

## 120V N-Channel Enhancement Mode MOSFET

### Description

The AP6N12MI uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 120V$   $I_D = 6A$

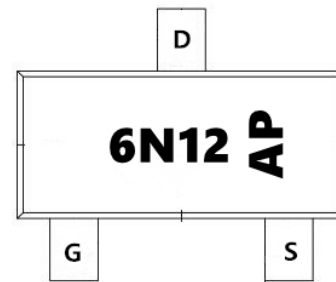
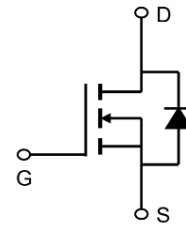
$R_{DS(ON)} < 180m\Omega @ V_{GS}=10V$  (Type: **110mΩ**)

### Application

Automotive lighting

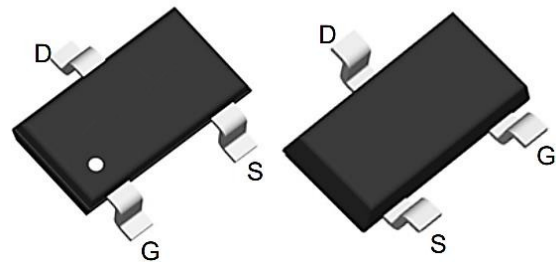
Load switch

Uninterruptible power supply



Top View

Bottom View



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP6N12MI	SOT23-3L	6N12-AP	3000

### Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	120	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C=25^\circ C$	Drain Current, $V_{GS} @ 10V$	6	A
$I_D @ T_C=100^\circ C$	Drain Current, $V_{GS} @ 10V$	3.5	A
IDM	Pulsed Drain Current <sup>1</sup>	18	A
$P_D @ T_C=25^\circ C$	Total Power Dissipation	30	W
$P_D @ T_A=25^\circ C$	Total Power Dissipation <sup>3</sup>	2.7	W
TSTG	Storage Temperature Range	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Maximum Thermal Resistance, Junction ambient	125	°C/W
$R_{\theta JC}$	Maximum Thermal Resistance, Junction-case	5.1	°C/W



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### Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)

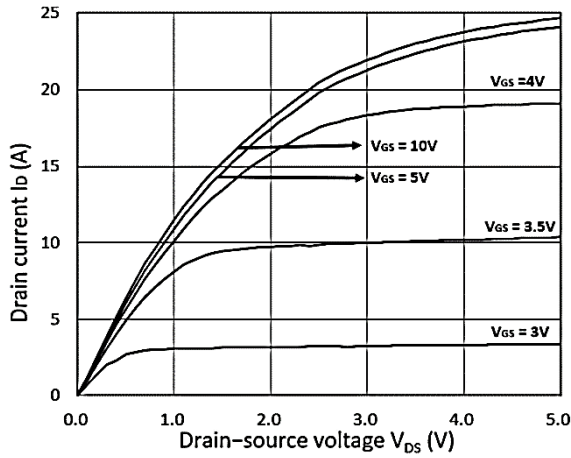
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	VGS=0V, ID=250μA	120	135	-	V
IDSS	Zero Gate Voltage Drain Current	VDS=100V, VGS=0V,	-	-	1.0	μA
IGSS	Gate to Body Leakage Current	VDS=0V, VGS=±20V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	VDS=VGS, ID=250μA	1.2	2.0	2.5	V
RDS(on)	Static Drain-Source on-Resistance note3	VGS=10V, ID=5A	-	110	180	mΩ
		VGS=4.5V, ID=3A	-	120	200	mΩ
g fs	Forward Transconductance	V DS =5V , I D =5A		14		S
RG	Gate Resistance	VDS = 0V, VGS =0V,f =1MHz		3		Ω
Ciss	Input Capacitance	VDS=15V, VGS=0V, f=1.0MHz	-	1100	-	pF
Coss	Output Capacitance		-	55	-	pF
Crss	Reverse Transfer Capacitance		-	40	-	pF
Qg	Total Gate Charge	VDS=50V, ID=5A, VGS=10V	-	11.9	-	nC
Qgs	Gate-Source Charge		-	2.8	-	nC
Qgd	Gate-Drain("Miller") Charge		-	1.7	-	nC
td(on)	Turn-on Delay Time	VDS=30V, ID=5A, RG=1.8Ω, VGS=10V	-	3.8	-	ns
tr	Turn-on Rise Time		-	25.8	-	ns
td(off)	Turn-off Delay Time		-	16	-	ns
tf	Turn-off Fall Time		-	8.8	-	ns
IS	Continuous Source Current1,5	VG=VD=0V , Force Current	-	-	14.6	A
ISM	Pulsed Source Current2,5		-	-	25	A
VSD	Diode Forward Voltage2	VGS=0V, IS=10A	-	-	1.2	V

#### Note :

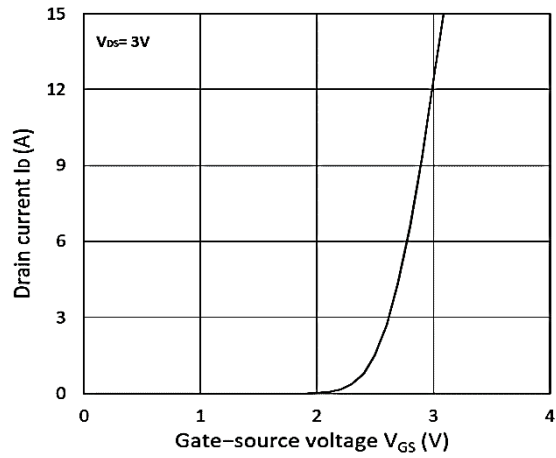
- 1、 The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3、 The power dissipation is limited by 150°C junction temperature
- 4、 The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

**120V N-Channel Enhancement Mode MOSFET**

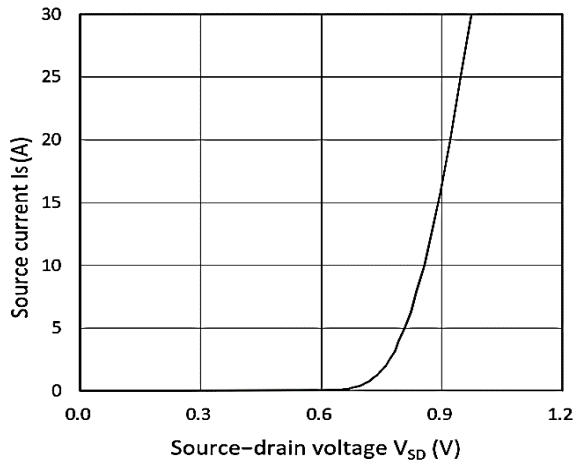
**Typical Characteristics**



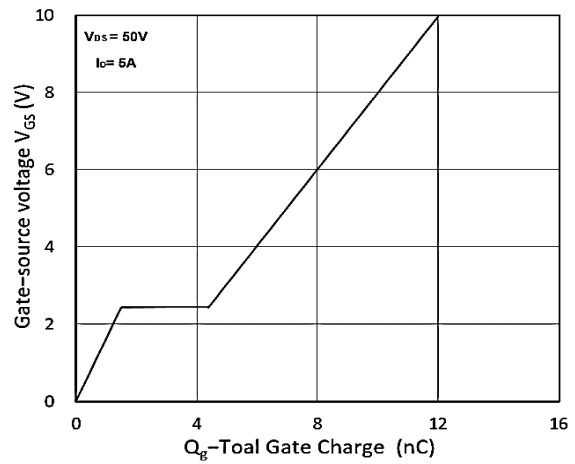
**Figure 1. Output Characteristics**



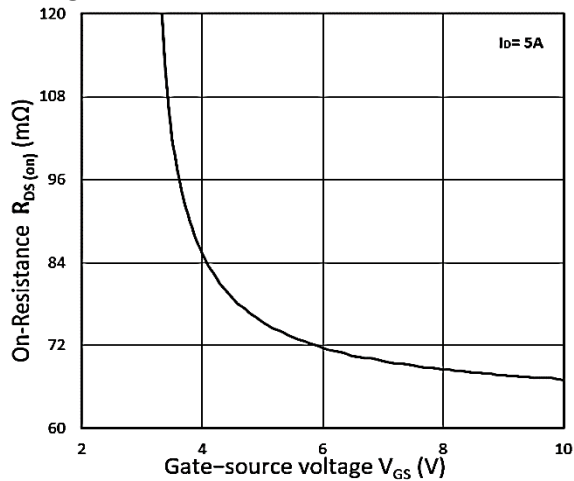
**Figure 2. Transfer Characteristics**



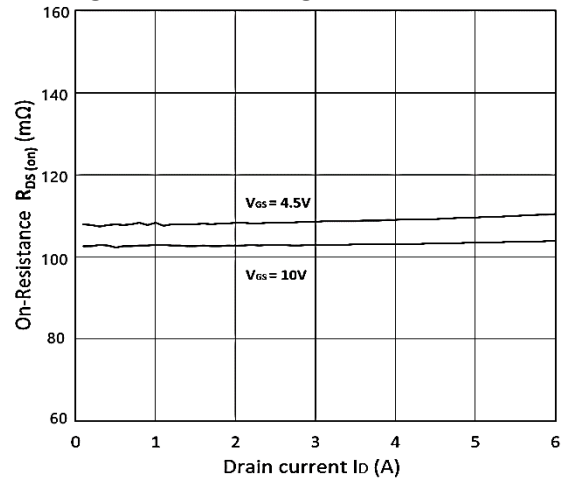
**Figure 3. Forward Characteristics of Reverse**



**Figure 4. Gate Charge Characteristics**



**Figure 5.  $R_{DS(on)}$  vs.  $V_{GS}$**



**Figure 6.  $R_{DS(on)}$  vs.  $I_D$**

**120V N-Channel Enhancement Mode MOSFET**

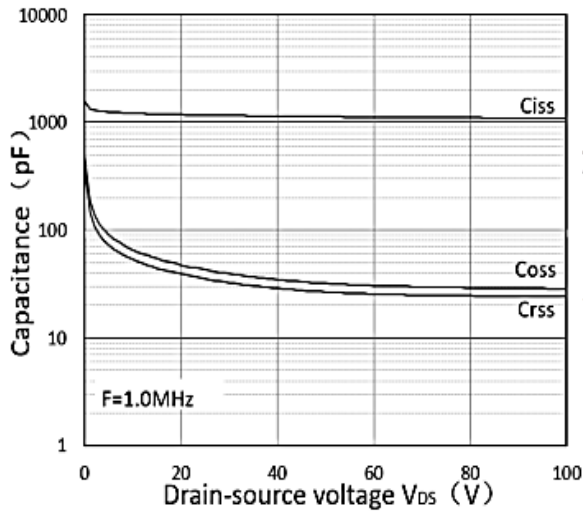


Figure 7. Capacitance Characteristics

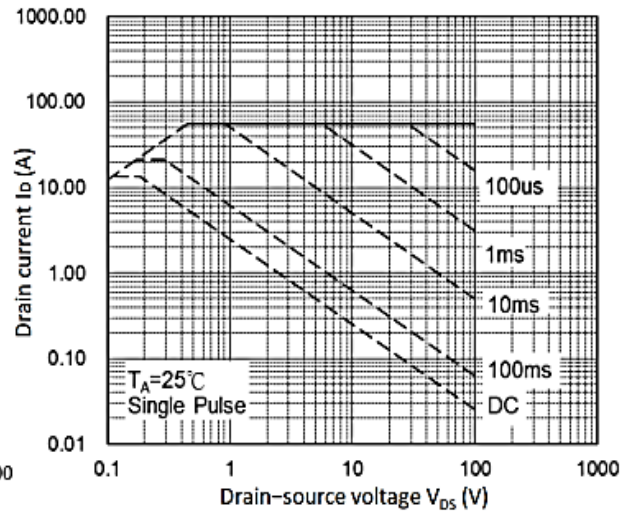


Figure 8. Safe Operating Area

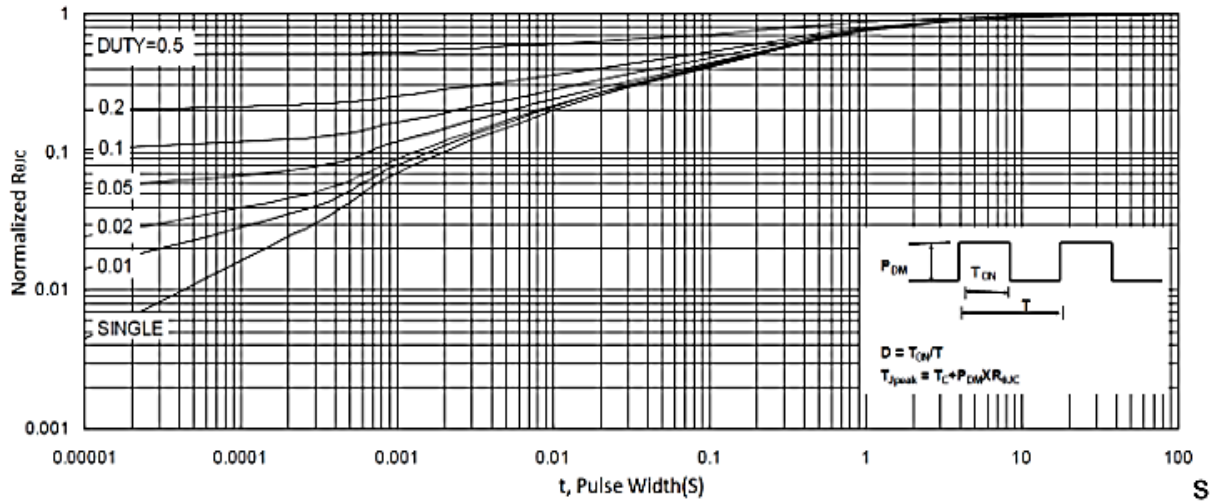


Figure 9. Normalized Maximum Transient Thermal Impedance

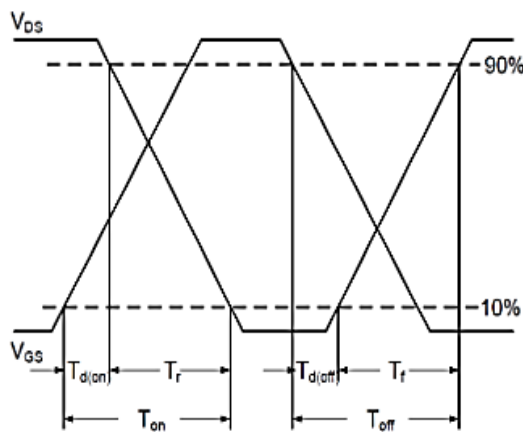


Figure 10. Switching Time Waveform

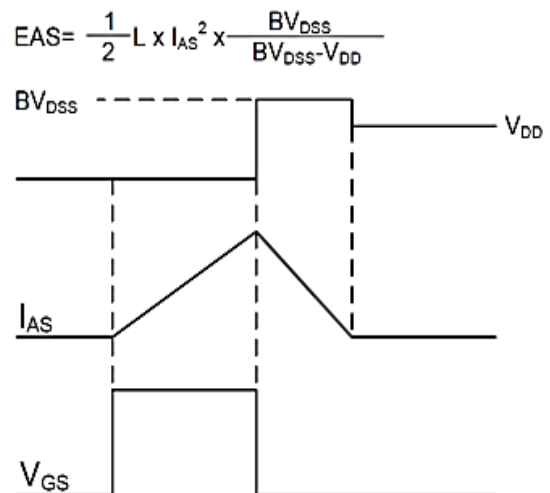
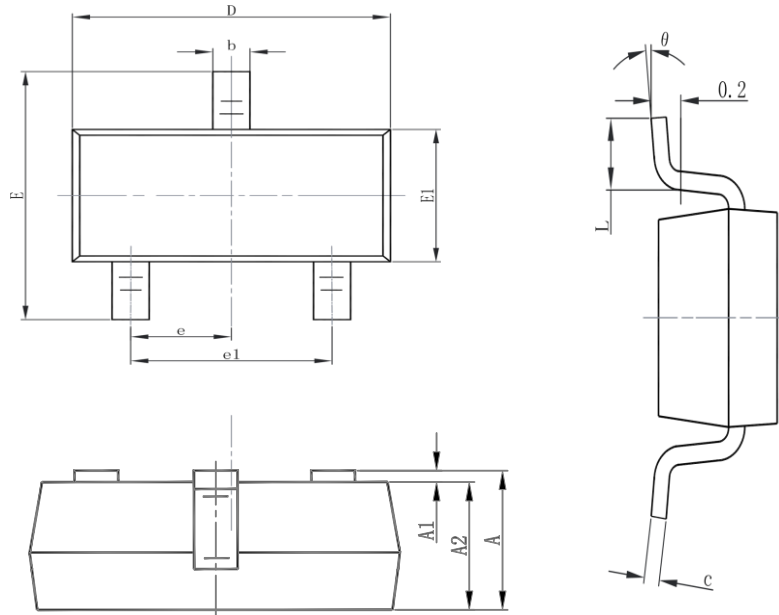


Figure 11. Unclamped Inductive Switching Waveform

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



## 120V N-Channel Enhancement Mode MOSFET Package Mechanical Data-SOT23-3-SLS-Single



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°