

ASC25N650MF3

650V, 25A, 88mΩ, N-Channel, Silicon Carbide MOSFET

Product Data Sheet

ASTC-3T01-71A-L A/0



爱仕特科技
AST TECHNOLOGY

General Description

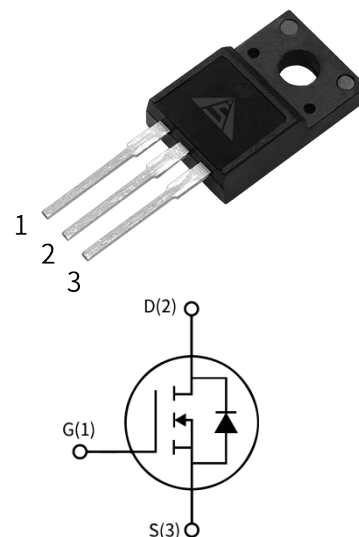
The AST-MF3 series SiC MOSFET in TO-220F package ensures stable high-temperature operation for power-dense and energy-critical systems, enabling compact designs with reduced EMI.

Features

- 3rd Generation SiC MOSFET Technology
- Extremely Low Switching Loss
- High Blocking Voltage with Low RDS(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	ASC25N650MF3
Marking	ASC25N650MF3
Package Type	TO-220F
Packing Method	Tube

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)	25			A	T _C =25°C
P _D	Power Dissipation	92			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	-	88	105	mΩ	V _{GS} =12V; I _D =15A; T _J =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	62	-	nC	V _{DS} =400V; V _{GS} =-3V/12V; I _D =15A; T _J =25°C
Q _{GD}	Gate-Drain Charge	-	20	-		

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; $T_c=25^\circ\text{C}$)	25	A
	Drain Current (continuous; $T_c=100^\circ\text{C}$)	18	
I_{DM}	Drain Current (pulsed)	78	A
V_{GS}	Gate-Source Voltage	-5/+15	V
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	92	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 _{DS} =0V; V _{GS} =-5 to 15V
V _{GS(th)}	Gate Threshold Voltage	1.2	1.8	2.5	V	V _{DS} =V _{GS} ; I _D =2mA
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	-	88	105	mΩ	V _{GS} =12V; I _D =15A; T _J =25°C
		-	118	-		V _{GS} =12V; I _D =15A; T _J =175°C
Dynamic characteristics (at T _J =25°C unless otherwise specified)						
C _{iss}	Input Capacitance	-	1320	-	pF	V _{DS} =600V; f=1MHZ; V _{AC} =25mV
C _{oss}	Output Capacitance	-	102	-		
C _{rss}	Reverse Transfer Capacitance	-	3.2	-		
g _{fs}	Transconductance	-	3.5	-	S	V _{DS} =20V; I _D =15A
E _{oss}	Coss Stored Energy	-	16	-	μJ	V _{DS} =600V; f=1MHZ
E _{on}	Turn-on Energy (Body Diode)	-	115	-	μJ	V _{DS} =400V; V _{GS} =-3/12V; I _D =15A , L=150μH; R _{G(ext)} =2.5Ω; T _J =175°C
E _{off}	Turn-off Energy (Body Diode)	-	40	-		
Q _G	Total Gate Charge	-	62	-	nC	V _{DS} =400V; V _{GS} =-3V/12V; I _D =15A
Q _{GS}	Gate-Source Charge	-	18	-		
Q _{GD}	Gate-Drain Charge	-	20	-		
R _{G(int)}	Internal Gate Resistance	-	4.7	-	Ω	f=1MHz; V _{AC} =25mV
t _{d(on)}	Turn-on Delay Time	-	10	-	ns	V _{DS} =400V; V _{GS} =-3V/12V; I _D =15A; L=150μH; R _{G(ext)} =2.5Ω
t _r	Rise Time	-	18	-		
t _{d(off)}	Turn-off Delay Time	-	20	-		
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	$V_{GS}=0\text{V}; I_F=5\text{A}; T_J=25^{\circ}\text{C}$
		-	3.8	6		$V_{GS}=0\text{V}; I_F=5\text{A}; T_J=175^{\circ}\text{C}$
I_S	Continuous Diode Forward Current	-	22	-	A	$V_{GS}=0\text{V}; T_C=25^{\circ}\text{C}$
t_{rr}	Reverse Recovery Time	-	12	-	ns	$V_{GS}=-3\text{V}; I_F=15\text{A}; V_R=400\text{V};$ $di/dt=240\text{A}/\mu\text{s}; T_J=175^{\circ}\text{C}$
Q_{rr}	Reverse Recovery Charge	-	80	-	nC	
I_{rrm}	Peak Reverse Recovery Current	-	8	-	A	

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	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

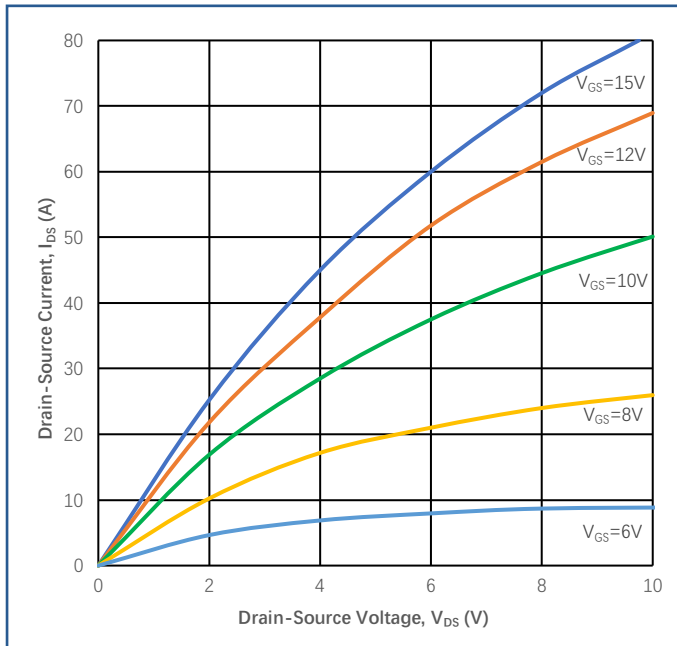


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

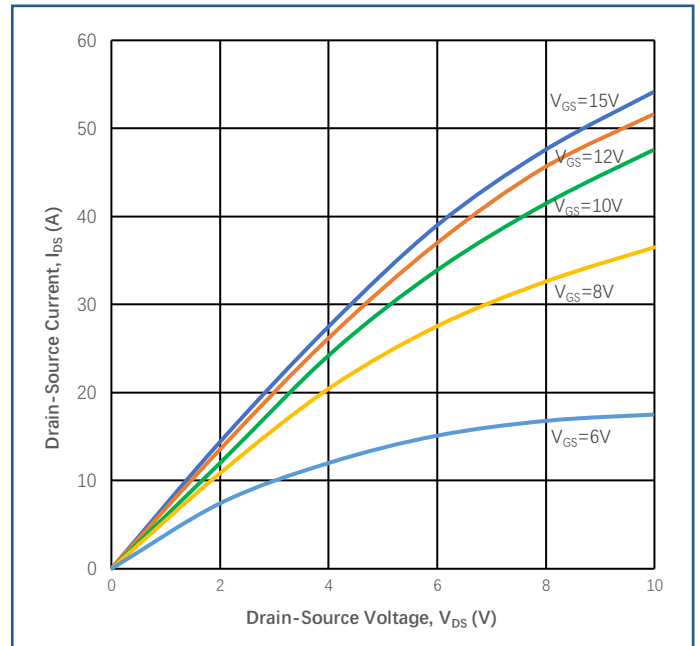


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

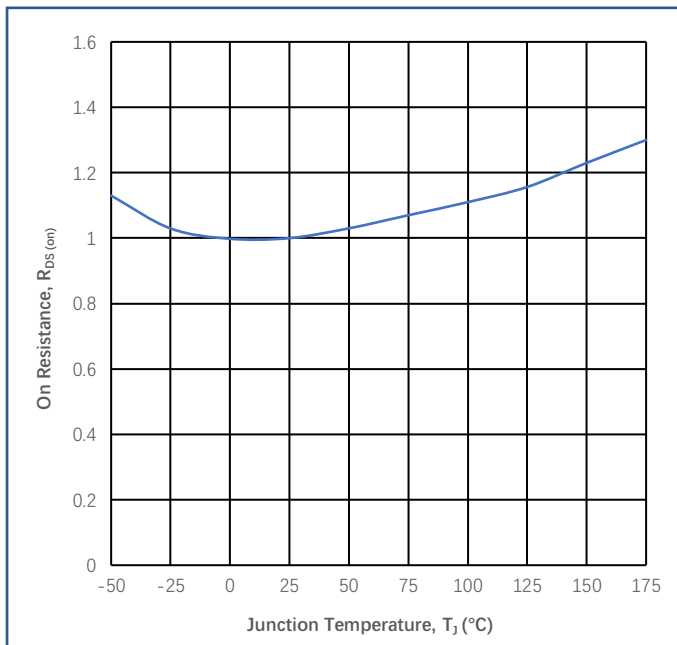


Figure 3
Normalized On-Resistance vs. Temperature

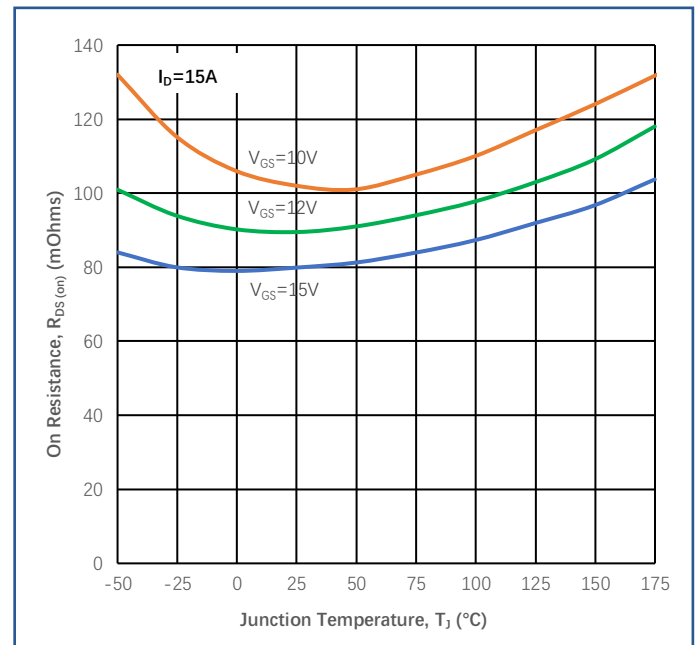


Figure 4
On-Resistance vs. Temperature

Typical Performance

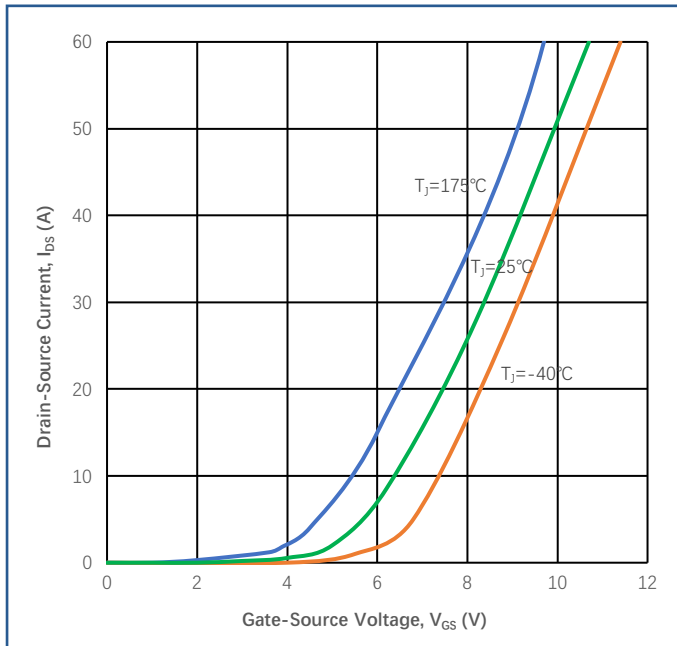


Figure 5
Transfer Characteristic

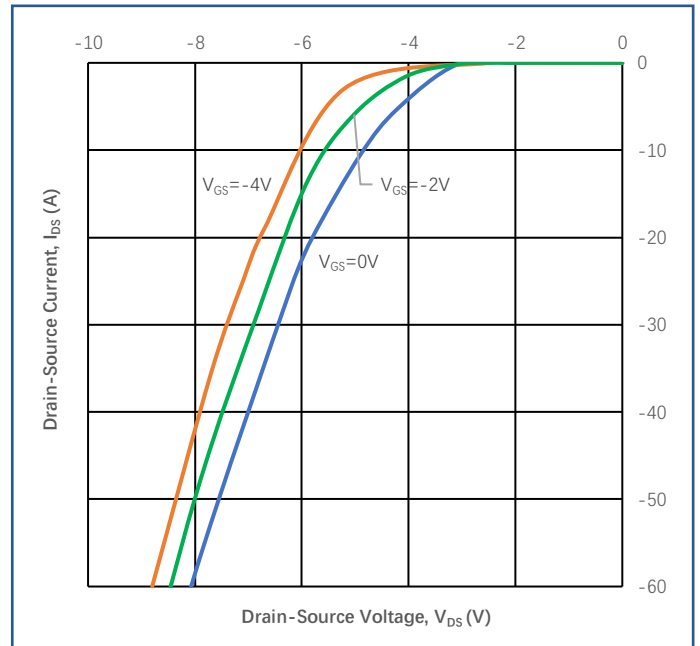


Figure 6
Body Diode Characteristic at 25°C

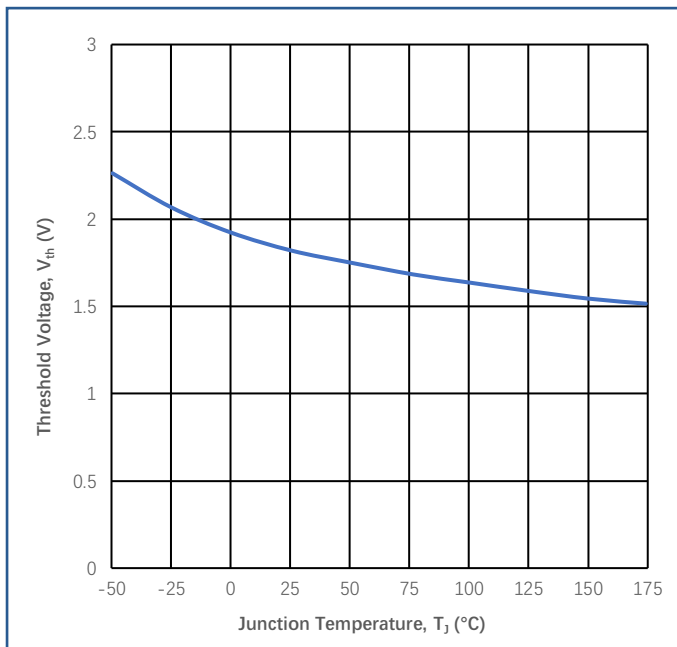


Figure 7
Threshold Voltage vs. Temperature

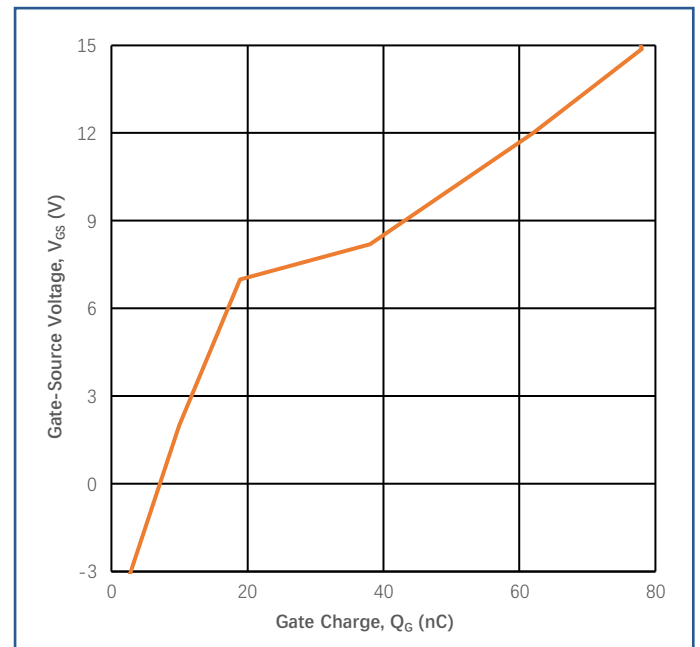


Figure 8
Gate Charge Characteristics

Typical Performance

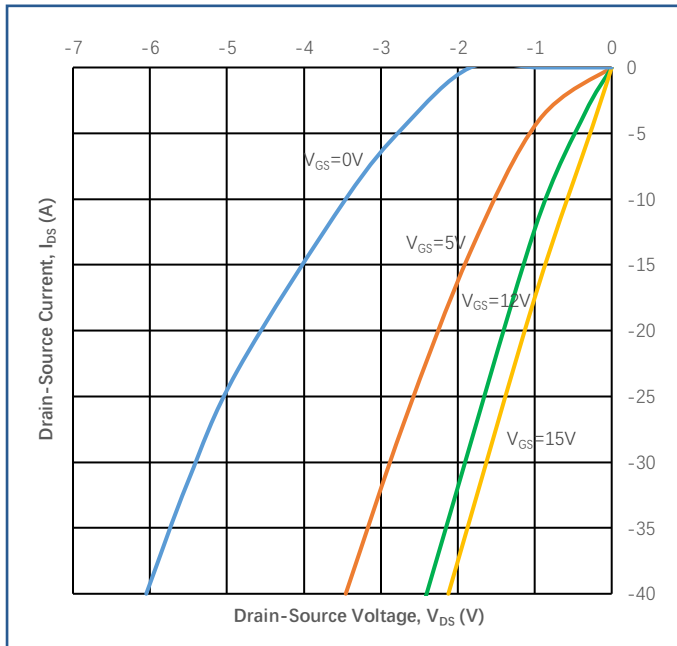


Figure 9
3rd Quadrant Characteristic at 25°C

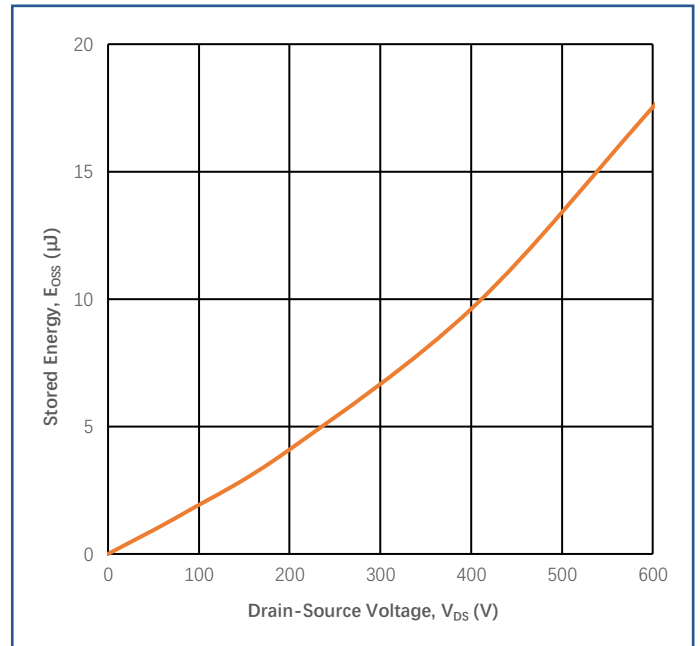


Figure 10
Output Capacitor Stored Energy

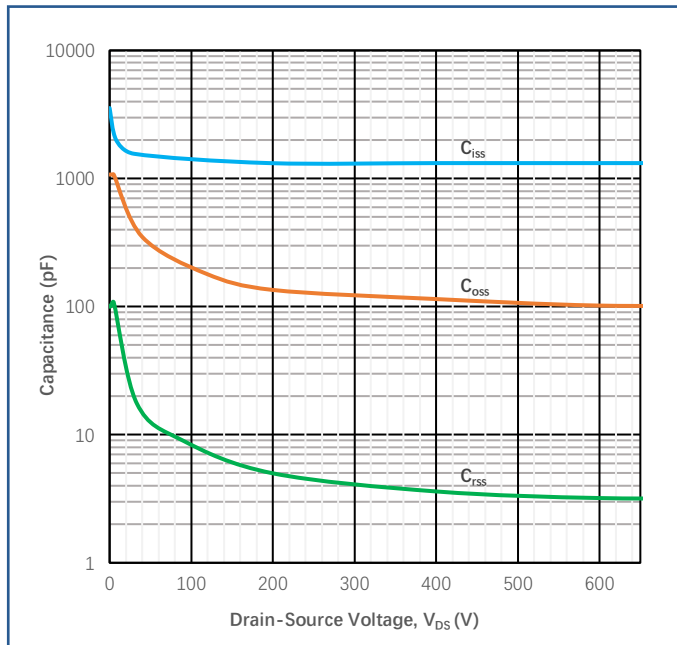


Figure 11
Capacitances vs. Drain-Source

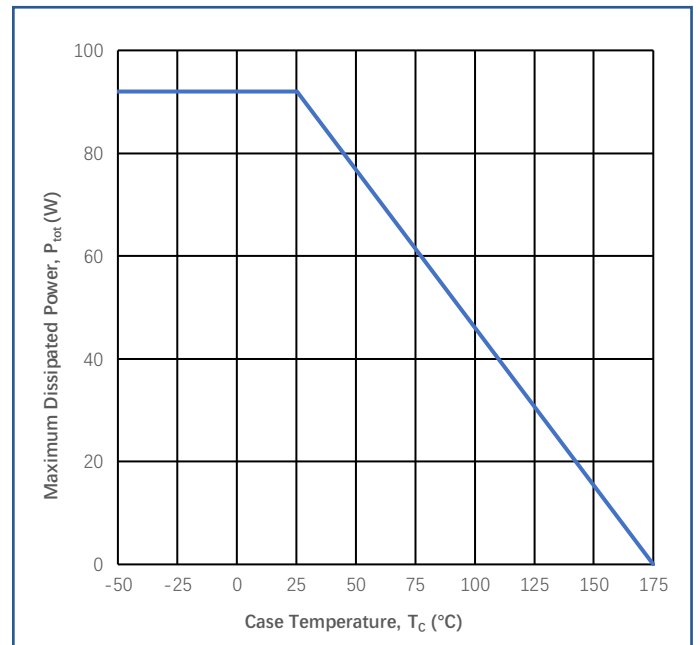


Figure 12
Max Power Dissipation Derating vs T_C

Typical Performance

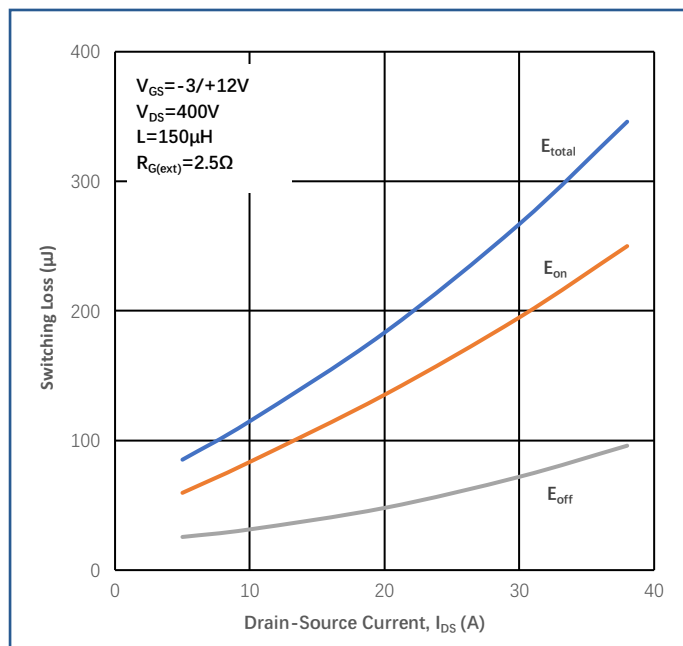


Figure 13
Switching Energy vs. Drain Current

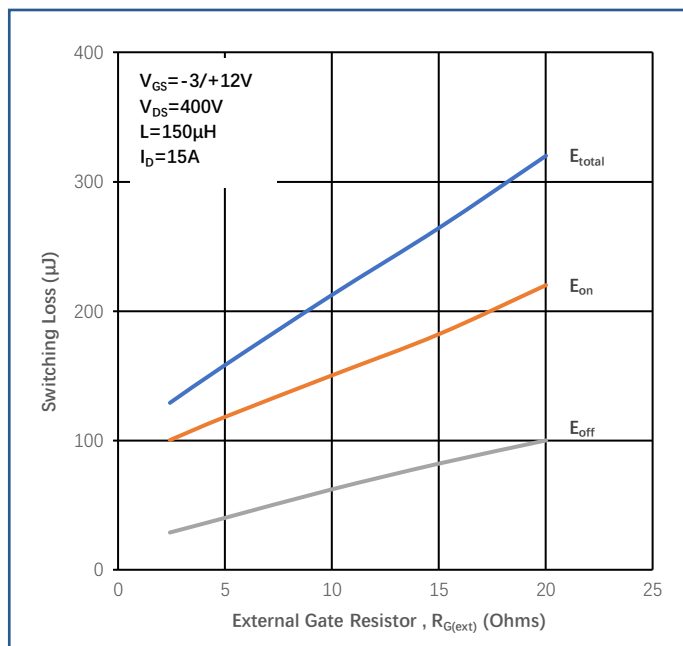


Figure 14
Switching Energy vs. $R_{G(\text{ext})}$

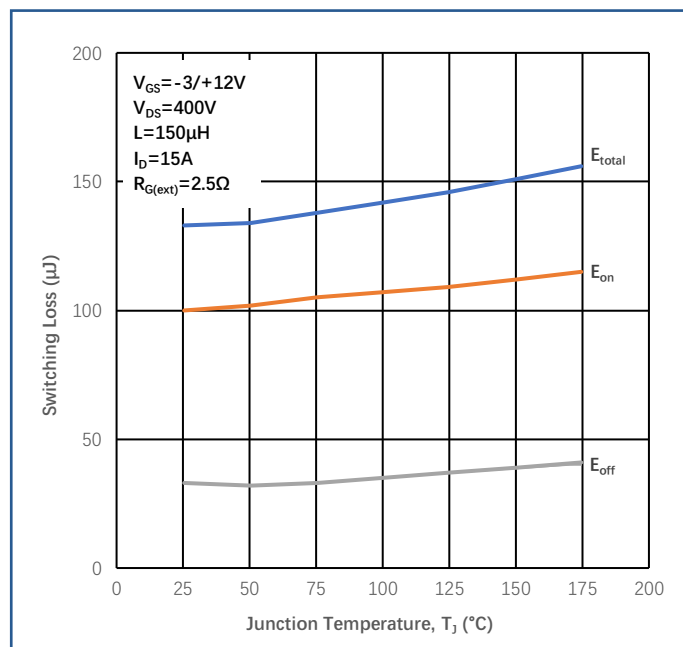


Figure 15
Switching Energy vs. Temperature

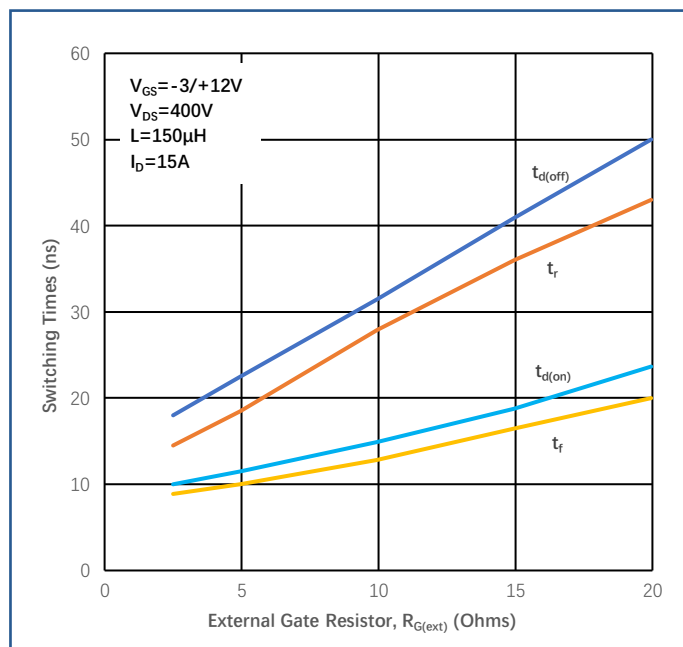


Figure 16
Switching Times vs. $R_{G(\text{ext})}$

Typical Performance

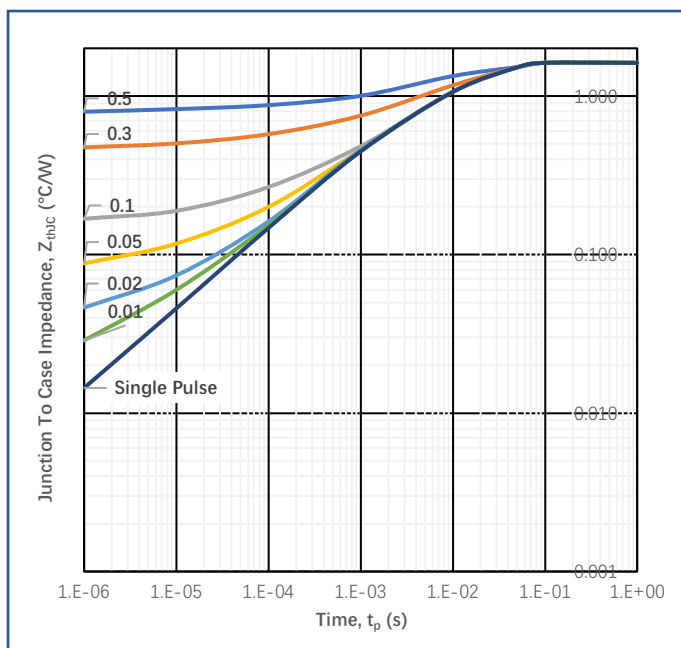


Figure 17

Transient Thermal Impedance

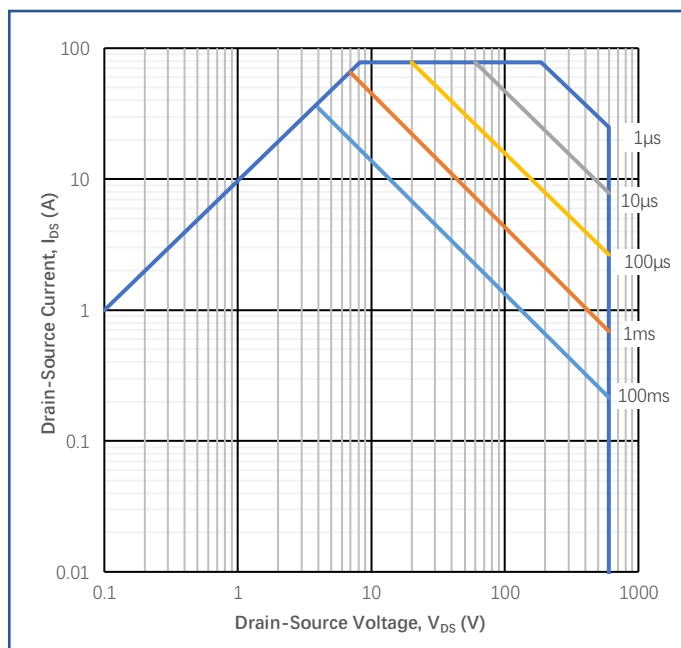
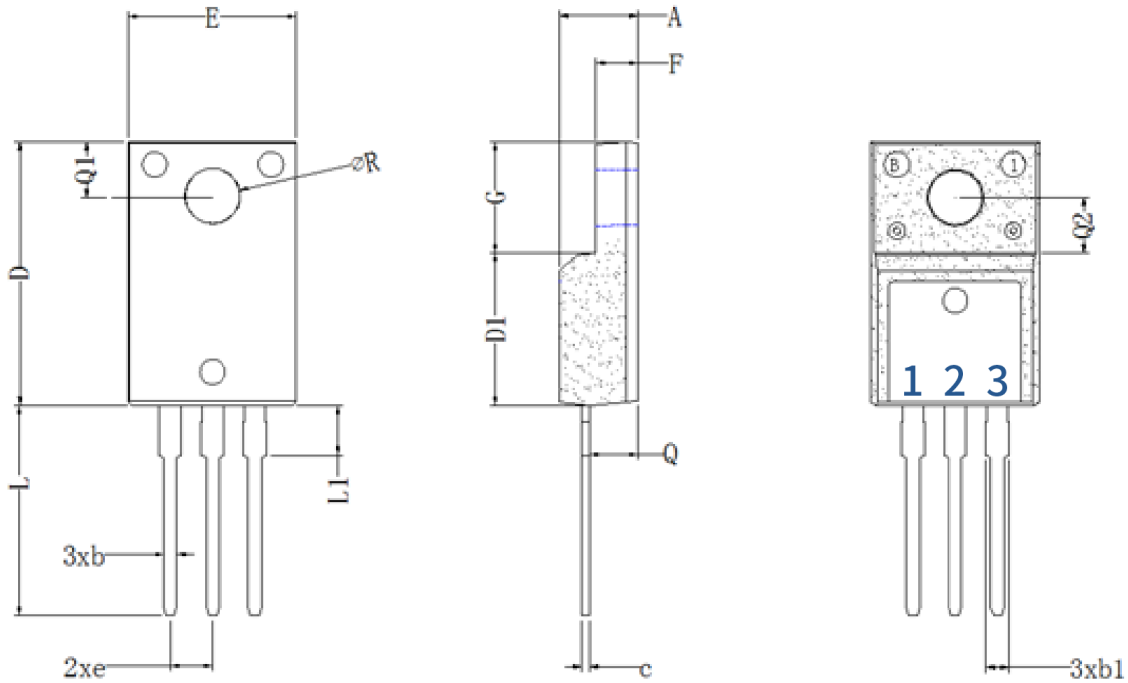


Figure 18

Safe Operating Area

Package Dimensions (mm)

Package Type: TO-220F



Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	4.50	4.70	4.90
b	0.60	0.80	1.00
b1	1.16	1.36	1.56
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	8.99	9.19	9.39
e	2.04	2.54	3.04
E	9.86	10.16	10.46
F	2.34	2.54	2.74
G	6.48	6.68	6.88
L	12.48	12.68	12.88
L1	2.78	2.98	3.18
Q	2.70	2.90	3.10
Q1	3.15	3.35	3.55
Q2	3.13	3.33	3.53
øR	3.10	3.30	3.50

Pin	Symbol	Description
1	G	Gate
2	D	Drain
3	S	Source

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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