

ASC30N650MT7

650V, 36A, 60mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T04-52A A/1



爱仕特科技
AST TECHNOLOGY

General Description

The AST-MT7 series SiC MOSFET in TO-263-7 package ensures stable high-temperature operation for power-dense and energy-critical systems, enabling compact designs with reduced EMI.

Features

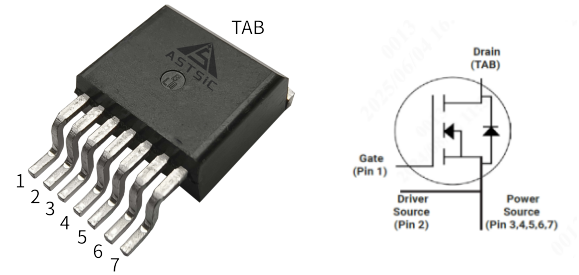
- 3rd Generation SiC MOSFET Technology
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Optimized Package with Separate Driver Source Pin
- Easy to Parallel and Simple to Drive
- RoHS Compliant, Halogen Free

Applications

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

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)	36			A	T _C =25°C
P _D	Power Dissipation	132			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	-	60	80	mΩ	V _{GS} =18V; I _D =15A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	75	-	nC	V _{DS} =400V; V _{GS} =-5/+18V; I _D =15A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	26	-		
Source-drain diode						
Q _{rr}	Reverse Recovery Charge	-	80	-	nC	V _{GS} =-5V; I _F =15A; V _R =400V; di/dt=2400A/us; T _J =175°C



Ordering Informations

Order Number / Marking	ASC30N650MT7
Package Type	TO-263-7
Packing Method	Reel

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; $T_c=25^\circ\text{C}$)	36	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	26	
I_{DM}	Drain Current (pulsed)	100	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	132	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	-	5	100	μA	V _{DS} =650V; V _{GS} =0V
I _{GSS}	Gate-Body Leakage Current	-	10	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 =5mA
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	-	60	80	mΩ	V _{GS} =18V; I _D =15A; T _J =25°C
		-	75	-		V _{GS} =18V; I _D =15A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	1480	-	pF	V _{DS} =600V; f=1MHz; V _{AC} =25mV
C _{oss}	Output Capacitance	-	110	-		
C _{rss}	Reverse Transfer Capacitance	-	4.8	-		
g _{fs}	Transconductance	-	3.5	-	S	V _{DS} =20V; I _D =15A
E _{oss}	Coss Stored Energy	-	17	-	μJ	V _{DS} =600V; f=1MHz
E _{on}	Turn-on Energy (Body Diode)	-	75	-	μJ	V _{DS} =400V; V _{GS} =-5/+18V; I _D =15A; L=150μH; R _{G(ext)} =2.5Ω; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	8	-		
Q _G	Total Gate Charge	-	75	-	nC	V _{DS} =400V; V _{GS} =-5/+18V; I _D =15A
Q _{GS}	Gate-Source Charge	-	19	-		
Q _{GD}	Gate-Drain Charge	-	26	-		
R _{G(int)}	Internal Gate Resistance	-	5.5	-	Ω	f=1MHz; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	10	-	ns	V _{DS} =400V; V _{GS} =-5/+18V; I _D =15A; R _{G(ext)} =2.5Ω; Load=100μH
t _r	Rise Time	-	21	-		
t _{d(off)}	Turn-off Delay Time	-	17	-		
t _f	Fall Time	-	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	-	3.6	6	V	$V_{GS}=0\text{V}; I_F=7.5\text{A}; T_J=25^{\circ}\text{C}$
		-	3.0	6		$V_{GS}=0\text{V}; I_F=7.5\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	22	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$
T_{rr}	Reverse Recovery Time	-	13.6	-	ns	$V_{GS}=-5\text{V}; I_F=15\text{A}; V_R=400\text{V};$ $di/dt=2400\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	80	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	12	-	A	

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.14	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	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

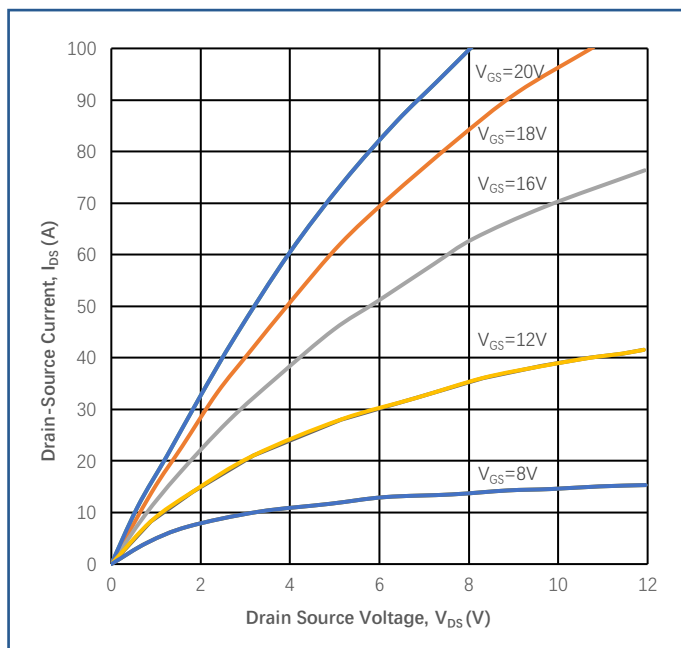


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

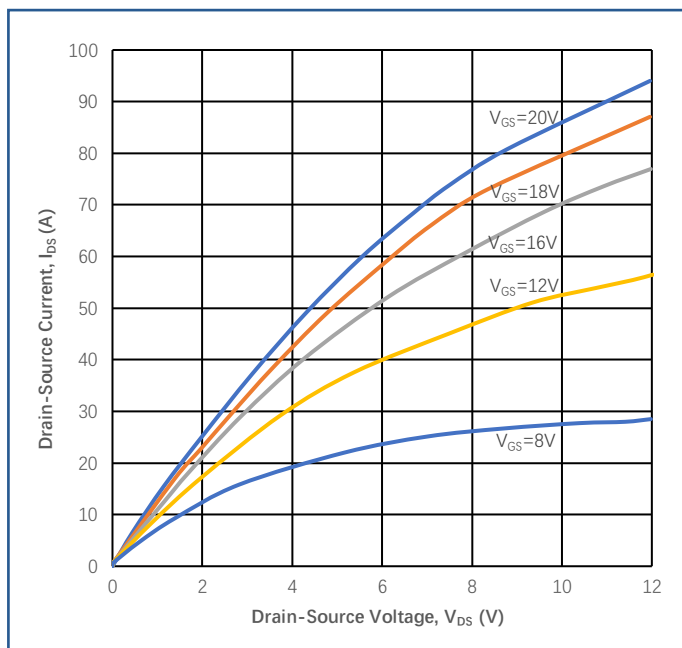


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

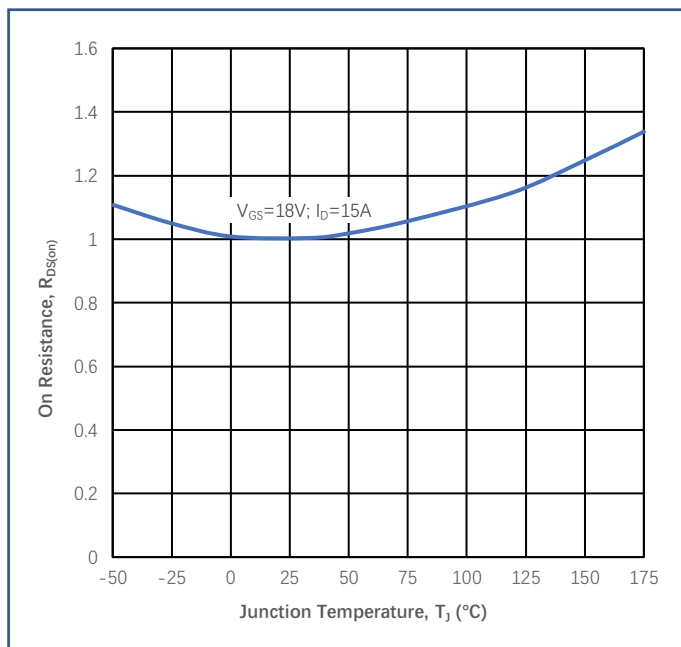


Figure 3
Normalized On-Resistance vs. Temperature

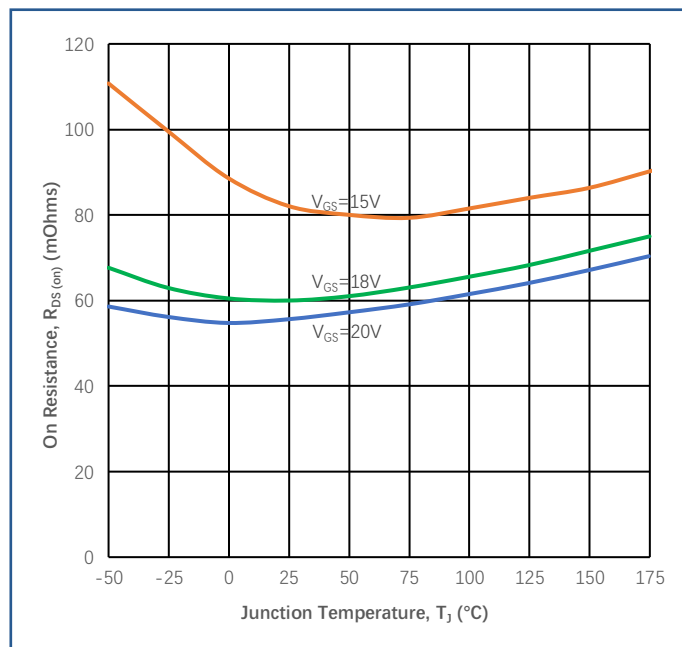


Figure 4
On-Resistance vs. Temperature

Typical Performance

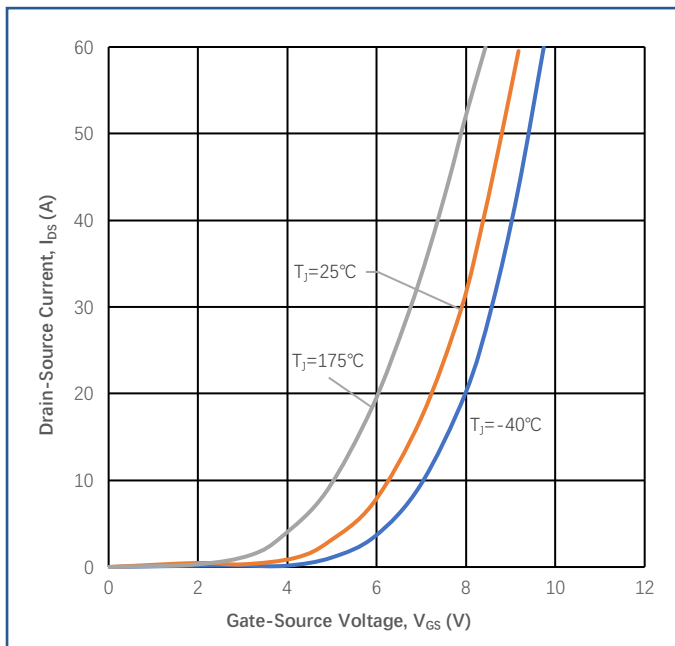


Figure 5

Transfer Characteristic

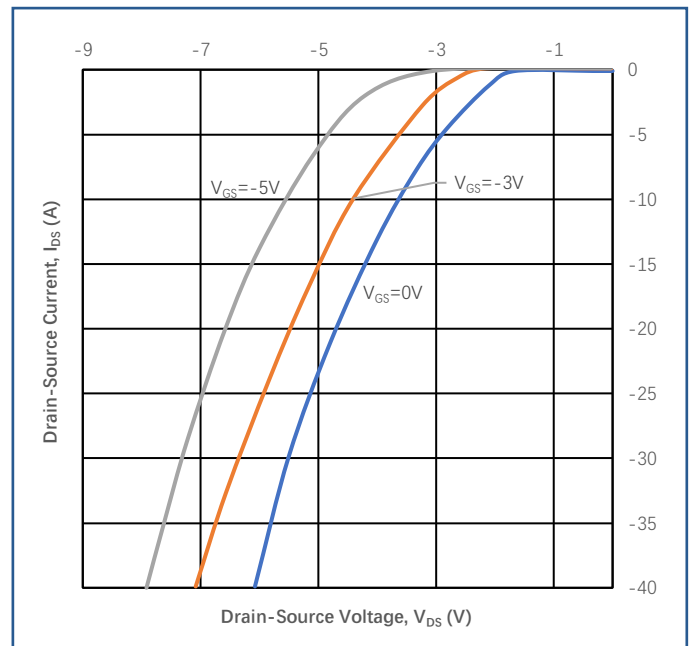


Figure 6

Body Diode Characteristic at 25°C

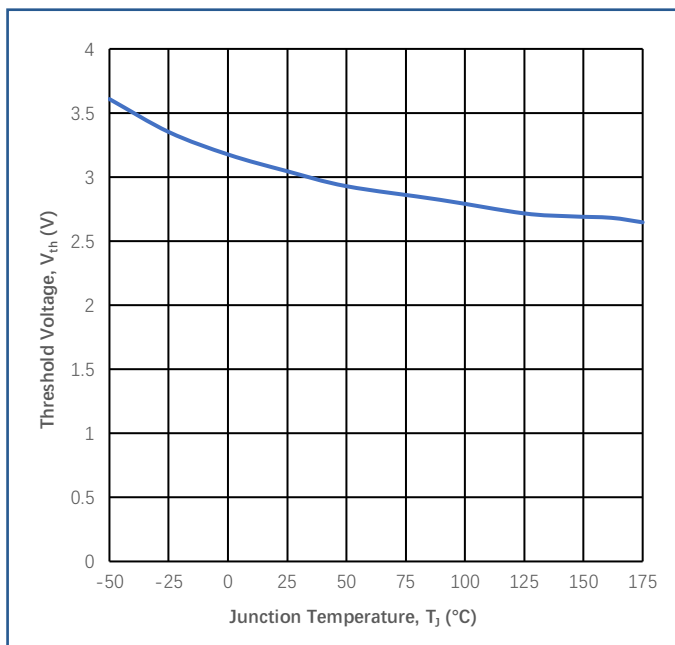


Figure 7

Threshold Voltage vs. Temperature

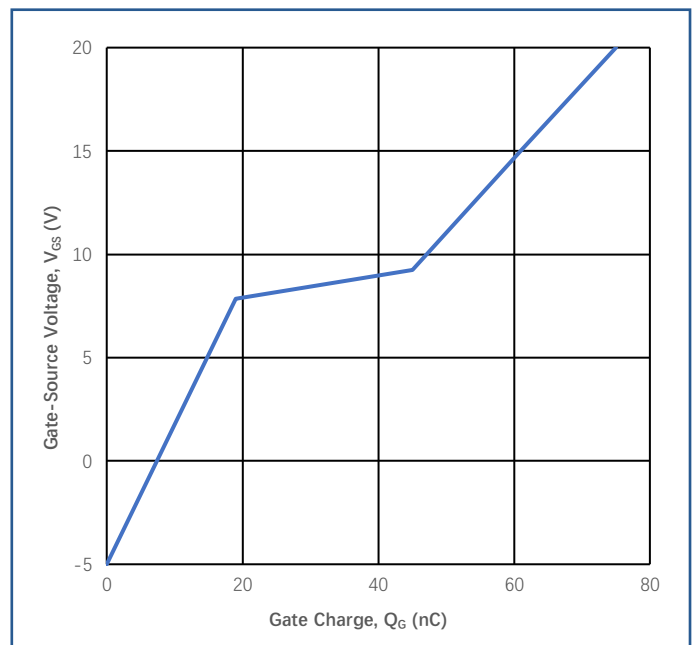


Figure 8

Gate Charge Characteristics

Typical Performance

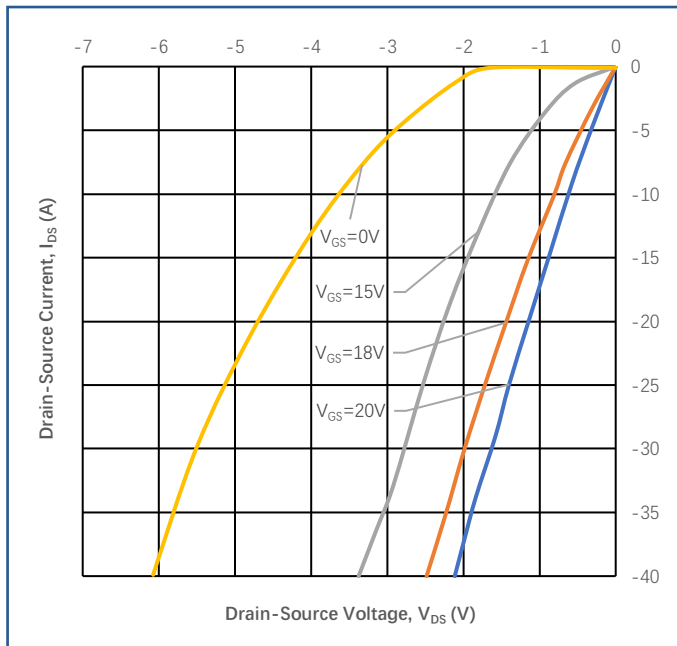


Figure 9

3rd Quadrant Characteristic at 25°C

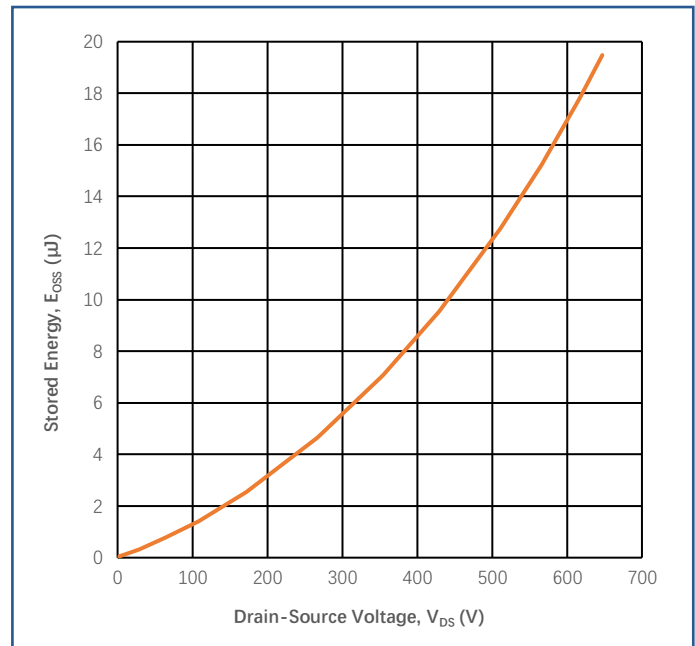


Figure 10

Output Capacitor Stored Energy

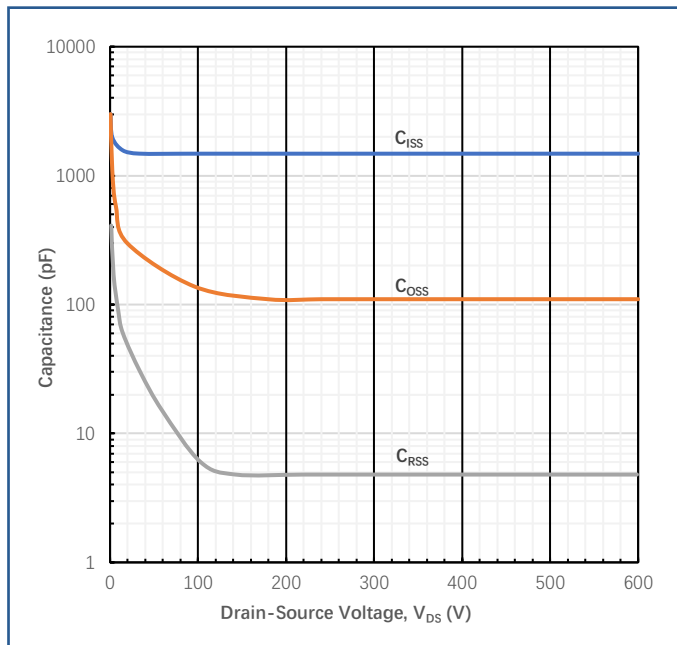


Figure 11

Capacitances vs. Drain-Source

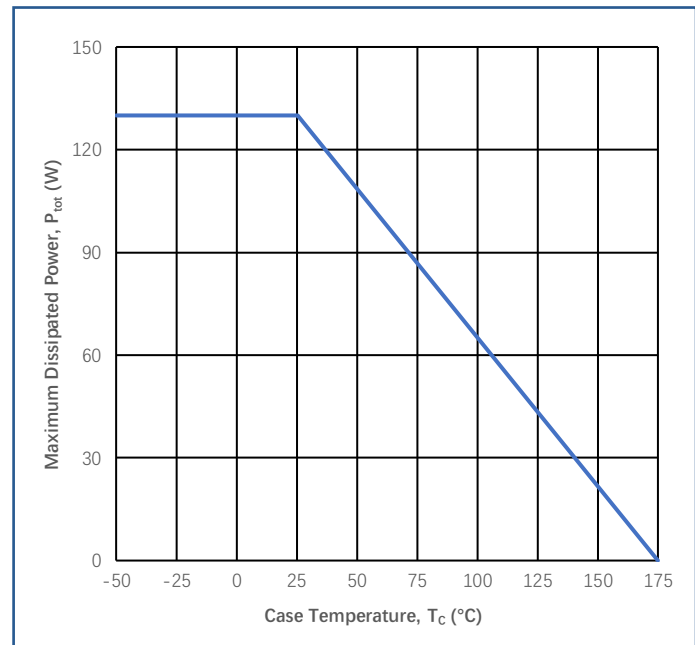


Figure 12

Max Power Dissipation Derating vs T_C

Typical Performance

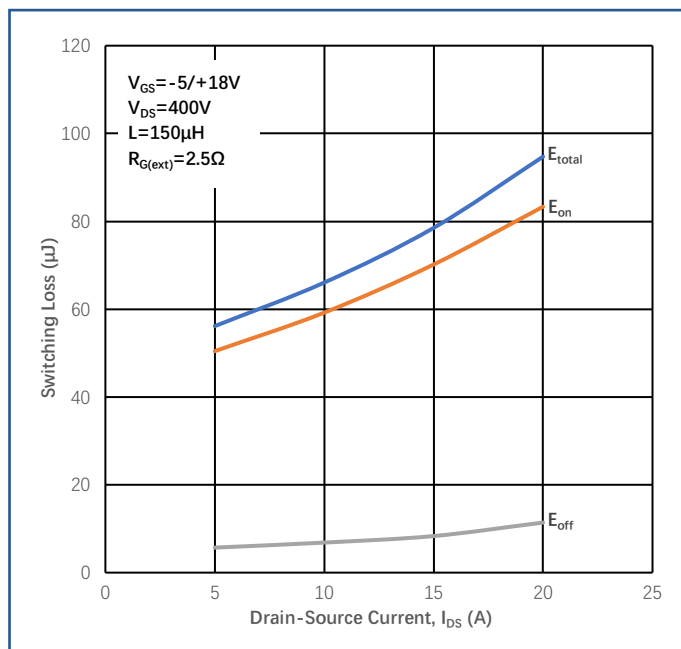


Figure 13
Switching Energy vs. Drain Current

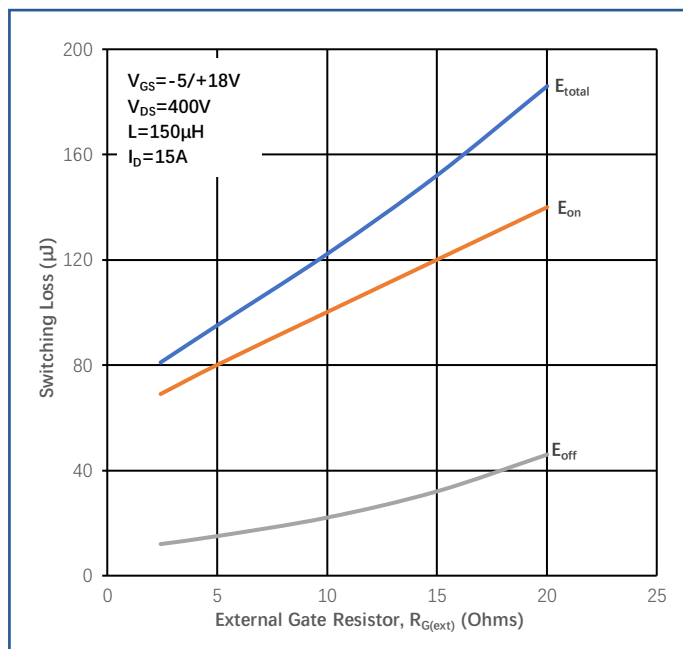


Figure 14
Switching Energy vs. $R_{\text{G(ext)}}$

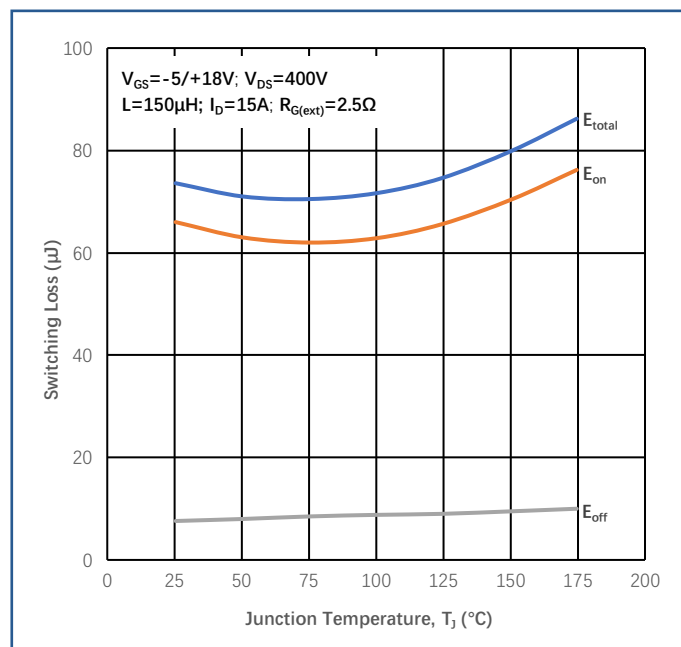


Figure 15
Switching Energy vs. Temperature

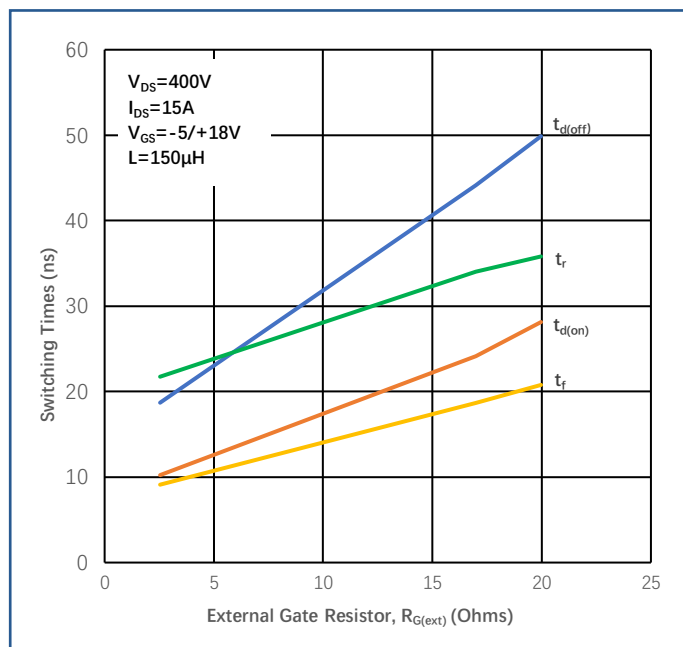


Figure 16
Switching Times vs. $R_{\text{G(ext)}}$

Typical Performance

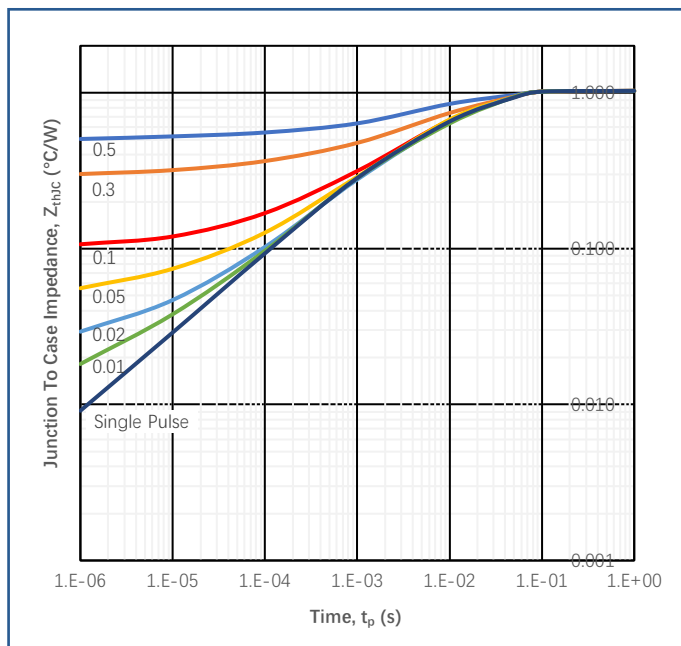


Figure 17

Transient Thermal Impedance

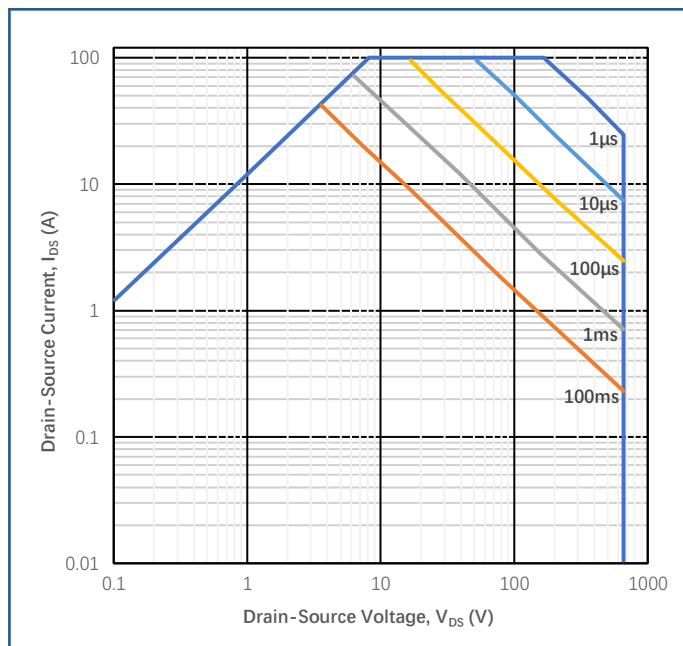
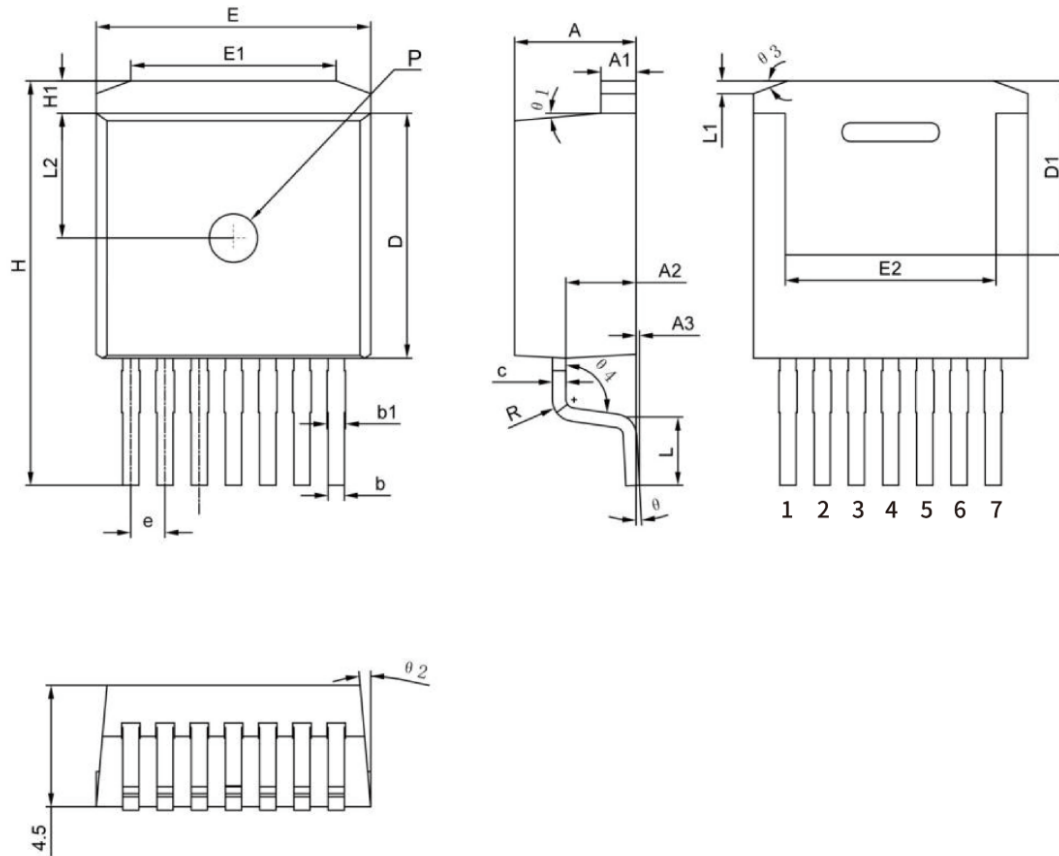


Figure 18

Safe Operating Area

Package Dimensions (mm)

Package Type: TO-263-7



Symbol	Millimeters			Symbol	Millimeters		
	Min.	Type.	Max.		Min.	Type.	Max.
A	4.40	4.50	4.60	e	1.17	1.27	1.37
A1	1.25	1.30	1.40	H	14.75	15.00	15.25
A2	2.45	2.60	2.70	H1	1.10	1.20	1.30
A3	0.05	0.13	0.20	L	2.35	2.55	2.75
b	0.50	0.60	0.70	L1	0.37	0.57	0.77
b1	0.60	0.70	0.85	L2	4.48	4.63	4.78
C	0.45	0.50	0.60	θ	0°	3°	5°
D	8.88	9.08	9.28	θ_1	3°	5°	7°
D1	6.25	6.45	6.65	θ_2	3°	5°	7°
E	9.88	10.18	10.28	θ_3	15°	20°	25°
E1	6.67	7.07	7.47	R	0.75	0.80	0.85
E2	7.67	7.82	7.97	P	1.70	1.80	1.90

Pin	Symbol	Description
1	G	Gate Drain
2	S	Driver Source
3-7	S	Power Source
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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