ASC60N650MT7

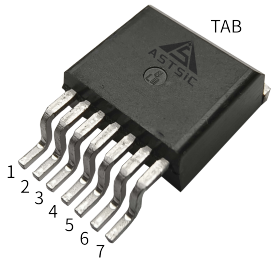
650V, 60A, 30mΩ, N-Channel, Silicon Carbide MOSFET

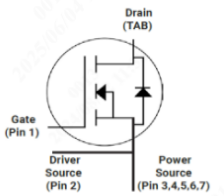
Product Data Sheet ASTC-3T04-41A A/1

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

Ordering Informations

Order Number / Marking	ASC60N650MT7
Package Type	TO-263-7
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)		60		A	T_C=25°C
P_D	Power Dissipation		326		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	-	30	38	mΩ	V_{GS}=18V; I_D=30A; T_J=25°C
Dynamic characteristics						
Q_G	Total Gate Charge	-	128	-	nC	V_{DS}=400V; V_{GS}=-5/+18V; I_D=30A; T_J=25°C
Q_{GD}	Gate-Drain Charge	-	24	-		
Source-drain diode						
Q_{rr}	Reverse Recovery Charge	-	160	-	nC	V_{GS}=-5V; I_F=15A; V_R=400V; di/dt=2400A/μs; T_J=175°C

Absolute Maximum Ratings (at T_C=25°C unless otherwise specified)

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	650	V
I_D	Drain Current (continuous; T_C=25°C)	60	A
	Drain Current (continuous; T_C=100°C)	48	A
I_{DM}	Drain Current (pulsed)	135	A
V_{GS}	Gate-Source Voltage	-10/+22	V
P_D	Power Dissipation (T_C=25°C)	326	W
T_J; T_{stg}	Junction and Storage Temperature Range	-55 to +175	°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	-	1	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	-	30	38	mΩ	V_{GS}=18V; I_D=30A; T_J=25°C
		-	42	-		V_{GS}=18V; I_D=30A; T_J=175°C
Dynamic characteristics (at T_J=25°C unless otherwise specified)						
C_{iss}	Input Capacitance	-	2112	-	pF	V_{DS}=600V; f=1MHz; V_{AC}=25mV
C_{oss}	Output Capacitance	-	212	-		
C_{rss}	Reverse Transfer Capacitance	-	5	-		
g_{fs}	Transconductance	-	23	-	S	V_{DS}=20V; I_D=20A
E_{oss}	Coss Stored Energy	-	12	-	μJ	V_{DS}=400V; f=1MHz
E_{on}	Turn-on Energy (Body Diode)	-	59	-	μJ	V_{DS}=400V; V_{GS}=-5/+18V; I_D=30A; L=100μH; $R_{G(ext)}$=2.5Ω; T_J=175°C
E_{off}	Turn-off Energy (Body Diode)	-	14	-		
Q_G	Total Gate Charge	-	128	-	nC	V_{DS}=400V; V_{GS}=-5/+18V; I_D=30A
Q_{GS}	Gate-Source Charge	-	33	-		
Q_{GD}	Gate-Drain Charge	-	24	-		
$R_{G(int)}$	Internal Gate Resistance	-	4.1	-	Ω	f=1MHz; V_{AC}=25mV
$t_{d(on)}$	Turn-on Delay Time	-	10	-	ns	V_{DS}=400V; V_{GS}=-5/+18V; I_D=30A; $R_{G(ext)}$=2.5Ω; Load=100μH
t_r	Rise Time	-	11	-		
$t_{d(off)}$	Turn-off Delay Time	-	19	-		
t_f	Fall Time	-	7	-		

Body Diode Characteristics (at T_J=25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	-	3.5	6	V	V_{GS}=0V; I_F=15A; T_J=25°C
		-	3.0	6		V_{GS}=0V; I_F=15A; T_J=175°C
I_S	Continuous Diode Forward Current	-	55	-	A	V_{GS}=0V; T_C=25°C
T_{rr}	Reverse Recovery Time	-	18	-	ns	V_{GS}=-5V; I_F=15A; V_R=400V; di/dt=2400A/μs; T_J=175°C
Q_{rr}	Reverse Recovery Charge	-	160	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	8.5	-	A	

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.46	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	°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°C.

Typical Performance

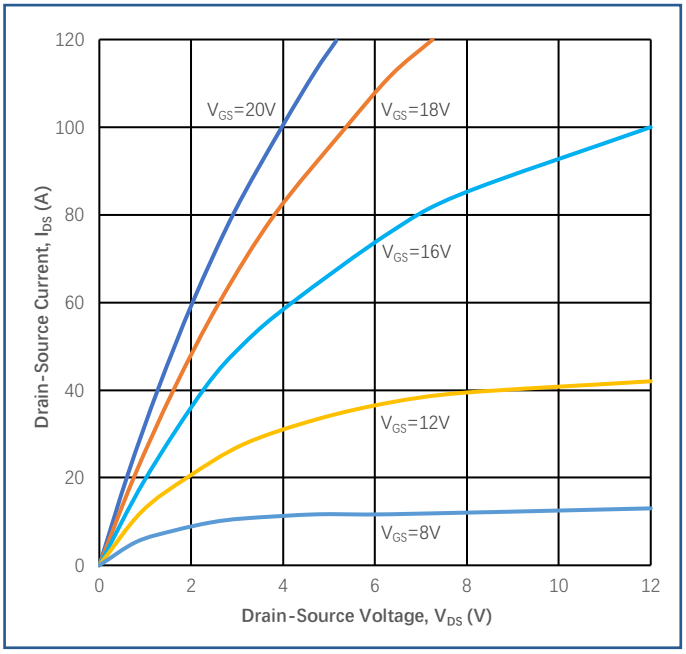


Figure 1
Output Characteristics (T_J=25 °C)

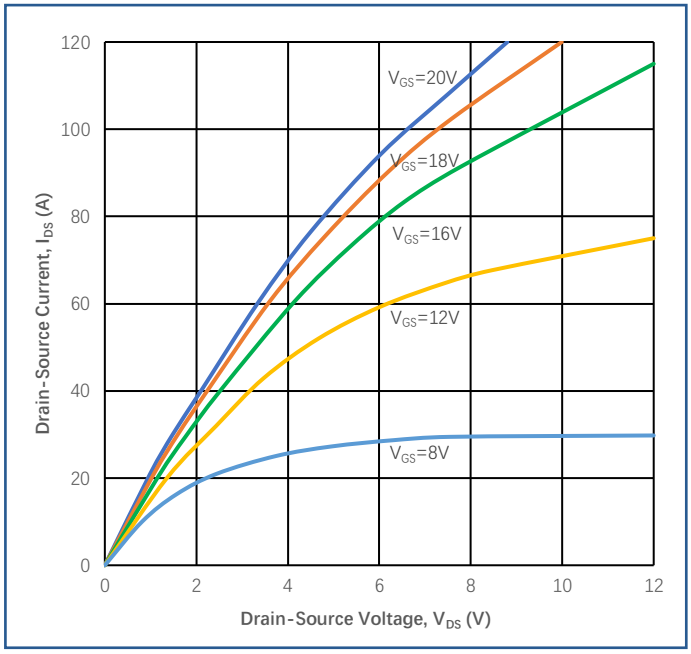


Figure 2
Output Characteristics (T_J=175°C)

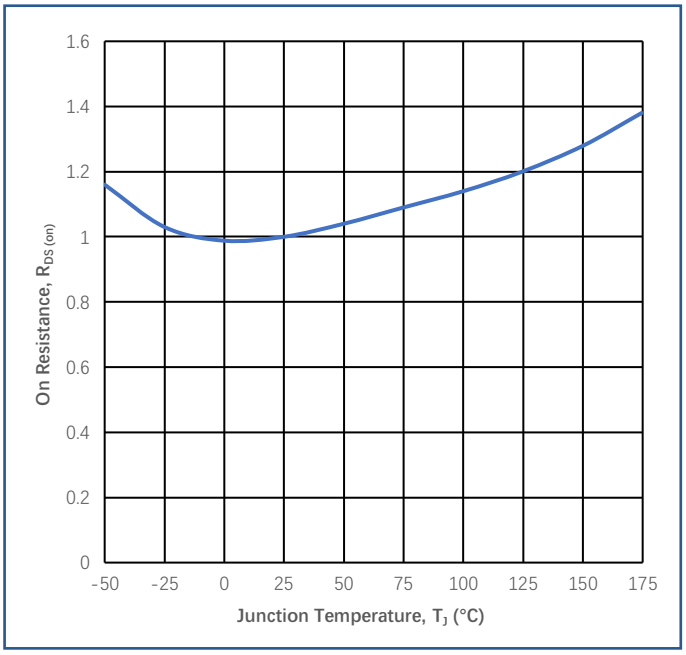


Figure 3
Normalized On-Resistance vs. Temperature

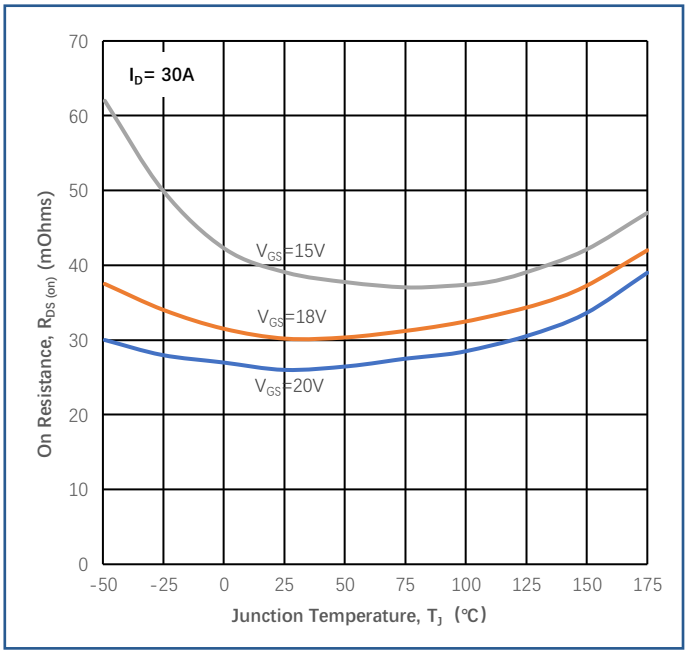


Figure 4
On-Resistance vs. Temperature

Typical Performance

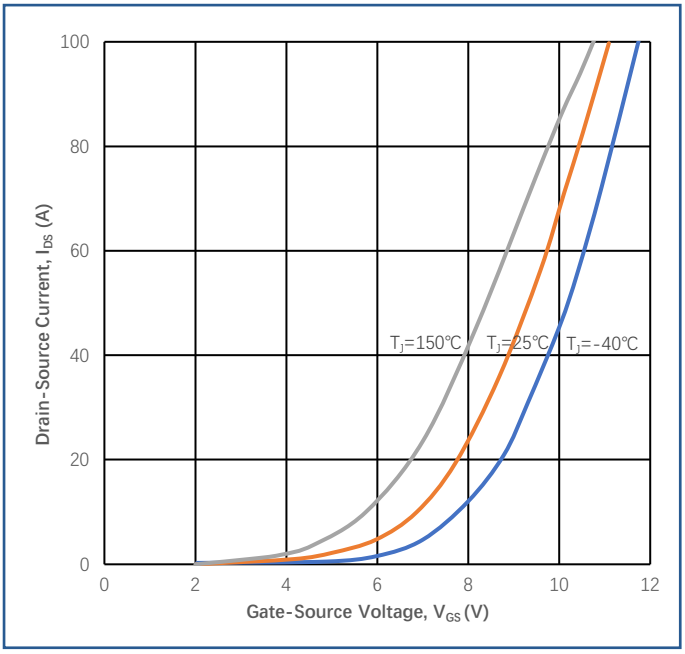


Figure 5
Transfer Characteristic

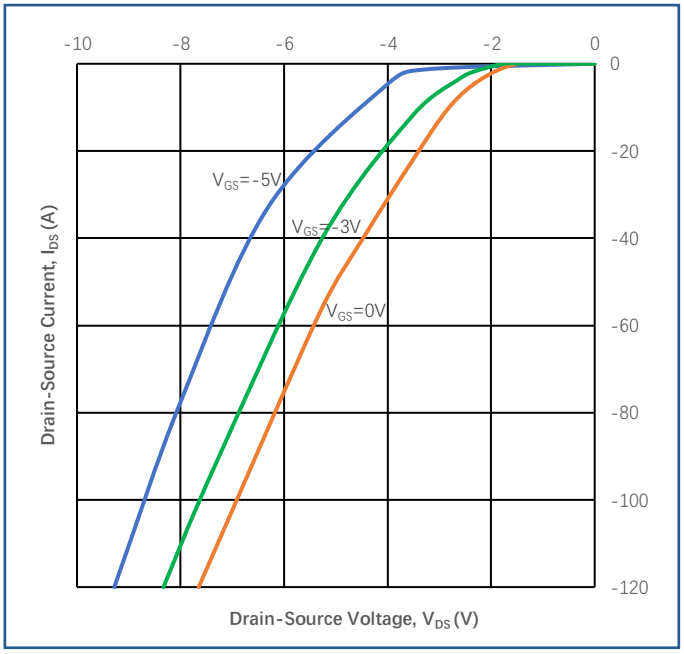


Figure 6
Body Diode Characteristic at 25°C

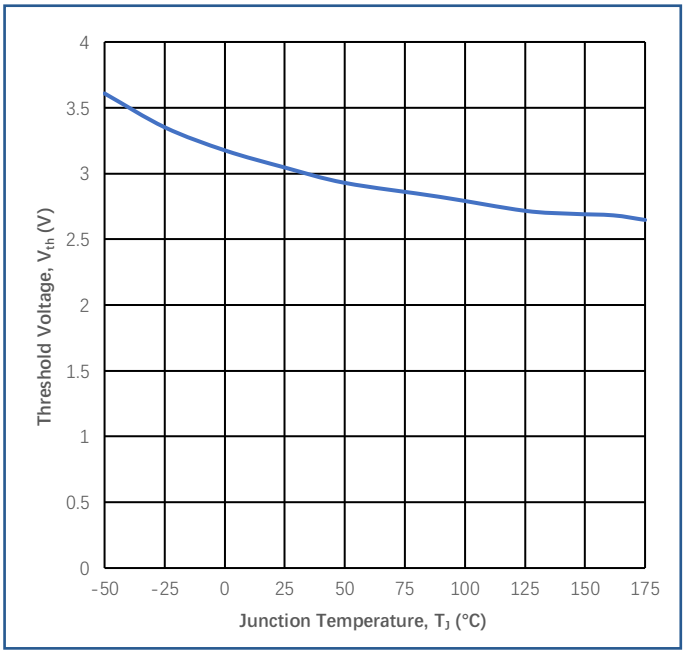


Figure 7
Threshold Voltage vs. Temperature

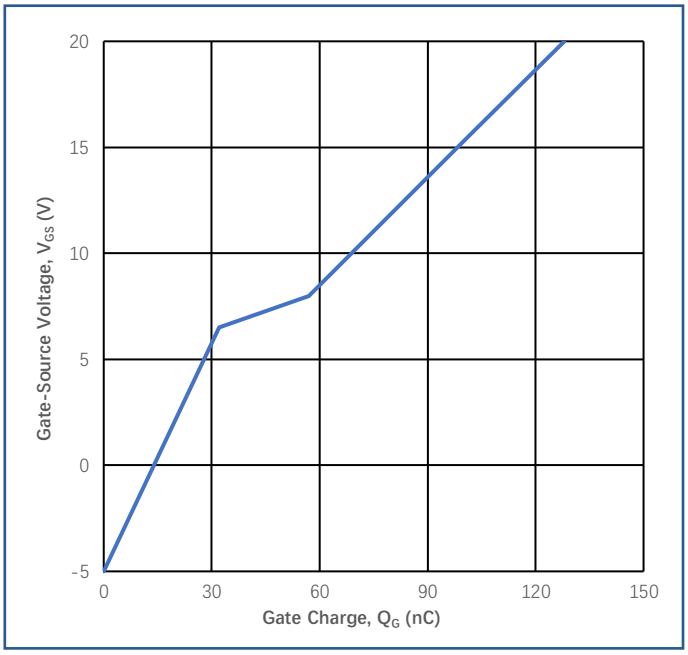


Figure 8
Gate Charge Characteristics

Typical Performance

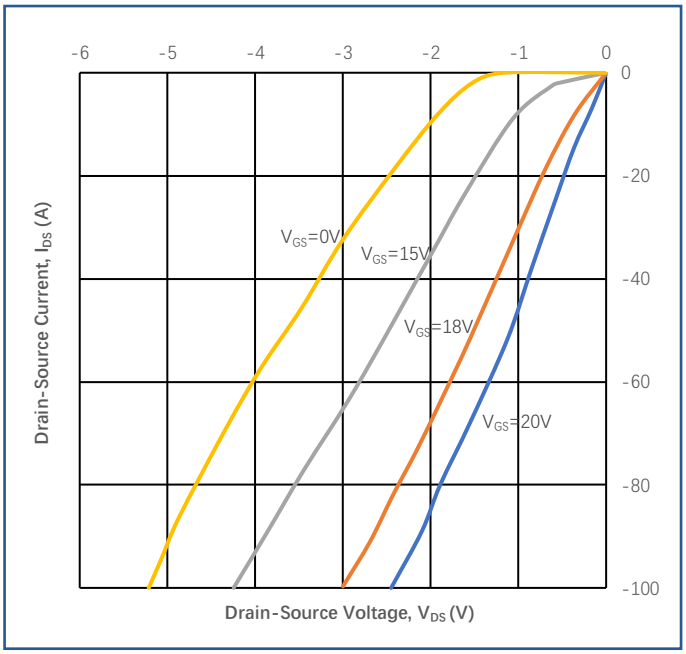


Figure 9
3rd Quadrant Characteristic at 25°C

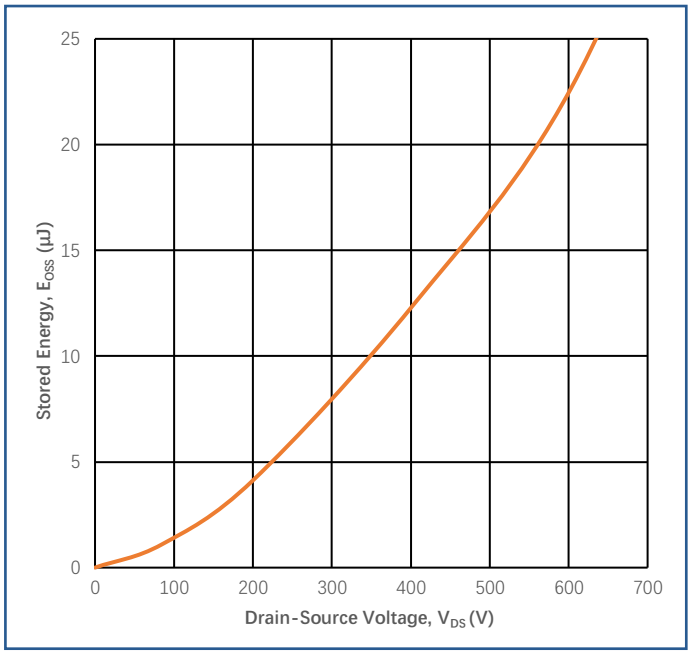


Figure 10
Output Capacitor Stored Energy

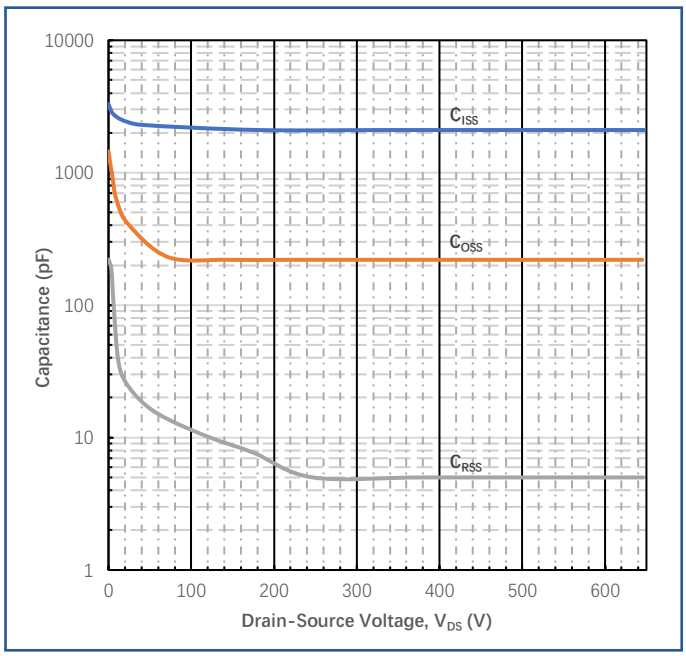


Figure 11
Capacitances vs. Drain-Source

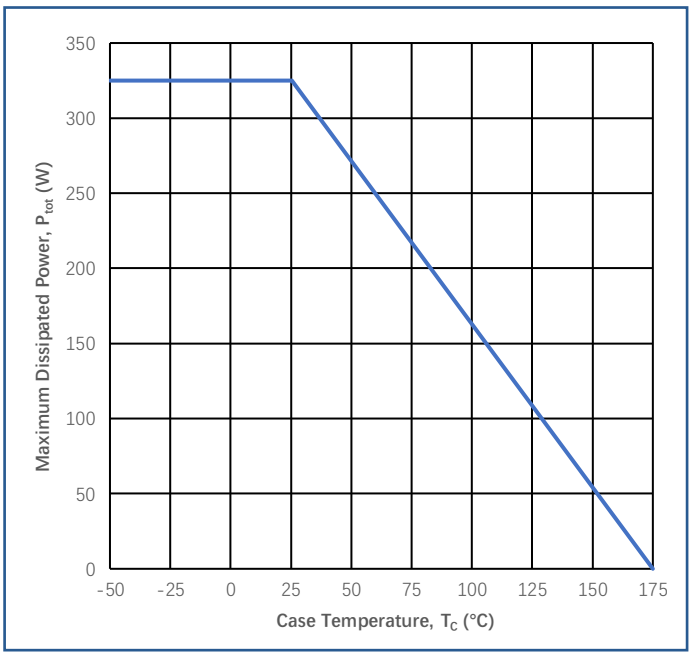


Figure 12
Max Power Dissipation Derating vs T_C

Typical Performance

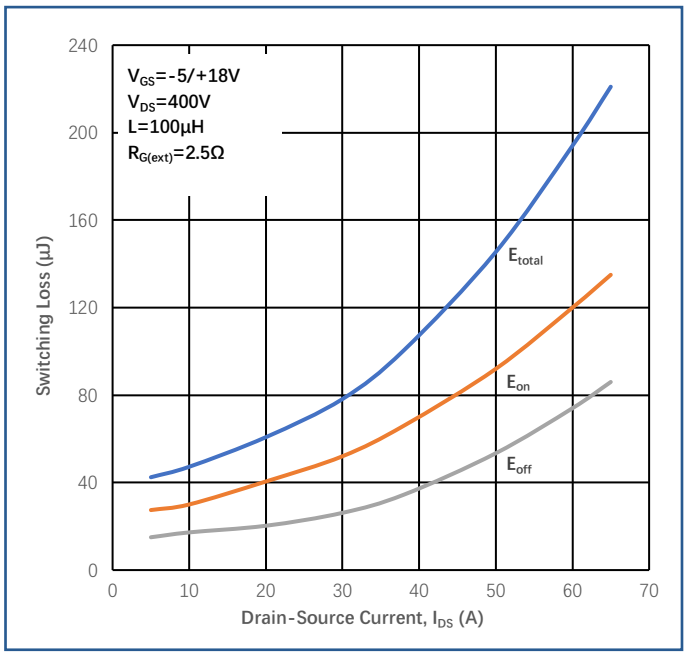


Figure 13
Switching Energy vs. Drain Current

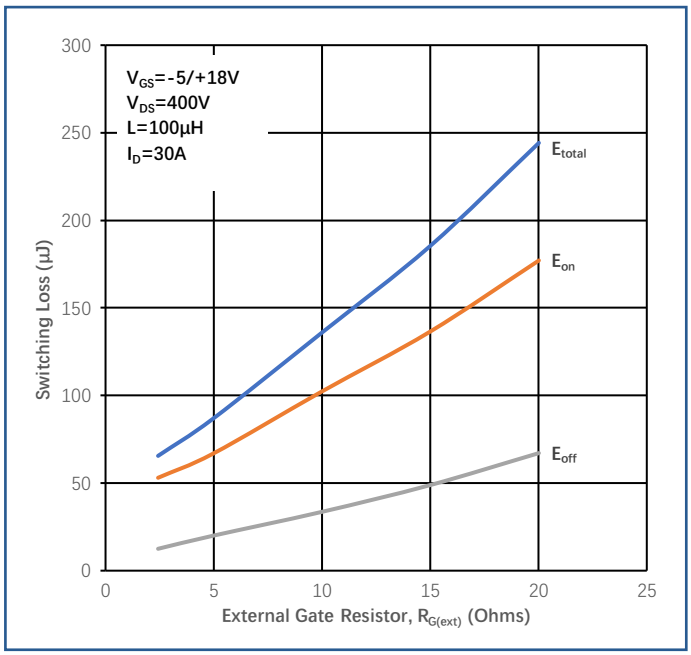


Figure 14
Switching Energy vs. $R_{G(ext)}$

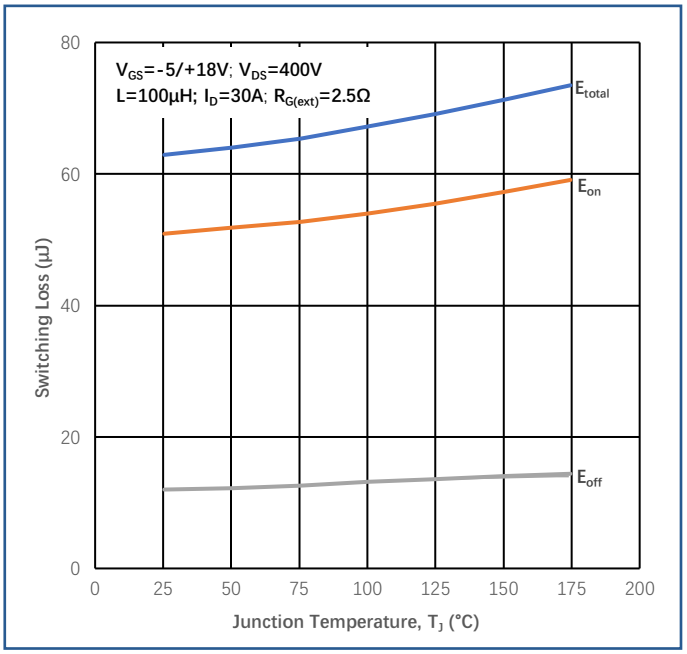


Figure 15
Switching Energy vs. Temperature

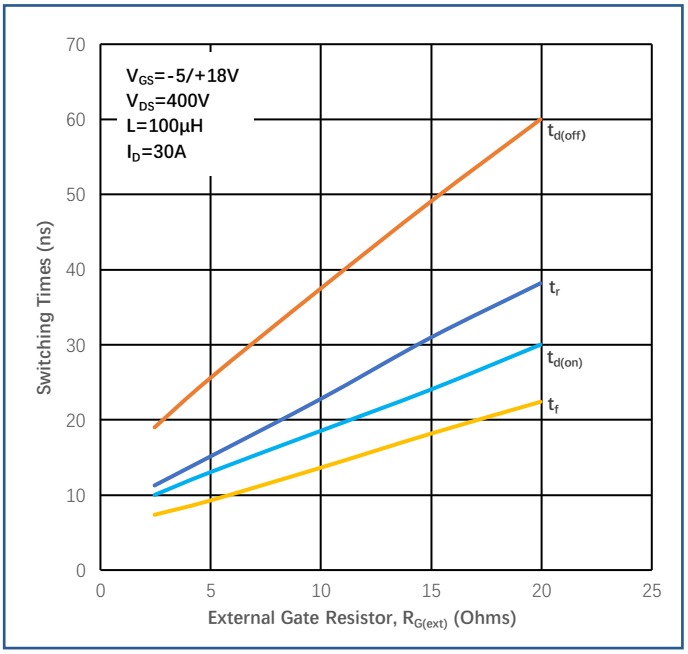


Figure 16
Switching Times vs. $R_{G(ext)}$

Typical Performance

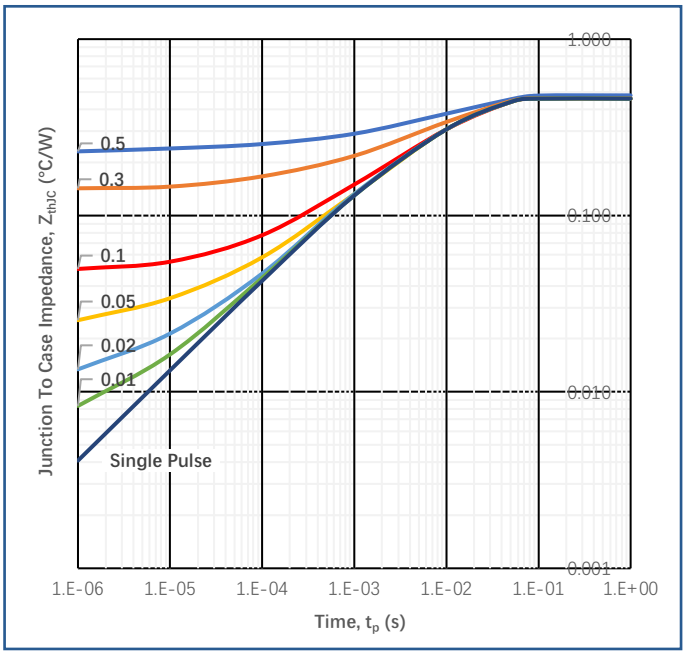


Figure 17
Transient Thermal Impedance

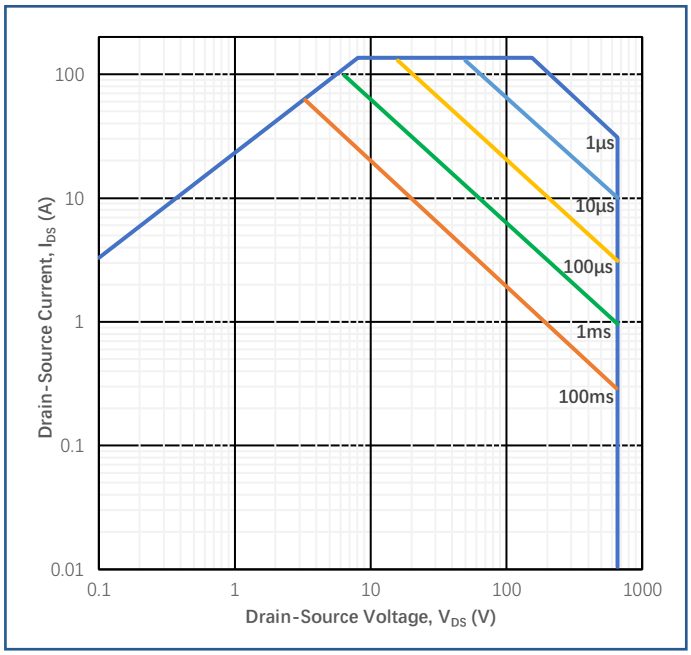
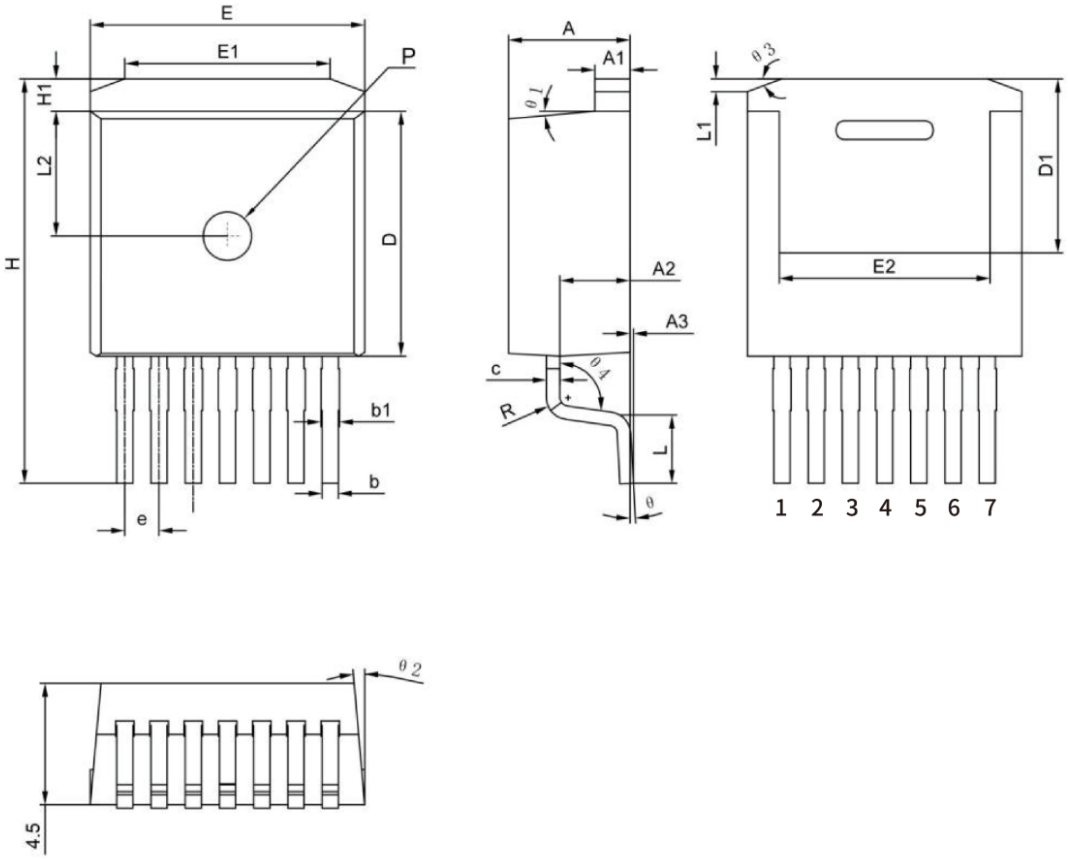


Figure 18
Safe Operating Area

Package Dimensions (mm)

Package Type: TO-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	θ1	3°	5°	7°
D1	6.25	6.45	6.65	θ2	3°	5°	7°
E	9.88	10.18	10.28	θ3	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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