

ASC600N1200MEDF

1200V, 2.7m Ω , Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-229A A/0



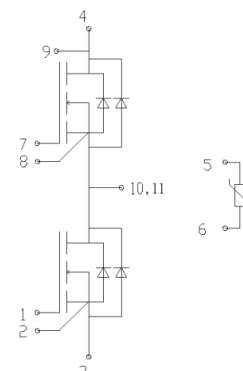
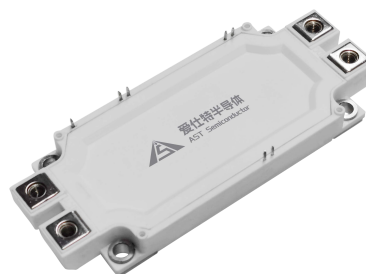
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AST Semiconductor

General Description

The AST-MED module incorporates AST's 1200V Gen3 N-channel SiC MOSFET and SiC Diode. NTC temperature sensor inside.

Features

- High Temperature, Humidity and Bias Operation
- Ultra Low Loss
- High-Frequency Operation
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-Safe Device Operation
- Copper Baseplate and Silicon Nitride Insulator



Applications

- High Power Converters
- Motor Drives
- Servo Drives
- UPS Systems
- Wind Turbines

Ordering Informations

Order Number	ASC600N1200MEDF
Marking	ASC600N1200MEDF
Package Type	MED

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)	510			A	T _C =25°C
		430				T _C =65°C
T _J ; Max	Junction Temperature	175			°C	
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics						
R _{DS(on)}	Static Drain-Source on Resistance	-	2.7	3.7	mΩ	V _{GS} =18V; I _D =300A; T _C =25°C
Dynamic characteristics						
Q _G	Total Gate Charge	-	1428	-	nC	V _{DD} =800V; I _D =300A; V _{GS} =-5/+18V; T _C =25°C
Q _{GD}	Gate-Drain Charge	-	469	-		
Source-drain diode						
Q _{RR}	Reverse Recovery Charge	-	3678	-	nC	V _{GS} =-5/+18V; I _F =300A; V _R =800V; I _{load} =100uH; T _J =25°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
V_{GS}	Gate-Source Voltage (dynamic)	-10/+22	V
I_D	Drain Current (continuous; $T_c=25^\circ\text{C}$)	510	A
	Drain Current (continuous; $T_c=65^\circ\text{C}$)	430	
I_{DM}	Drain Current (pulsed)	860	A
T_{op}, T_{stg}	Operating and Storage Temperature Range	-40 to +175	$^\circ\text{C}$
$T_{J, Max}$	Junction Temperature	175	$^\circ\text{C}$
L_{Stray}	Stray Inductance	20	nH
V_{isol}	Isolation Test Voltage (DC; 2mA; $t=10s$)	4.2	kV
$R_{th, Jh}$	Thermal Resistance, Junction-to-Heatsink	0.12	$^\circ\text{C}/\text{W}$

MOSFET Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
Static characteristics (at $T_c=25^\circ\text{C}$ unless otherwise specified)						
BV_{DS}	Drain-Source Breakdown Voltage	1200	-	-	V	$V_{GS}=0V$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	60	μA	$V_{DS}=1200V$; $V_{GS}=0V$
I_{GSS}	Gate-Body Leakage Current	-	-	3	μA	$V_{GS}=-10/20V$; $V_{DS}=0V$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}$; $I_D=60mA$
$R_{DS(on)}$	Static Drain-Source on Resistance	-	2.7	3.7	$m\Omega$	$V_{GS}=18V$; $I_D=300A$; $T_c=25^\circ\text{C}$
$V_{GS(on)}$	Recommended Turn-on Voltage	-	18	-	V	Static
$V_{GS(off)}$	Recommended Turn-off Voltage	-	-5	-		
R_G	Gate Resistance	-	0.5	-	Ω	$V_{GS}=0V$; $f=1MHz$
Dynamic characteristics (at $T_J=25^\circ\text{C}$ unless otherwise specified)						
C_{iss}	Input Capacitance	-	41.3	-	nF	$V_{DS}=800V$; $f=1MHz$; $V_{AC}=25mV$
C_{oss}	Output Capacitance	-	1.7	-		
C_{rss}	Reverse Transfer Capacitance	-	78	-	pF	
E_{on}	Turn-on Energy	-	25.9	-	mJ	$V_{DS}=800V$; $V_{GS}=-5/+18V$; $I_D=300A$; $R_{G(ext)}=5.0\Omega$; Load=100 μH
E_{off}	Turn-off Energy	-	18.9	-		
Q_{GS}	Gate-Source Charge	-	460	-	nC	$V_{DD}=800V$; $V_{GS}=-5/+18V$; $I_D=300A$
Q_{GD}	Gate-Drain Charge	-	469	-		
Q_G	Total Gate Charge	-	1428	-		
$t_{d(on)}$	Turn-on Delay Time	-	127	-	ns	$V_{DD}=800V$; $V_{GS}=-5/+18V$; $I_D=300A$; $R_{G(ext)}=5.0\Omega$; Load=100 μH
t_r	Rise Time	-	100	-		
$t_{d(off)}$	Turn-off Delay Time	-	412	-		
t_f	Fall Time	-	97	-		



SiC Diode Characteristics (at $T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{FSD}	Forward Voltage	-	-	1.9	V	$V_{GS}=0\text{V}$; $I_F=600\text{A}$
I_S	Continuous Diode Forward Current	-	600	-	A	$V_{GS}=0\text{V}$; $T_C=125^{\circ}\text{C}$
t_{RR}	Reverse Recovery Time	-	66	-	ns	$V_{GS}=-5/+18\text{V}$; $I_F=300\text{A}$; $V_R=800\text{V}$; $R_{G(\text{ext})}=5.0\Omega$; Load=100 μH
Q_{RR}	Reverse Recovery Charge	-	3678	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	108	-	A	

NTC Thermistor Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
R_{25}	Rated Resistance	-	5.00	-	k Ω	$T_{NTC}=25^{\circ}\text{C}$
$\Delta R/R$	Deviation of R_{100}	-5	-	5	%	$T_{NTC}=100^{\circ}\text{C}$; $R_{100}=493.3\Omega$
$B_{25/50}$	Beta Value for 25°C to 50°C	-	3375	-	K	$R_2=R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$
$B_{25/80}$	Beta Value for 25°C to 80°C	-	3414	-	K	$R_2=R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$
$B_{25/100}$	Beta Value for 25°C to 100°C	-	3436	-	K	$R_2=R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$

Typical Performance

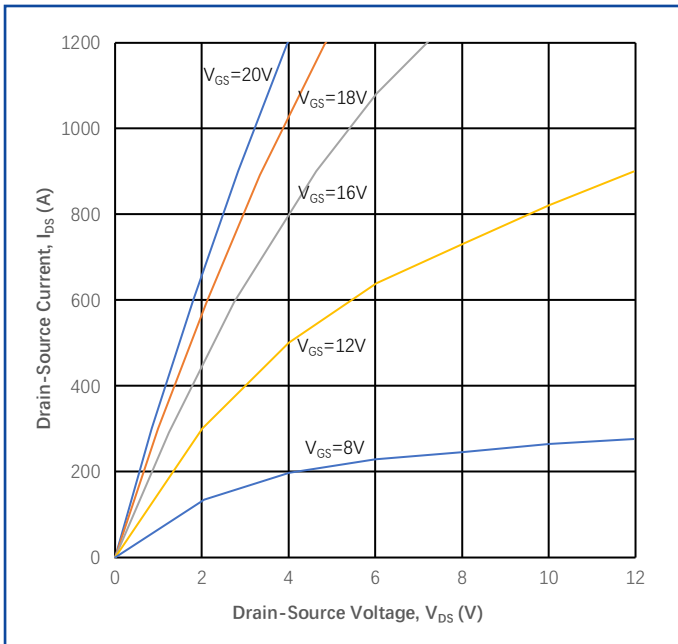


Figure 1
Output Characteristics ($T_J = 25^\circ\text{C}$)

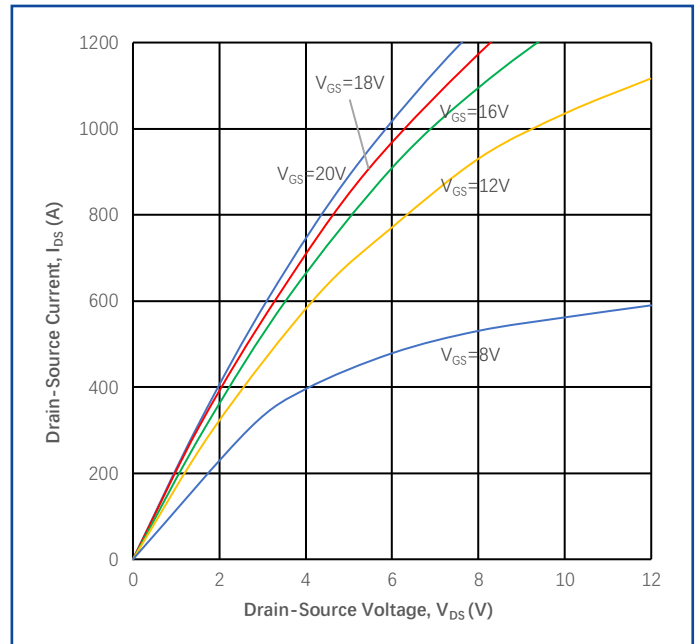


Figure 2
Output Characteristics ($T_J = 175^\circ\text{C}$)

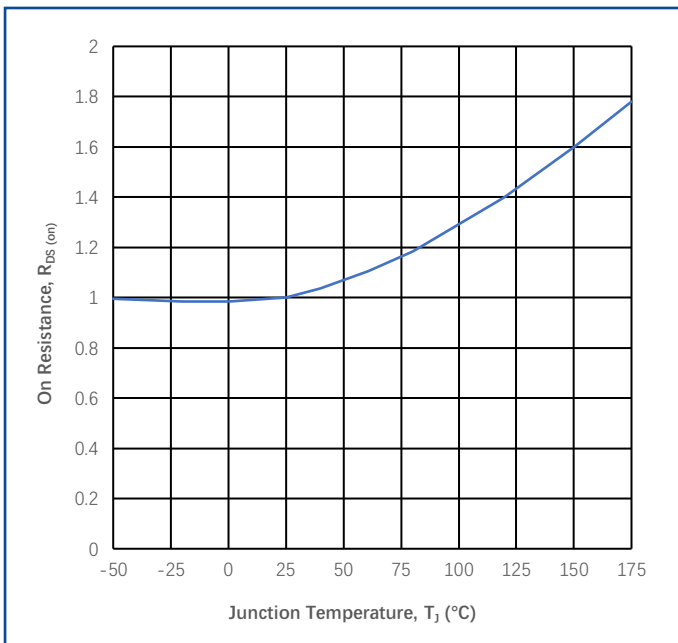


Figure 3
Normalized On-Resistance vs. Temperature

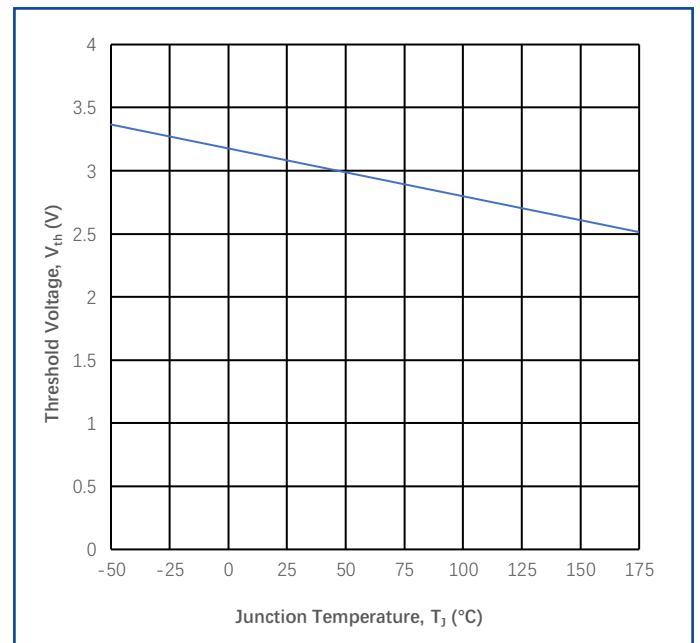


Figure 4
Threshold Voltage vs. Temperature

Typical Performance

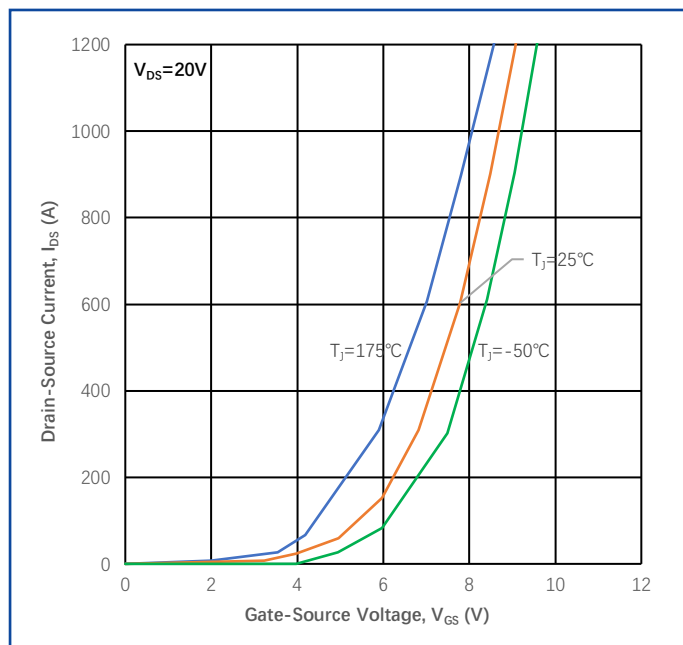


Figure 5

Transfer Characteristic for Various T_j

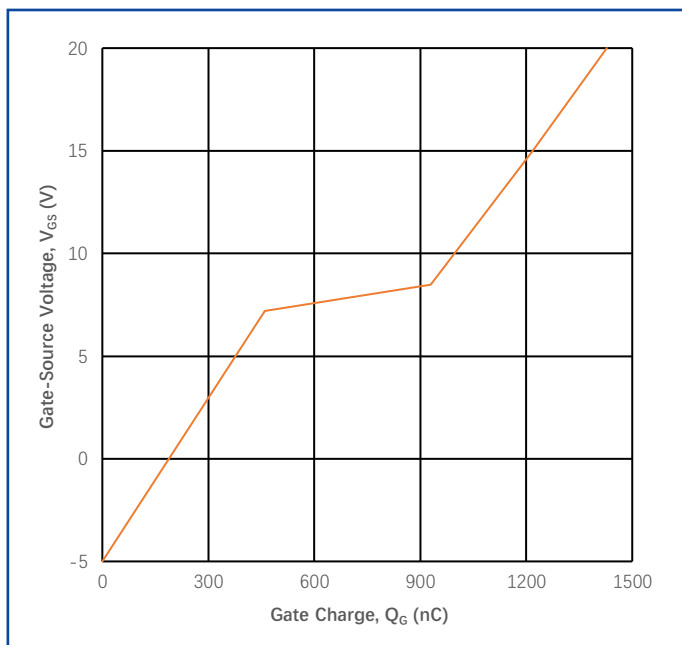


Figure 6

Typical Gate Charge Characteristics

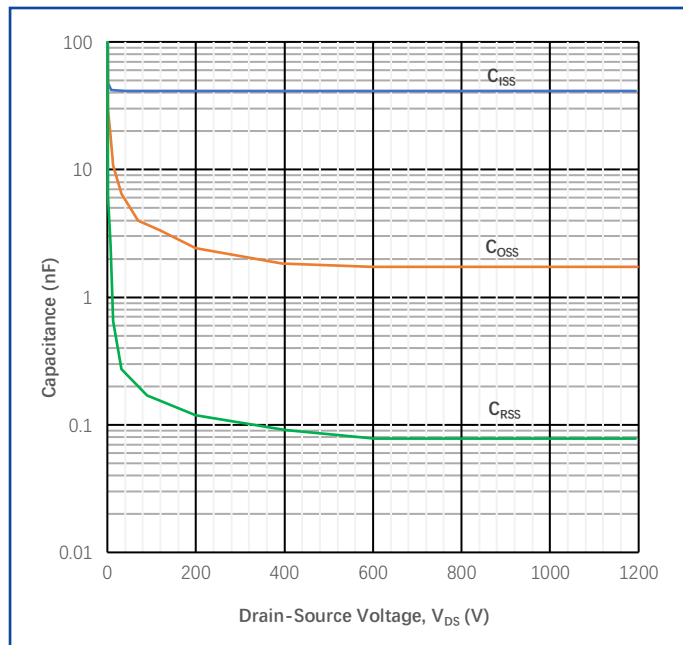


Figure 7

Typical Capacitances vs. Drain-Source Voltage

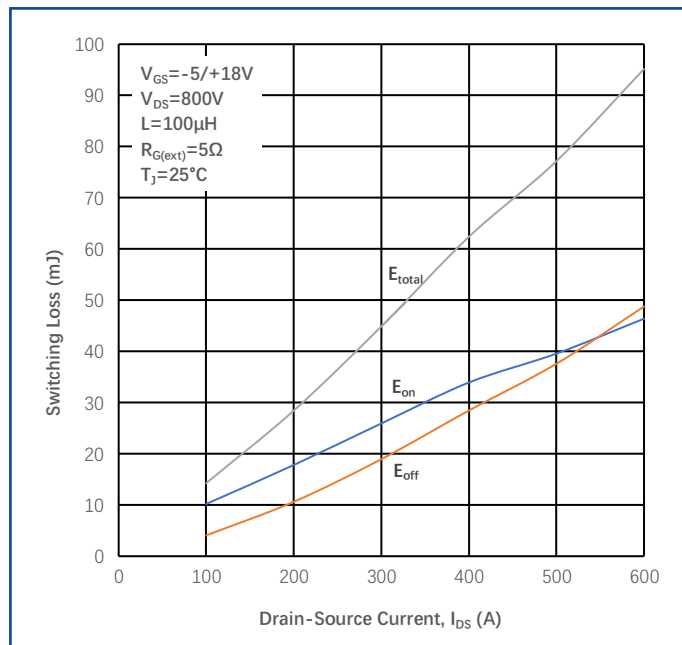


Figure 8

Inductive Switching Energy vs. Drain Current

Typical Performance

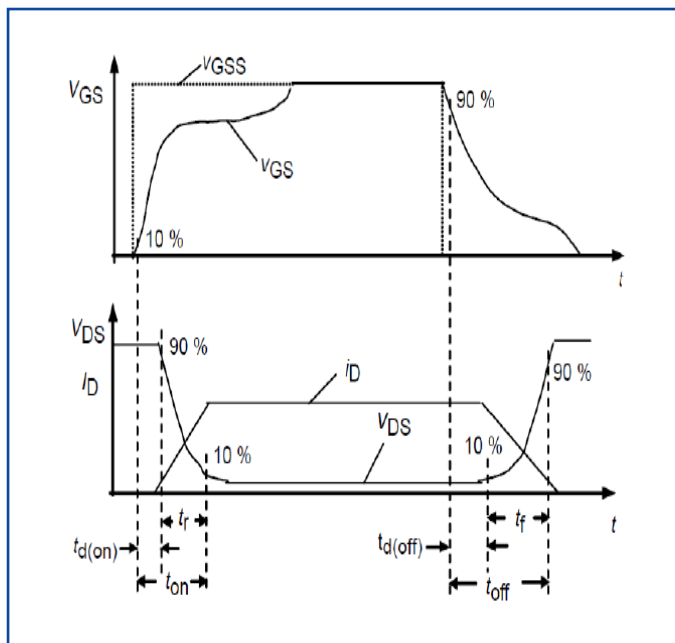


Figure 9

Switching Time Description

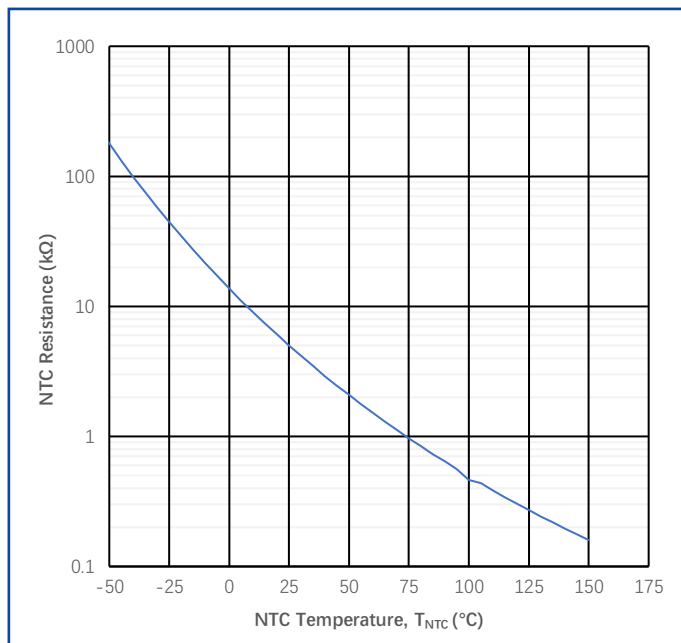


Figure 10

NTC-Temperature Characteristic (Typical)

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