



N-channel Enhancement-mode Power MOSFET

- Simple Drive Requirement**
- 100% Avalanche Tested**
- Fast Switching Performance**
- RoHS-compliant, halogen-free**



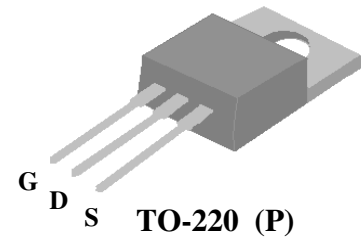
BV_{DSS}	650V
$R_{DS(ON)}$	0.75Ω
I_D	9A

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP09N70P-A-HF-3 is in the popular TO-220 through-hole package which is widely used in commercial and industrial applications where a small PCB footprint or an attached heatsink is required.

This device is well suited for use in high voltage applications such as off-line AC/DC converters.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	±30	V
I_D at $T_C=25\text{ }^\circ\text{C}$	Continuous Drain Current ³	9	A
I_D at $T_C=100\text{ }^\circ\text{C}$	Continuous Drain Current ³	5	A
I_{DM}	Pulsed Drain Current ¹	40	A
P_D at $T_C=25\text{ }^\circ\text{C}$	Total Power Dissipation	156	W
	Linear Derating Factor	1.25	W/°C
E_{AS}	Single Pulse Avalanche Energy ²	305	mJ
I_{AR}	Avalanche Current	9	A
E_{AR}	Repetitive Avalanche Energy	9	mJ
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Value	Unit
Rthj-c	Maximum Thermal Resistance, Junction-case	0.8	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	62	°C/W

Ordering Information

AP09N70P-A-HF-3TB RoHS-compliant halogen-free TO-220, shipped in tubes



Electrical Specifications at $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	650	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1mA$	-	0.6	-	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ³	$V_{GS}=10V, I_D=4.5A$	-	-	0.75	Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=4.5A$	-	4.5	-	S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=600V, V_{GS}=0V$	-	-	10	μA
	Drain-Source Leakage Current ($T_j=125^\circ\text{C}$)	$V_{DS}=480V, V_{GS}=0V$	-	-	100	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	± 100	nA
Q_g	Total Gate Charge ³	$I_D=9A$	-	44	-	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=480V$	-	11	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	12	-	nC
$t_{d(on)}$	Turn-on Delay Time ³	$V_{DD}=300V$	-	19	-	ns
t_r	Rise Time	$I_D=9A$	-	21	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=10\Omega, V_{GS}=10V$	-	56	-	ns
t_f	Fall Time	$R_D=34\Omega$	-	24	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	2660	-	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	170	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	-	10	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current (Body Diode)	$V_D=V_G=0V, V_S=1.5V$	-	-	9	A
I_{SM}	Pulsed Source Current (Body Diode) ¹		-	-	40	A
V_{SD}	Forward On Voltage ³	$T_j=25^\circ\text{C}, I_S=9A, V_{GS}=0V$	-	-	1.5	V

Notes:

1. Pulse width limited by maximum junction temperature.
2. Starting $T_j=25^\circ\text{C}$, $V_{DD}=50V$, $L=6.8mH$, $R_G=25\Omega$, $I_{AS}=9A$.
3. Pulse test - pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

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Typical Electrical Characteristics

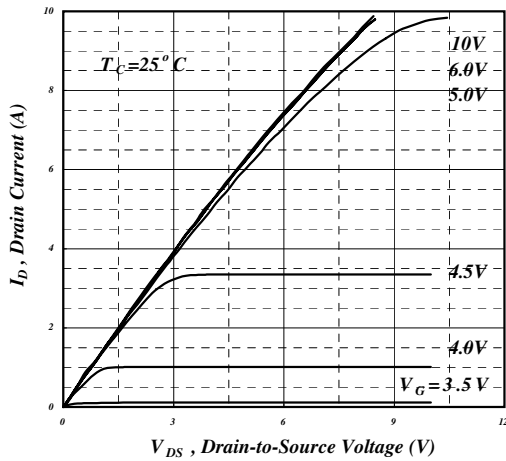


Fig 1. Typical Output Characteristics

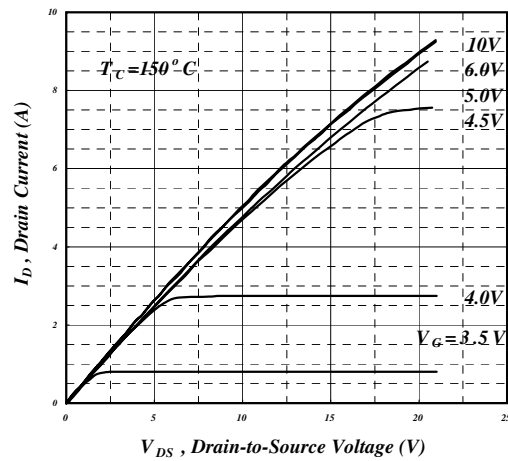


Fig 2. Typical Output Characteristics

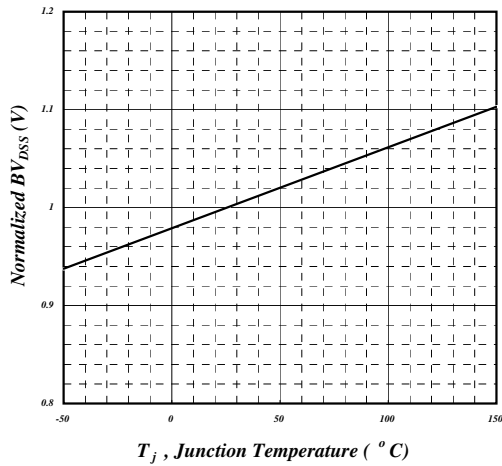


Fig 3. Normalized BV_{DSS} vs. Junction Temperature

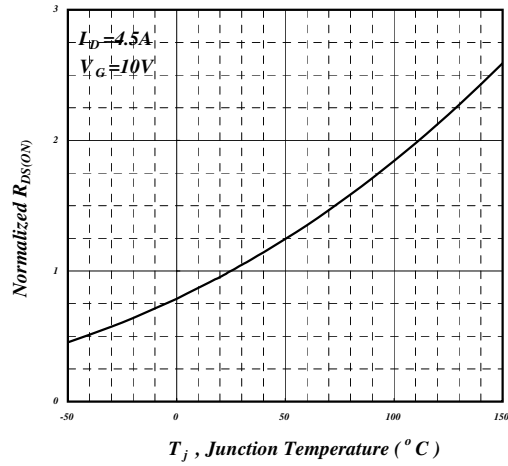


Fig 4. Normalized On-Resistance vs. Junction Temperature

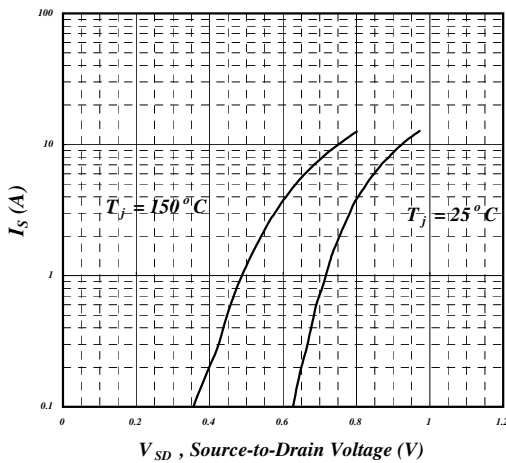


Fig 5. Forward Characteristic of Reverse Diode

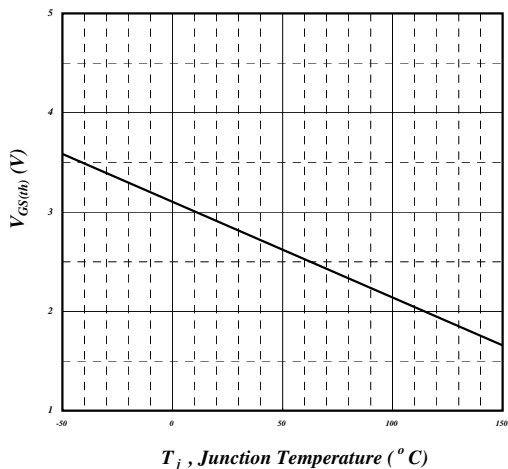


Fig 6. Gate Threshold Voltage vs. Junction Temperature



Typical Electrical Characteristics (cont.)

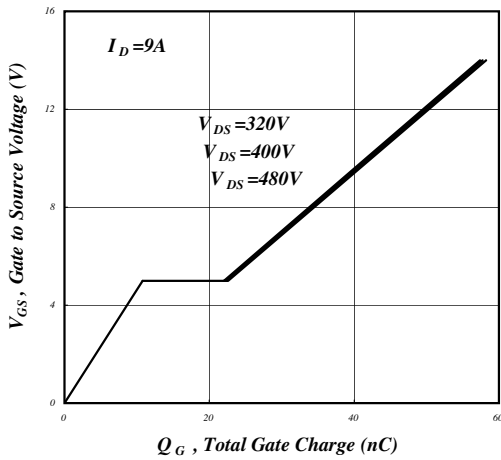


Fig 7. Gate Charge Characteristics

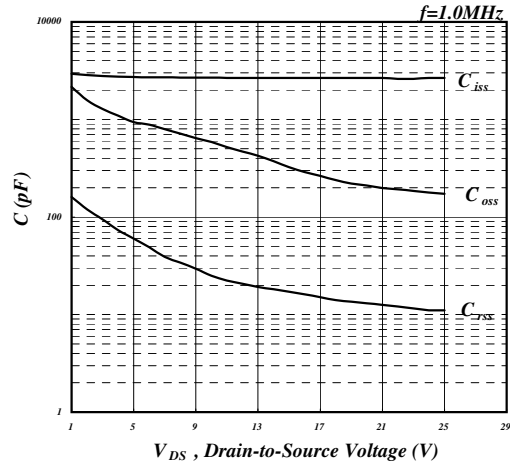


Fig 8. Typical Capacitance Characteristics

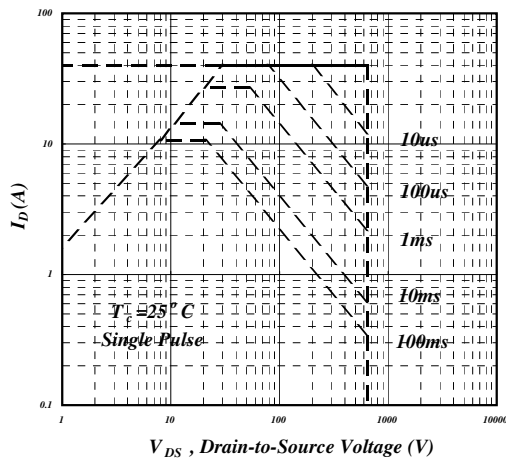


Fig 9. Maximum Safe Operating Area

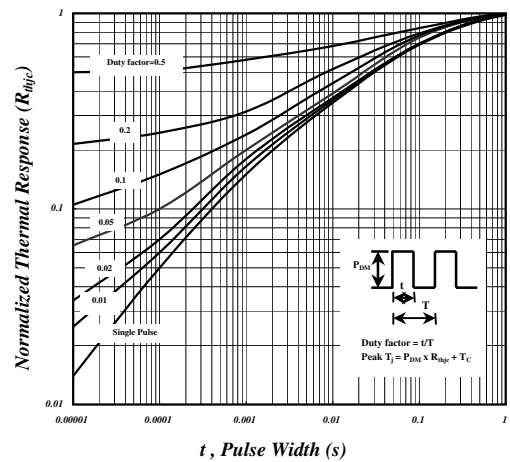


Fig 10. Effective Transient Thermal Impedance

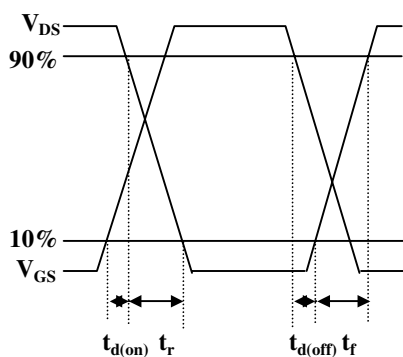


Fig 11. Switching Time Waveforms

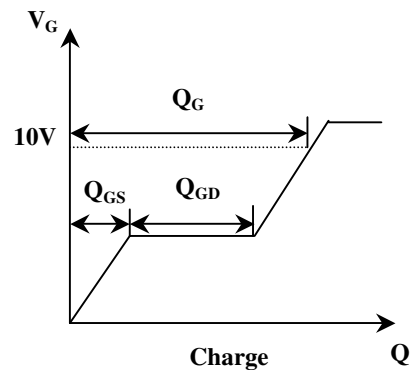
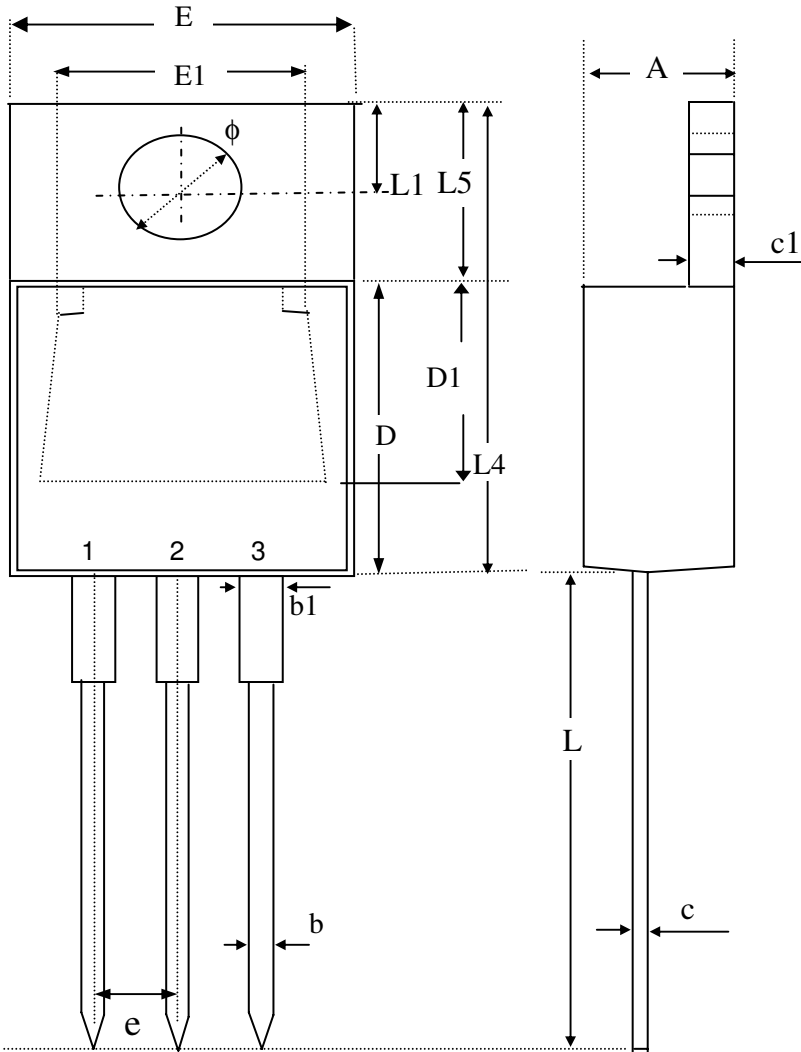


Fig 12. Gate Charge Waveform



Package Dimensions: TO-220



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.40	4.60	4.80
b	0.76	0.88	1.00
D	8.60	8.80	9.00
c	0.36	0.43	0.50
E	9.80	10.10	10.40
L4	14.70	15.00	15.30
L5	6.20	6.40	6.60
D1	5.10 REF.		
c1	1.25	1.35	1.45
b1	1.17	1.32	1.47
L	13.25	13.75	14.25
e	2.54 REF.		
L1	2.60	2.75	2.89
phi	3.71	3.84	3.96
E1	7.4 REF.		

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information: TO-220

