

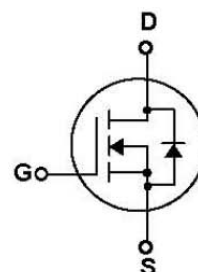
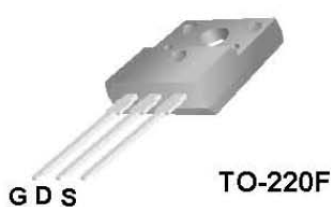
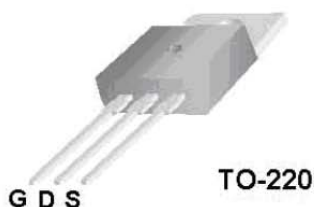
#### 1 Description

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

- 400V / 10A
- $R_{DS(on)} = 0.49\Omega(\text{typ}) \cdot V_{GS} = 10V, I_D = 6A$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- Fast switch



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

Symbol	Parameter	APQ10SN40AH-XXM0	APQ10SN40AF-XXM0	Units
		APQ10SN40AH-XXJ0	APQ10SN40AF-XXJ0	
		TO-220	TO-220F	
$V_{DSS}$	Drain-Source Voltage	400		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	10		A
		6		A
$I_{DM}$	Drain Current – Pulsed ①	40		A
$V_{GS}$	Gate-Source Voltage	$\pm 30$		V
$E_{AS}$	Single Pulsed Avalanche Energy ②	520		mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.0		V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ ) - De-rate above $25^\circ\text{C}$	134	44	W
		1.08	0.35	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  $V_{DD} = 50V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = \text{TBD}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 10A$

③  $I_{SD} \leq 10A$ ,  $di/dt \leq 300A/\mu\text{s}$ ,  $V_{DD} \leq V_{B_{DSS}}$ ,  $T_J \leq 150^\circ\text{C}$



# DEVICE SPECIFICATION

APQ10SN40AH  
APQ10SN40AF

400V/10A N-Channel MOSFET

## 4 Thermal Characteristics

Symbol	Parameter	APQ10SN40AH-XXM0	APQ10SN40AF-XXM0	Units
		APQ10SN40AH-XXJ0	APQ10SN40AF-XXJ0	
		TO-220	TO-220F	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.93	2.86	°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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	400	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.4	--	V/°C
$I_{DSS}$	Gate to Source leakage current	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	--	--	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	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$ ④	--	0.49	0.55	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 5\text{ A}$ ①	--	--	10	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	--	1400	--	pF
$C_{oss}$	Output Capacitance		--	330	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	120	--	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200\text{ V}, I_D = 10\text{ A}, R_G = 9.1\ \Omega, R_D = 20\ \Omega$ ④	--	14	--	ns
$t_r$	Turn-On Rise Time		--	27	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	50	--	ns
$t_f$	Turn-Off Fall Time		--	24	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = 320\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}$ ④	--	41	63	nC
$Q_{gs}$	Gate-Source Charge		--	--	9.0	nC
$Q_{gd}$	Gate-Drain Charge		--	--	32	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode forward Current	--	--	10	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	40	A	



# DEVICE SPECIFICATION

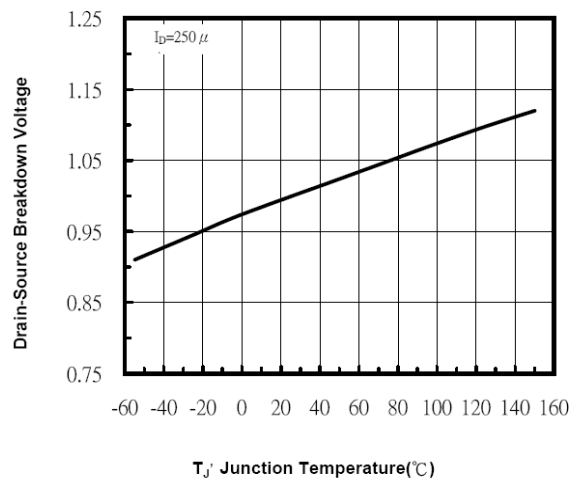
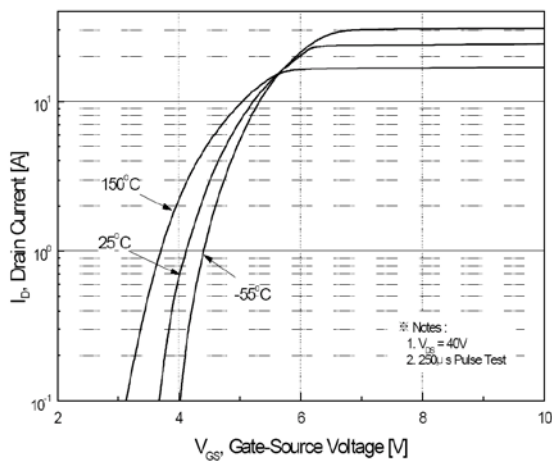
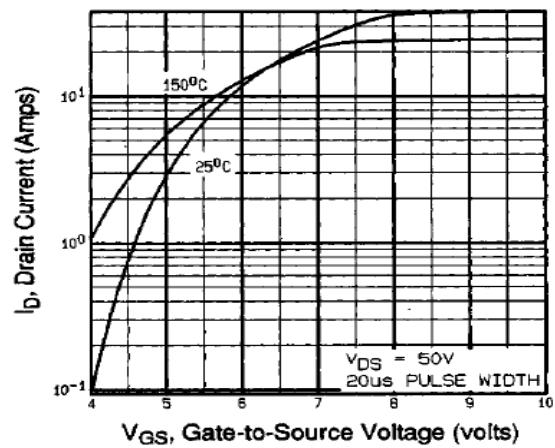
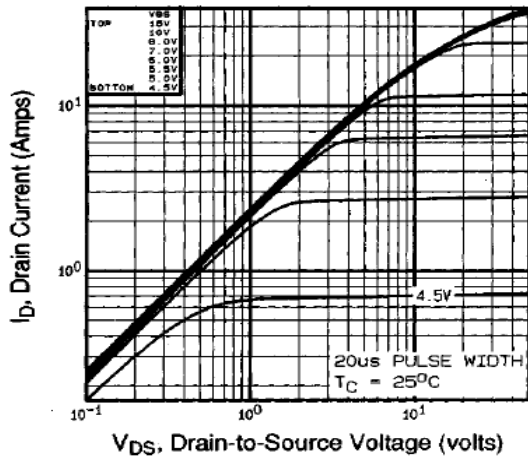
APQ10SN40AH  
APQ10SN40AF

## 400V/10A N-Channel MOSFET

$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	--	--	2.0	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_F = 10\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$ ④	--	370	790	ns
$Q_{rr}$	Reverse Recovery Charge		--	3.8	8.2	$\mu\text{C}$

**Notes:**

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 50\text{V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = \text{TBD}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 10\text{A}$
- ③  $I_{SD} \leq 10\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ . Depend on FT Test.

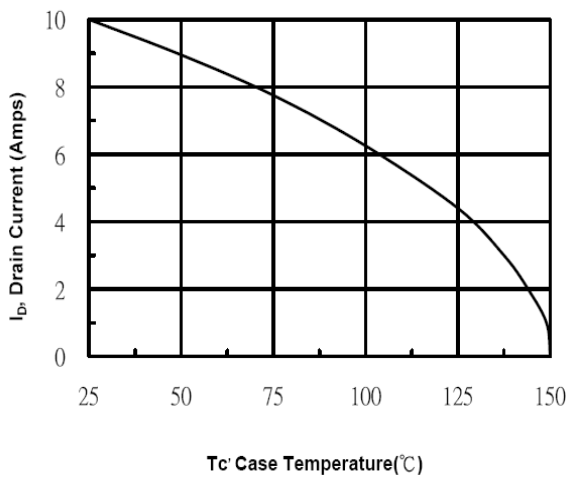
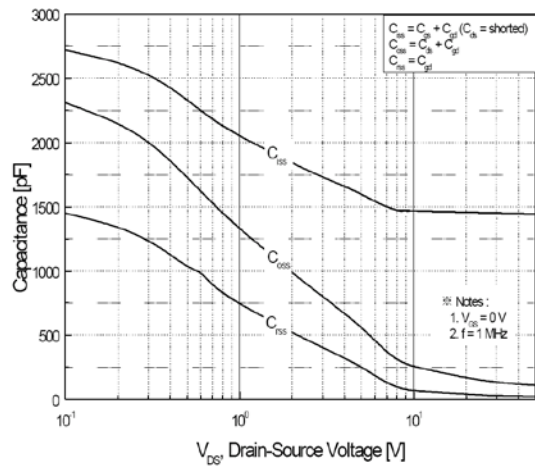
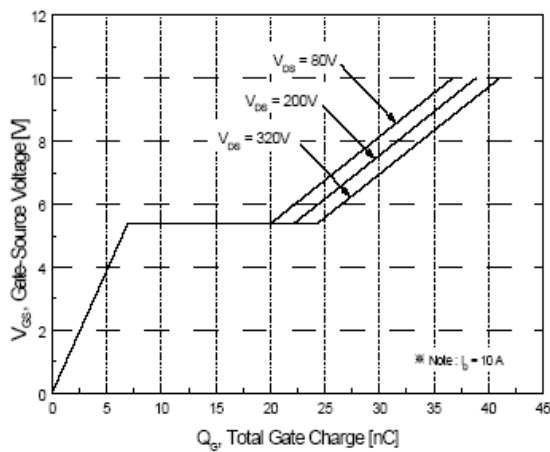
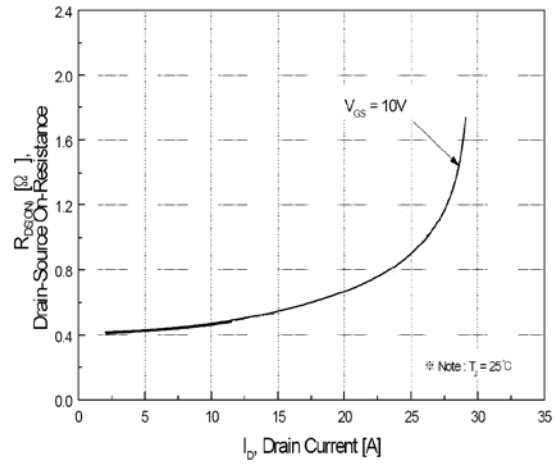
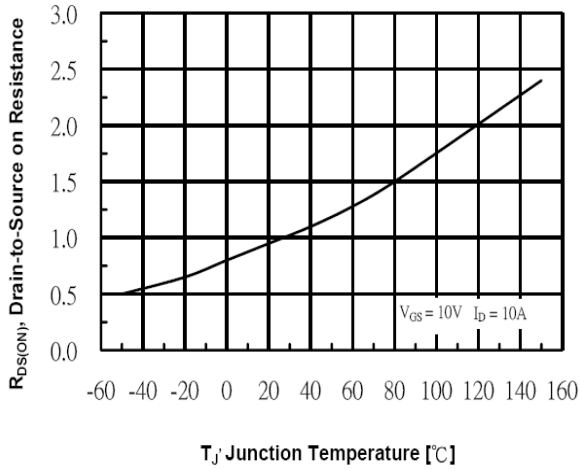




# DEVICE SPECIFICATION

APQ10SN40AH  
APQ10SN40AF

## 400V/10A N-Channel MOSFET

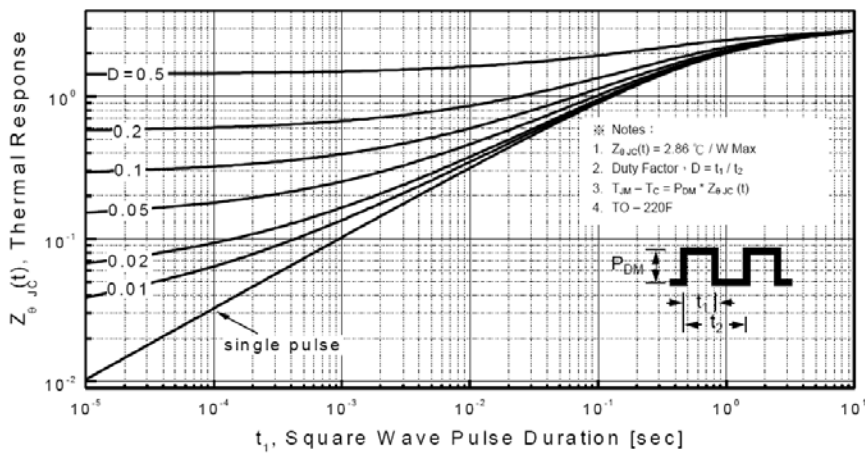
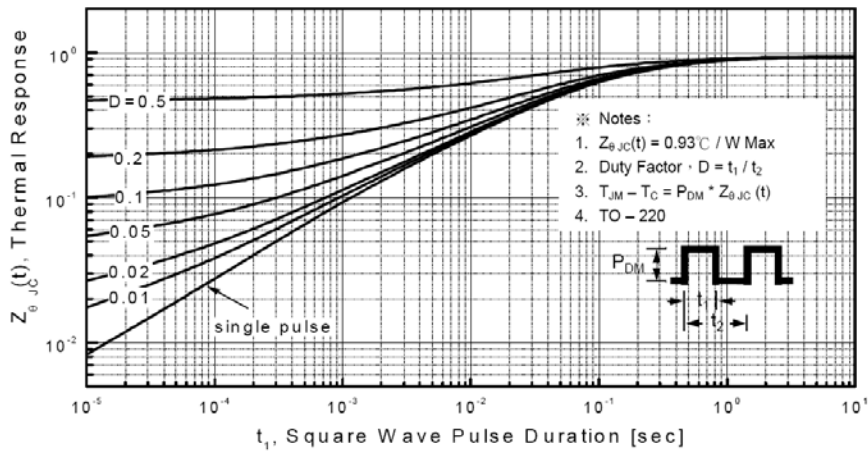
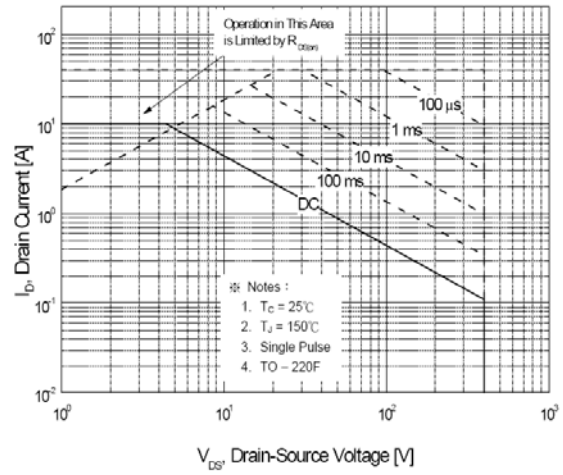
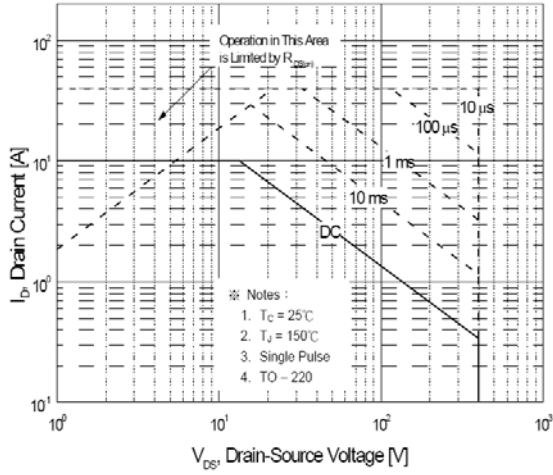




# DEVICE SPECIFICATION

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APQ10SN40AF

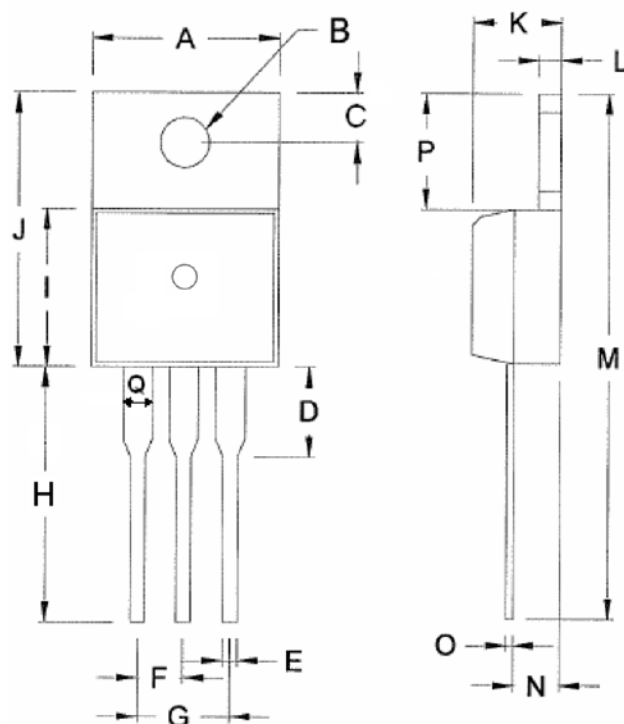
## 400V/10A N-Channel MOSFET



6 Package Dimensions

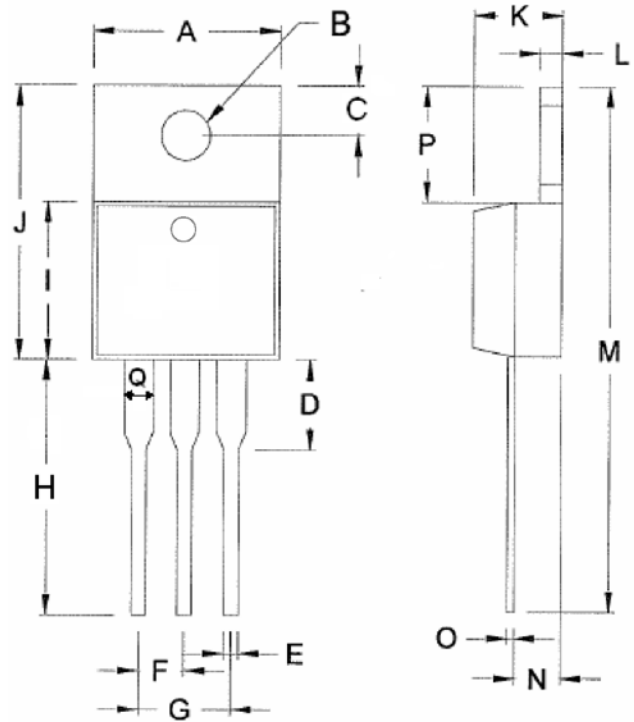
APQ10SN40AH-XXM0  
TO-220

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



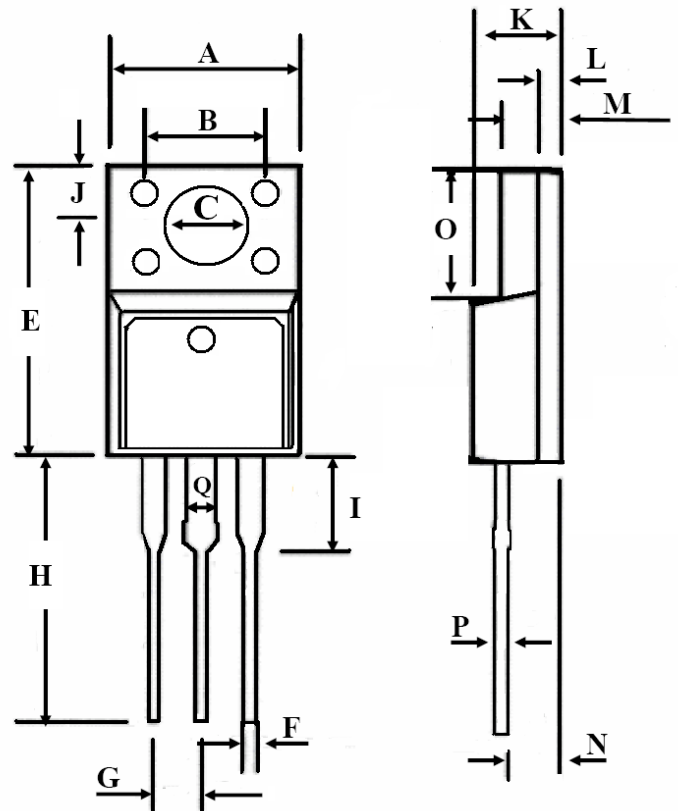
APQ10SN40AH-XXJ0  
TO-220

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



APQ10SN40AF-XXM0  
TO-220F

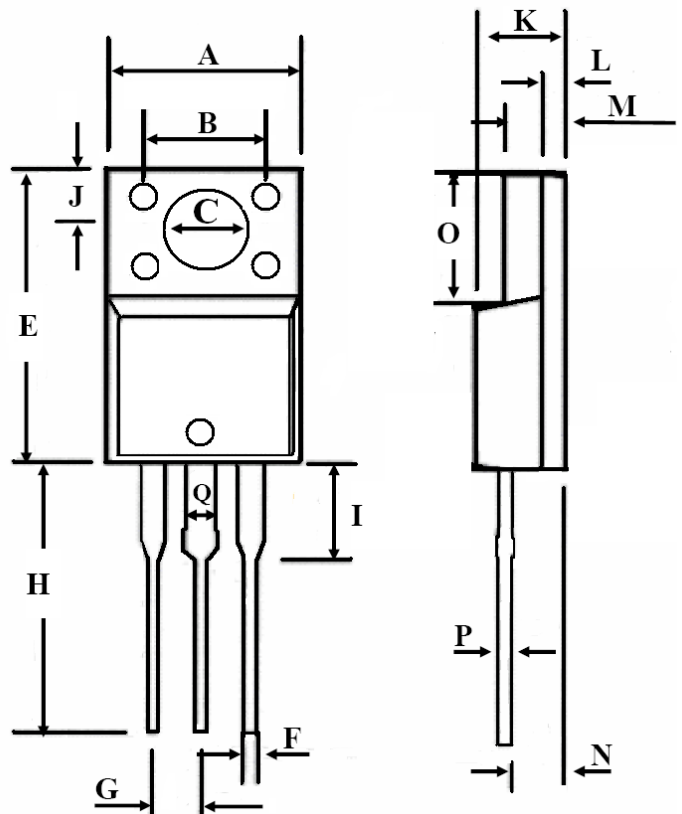
TO-220F DIMENSION			
DIM	MILLIMETERS		
	MIN	MAX	TYP.
A	9.96	10.36	10.16
B	6.50 TYP.		6.50
C	3.00	3.20	3.10
E	15.10	16.07	15.59
F	0.55	1.39	0.97
G	2.54 TYP.		
H	12.37	13.5	12.94
I	2.23	3.90	3.07
J	2.90	3.50	3.2
K	4.45	4.93	4.69
L	1.15 TYP.		
M	2.34	2.74	2.54
N	2.56	2.96	2.76
O	6.50	7.10	6.8
P	0.36	0.68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





APQ10SN40AF-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

APQ10SN40AH  
APQ10SN40AF

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**400V/10A N-Channel MOSFET**

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### Note

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