



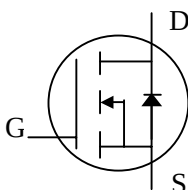
N-channel Enhancement-mode Power MOSFET

Low Gate Charge

Simple Drive Requirement

Low On-resistance

RoHS-compliant, Halogen-free

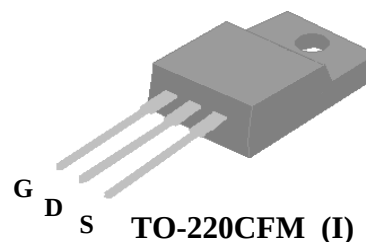


BV_{DSS}	60V
$R_{DS(ON)}$	18m Ω
I_D	35A

Description

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

The AP9972GI-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 and/or an attached isolated heatsink is required. This device is well suited for use in medium voltage applications such as DC/DC converters and motor drives.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 25	V
I_D at $T_C=25^\circ\text{C}$	Continuous Drain Current	35	A
I_D at $T_C=100^\circ\text{C}$	Continuous Drain Current	22	A
I_{DM}	Pulsed Drain Current ¹	120	A
P_D at $T_C=25^\circ\text{C}$	Total Power Dissipation	31.3	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Value	Units
Rthj-c	Maximum Thermal Resistance, Junction-case	4	$^\circ\text{C/W}$
Rthj-a	Maximum Thermal Resistance, Junction-ambient	62	$^\circ\text{C/W}$

Ordering Information

AP9972GI-HF-3TB

RoHS-compliant, halogen-free TO-220CFM, 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	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	-	0.06	-	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=23A$	-	-	18	$m\Omega$
		$V_{GS}=4.5V, I_D=12A$	-	-	22	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=23A$	-	40	-	S
I_{DSS}	Drain-Source Leakage Current ($T_J=25^{\circ}\text{C}$)	$V_{DS}=60V, V_{GS}=0V$	-	-	10	μA
	Drain-Source Leakage Current ($T_J=150^{\circ}\text{C}$)	$V_{DS}=48V, V_{GS}=0V$	-	-	25	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 25V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=23A$	-	35	56	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=48V$	-	9.5	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=4.5V$	-	20	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=30V$	-	12	-	ns
t_r	Rise Time	$I_D=35A$	-	37	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	47	-	ns
t_f	Fall Time	$R_D=0.86\Omega$	-	59	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	3160	5060	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	280	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	230	-	pF
R_g	Gate Resistance	$f=1.0\text{MHz}$	-	1.6	2.4	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=23A, V_{GS}=0V$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$I_S=23A, V_{GS}=0V,$	-	36	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100A/\mu s$	-	45	-	nC

Notes:

1. Pulse width limited by maximum junction temperature.
2. Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. Starting $T_J=25^{\circ}\text{C}$, $V_{DD}=30V$, $L=1\text{mH}$, $R_G=25\Omega$, $I_{AS}=30A$.

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.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

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Typical Electrical Characteristics

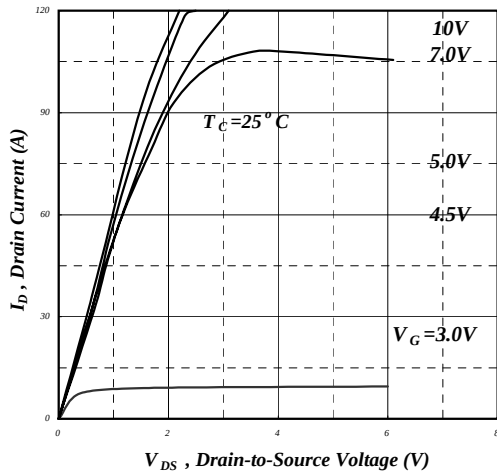


Fig 1. Typical Output Characteristics

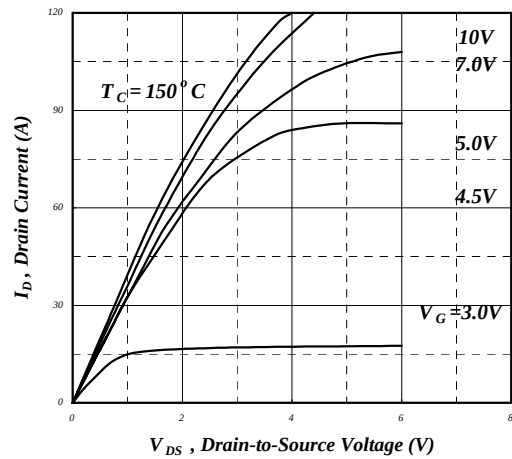


Fig 2. Typical Output Characteristics

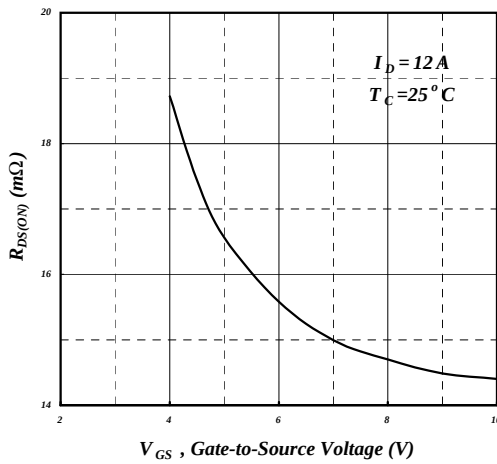


Fig 3. On-Resistance
vs. Gate Voltage

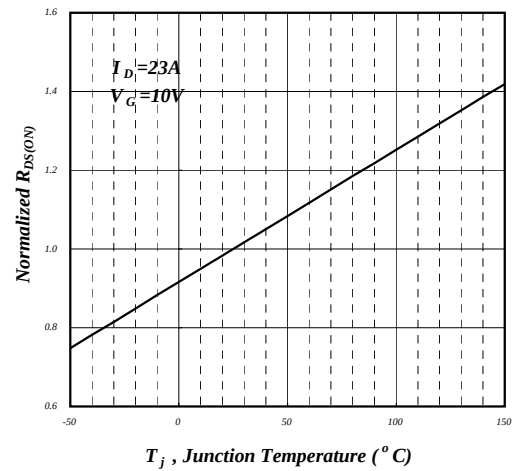


Fig 4. Normalized On-Resistance
vs. Junction Temperature

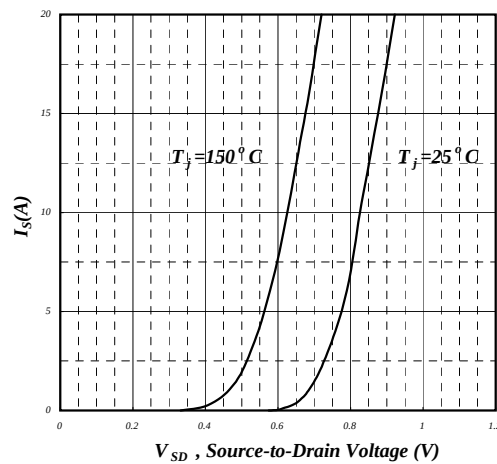


Fig 5. Forward Characteristic of
Reverse Diode

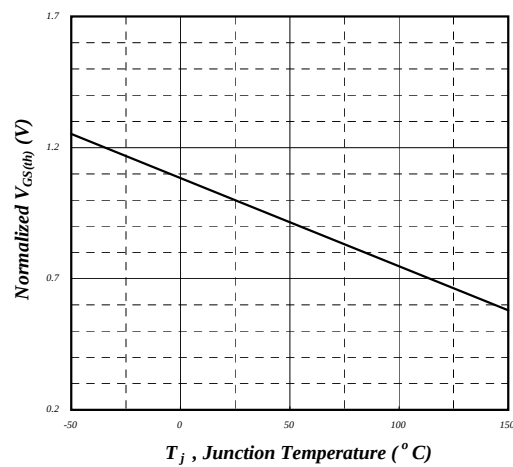


Fig 6. Gate Threshold Voltage vs.
Junction Temperature



Typical Electrical Characteristics (cont.)

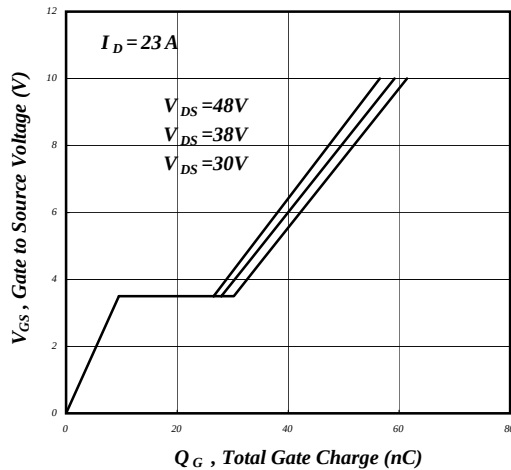


Fig 7. Gate Charge Characteristics

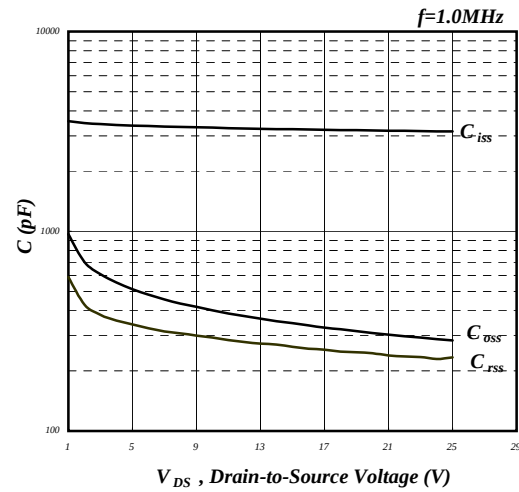


Fig 8. Typical Capacitance Characteristics

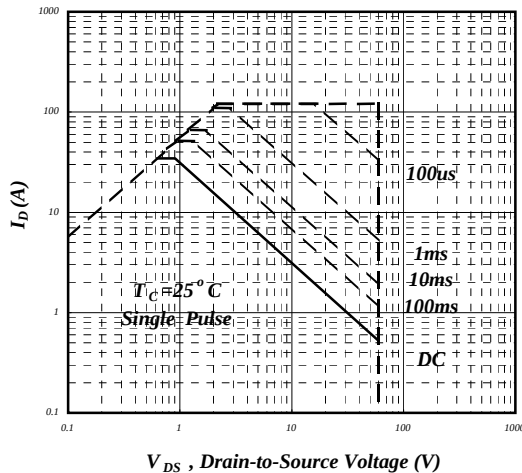


Fig 9. Maximum Safe Operating Area

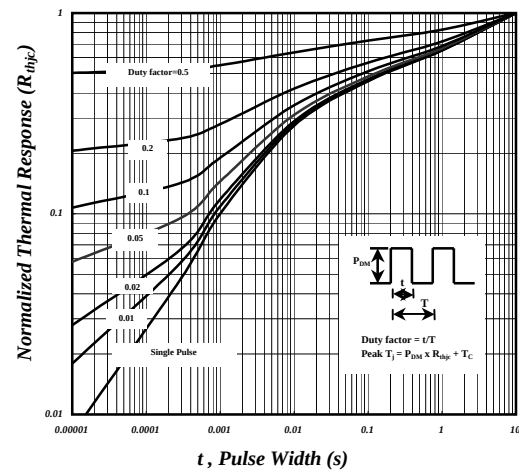


Fig 10. Effective Transient Thermal Impedance

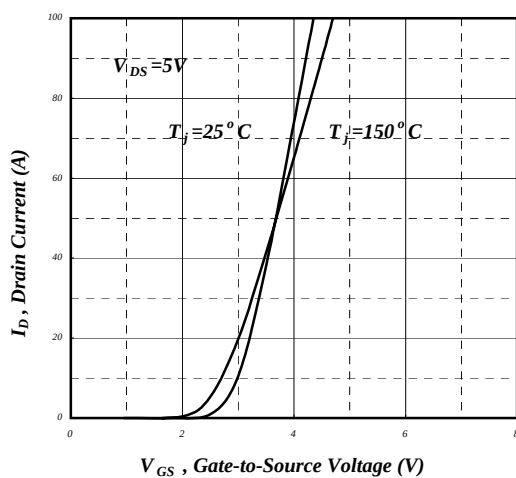


Fig 11. Transfer Characteristics

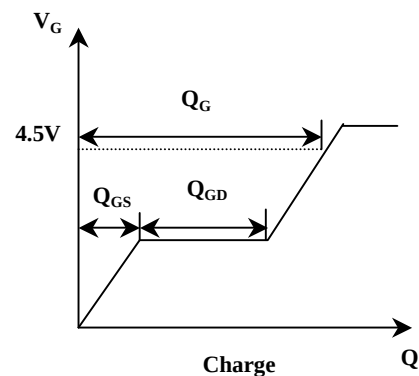
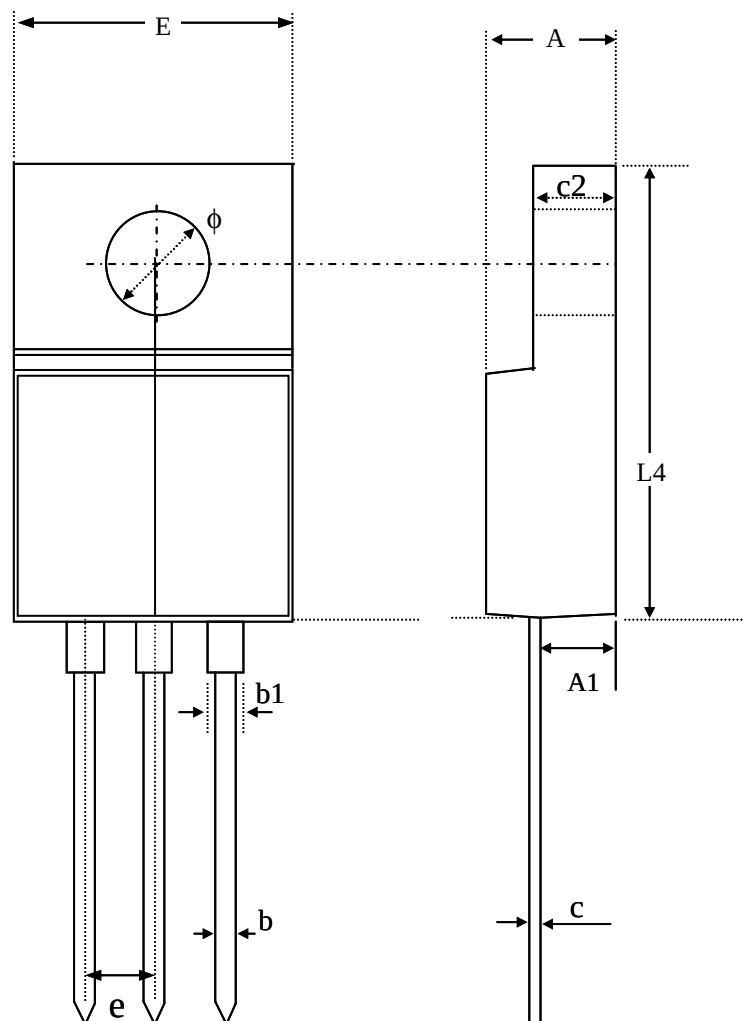


Fig 12. Gate Charge Waveform



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.Dimension Does Not Include Mold Protrusions.

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

Marking Information

