

## 60V N-Channel Enhancement Mode MOSFET

### Description

The AP220N06MP uses advanced **SGT<sub>r</sub>** 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

$V_{DS} = 60V$   $I_D = 220A$

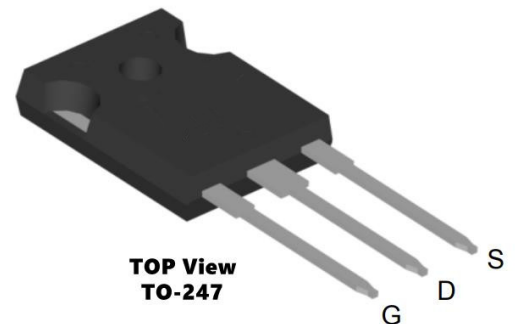
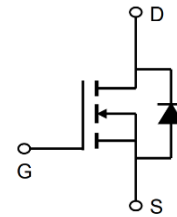
$R_{DS(ON)} < 3m\Omega$  @  $V_{GS}=10V$  (Type: **2.4mΩ**)

### Application

Battery protection

Load switch

Uninterruptible power supply



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP220N06MP	TO-247-3L	AP220N06MP XXX YYYY	300

### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current <sup>1,6</sup>	220	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current <sup>1,6</sup>	136	A
IDM	Pulsed Drain Current <sup>2</sup>	660	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	101	mJ
IAS	Avalanche Current	130	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	168	W
TSTG	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	40	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	1.5	$^\circ\text{C/W}$

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### Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)

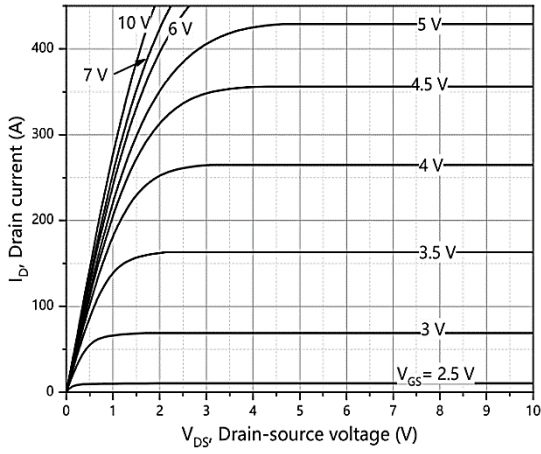
Symbol	Parameter	Conditions	Min	Typ	Max	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	60	67		V
IDSS	Zero Gate Voltage Drain Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V			1	μA
IGSS	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V			±100	nA
VGS(th)	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	2.6	4.0	V
RDS(ON)	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> =20A		2.4	3.0	mΩ
		V <sub>GS</sub> = 6V, I <sub>D</sub> =15A		4.2	5.0	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=100KHZ		5950		pF
C <sub>oss</sub>	Output Capacitance			1250		
C <sub>rss</sub>	Reverse Transfer Capacitance			85		
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, I <sub>D</sub> =50A		93		nC
Q <sub>gs</sub>	Gate-Source Charge			17		
Q <sub>gd</sub>	Gate-Drain Charge			14		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> =25A, di/dt=100A/us		73		ns
t <sub>rr</sub>	Reverse Recovery Time			68		
td(on)	Turn-on Delay Time	V <sub>GS</sub> =10V, V <sub>DD</sub> =30V, I <sub>D</sub> =25A R <sub>GEN</sub> =2Ω		22.5		ns
t <sub>r</sub>	Turn-on Rise Time			6.7		
td(off)	Turn-off Delay Time			80.3		
t <sub>f</sub>	Turn-off fall Time			26.9		
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =20A, V <sub>GS</sub> =0V			1.2	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				200	A

#### Note :

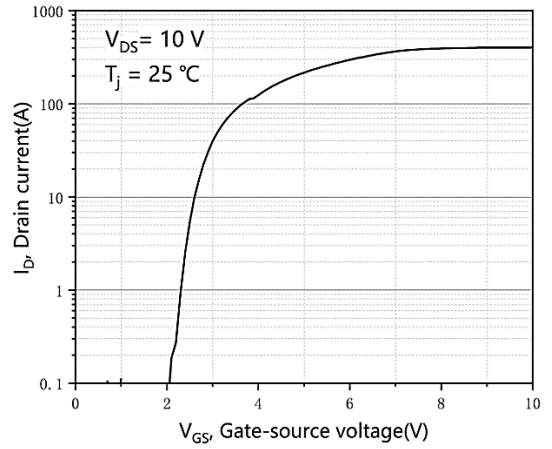
- 1、 The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、 The EAS data shows Max. rating . The test condition is VDD=48V, VGS=10V, L=0.1mH IAS=130A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation

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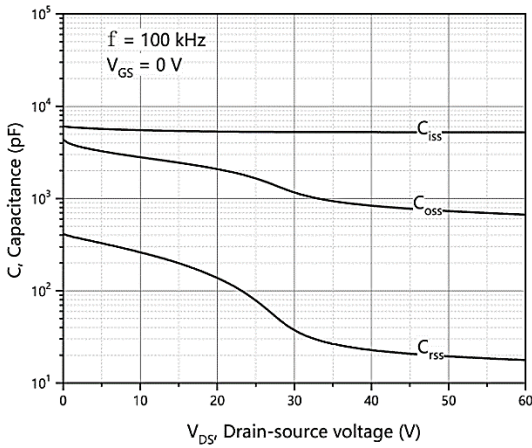
**Typical Characteristics**



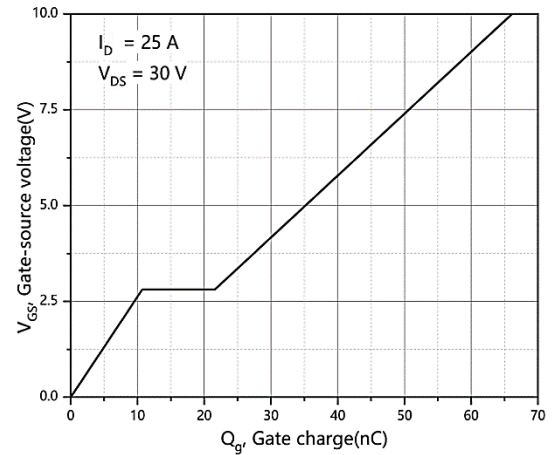
**Figure 1. Typ. output characteristics**



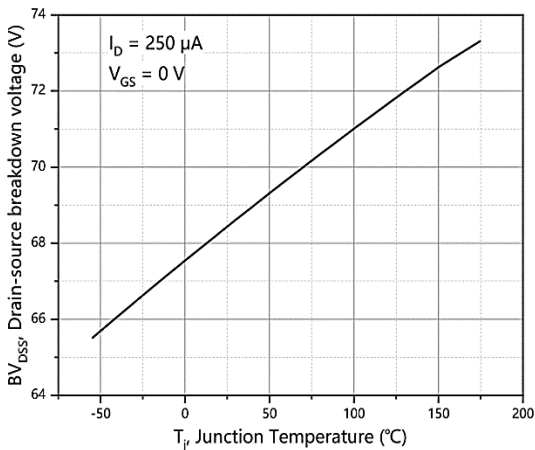
**Figure 2. Typ. transfer characteristics**



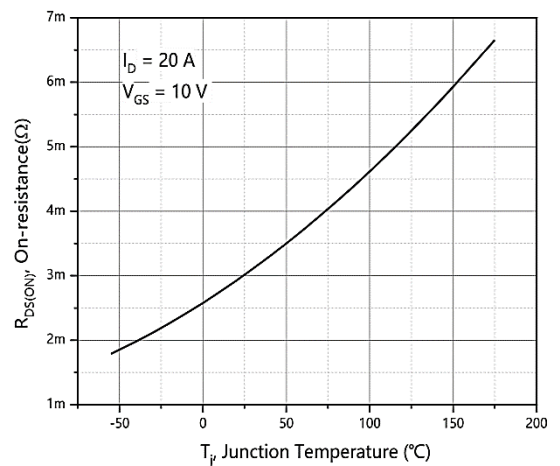
**Figure 3. Typ. capacitances**



**Figure 4. Typ. gate charge**

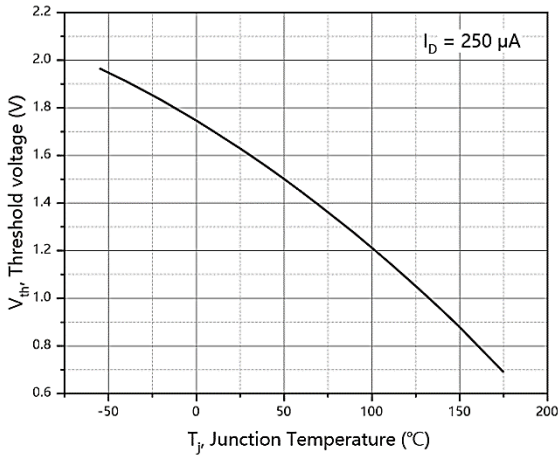


**Figure 5. Drain-source breakdown voltage**

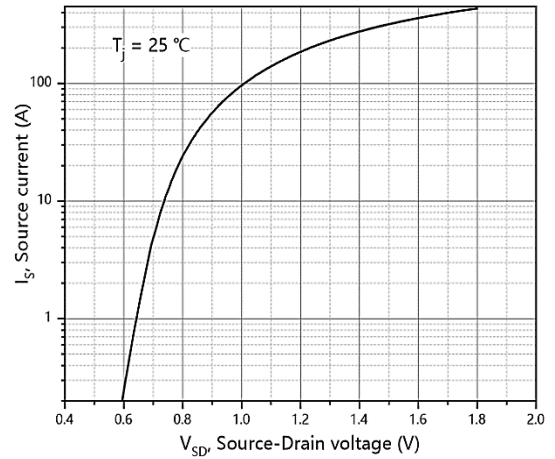


**Figure 6. Drain-source on-state resistance**

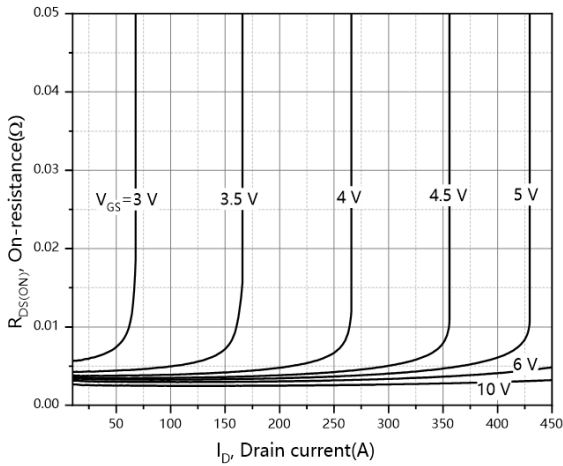
**60V N-Channel Enhancement Mode MOSFET**



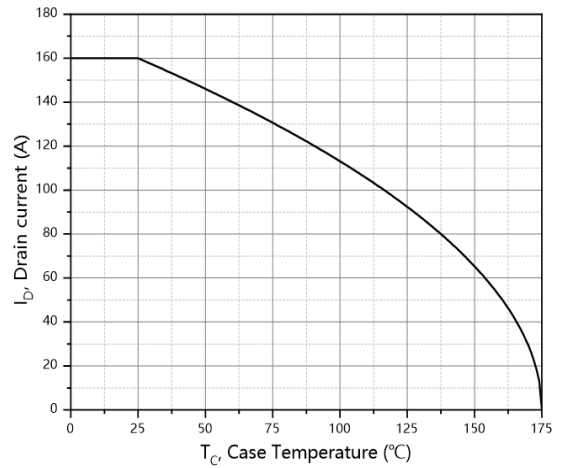
**Figure 7. Threshold voltage**



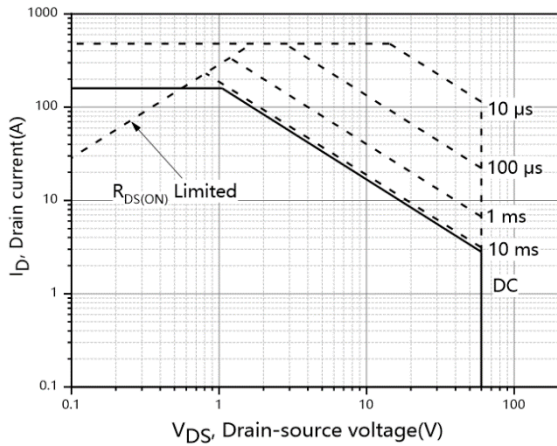
**Figure 8. Forward characteristic of body diode**



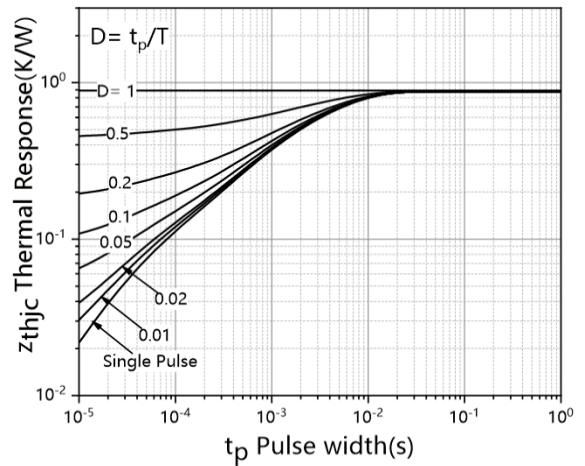
**Figure 9. Drain-source on-state resistance**



**Figure 10. Drain current**



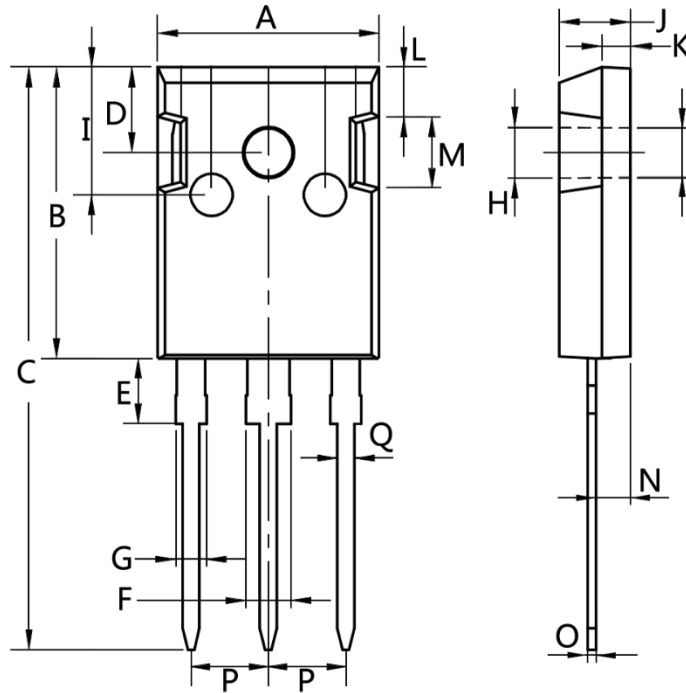
**Figure 11. Safe operation area T<sub>C</sub>=25 °C**



**Figure 12. Max. transient thermal impedance**

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### Package Mechanical Data-TO-247-3L



Dim.	Min.	Max.
A	15.0	16.0
B	20.0	21.0
C	41.0	42.0
D	5.0	6.0
E	4.0	5.0
F	2.5	3.5
G	1.75	2.5
H	3.0	3.5
I	8.0	10.0
J	4.9	5.1
K	1.9	2.1
L	3.5	4.0
M	4.75	5.25
N	2.0	3.0
O	0.55	0.75
P	Typ 5.08	
Q	1.2	1.3