

ASR45N1200MD02

1200V, 60A, 45mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T04-39A A/0



爱仕特科技
AST TECHNOLOGY

General Description

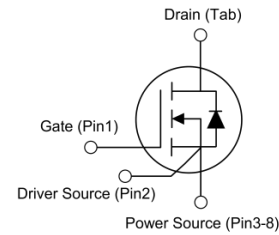
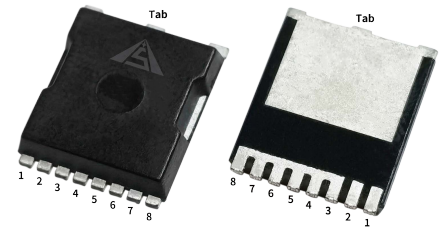
The AST-MD02 series SiC MOSFET in TOLL package ensures stable high-temperature operation for power-dense and energy-critical systems, enabling compact designs with reduced EMI.

Features

- 3rd Generation SiC MOSFET Technology
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Low Impedance Package with Driver Source Pin
- Easy to Parallel and Simple to Drive
- RoHS Compliant, Halogen Free

Applications

- EV motor drive
- Solar inverters
- EV Charging
- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Power Factor Correction Modules



Ordering Informations

Order Number	ASR45N1200MD02
Marking	ASR45N1200MD02
Package Type	TOLL
Packing Method	Reel

Key Parameters

Symbol	Parameter	Values			Unit	Test Conditions
Absolute maximum rating						
V _{DS}	Drain-Source Voltage	1200			V	T _C =25°C
I _D	Drain Current (continuous)	60			A	T _C =25°C
P _D	Power Dissipation	218			W	T _C =25°C
T _J ; MAX	Maximum Junction Temperature	175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Static Drain-Source on Resistance	-	45	52	mΩ	V _{GS} =18V; I _D =20A; T _J =25°C
		-	81	-		V _{GS} =18V; I _D =20A; T _J =175°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	125	-	nC	V _{DS} =800V; V _{GS} =-5/18V; I _D =20A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	33	-		
Source-drain diode						
Q _{rr}	Reverse Recovery Charge	-	712	-	nC	V _{GS} =-5V; I _F =20A; V _R =800V; 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	1200	V
I_D	Drain Current (continuous; $T_c=25^\circ\text{C}$)	60	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	48	
I_{DM}	Drain Current (pulsed)	200	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	218	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	1200	-	-	V	I _D =250μA; V _{GS} =0V
I _{DSS}	Zero Gate Voltage Drain Current	-	-	100	μA	V _{DS} =1200V; 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	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	-	45	52	mΩ	V _{GS} =18V; I _D =20A; T _J =25°C
		-	81	-		V _{GS} =18V; I _D =20A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	2565	-	pF	V _{DS} =1000V; f=1MHz; V _{AC} =25mV
C _{oss}	Output Capacitance	-	109	-		
C _{rss}	Reverse Transfer Capacitance	-	4	-		
g _{fs}	Transconductance	-	24	-	S	V _{DS} =20V; I _D =20A
E _{oss}	Coss Stored Energy	-	63	-	μJ	V _{DS} =1000V; f=1MHz
E _{on}	Turn-on Energy (Body Diode)	-	556	-		V _{DS} =800V; V _{GS} =-5/18V; I _D =20A;
E _{off}	Turn-off Energy (Body Diode)	-	93	-		Load=100μH; R _{G(ext)} =2.5Ω; T _J =175°C
Q _G	Total Gate Charge	-	125	-	nC	V _{DS} =800V; V _{GS} =-5/18V; I _D =20A
Q _{GS}	Gate-Source Charge	-	32	-		
Q _{GD}	Gate-Drain Charge	-	33	-		
R _{G(int)}	Internal Gate Resistance	-	4.2	-	Ω	f=1MHz; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	13	-	ns	V _{DS} =800V; V _{GS} =-5/18V; I _D =20A; R _{G(ext)} =2.5Ω; Load=100μH
t _r	Rise Time	-	17	-		
t _{d(off)}	Turn-off Delay Time	-	23	-		
t _f	Fall Time	-	9	-		

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	-	4.2	6	V	$V_{GS}=0\text{V}; I_F=20\text{A}; T_J=25^{\circ}\text{C}$
		-	3.5	6		$V_{GS}=0\text{V}; I_F=20\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	55	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$
t_{rr}	Reverse Recovery Time	-	50	-	ns	$V_{GS}=-5\text{V}; I_F=20\text{A}; V_R=800\text{V};$ $di/dt=900\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	712	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	19	-	A	

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.69	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	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

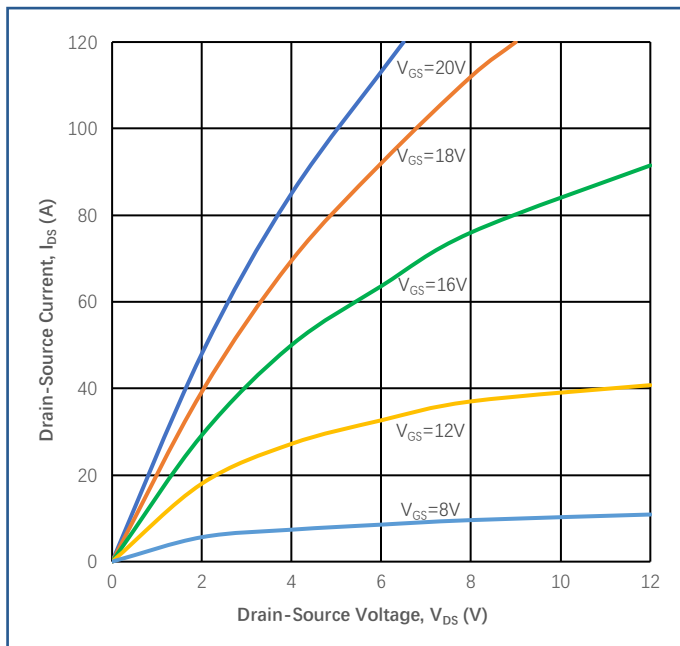


Figure 1

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

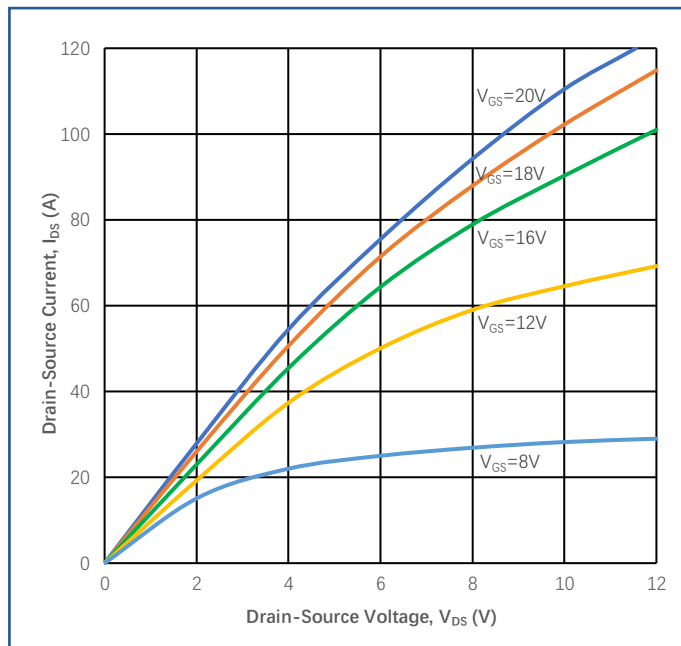


Figure 2

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

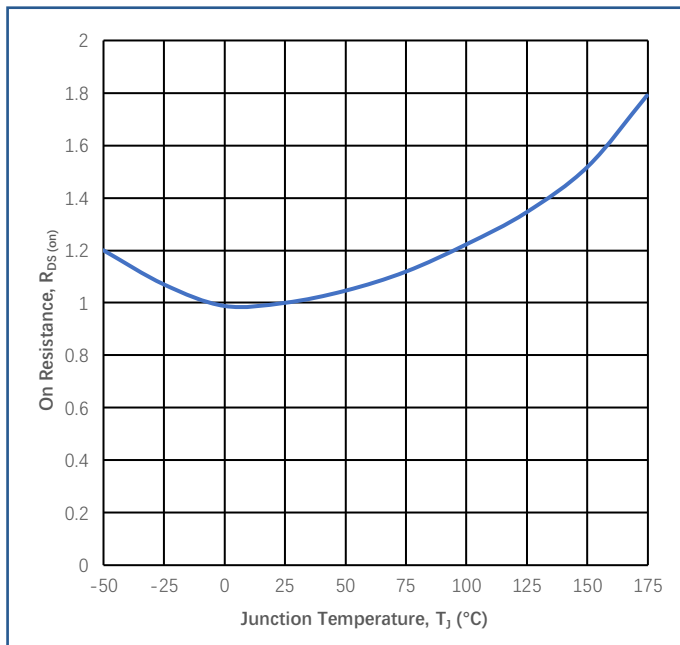


Figure 3

Normalized On-Resistance vs. Temperature

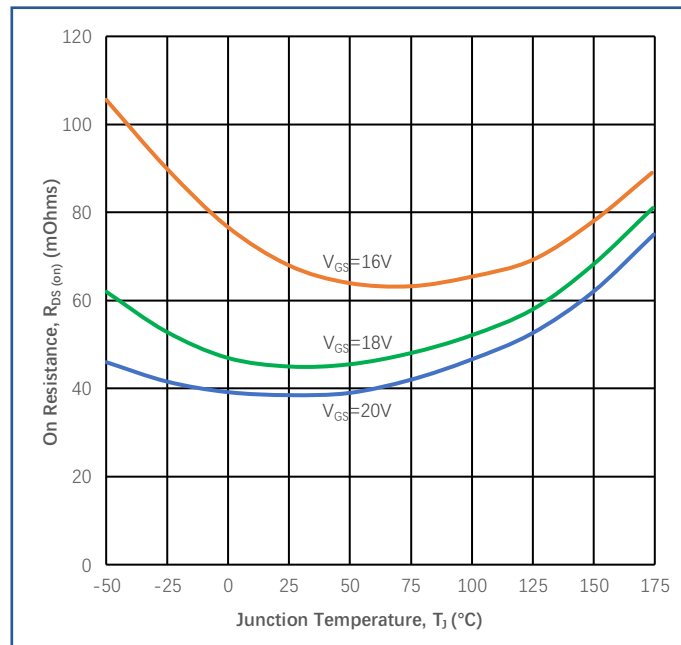


Figure 4

On-Resistance vs. Temperature

Typical Performance

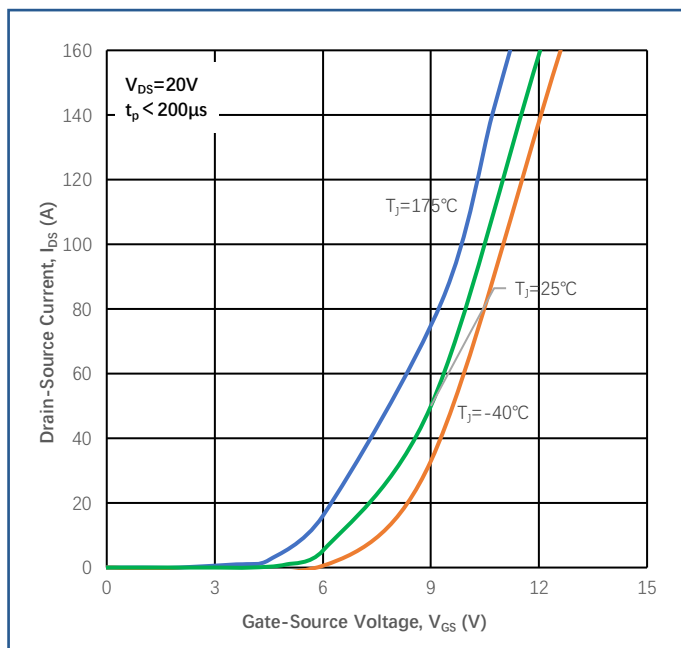


Figure 5
Transfer Characteristic

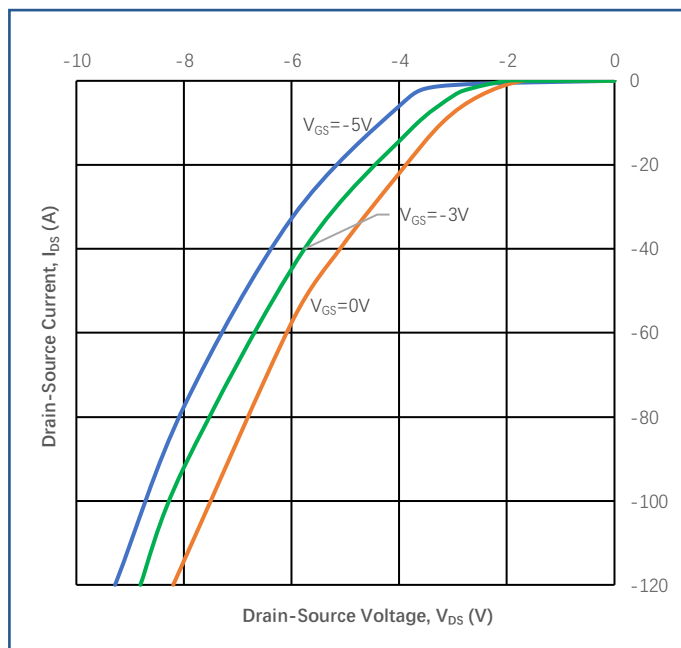


Figure 6
Body Diode Characteristic at $25^\circ C$

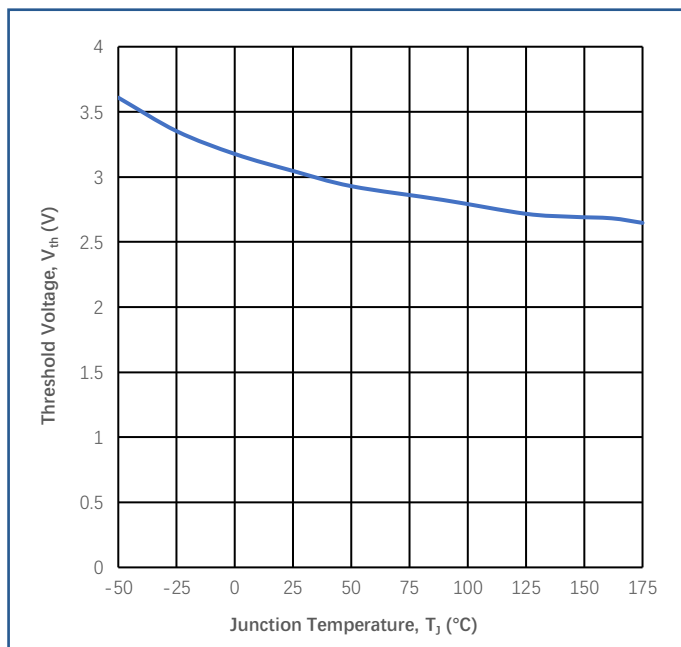


Figure 7
Threshold Voltage vs. Temperature

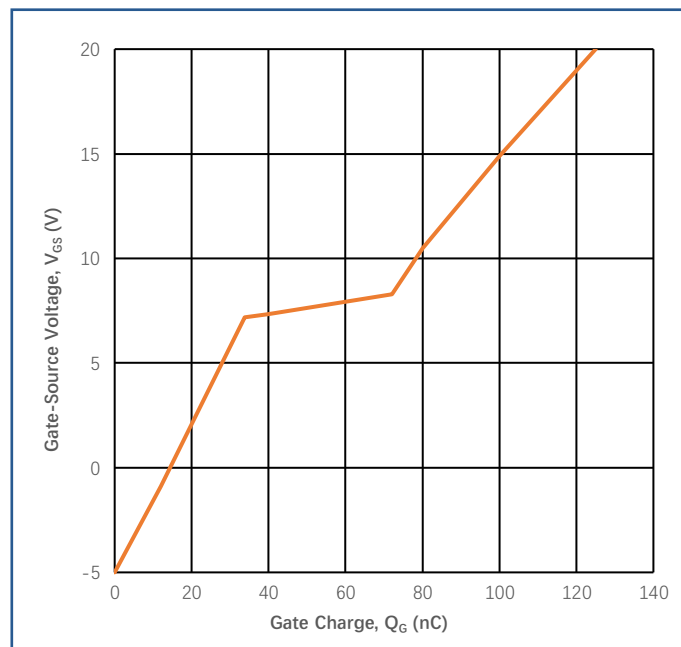


Figure 8
Gate Charge Characteristics

Typical Performance

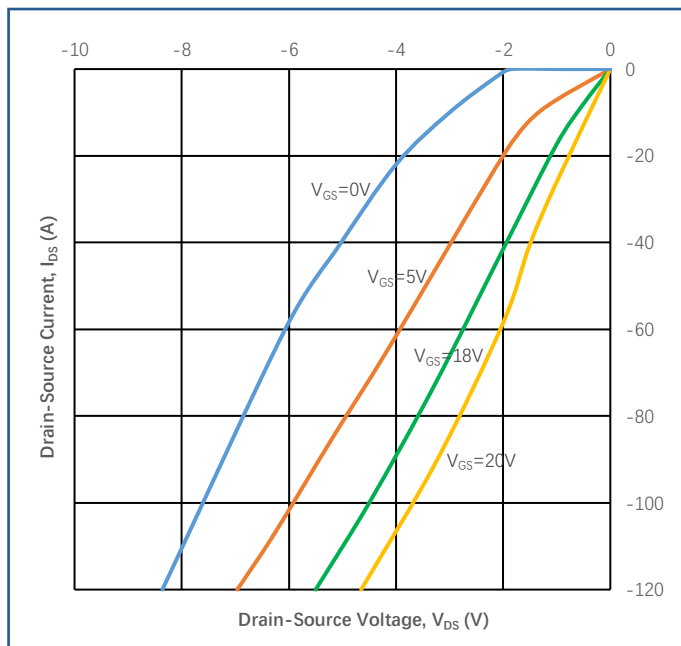


Figure 9

3rd Quadrant Characteristic at 25°C

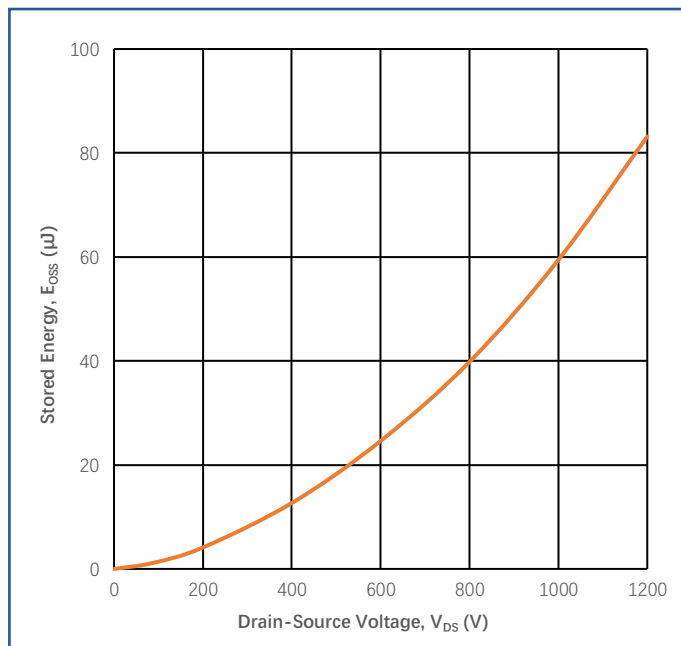


Figure 10

Output Capacitor Stored Energy

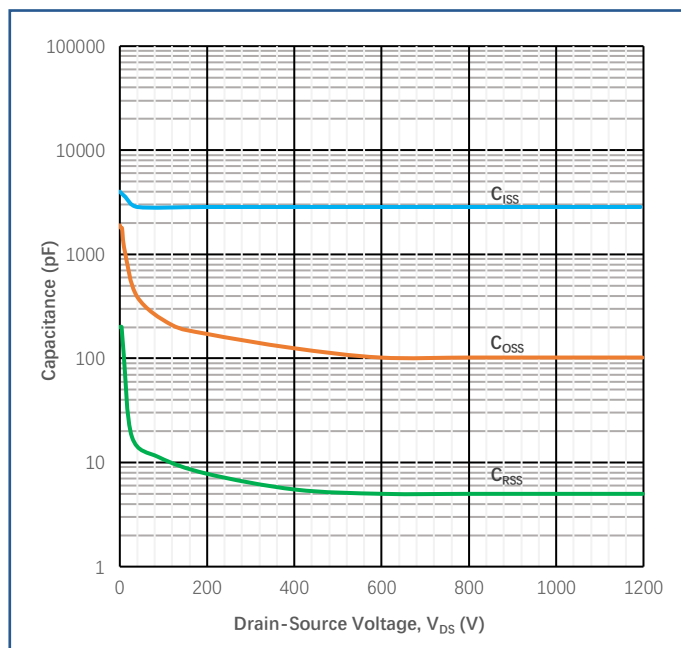


Figure 11

Capacitances vs. Drain-Source

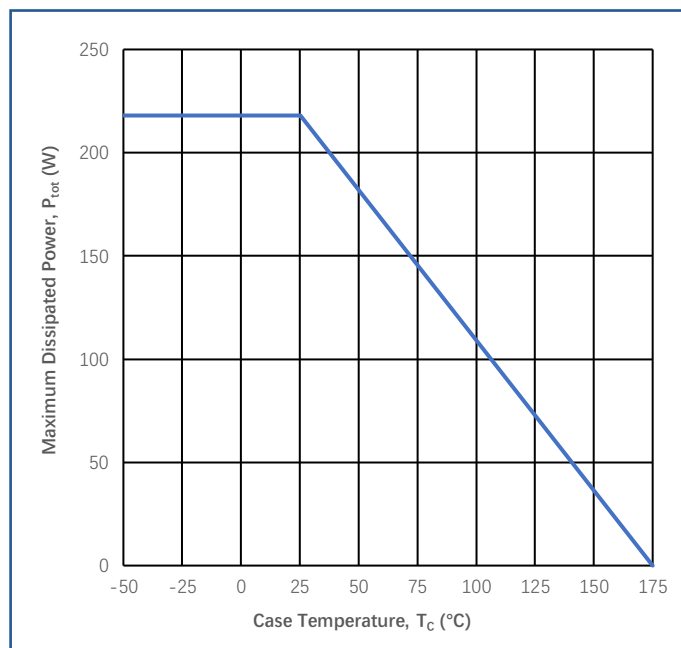


Figure 12

Max Power Dissipation Derating vs T_C

Typical Performance

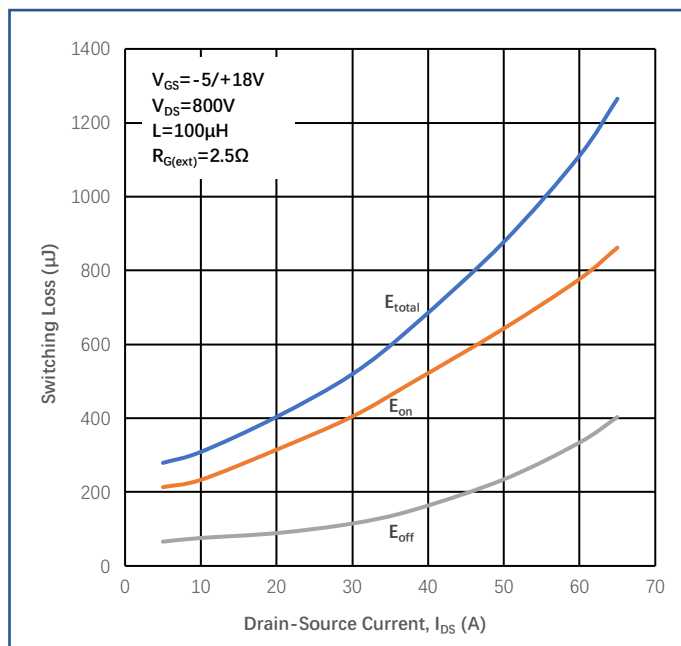


Figure 13

Switching Energy vs. Drain Current

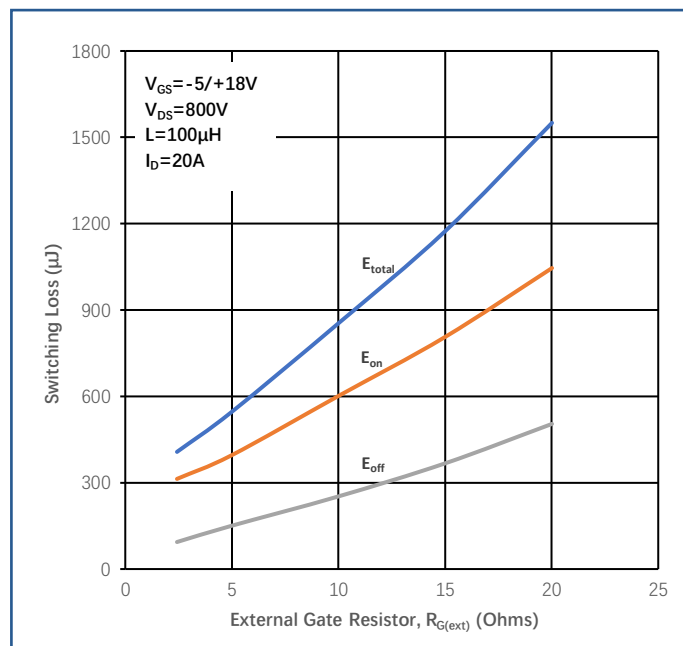


Figure 14

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

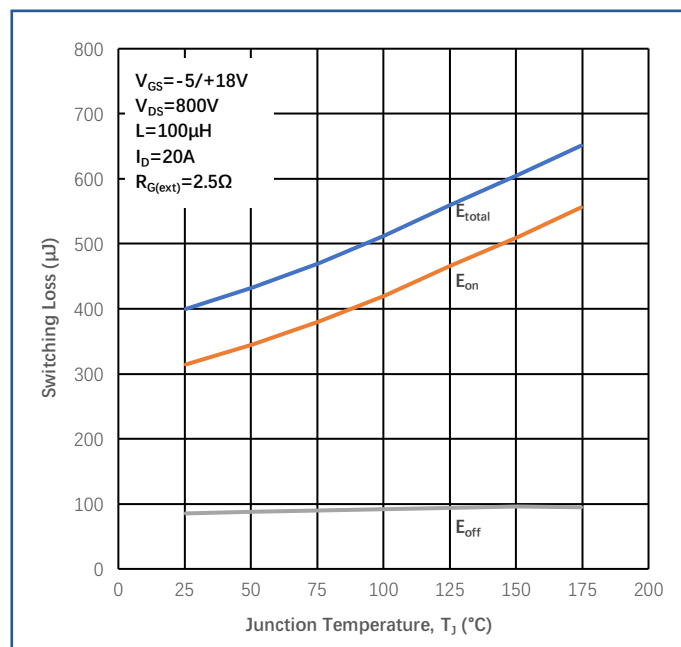


Figure 15

Switching Energy vs. Temperature

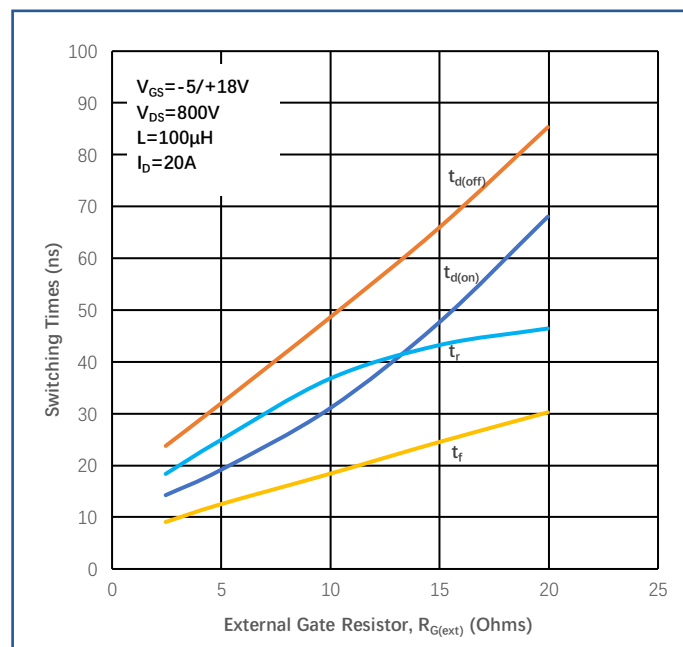


Figure 16

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

Typical Performance

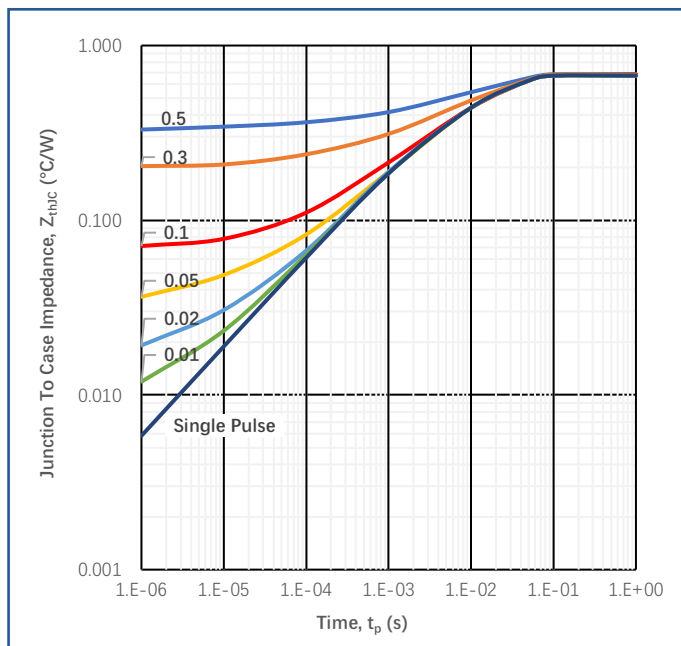


Figure 17

Transient Thermal Impedance

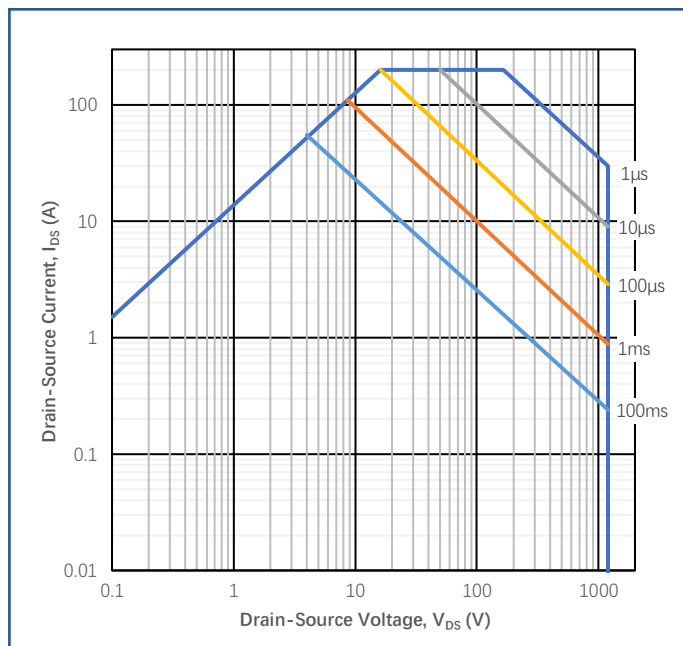
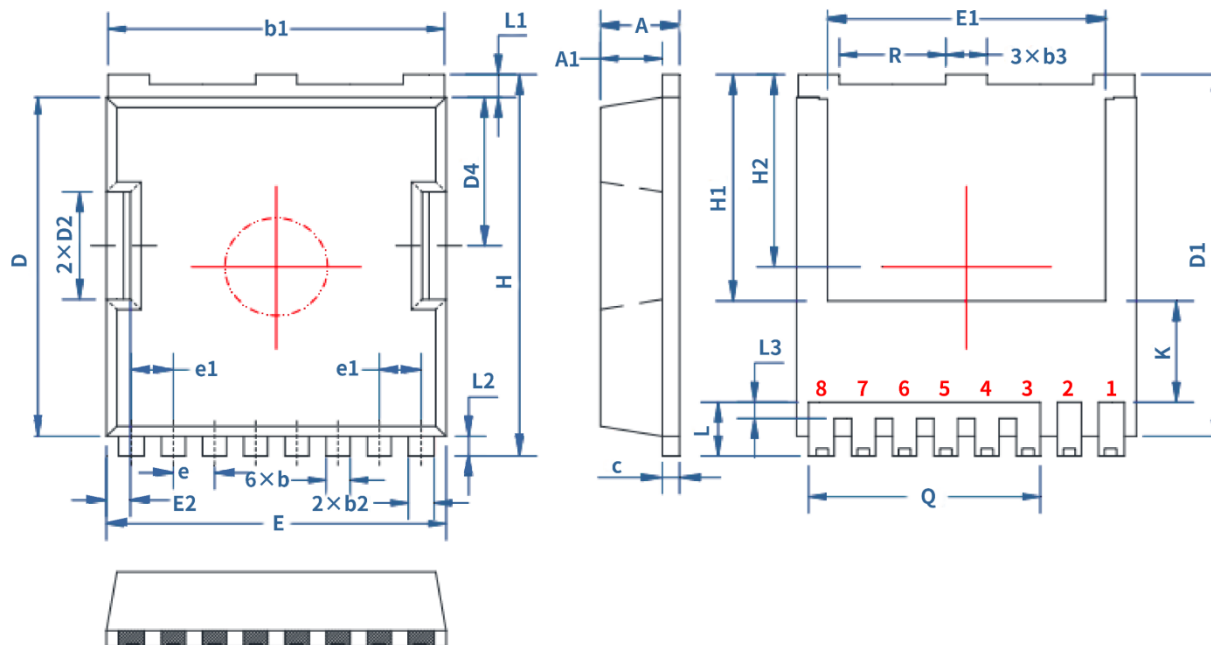


Figure 18

Safe Operating Area

Package Dimensions (mm)

Package Type: TOLL



Symbol	Millimeters			Symbol	Millimeters		
	Min.	Type.	Max.		Min.	Type.	Max.
A	2.25	2.30	2.35	E	9.85	9.90	9.95
A1	1.75	1.80	1.85	E1	8.00	8.10	8.20
b	0.65	0.70	0.75	E2	0.65	0.70	0.75
b1	9.75	9.80	9.90	H	11.60	11.70	11.80
b2	0.70	0.75	0.80	H1	6.95 BSC		
b3	1.15	1.20	1.25	H2	5.90 BSC		
C	0.45	0.50	0.55	K	3.10 REF		
D	10.35	10.40	10.45	L	1.55	1.65	1.75
D1	11.00	11.10	11.20	L1	0.65	0.70	0.75
D2	3.25	3.30	3.35	L2	0.50	0.60	0.70
D4	4.50	4.55	4.60	L3	0.40	0.50	0.60
e	1.20 BSC			Q	6.75 REF		
e1	1.225 BSC			R	3.00	3.10	3.20

Pin	Symbol	Description
1	G	Gate
2	S	Driver Source
3-8	S	Power Source
Tab	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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