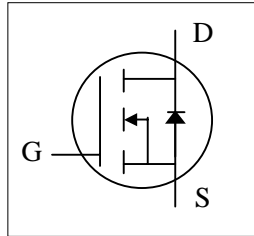




- ▼ 100% Avalanche Test
- ▼ Fast Switching Characteristic
- ▼ Simple Drive Requirement

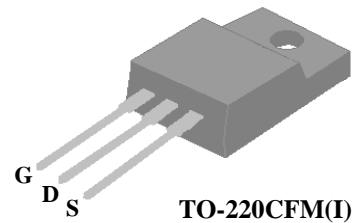


$BV_{DSS}$	600V
$R_{DS(ON)}$	2.35 $\Omega$
$I_D$	4A

## Description

AP04N60 series are specially designed as main switching devices for universal 90~265VAC off-line AC/DC converter applications.

TO-220CFM type provide high blocking voltage to overcome voltage surge and sag in the toughest power system with the best combination of fast switching, ruggedized design and cost-effectiveness.



**TO-220CFM(I)**

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	600	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	4	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	2.2	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	15	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	36.8	W
$E_{AS}$	Single Pulse Avalanche Energy <sup>3</sup>	8	mJ
$I_{AR}$	Avalanche Current	4	A
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

## Thermal Data

Symbol	Parameter	Value	Units
Rthj-c	Maximum Thermal Resistance, Junction-case	3.4	$^\circ C/W$
Rthj-a	Maximum Thermal Resistance, Junction-ambient	65	$^\circ C/W$



### Electrical Characteristics @ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=2A$	-	-	2.35	$\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=2A$	-	3.4	-	S
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=480V, V_{GS}=0V$	-	-	100	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>2</sup>	$I_D=1A$	-	19.5	31	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=480V$	-	3.5	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	8.5	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>2</sup>	$V_{DD}=300V$	-	21	-	ns
$t_r$	Rise Time	$I_D=2A$	-	20	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=50\Omega, V_{GS}=10V$	-	105	-	ns
$t_f$	Fall Time	$R_D=150\Omega$	-	27	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	740	1200	pF
$C_{oss}$	Output Capacitance	$V_{DS}=25V$	-	70	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	10	-	pF

### Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{SD}$	Forward On Voltage <sup>2</sup>	$I_S=2A, V_{GS}=0V$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time <sup>2</sup>	$I_S=2A, V_{GS}=0V$	-	280	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	2.94	-	$\mu C$

#### Notes:

1. Pulse width limited by max. junction temperature.
2. Pulse test
3. Starting  $T_j=25^\circ\text{C}$ ,  $V_{DD}=50V$ ,  $L=1\text{mH}$ ,  $R_G=25\Omega$

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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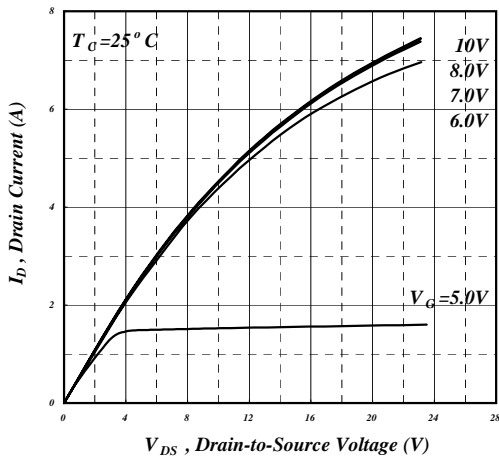


Fig 1. Typical Output Characteristics

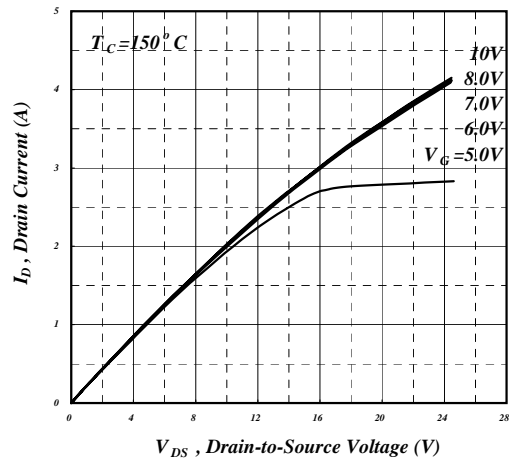


Fig 2. Typical Output Characteristics

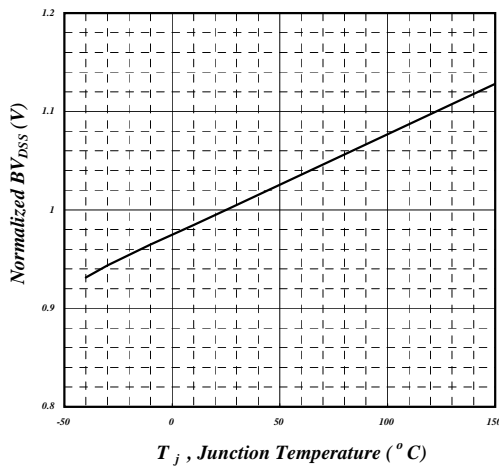


Fig 3. Normalized  $BV_{DSS}$  v.s. Junction Temperature

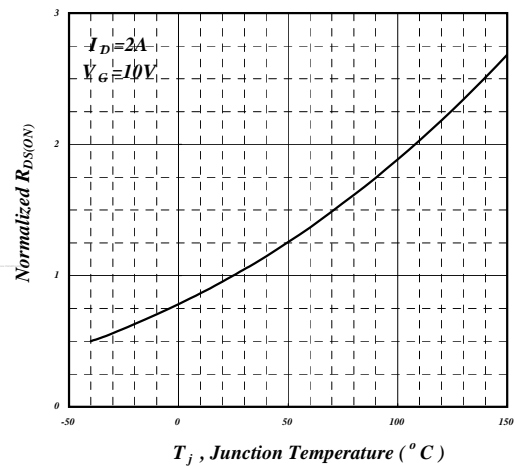


Fig 4. Normalized On-Resistance v.s. Junction Temperature

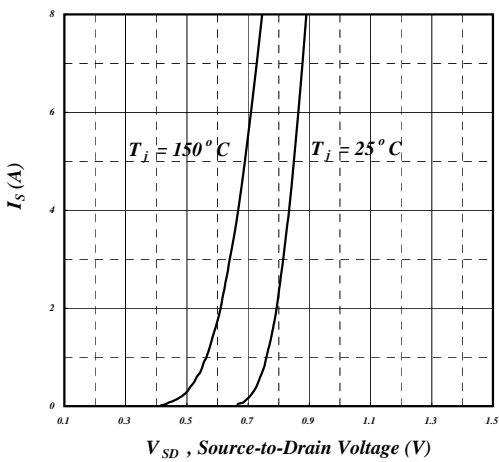


Fig 5. Forward Characteristic of Reverse Diode

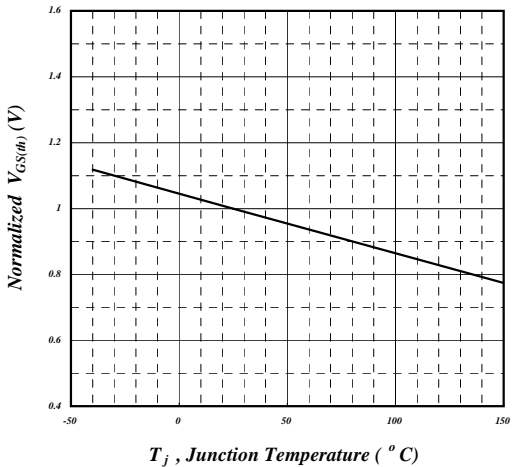


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

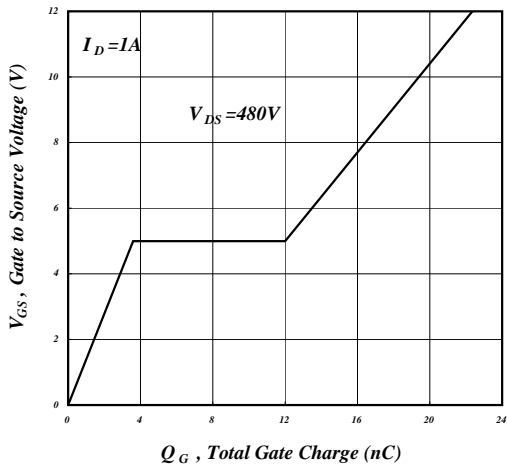


Fig 7. Gate Charge Characteristics

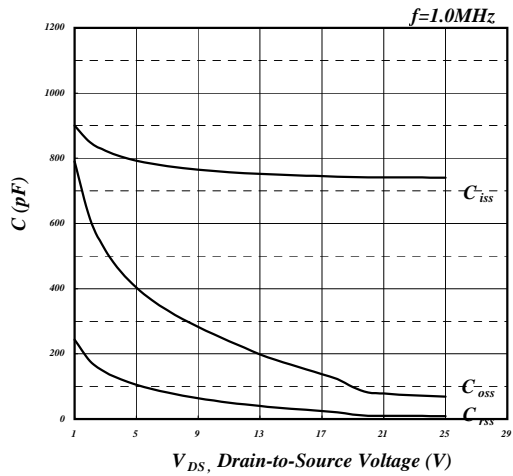


Fig 8. Typical Capacitance Characteristics

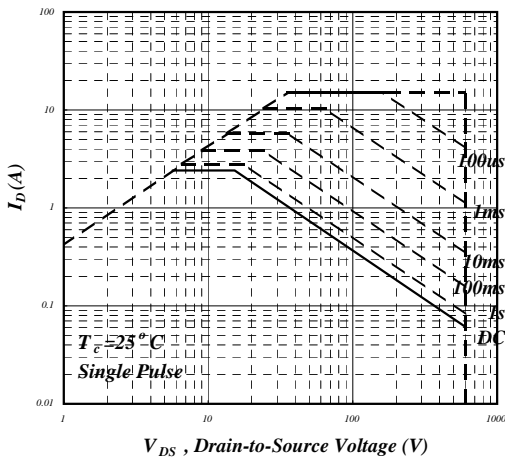


Fig 9. Maximum Safe Operating Area

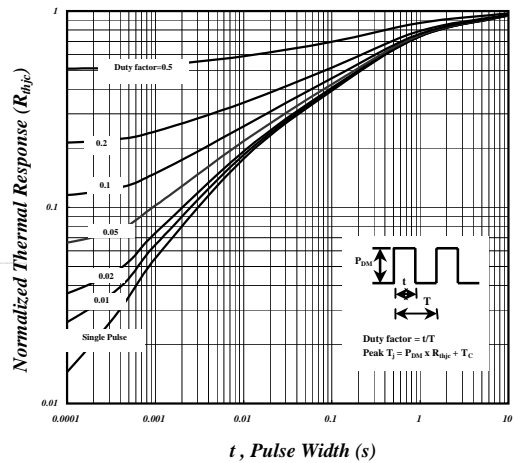


Fig 10. Effective Transient Thermal Impedance

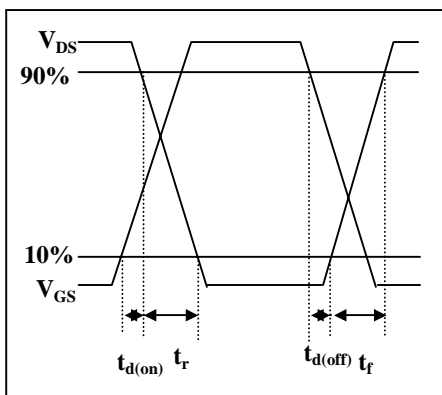


Fig 11. Switching Time Waveform

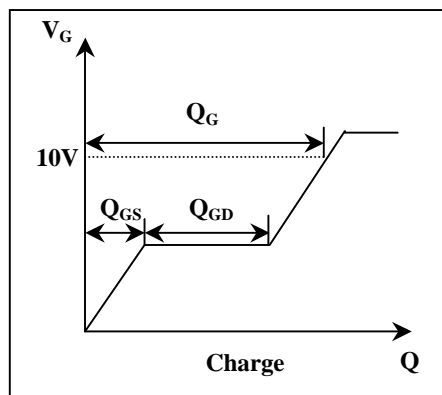


Fig 12. Gate Charge Waveform