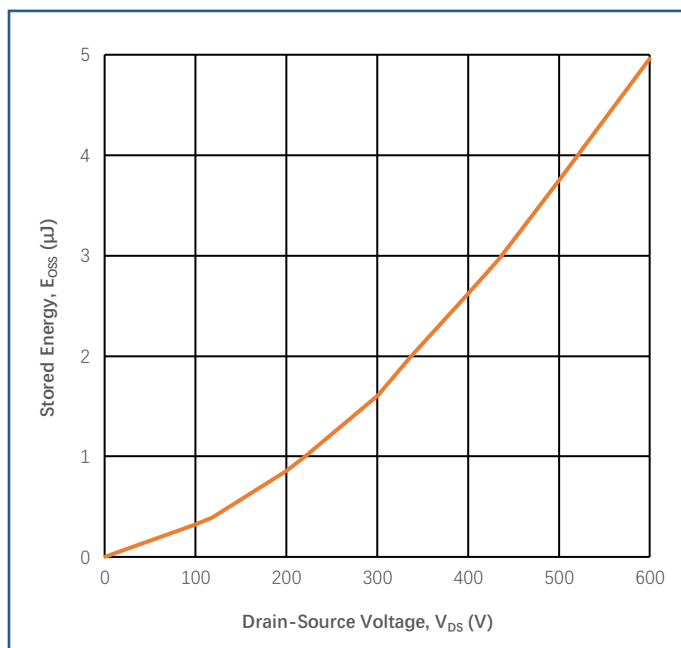


Figure 10
Output Capacitor Stored Energy

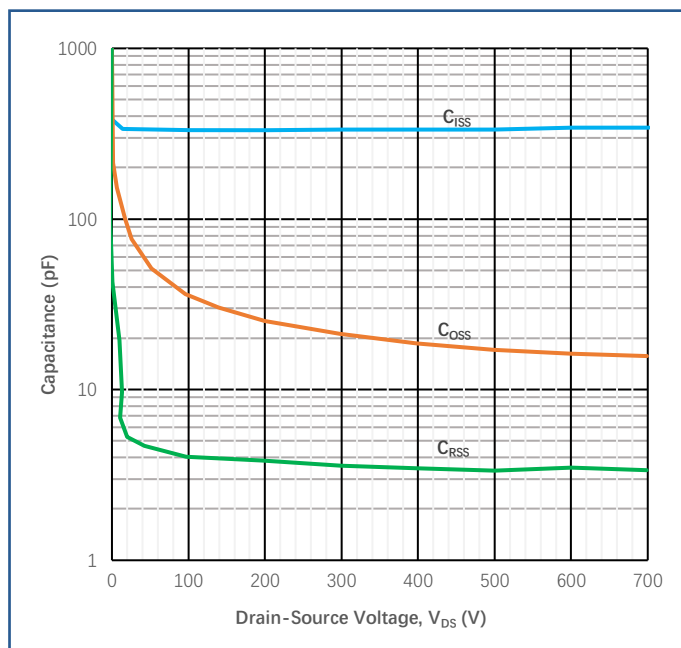


Figure 11
Capacitances vs. Drain-Source

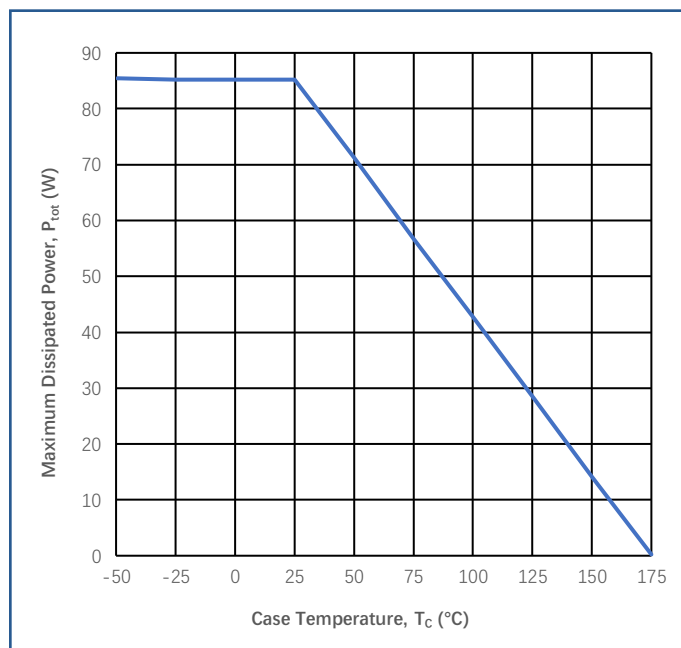


Figure 12
Max Power Dissipation Derating vs T_c

Typical Performance

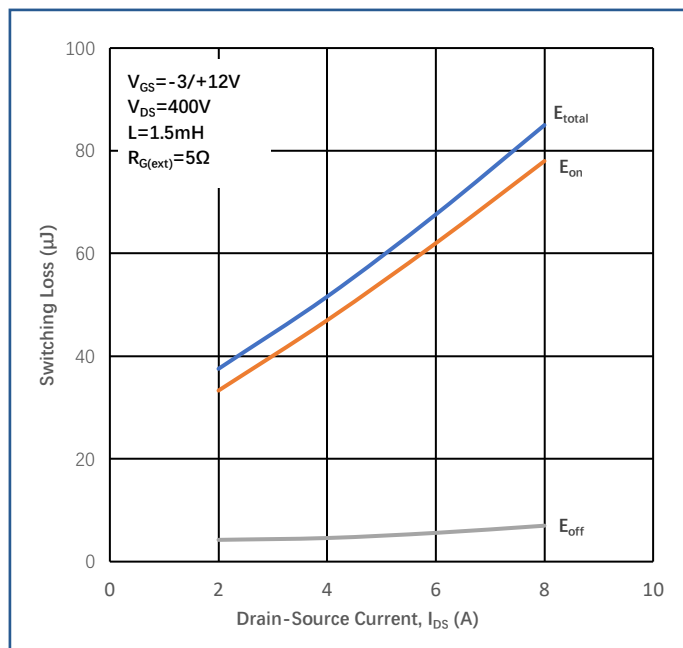


Figure 13

Switching Energy vs. Drain Current

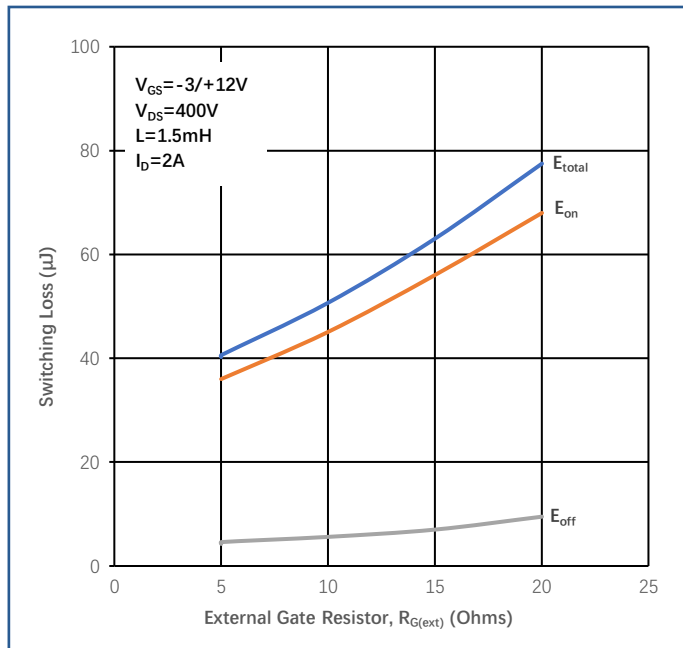


Figure 14

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

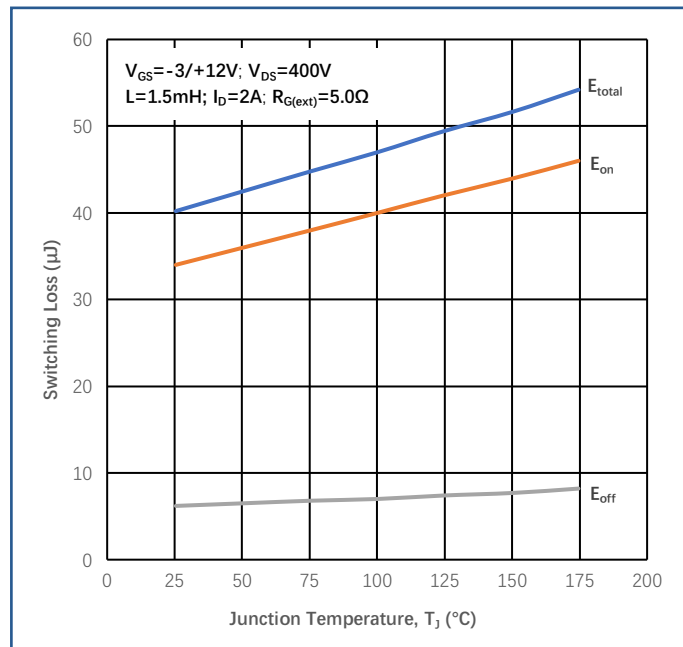


Figure 15

Switching Energy vs. Temperature

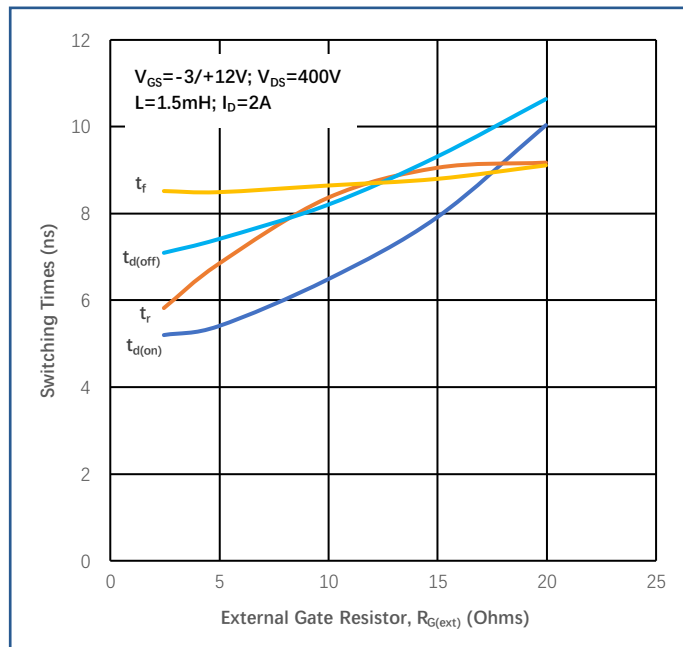


Figure 16

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

Typical Performance

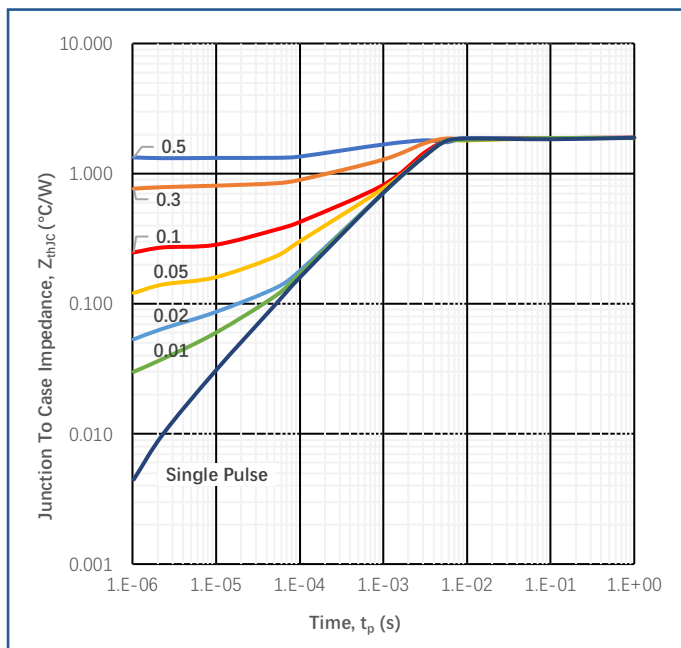


Figure 17
Transient Thermal Impedance

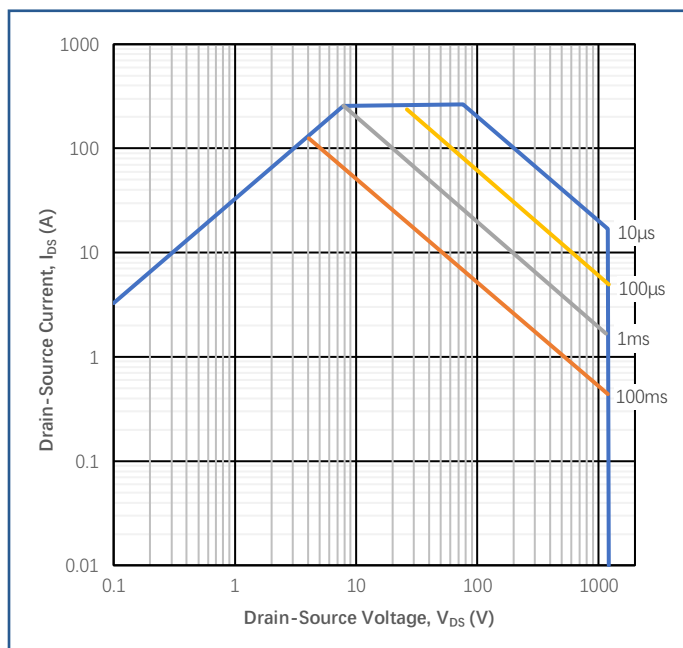
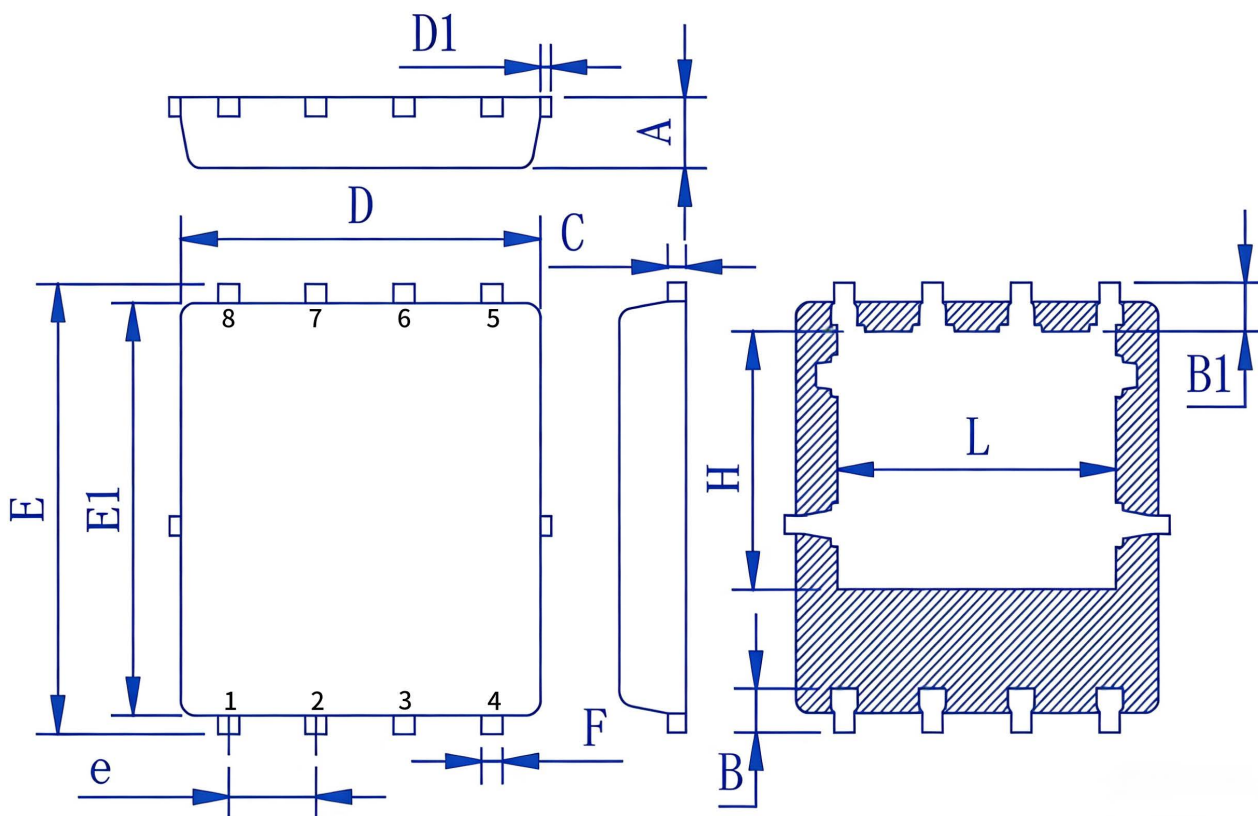


Figure 18
Safe Operating Area

Package Dimensions (mm)

Package Type: PDFN5*6



Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	0.90	0.95	1.00
B	0.48	0.58	0.68
B1	0.55	0.65	0.75
C	0.20	0.254	0.30
D	5.10	5.20	5.30
D1	-	-	0.15
E	5.90	6.05	6.20
E1	5.40	5.55	5.70
e	1.22	1.27	1.32
F	0.25	0.30	0.35
H	3.27	3.47	3.67
L	3.80	4.00	4.20

Pin	Symbol	Description
1-3	S	Source
4	G	Gate
5-8	D	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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