



**Advanced Power  
Electronics Corp.**

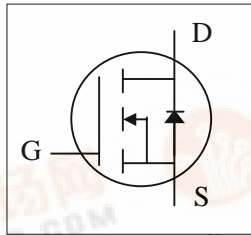
**AP09N70P-A**

**Pb Free Plating Product**

*N-CHANNEL ENHANCEMENT MODE*

*POWER MOSFET*

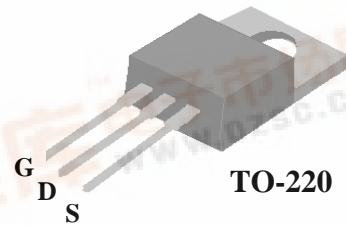
- ▼ Dynamic dv/dt Rating
- ▼ Repetitive Avalanche Rated
- ▼ Fast Switching
- ▼ Simple Drive Requirement
- ▼ RoHS Compliant



$BV_{DSS}$	650V
$R_{DS(ON)}$	0.75 $\Omega$
$I_D$	9A

### Description

The TO-220 package is universally preferred for all commercial-industrial applications. The device is suited for DC-DC, AC-DC converters for power applications.

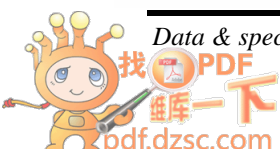


### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	650	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	9	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	5	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	40	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	156	W
	Linear Derating Factor	1.25	W/ $^\circ C$
$E_{AS}$	Single Pulse Avalanche Energy <sup>2</sup>	305	mJ
$I_{AR}$	Avalanche Current	9	A
$E_{AR}$	Repetitive Avalanche Energy	9	mJ
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

### Thermal Data

Symbol	Parameter	Value	Unit
Rthj-c	Thermal Resistance Junction-case	Max. 0.8	$^\circ C/W$
Rthj-a	Thermal Resistance Junction-ambient	Max. 62	$^\circ C/W$





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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =1mA	650	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	-	0.6	-	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A	-	-	0.75	Ω
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2	-	4	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =4.5A	-	4.5	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current (T <sub>j</sub> =25°C)	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V	-	-	10	uA
	Drain-Source Leakage Current (T <sub>j</sub> =150°C)	V <sub>DS</sub> =480V, V <sub>GS</sub> =0V	-	-	100	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±30V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>3</sup>	I <sub>D</sub> =9A	-	44	-	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =480V	-	11	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =10V	-	12	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time <sup>3</sup>	V <sub>DD</sub> =300V	-	19	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =9A	-	21	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =10Ω, V <sub>GS</sub> =10V	-	56	-	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =34Ω	-	24	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	2660	-	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =25V	-	170	-	pF
C <sub>riss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	10	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I <sub>S</sub>	Continuous Source Current ( Body Diode )	V <sub>D</sub> =V <sub>G</sub> =0V , V <sub>S</sub> =1.5V	-	-	9	A
I <sub>SM</sub>	Pulsed Source Current ( Body Diode ) <sup>1</sup>		-	-	40	A
V <sub>SD</sub>	Forward On Voltage <sup>3</sup>	T <sub>j</sub> =25°C, I <sub>S</sub> =9A, V <sub>GS</sub> =0V	-	-	1.5	V

**Notes:**

- 1.Pulse width limited by safe operating area.
- 2.Starting T<sub>j</sub>=25°C , V<sub>DD</sub>=50V , L=6.8mH , R<sub>G</sub>=25Ω , I<sub>AS</sub>=9A.
- 3.Pulse width ≤300us , duty cycle ≤2%.

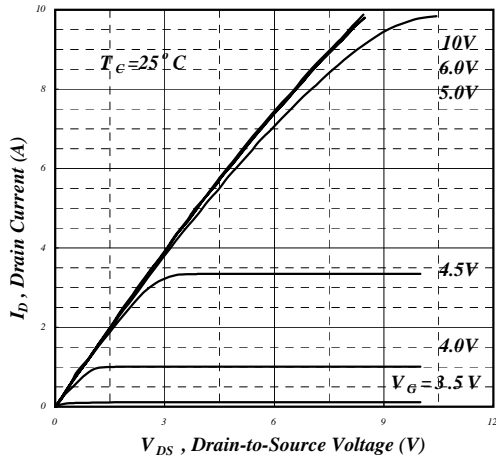


Fig 1. Typical Output Characteristics

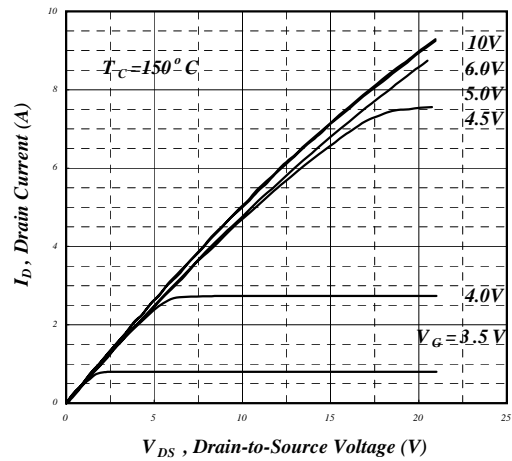


Fig 2. Typical Output Characteristics

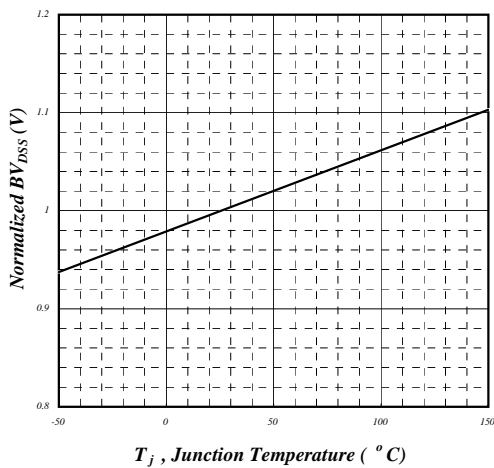


Fig 3. Normalized  $BV_{DSS}$  v.s. Junction Temperature

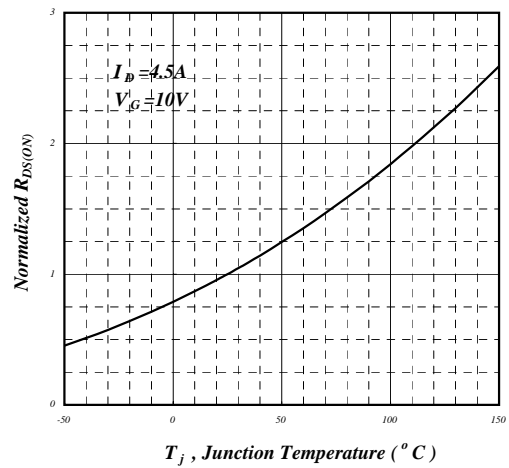


Fig 4. Normalized On-Resistance v.s. Junction Temperature

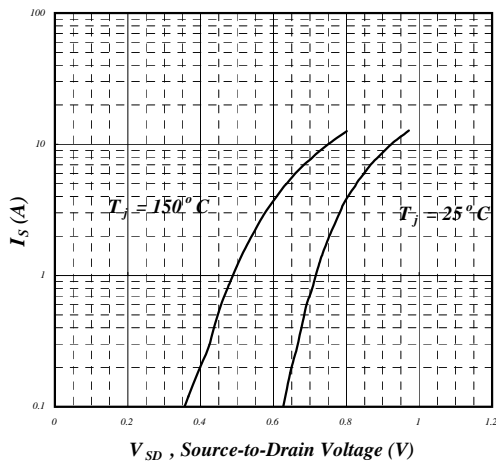


Fig 5. Forward Characteristic of Reverse Diode

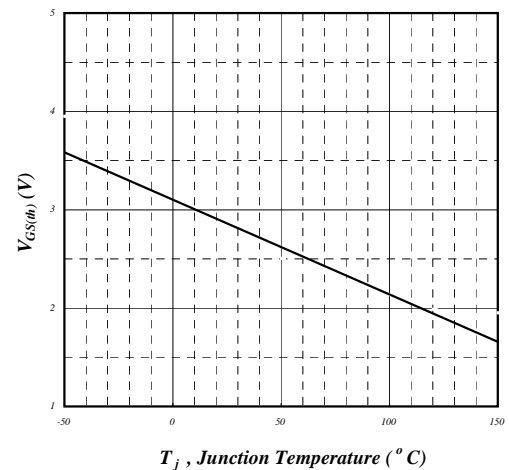


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

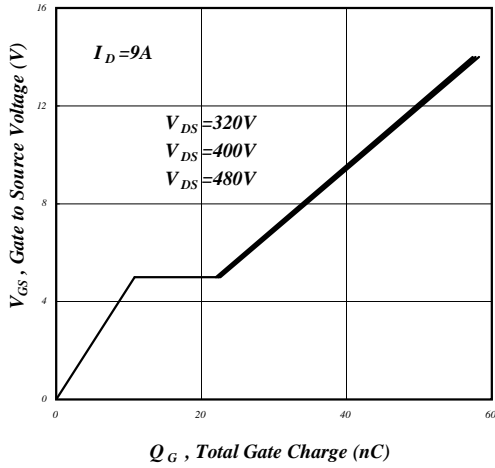


Fig 7. Gate Charge Characteristics

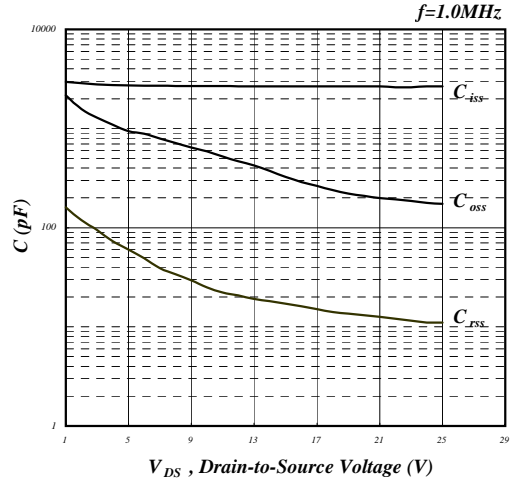


Fig 8. Typical Capacitance Characteristics

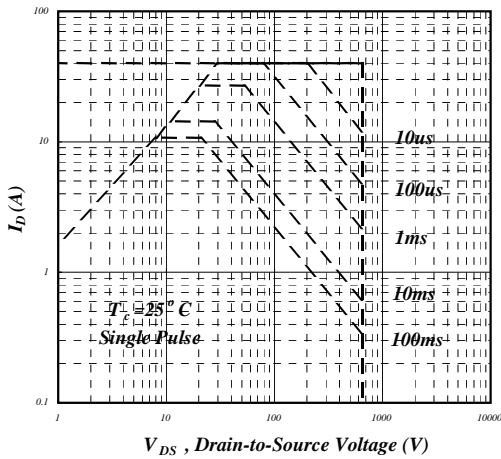


Fig 9. Maximum Safe Operating Area

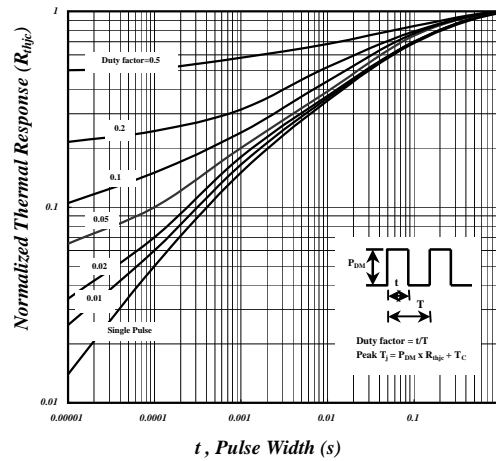


Fig 10. Effective Transient Thermal Impedance

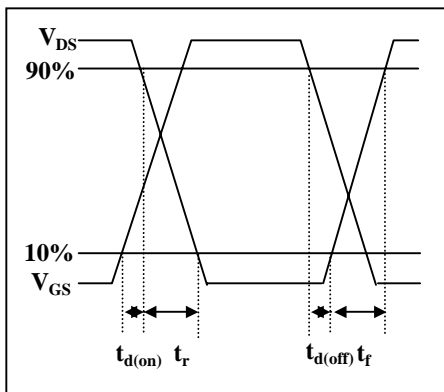


Fig 11. Switching Time Waveform

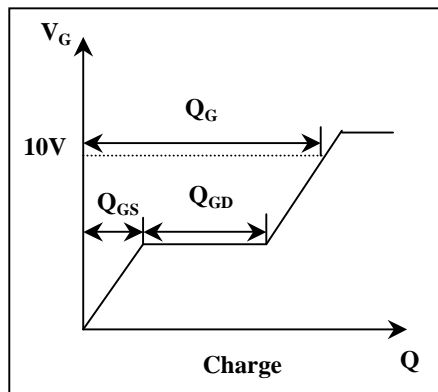


Fig 12. Gate Charge Waveform