



**N-channel Enhancement-mode Power MOSFET**

- Simple Drive Requirement**
- Low On-resistance**
- Fast Switching Speed**
- RoHS-compliant, halogen-free**



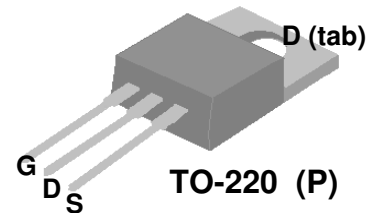
$BV_{DSS}$	900V
$R_{DS(ON)}$	7.2Ω
$I_D$	1.9A

**Description**

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

The AP02N90P-HF-3 provides high blocking voltage to overcome voltage surge and sag in the toughest power systems and is well suited for DC-DC, AC-DC converters for power applications.

The TO-220 through-hole package is widely used in commercial and industrial applications where a small pcb footprint or an attached heatsink are required.



**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	900	V
$V_{GS}$	Gate-Source Voltage	±30	V
$I_D$ at $T_C=25\text{ }^\circ\text{C}$	Continuous Drain Current <sup>3</sup>	1.9	A
$I_D$ at $T_C=100\text{ }^\circ\text{C}$	Continuous Drain Current <sup>3</sup>	1.2	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	6	A
$P_D$ at $T_C=25\text{ }^\circ\text{C}$	Total Power Dissipation	62.5	W
	Linear Derating Factor	0.5	W/°C
$E_{AS}$	Single Pulse Avalanche Energy <sup>2</sup>	18	mJ
$I_{AR}$	Avalanche Current	1.9	A
$T_{STG}$	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	2	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	62	°C/W

**Ordering Information**

**AP02N90P-HF-3TB** : in RoHS-compliant halogen-free TO-220, shipped in tubes, (50 pcs/tube)



**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	$V_{GS}=0V, I_D=1mA$	900	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}, I_D=1mA$	-	0.8	-	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>3</sup>	$V_{GS}=10V, I_D=0.85A$	-	-	7.2	$\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=1.9A$	-	2	-	S
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=900V, V_{GS}=0V$	-	-	10	$\mu A$
	Drain-Source Leakage Current ( $T_j=125^\circ\text{C}$ )	$V_{DS}=720V, V_{GS}=0V$	-	-	100	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>3</sup>	$I_D=1.9A$	-	12	20	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=540V$	-	2.5	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	4.7	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>3</sup>	$V_{DD}=450V$	-	10	-	ns
$t_r$	Rise Time	$I_D=1.9A$	-	5	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=10\Omega, V_{GS}=10V$	-	18	-	ns
$t_f$	Fall Time	$R_D=236\Omega$	-	9	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	630	1000	pF
$C_{oss}$	Output Capacitance	$V_{DS}=25V$	-	40	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0MHz$	-	4	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{SD}$	Forward On Voltage <sup>3</sup>	$I_S=1.9A, V_{GS}=0V$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time <sup>3</sup>	$I_S=1.9A, V_{GS}=0V,$	-	360	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=100A/\mu s$	-	1.8	-	$\mu C$

**Notes:**

1. Pulse width limited by maximum junction temperature.
2. Starting  $T_j=25^\circ\text{C}$ ,  $V_{DD}=50V$ ,  $L=10mH$ ,  $R_G=25\Omega$ ,  $I_{AS}=1.9A$ .
3. 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

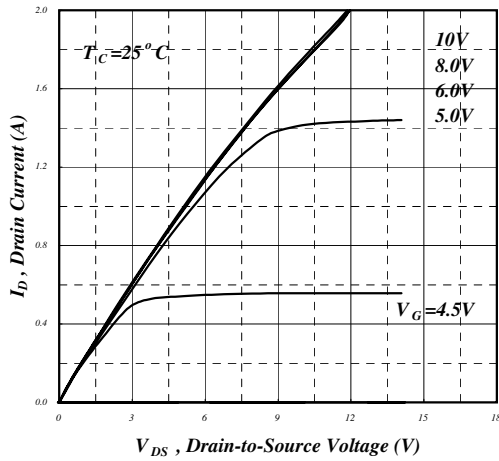


Fig 1. Typical Output Characteristics

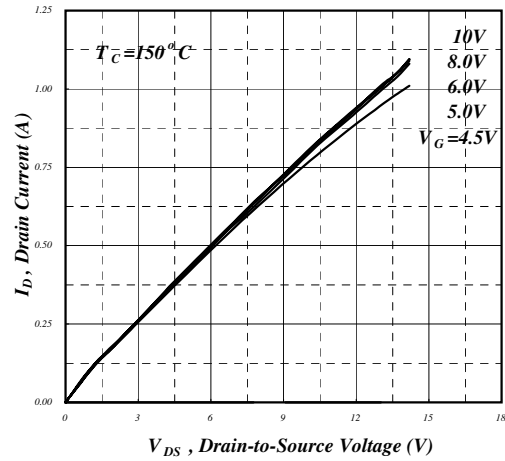


Fig 2. Typical Output Characteristics

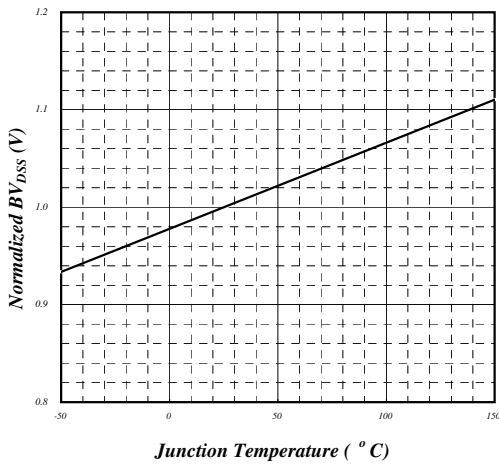


Fig 3. Normalized  $BV_{DSS}$  vs. Junction Temperature

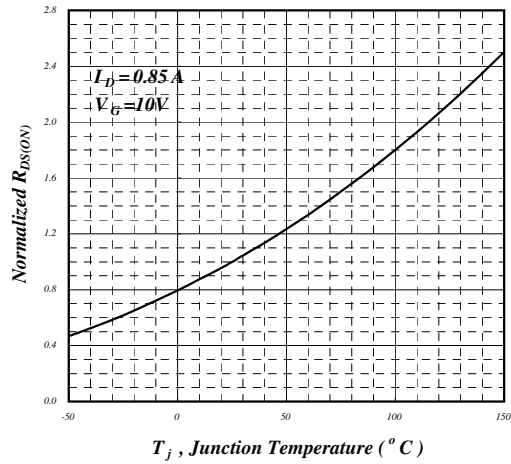


Fig 4. Normalized On-Resistance vs. Junction Temperature

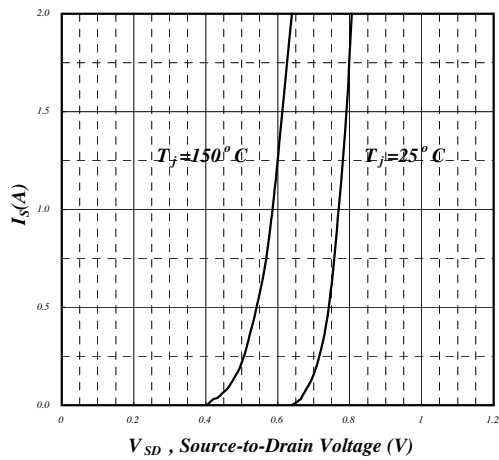


Fig 5. Forward Characteristic of Reverse Diode

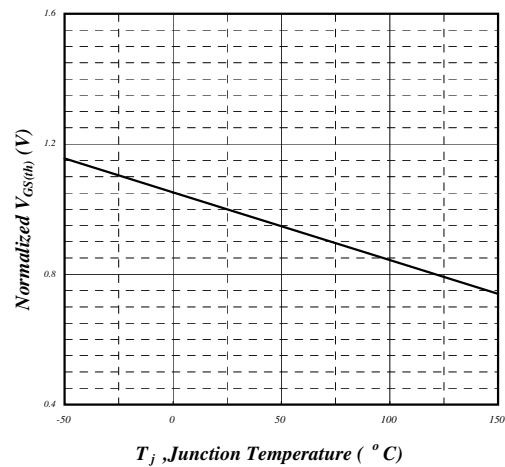


Fig 6. Gate Threshold Voltage vs. Junction Temperature



Typical Electrical Characteristics (cont.)

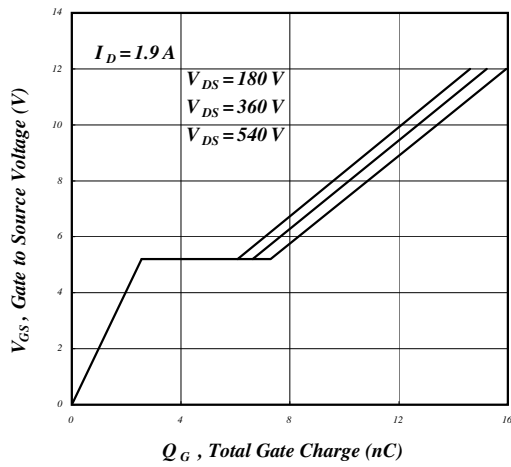


Fig 7. Gate Charge Characteristics

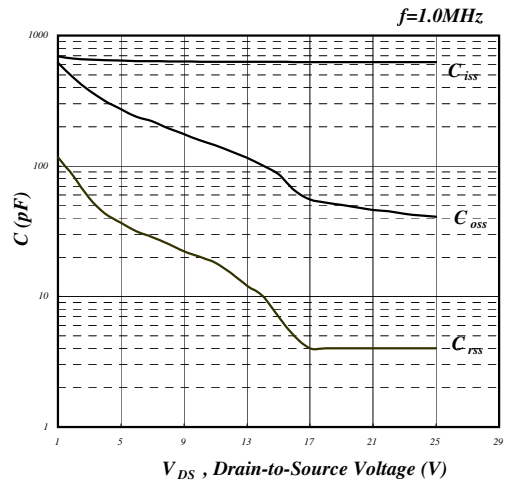


Fig 8. Typical Capacitance Characteristics

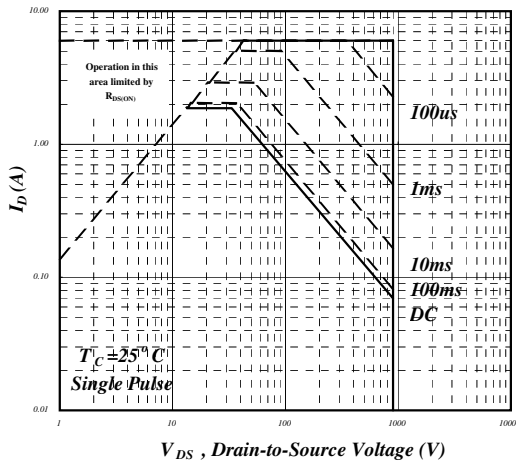


Fig 9. Maximum Safe Operating Area

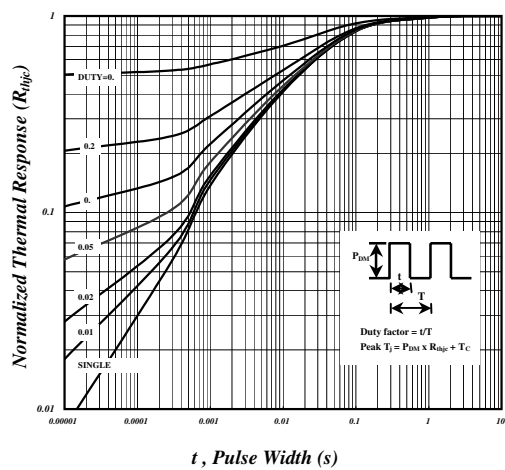


Fig 10. Effective Transient Thermal Impedance

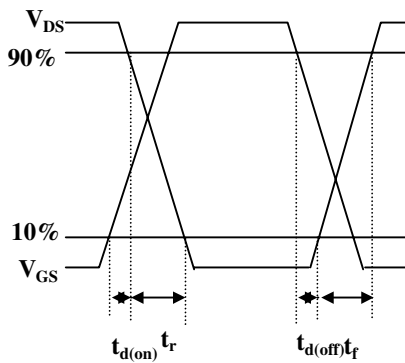


Fig 11. Switching Time Waveforms

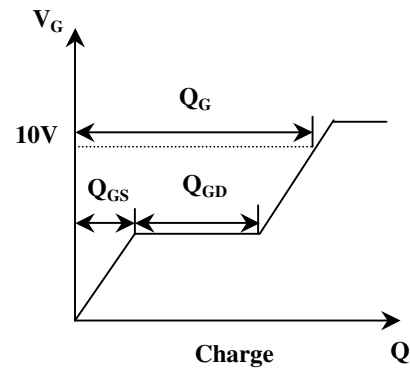
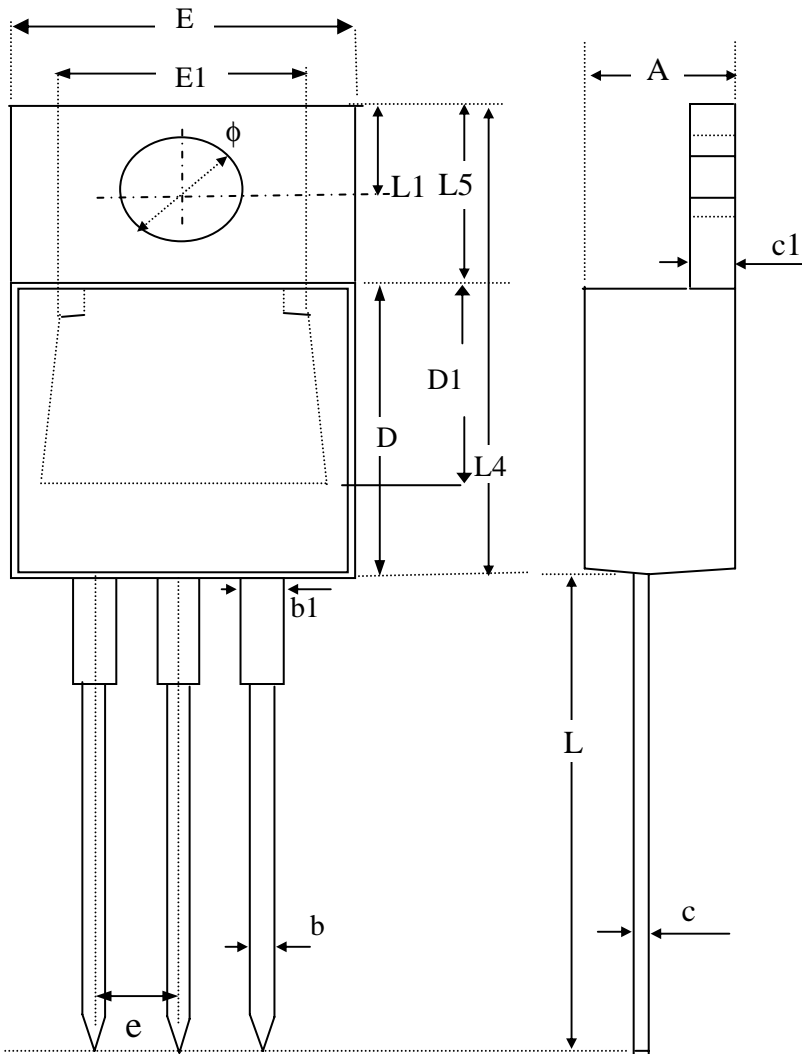


Fig 12. Gate Charge Waveform



**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**

