

## 60V N-Channel Enhancement Mode MOSFET

### Description

The AP90N06P/T uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 10V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 60V$   $I_D = 90A$

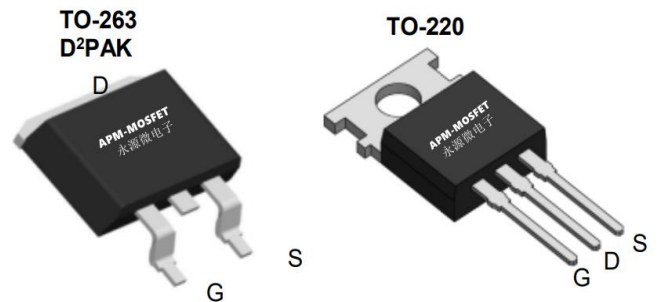
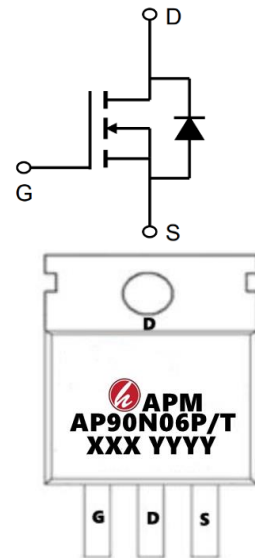
$R_{DS(ON)} < 7.0m\Omega$  @  $V_{GS}=10V$  (Type: 5.8m $\Omega$ )

### Application

Battery protection

Load switch

Uninterruptible power supply



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP90N06P	TO-220-3L	AP90N06P XXX YYYY	1000
AP90N06T	TO-263-3L	AP90N06T XXX YYYY	800

### Absolute Maximum Ratings@ $T_j=25^\circ C$ (unless otherwise specified)

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain source voltage	60	V
V <sub>GS</sub>	Gate source voltage	±20	V
I <sub>D</sub>	Continuous drain current <sup>1)</sup>	90	A
I <sub>DM</sub>	Pulsed drain current <sup>2)</sup>	320	A
I <sub>S</sub>	Diode forward current	37	A
I <sub>SP</sub>	Pulsed source current	210	A
P <sub>D</sub>	Power dissipation	108	W
EAS	Single pulsed avalanche energy <sup>3)</sup>	205.4	mJ
T <sub>stg</sub> , T <sub>j</sub>	Operation and storage temperature	-55 to 150	°C
R <sub>θJC</sub>	Thermal resistance, junction-case	1.4	°C/W
R <sub>θJA</sub>	Thermal resistance, junction-ambient <sup>4)</sup>	62.5	°C/W

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

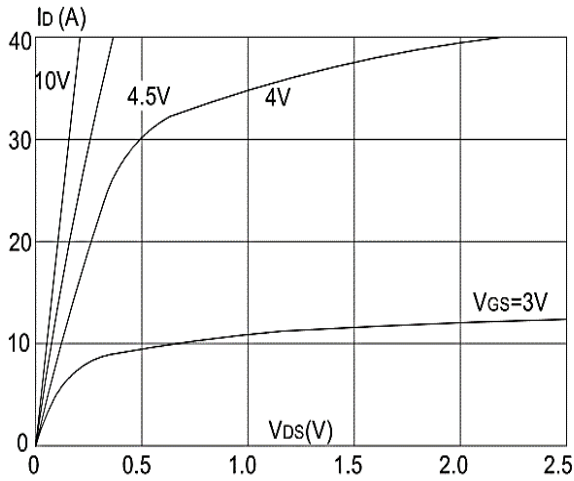
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60	64	-	V
IDSS	Zero Gate Voltage Drain Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V,	-	-	1.0	μA
IGSS	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.0	4.0	V
RDS(on)	Static Drain-Source on-Resistance note	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	5.8	7.0	mΩ
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1.0MHz	-	4136	-	pF
C <sub>oss</sub>	Output Capacitance		-	286	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	257	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	90	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	9	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	18	-	nC
td(on)	Turn-on Delay Time	V <sub>DS</sub> =30V, I <sub>D</sub> =30A, R <sub>G</sub> =1.8Ω, V <sub>GS</sub> =10V	-	9	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	7	-	ns
td(off)	Turn-off Delay Time		-	40	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	15	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	90	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	320	A
VSD	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I <sub>F</sub> =30A, di/dt=100A/μs	-	33	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	46	-	nC

#### Note :

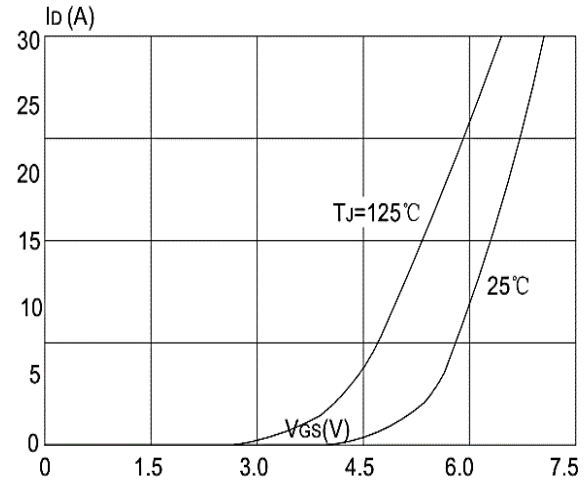
- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width .The EAS data shows Max. rating .
- 3、 The test cond ≅ 300us duty cycle ≅ 2%, duty cycle ition is T<sub>J</sub> =25°C, VDD =35V, VG =10V, R G =25Ω, L=0.5mH, IAS =21A
- 4、 The power dissipation is limited by 175°C junction temperature
- 5、 The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

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

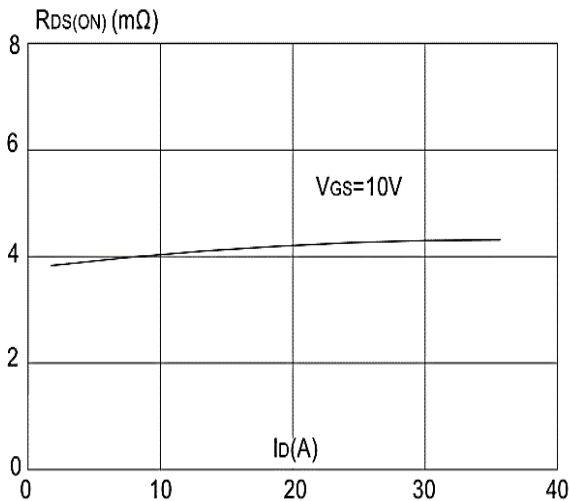
**Electrical Characteristics Diagrams**



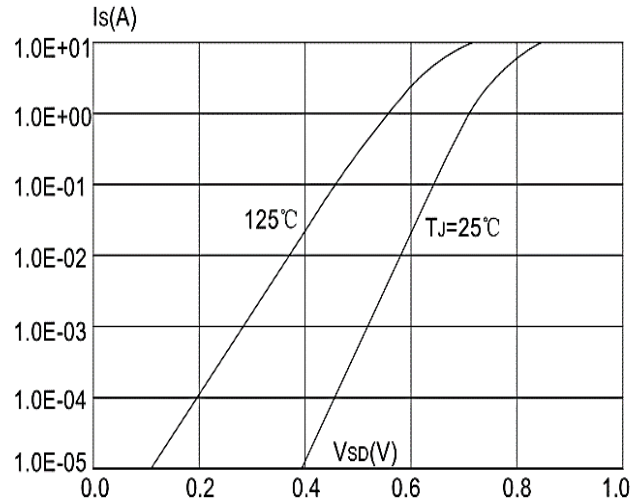
**Figure 1: Output Characteristics**



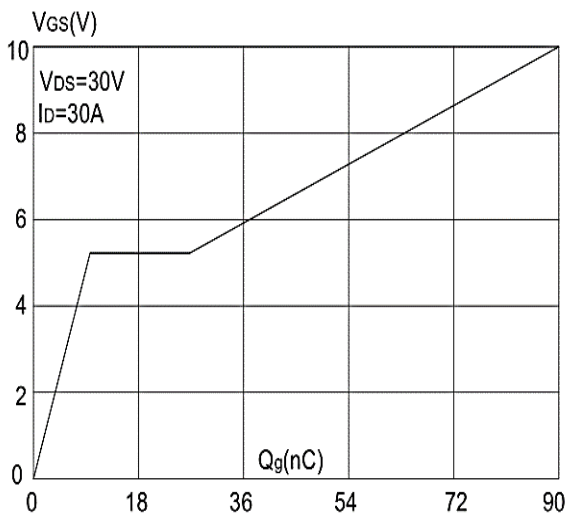
**Figure 2: Typical Transfer Characteristics**



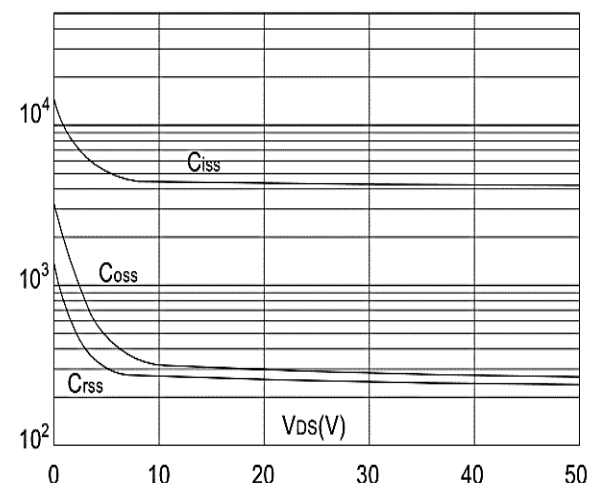
**Figure 3: On-resistance vs. Drain Current**



**Figure 4: Body Diode Characteristics**



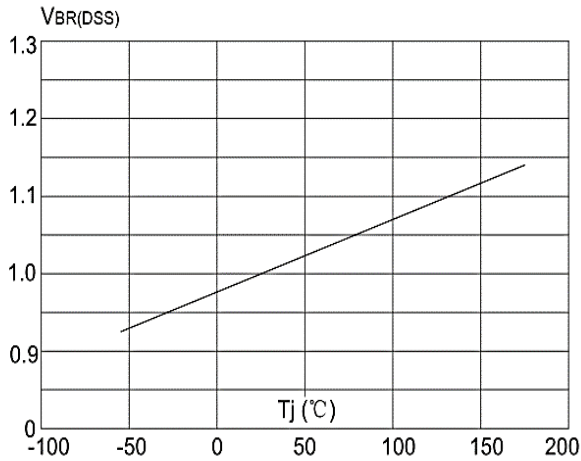
**Figure 5: Gate Charge Characteristics**



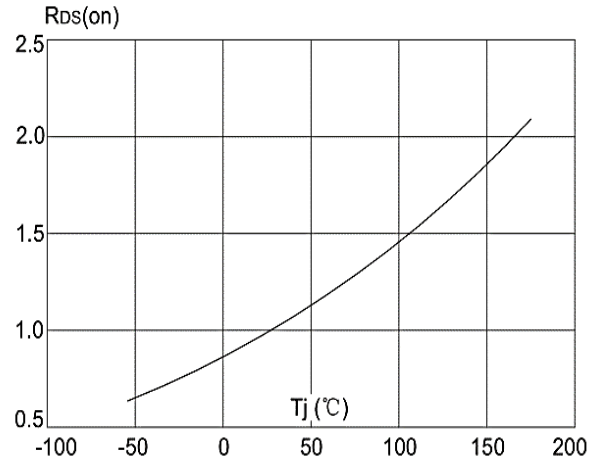
**Figure 6: Capacitance Characteristics**



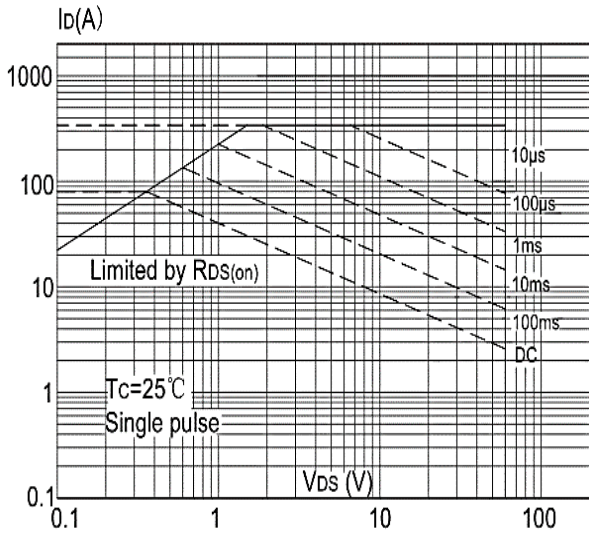
## 60V N-Channel Enhancement Mode MOSFET



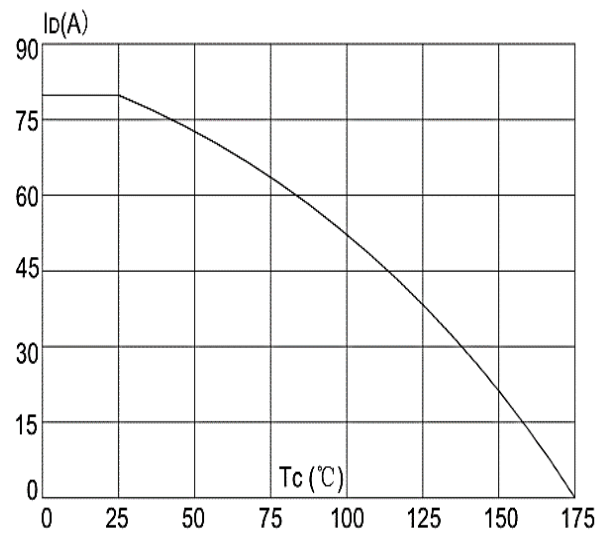
**Figure 7: Normalized Breakdown Voltage vs Junction Temperature**



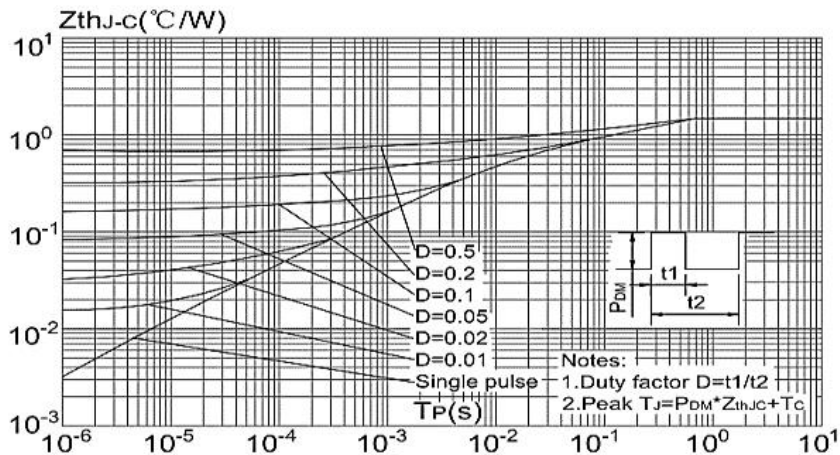
**Figure 8: Normalized on Resistance vs. Junction Temperature**



**Figure 9: Maximum Safe Operating Area**



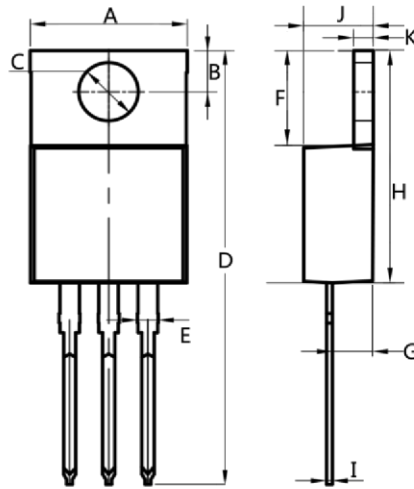
**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambien**

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

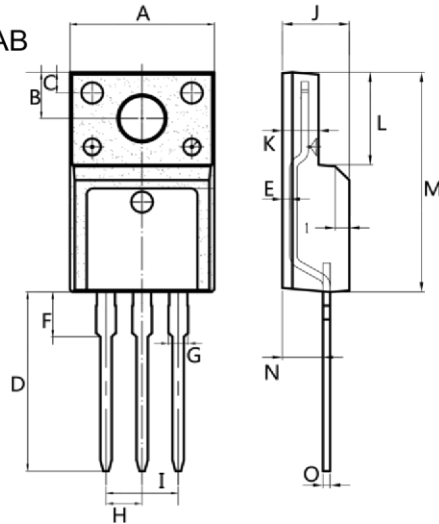
TO-220AB



Dim.	Min.	Max.
A	10.0	10.4
B	2.5	3.0
C	3.5	4.0
D	28.0	30.0
E	1.1	1.5
F	6.2	6.6
G	2.9	3.3
H	15.0	16.0
I	0.35	0.45
J	4.3	4.7
K	1.2	1.4

All Dimensions in millimeter

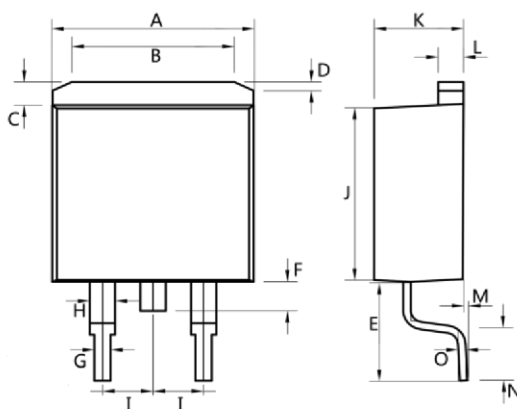
ITO-220AB



Dim.	Min.	Max.
A	9.9	10.3
B	2.9	3.5
C	1.15	1.45
D	12.75	13.25
E	0.55	0.75
F	3.1	3.5
G	1.25	1.45
H	Typ 2.54	
I	Typ 5.08	
J	4.55	4.75
K	2.4	2.7
L	6.35	6.75
M	15.0	16.0
N	2.75	3.15
O	0.45	0.60

All Dimensions in millimeter

TO-263



Dim.	Min.	Max.
A	10.0	10.5
B	7.25	7.75
C	1.3	1.5
D	0.55	0.75
E	5.0	6.0
F	1.4	1.6
G	0.75	0.95
H	1.15	1.35
I	Typ 2.54	
J	8.4	8.6
K	4.4	4.6
L	1.25	1.45
M	0.02	0.1
N	2.4	2.8
O	0.35	0.45

All Dimensions in millimeter

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## 60V N-Channel Enhancement Mode MOSFET

Edition	Date	Change
Rve1.0	2020/7/15	Initial release

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