

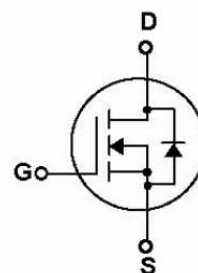
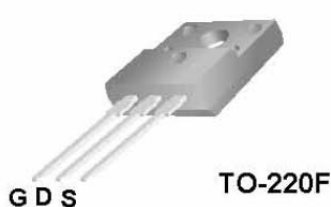
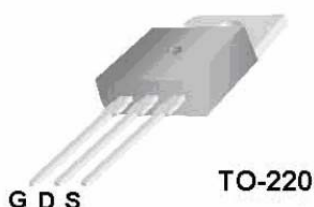
#### 1 Description

These N-Channel enhancement mode power field effect transistors are produced using planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

#### 2 Features

- 600V / 4A
- $R_{DS(on)} = 1.9\Omega(\text{typ})$ ,  $V_{GS} = 10\text{V}$ ,  $I_D = 2.4\text{A}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability..



#### 3 Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	APQ04SN60CH-XXM0	APQ04SN60CF-XXM0	Units
		APQ04SN60CH-XXJ0	APQ04SN60CF-XXJ0	
		TO-220	TO-220F	
$V_{DSS}$	Drain-Source Voltage	600		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	4		A
		2.5		A
$I_{DM}$	Drain Current - Pulsed ①	16		A
$V_{GS}$	Gate-Source Voltage	$\pm 30$		V
$E_{AS}$	Single Pulsed Avalanche Energy ②	260		mJ
$I_{AR}$	Avalanche Current ①	4		A
$E_{AR}$	Repetitive Avalanche Energy ①	10		mJ
dv/dt	Peak Diode Recovery dv/dt ③	5		V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ ) - De-rate above $25^\circ\text{C}$	100	33	W
		0.8	0.26	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

\* note :

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 50\text{V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = \text{TBD}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 4\text{A}$
- ③  $I_{SD} \leq 4\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .



# DEVICE SPECIFICATION

APQ04SN60CH  
APQ04SN60CF

600V/4A N-Channel MOSFET

## 4 Thermal Characteristics

Symbol	Parameter	APQ04SN60CH-XXM0	APQ04SN60CF-XXM0	Units
		APQ04SN60CH-XXJ0	APQ04SN60CF-XXJ0	
		TO-220	TO-220F	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.25	3.79	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

## 5 Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.6	--	V/°C
$I_{DSS}$	Gate to Source leakage current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	--	--	20	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 2.4\text{ A}$	--	1.9	2.3	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 2.0\text{ A}$ ④	--	--	15	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	--	575	--	pF
$C_{oss}$	Output Capacitance		--	67	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	12	--	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{ V}, I_D = 4\text{ A}, R_G = 25\ \Omega$ ④	--	11	--	ns
$t_r$	Turn-On Rise Time		--	36	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	46	--	ns
$t_f$	Turn-Off Fall Time		--	42	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = 480\text{ V}, I_D = 4\text{ A}, V_{GS} = 10\text{ V}$ ④	--	16	--	nC
$Q_{gs}$	Gate-Source Charge		--	2.9	--	nC
$Q_{gd}$	Gate-Drain Charge		--	6,3	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	4	--	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	16	--	A



# DEVICE SPECIFICATION

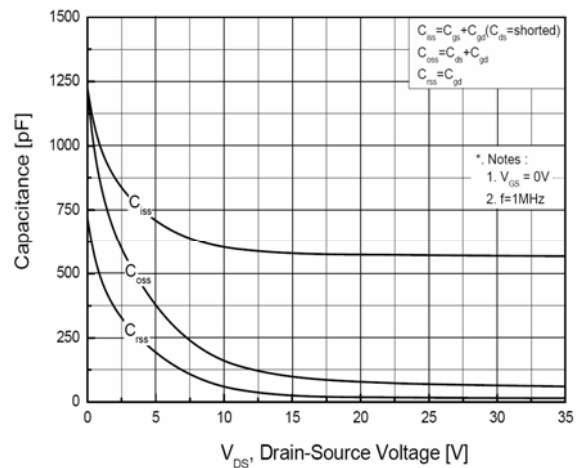
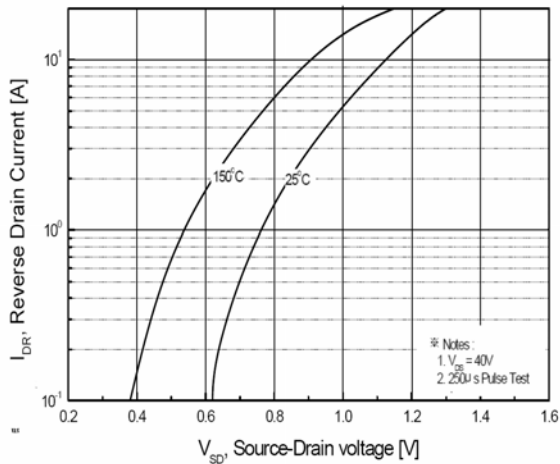
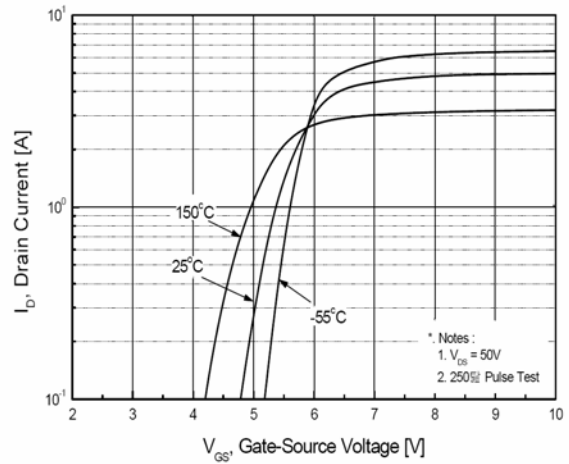
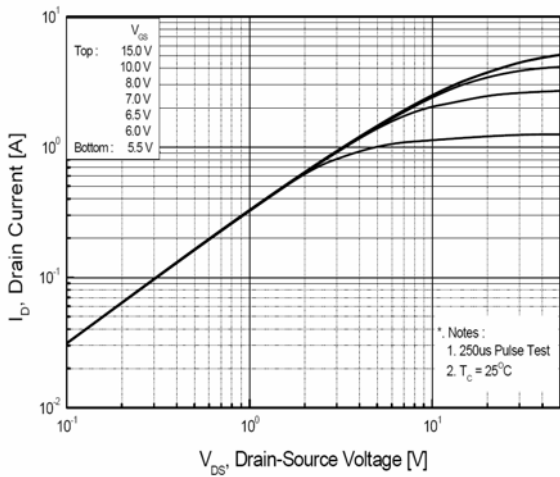
APQ04SN60CH  
APQ04SN60CF

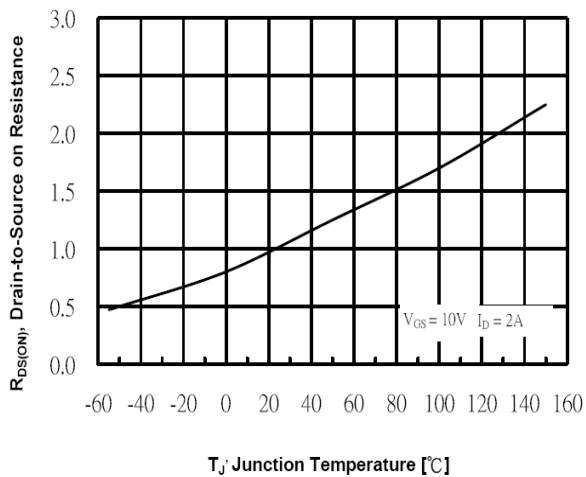
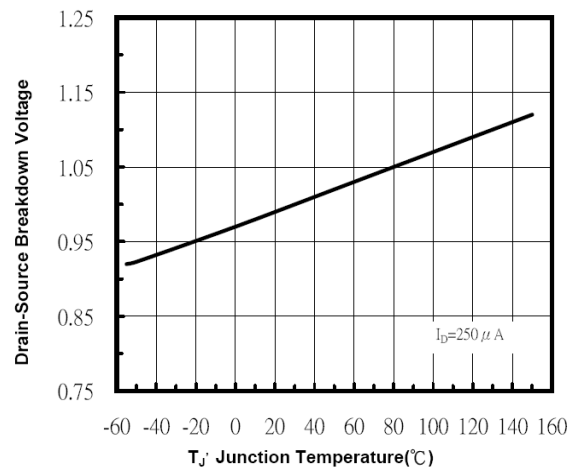
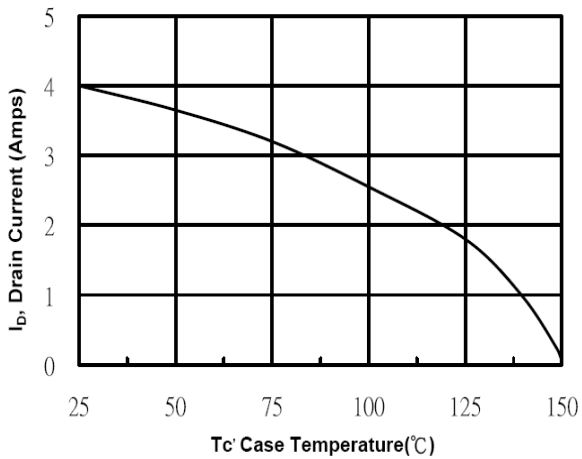
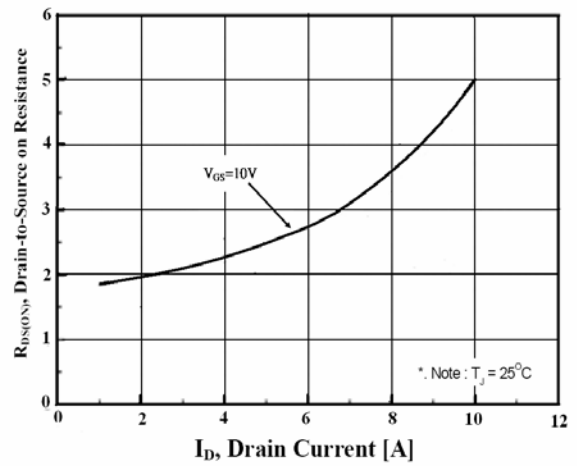
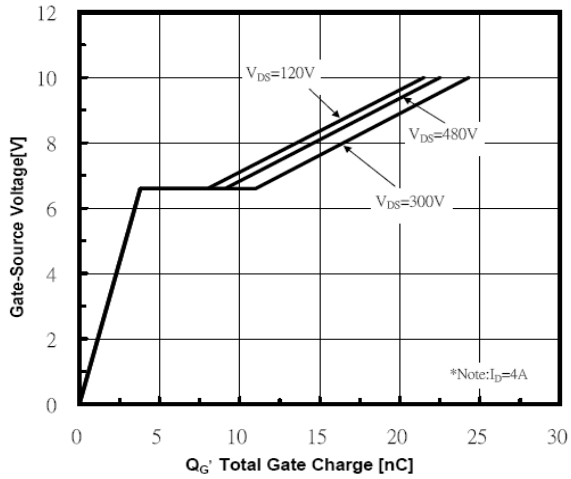
## 600V/4A N-Channel MOSFET

$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 4\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$ ④	--	310	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	2.3	--	$\mu\text{C}$

**Notes:**

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ② VDD=50V, starting  $T_J=25^\circ\text{C}$ , L=TDB,  $R_G=25\Omega$ ,  $I_{AS}=4\text{A}$
- ③  $I_{SD} \leq 4\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V(BR)DSS$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ . Depend on FT Test.
- ⑤ CP Test



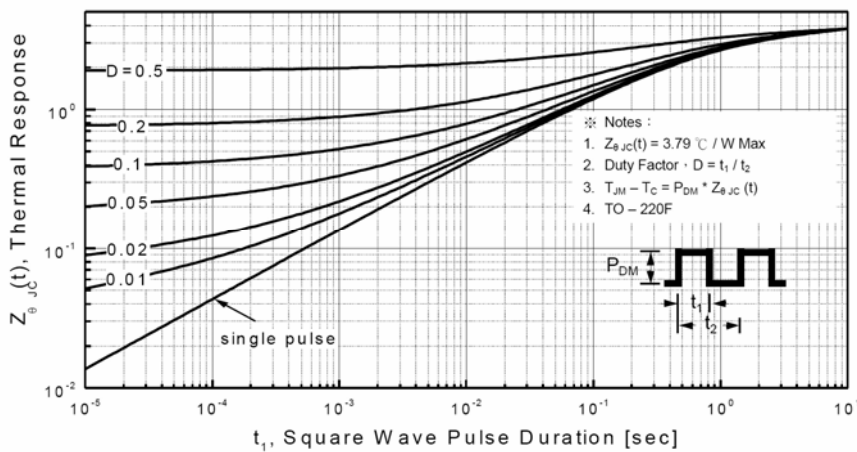
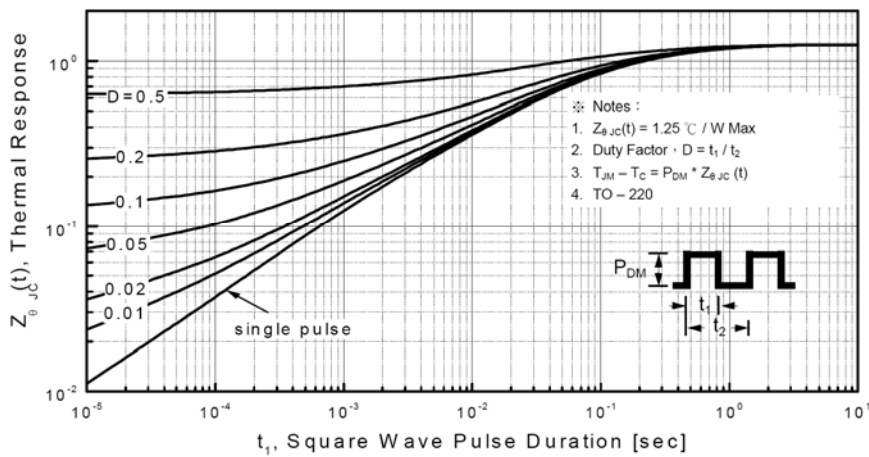
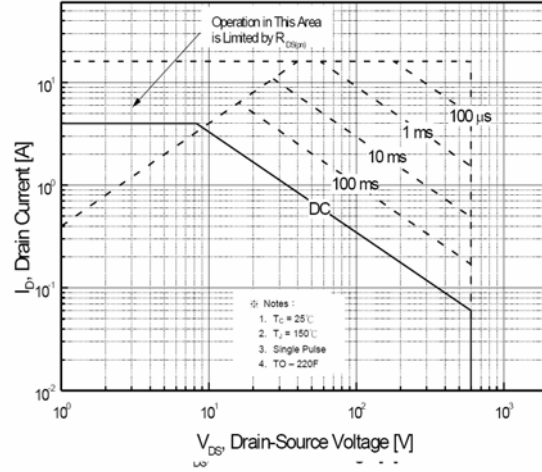
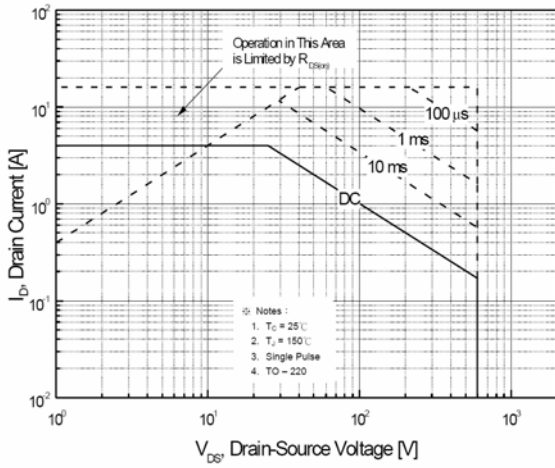




# DEVICE SPECIFICATION

APQ04SN60CH  
APQ04SN60CF

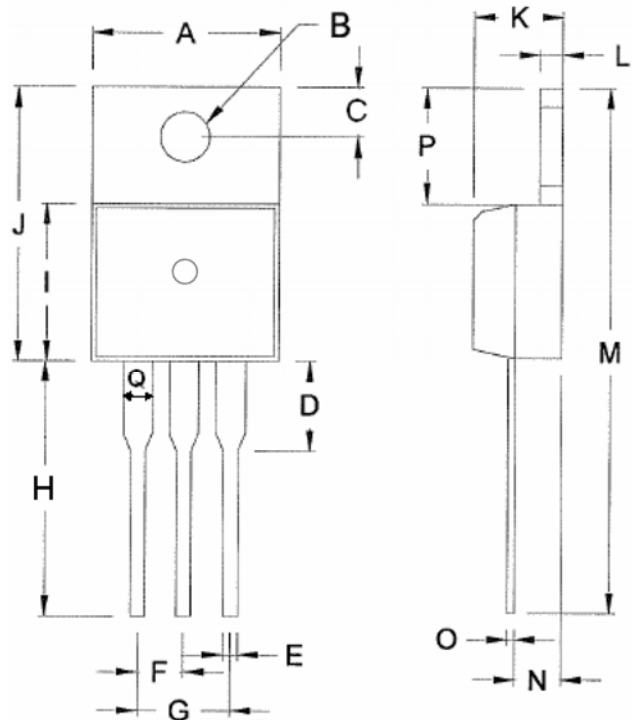
## 600V/4A N-Channel MOSFET



6 Package Dimensions

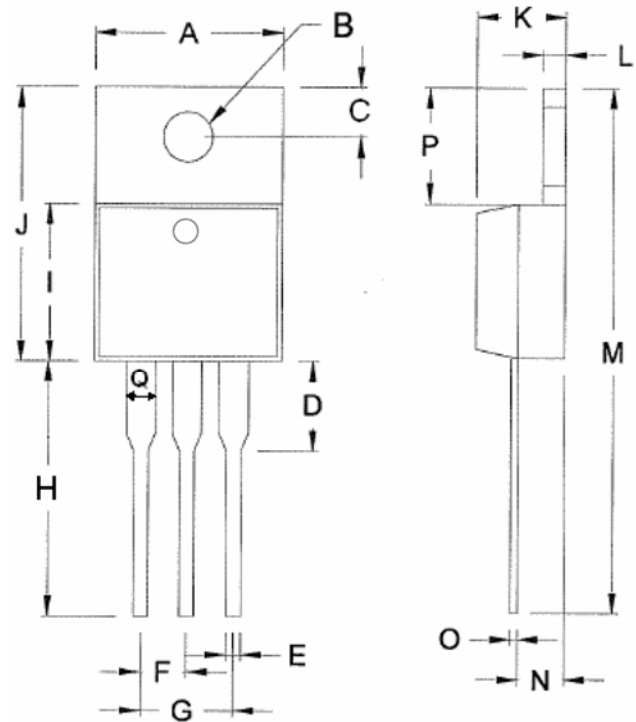
APQ04SN60CH—XXM0  
TO-220

TO-220 DIMENSION			
DIM	MILLIMETERS		
	MIN	MAX	TYP.
A	10.04	10.41	10.23
B	3.66	3.88	3.77
C	2.50	2.84	2.67
D	3.31	4.50	3.91
E	0.70	0.91	0.81
F	2.54(typ.)		2.54
G	5.08(typ.)		5.08
H	13.47	14.20	13.84
I	8.50	9.00	8.80
J	14.80	15.49	15.15
K	4.32	4.57	4.45
L	1.22	1.42	1.30
M	28.27	29.69	28.98
N	2.40	2.90	2.65
O	0.36	0.53	0.45
P	5.97	6.47	6.22
Q	1.15	1.45	1.30



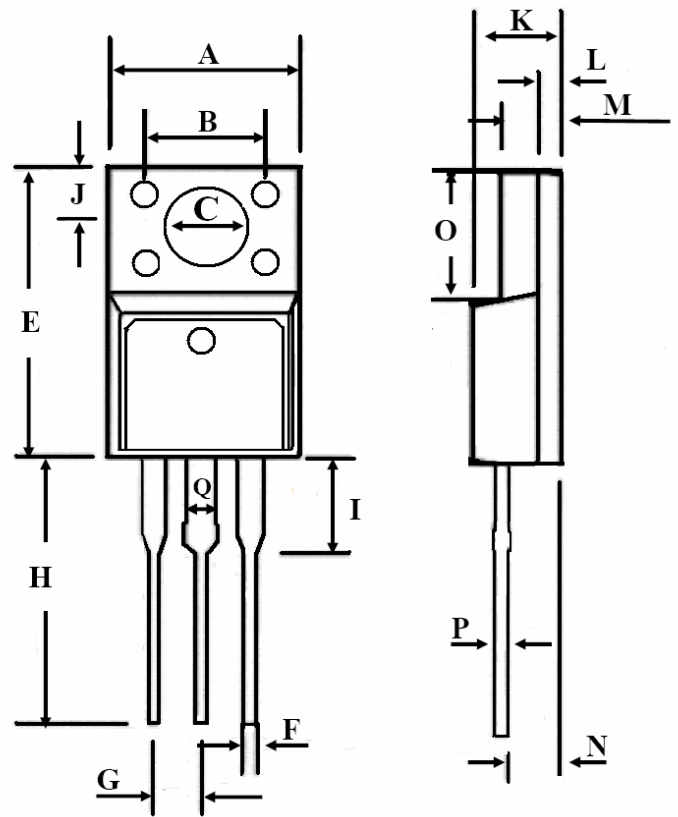
APQ04SN60CH—XXJ0  
TO-220

TO-220 DIMENSION			
DIM	MILLIMETERS		
	MIN	MAX	TYP.
A	10.01	10.31	10.16
B	3.66	3.94	3.80
C	2.59	2.89	2.74
D	3.5	3.96	3.73
E	0.70	0.90	0.80
F	2.54 TYP.		
G	4.98	5.18	5.08
H	13.4	13.8	13.6
I	8.5	8.9	8.70
J	14.65	15.35	15.05
K	4.47	4.67	4.57
L	1.22	1.42	1.32
M	28.05	29.15	28.60
N	2.52	2.82	2.67
O	0.31	0.53	0.42
P	6.10	6.50	6.30
Q	1.17	1.37	1.27



APQ04SN60CF-XXM0  
TO-220F

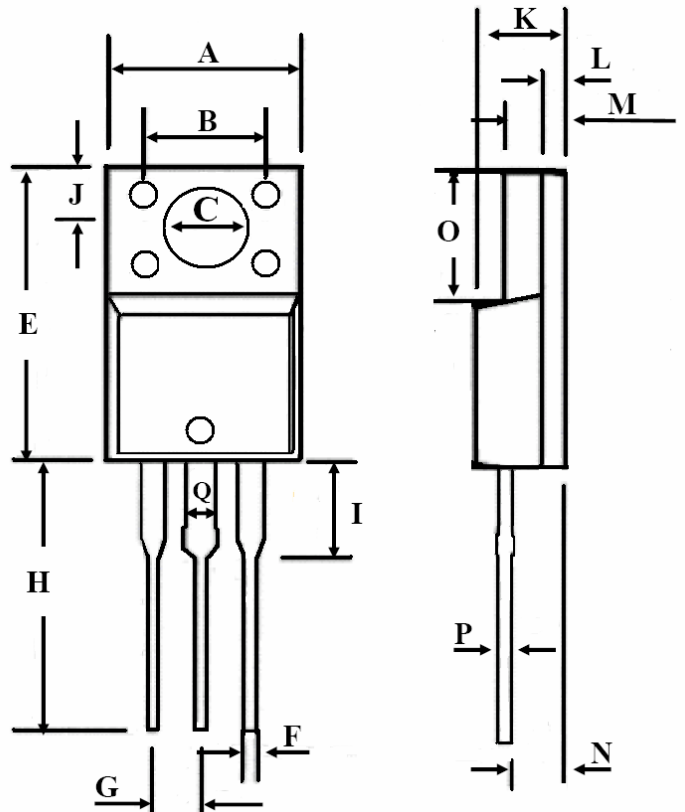
TO-220F DIMENSION			
DIM	MILLIMETERS		
	MIN	MAX	TYP.
A	9.96	10.36	10.16
B	6.50 TYP.		6.50
C	3.00	3.20	3.10
E	15.10	16.07	15.59
F	0.55	1.39	0.97
G	2.54 TYP.		
H	12.37	13.5	12.94
I	2.23	3.90	3.07
J	2.90	3.50	3.2
K	4.45	4.93	4.69
L	1.15 TYP.		
M	2.34	2.74	2.54
N	2.56	2.96	2.76
O	6.50	7.10	6.8
P	0.36	0.68	0.52
Q	1.15	1.66	1.41





APQ04SN60CF-XXJ0  
TO-220F

TO-220F DIMENSION			
DIM	MILLIMETERS		
	MIN	MAX	TYP.
A	9.96	10.36	10.16
B	6.50 TYP.		
C	3.5 REF.		
E	14.8	15.2	15.0
F	0.45	0.75	0.55
G	2.54 TYP.		
H	13.23	14.33	13.78
I	3.60	4.00	3.80
J	2.70 TYP.		
K	4.30	4.70	4.50
L	1.30 TYP.		
M	2.80	3.20	3.00
N	2.50	2.90	2.70
O	6.50	7.10	6.8
P	0.45	0.75	0.55
Q	1.05	1.75	1.40





## DEVICE SPECIFICATION

APQ04SN60CH  
APQ04SN60CF

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**600V/4A N-Channel MOSFET**

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### Note

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