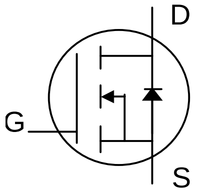
N-channel Enhancement-mode Power MOSFET

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

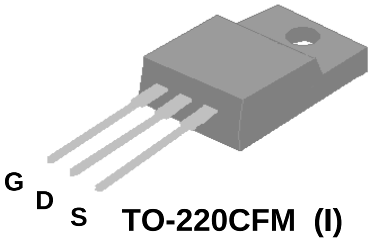


BV_{DSS}	700V
$R_{DS(ON)}$	2.4Ω
I_D	4A

Description

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

The AP04N70BI-H-HF-3 is in the TO-220CFM isolated through-hole package which is widely used in commercial and industrial applications where a small PCB footprint or an attached isolated heatsink is required.
This device is well suited for use in high voltage applications such as off-line AC/DC converters.



TO-220CFM (I)

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	700	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D at T_C=25°C	Continuous Drain Current [3]	4	A
I_D at T_C=100°C	Continuous Drain Current[3]	2.5	A
I_{DM}	Pulsed Drain Current[1]	15	A
P_D at T_C=25°C	Total Power Dissipation	33	W
	Linear Derating Factor	0.26	W/°C
E_{AS}	Single Pulse Avalanche Energy[2]	8	mJ
I_{AR}	Avalanche Current	4	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	3.8	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	65	°C/W

Ordering Information

AP04N70BI-H-HF-3TB : in RoHS-compliant halogen-free TO-220CFM, shipped in tubes (50pcs/tube)

Electrical Specifications at T_j=25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=1mA	700	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D=1mA	-	0.6	-	V/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance[3]	V_{GS}=10V, I_D=2A	-	-	2.4	Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, I_D=250uA	2	-	4	V
g_{fs}	Forward Transconductance	V_{DS}=10V, I_D=2A	-	2.5	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=600V, V_{GS}=0V	-	-	10	uA
	Drain-Source Leakage Current (T_j=125°C)	V_{DS}=480V, V_{GS}=0V	-	-	500	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±30V, V_{DS}=0V	-	-	±100	nA
Q_g	Total Gate Charge[3]	I_D=4A	-	16.7	-	nC
Q_{gs}	Gate-Source Charge	V_{DS}=480V	-	4.1	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=10V	-	4.9	-	nC
$t_{d(on)}$	Turn-on Delay Time[3]	V_{DD}=300V	-	11	-	ns
t_r	Rise Time	I_D=4A	-	8.3	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=10Ω , V_{GS}=10V	-	23.8	-	ns
t_f	Fall Time	R_D=75Ω	-	8.2	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	950	-	pF
C_{oss}	Output Capacitance	V_{DS}=25V	-	65	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	6	-	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	-	-	4	A
I_{SM}	Pulsed Source Current (Body Diode)		-	-	15	A
V_{SD}	Forward On Voltage[3]	Tj=25°C, I_S=4A, V_{GS}=0V	-	-	1.5	V

Notes:

1. Pulse width limited by maximum junction temperature.
2. Starting T_j=25°C , V_{DD}=50V , L=1mH, R_G=25Ω , I_{AS}=4A.
3. Pulse test - pulse width ≤ 300μs , duty cycle ≤ 2%

Typical Electrical Characteristics

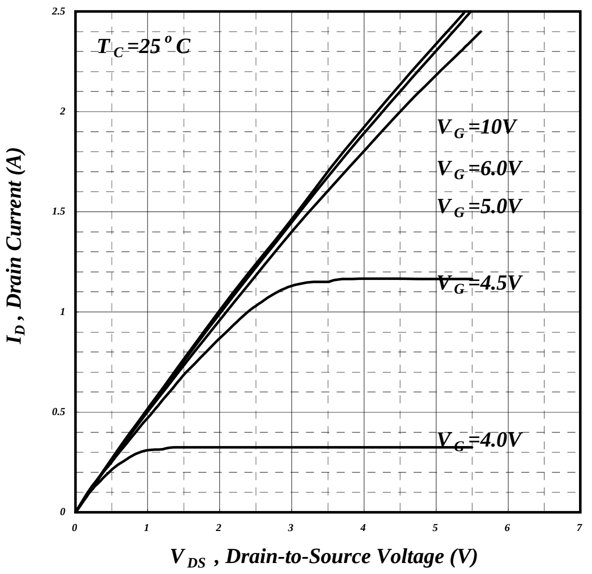


Fig 1. Typical Output Characteristics

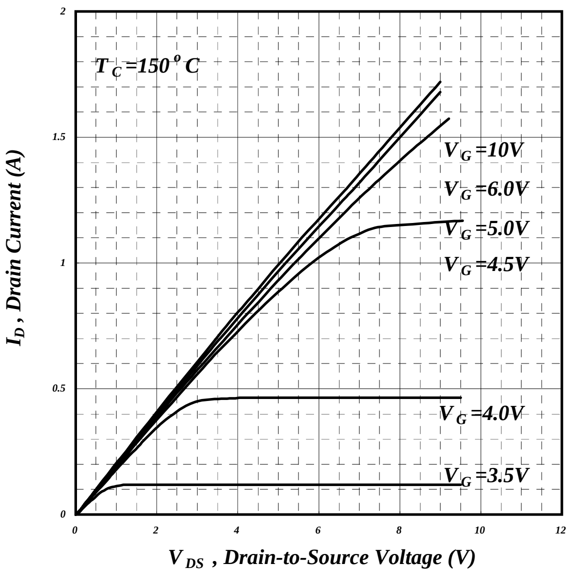


Fig 2. Typical Output Characteristics

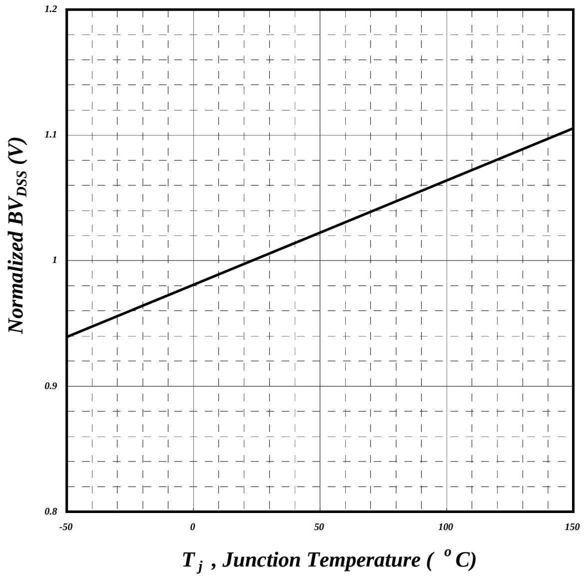


Fig 3. Normalized BVDSS vs. Junction Temperature

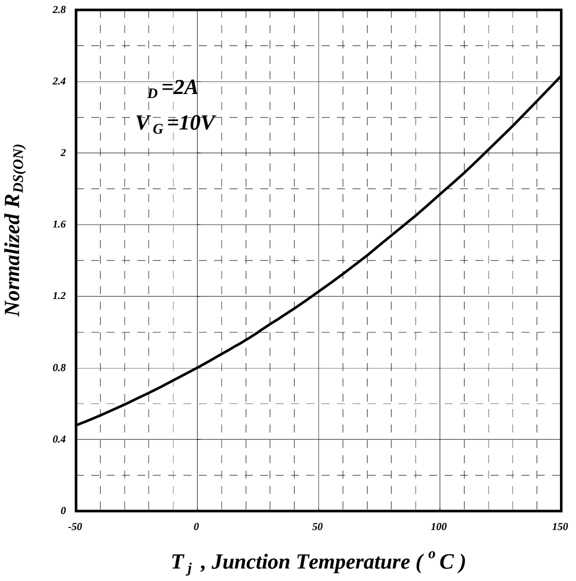


Fig 4. Normalized On-Resistance vs. Junction Temperature

Typical Electrical Characteristics

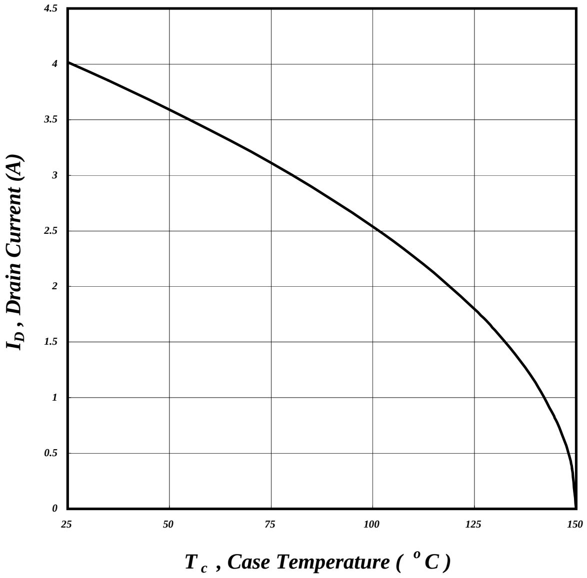


Fig 5. Maximum Drain Current vs. Case Temperature

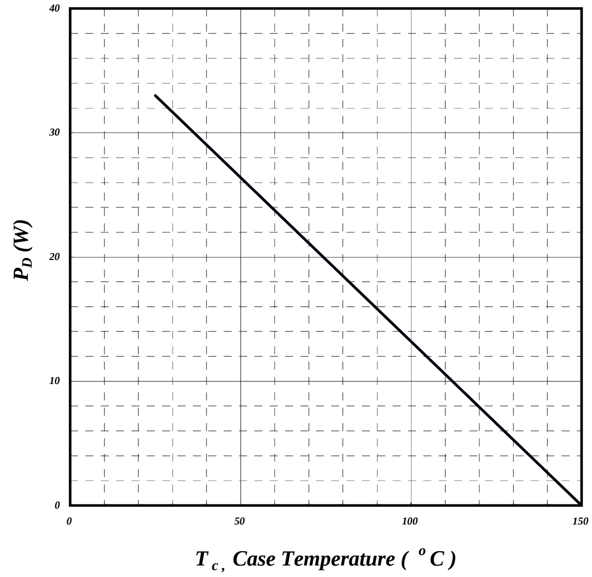


Fig 6. Typical Power Dissipation

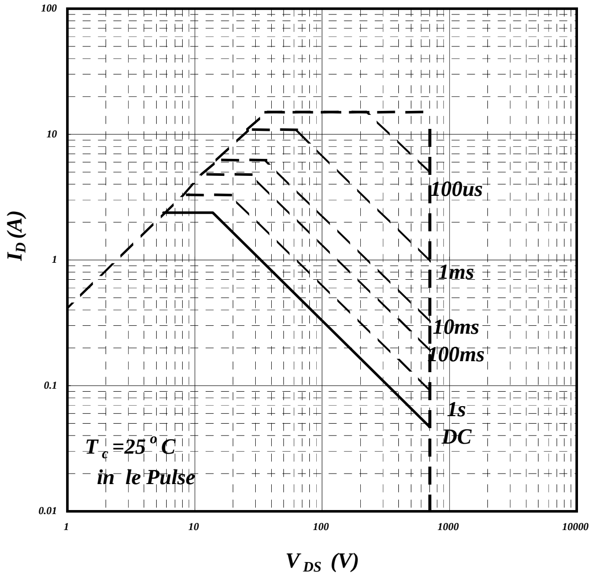


Fig 7. Maximum Safe Operating Area

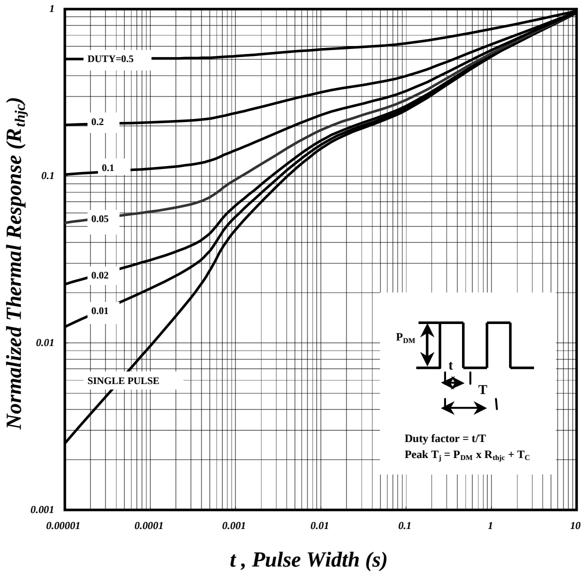


Fig 8. Effective Transient Thermal Impedance

Typical Electrical Characteristics (cont.)

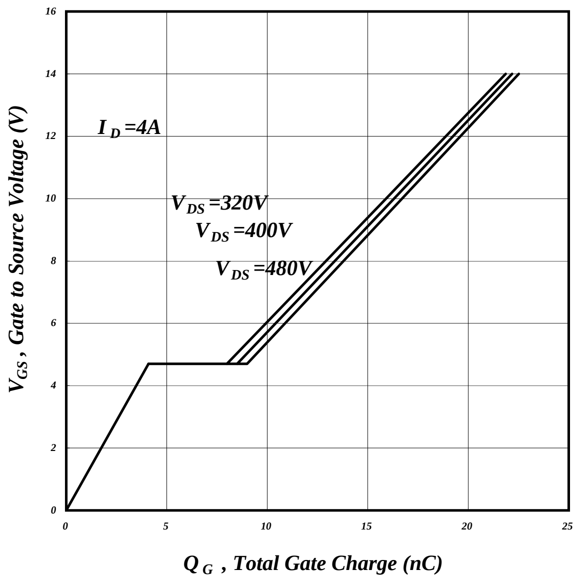


Fig 9. Gate Charge Characteristics

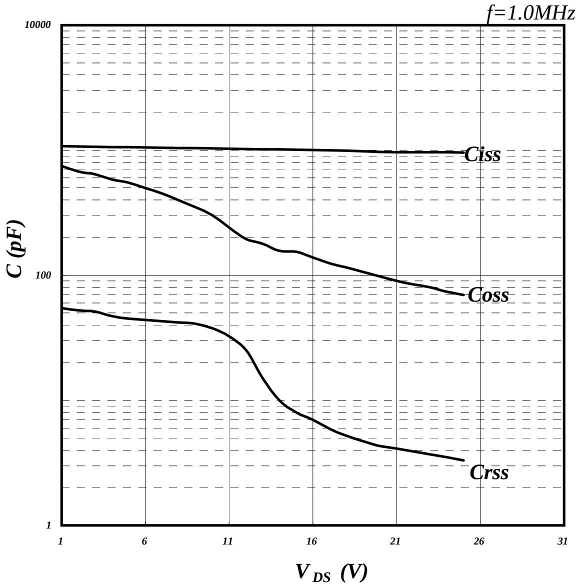


Fig 10. Typical Capacitance Characteristics

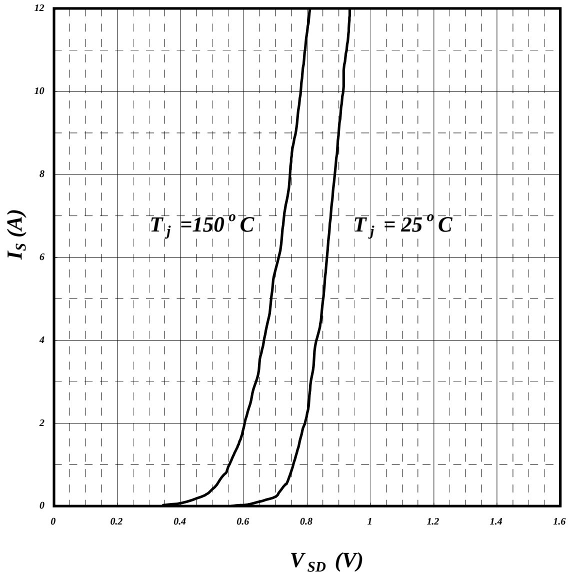


Fig 11. Forward Characteristic of
Reverse Diode

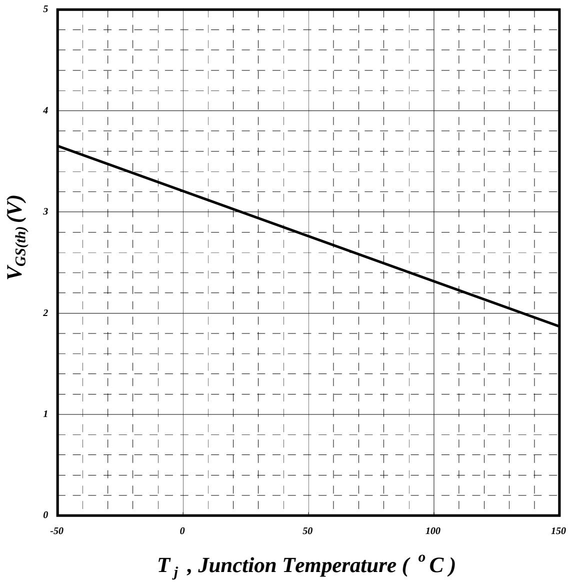


Fig 12. Gate Threshold Voltage vs.
Junction Temperature

Typical Electrical Characteristics (cont.)

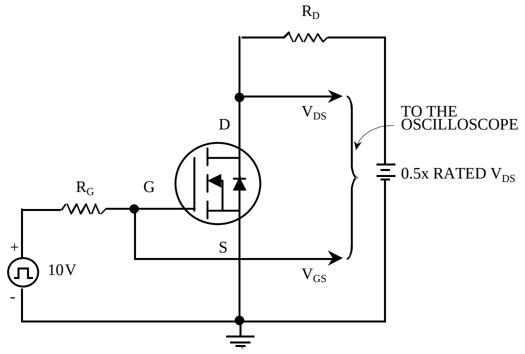


Fig 13. Switching Time Circuit

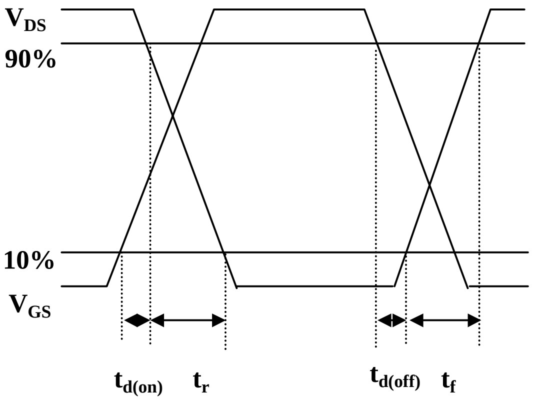


Fig 14. Switching Time Waveform

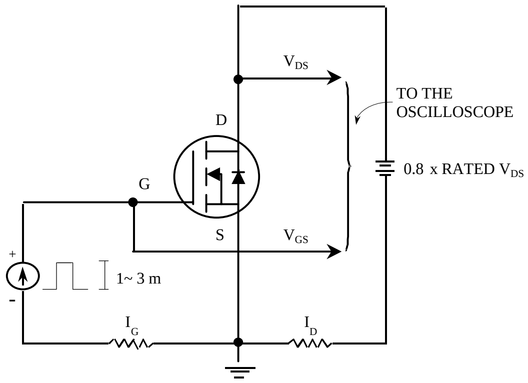


Fig 15. Gate Charge Circuit

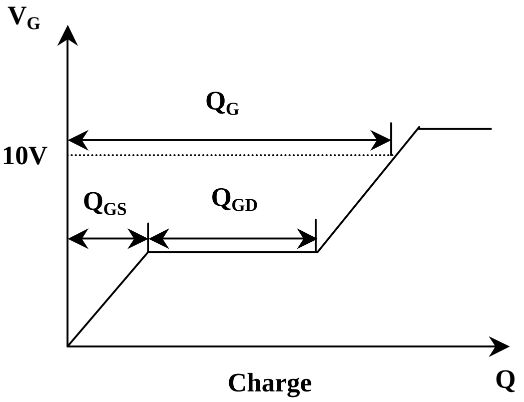
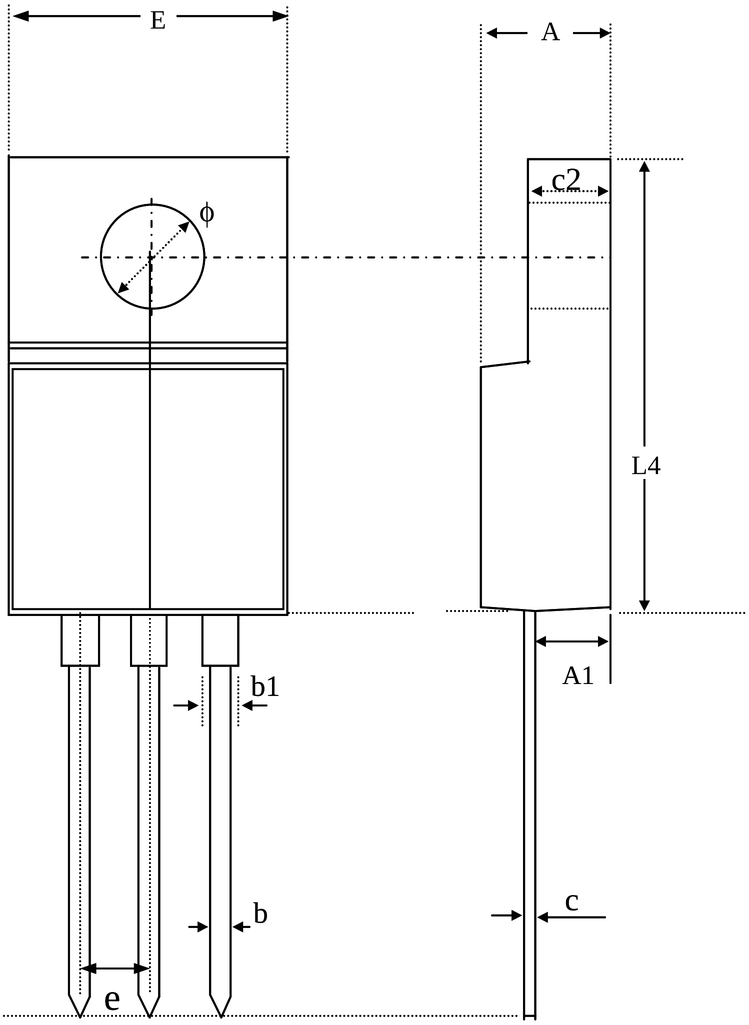


Fig 16. Gate Charge Waveform

Package Dimensions: TO-220CFM



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.30	4.60	4.90
A1	2.30	2.65	3.00
b	0.50	0.70	0.90
b1	0.95	1.20	1.50
c	0.45	0.65	0.80
c2	2.30	2.60	2.90
E	9.70	10.00	10.40
L4	14.70	15.40	16.10
ϕ	----	3.20	----
e	----	2.54	----

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

Marking Information: