

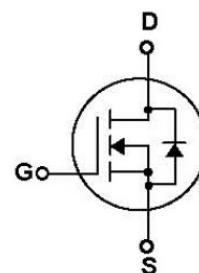
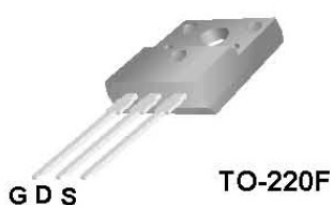
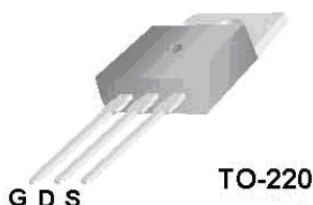
#### 1 Description

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

- 500V / 8A
- $R_{DS(on)} = 0.72\Omega(\text{typ})$ ,  $V_{GS} = 10V$ ,  $I_D = 4.8A$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability..



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

| Symbol         | Parameter   | APQ08SN50BH-XXM0 | APQ08SN50BF-XXM0 | Units               |
|----------------|---|------------------|------------------|---------------------|
|                |   | APQ08SN50BH-XXJ0 | APQ08SN50BF-XXJ0 |                     |
|                |   | TO-220           | TO-220F          |                     |
| $V_{DSS}$      | Drain-Source Voltage  | 500              |                  | V                   |
| $I_D$          | Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )<br>- Continuous ( $T_C = 100^\circ\text{C}$ ) | 8                |                  | A                   |
|                |   | 4.8              |                  | A                   |
| $I_{DM}$       | Drain Current – Pulsed ①  | 32               |                  | A                   |
| $V_{GS}$       | Gate-Source Voltage   | $\pm 30$         |                  | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy ②  | 320              |                  | mJ                  |
| $I_{AR}$       | Avalanche Current   | 8.0              |                  | A                   |
| $E_{AR}$       | Repetitive Avalanche Energy   | 13.4             |                  | mJ                  |
| dv/dt          | Peak Diode Recovery dv/dt ③   | 5.5              |                  | V/ns                |
| $P_D$          | Power Dissipation ( $T_C = 25^\circ\text{C}$ )<br>- 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  $T_J = 25^\circ\text{C}$ ,  $L = 14\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 8.0A$
- ③  $I_{SD} \leq 8.0A$ ,  $di/dt \leq 100A/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .



# DEVICE SPECIFICATION

APQ08SN50BH  
APQ08SN50BF

500V/8A N-Channel MOSFET

## 4 Thermal Characteristics

| Symbol          | Parameter                               | APQ08SN50BH-XXM0 | APQ08SN50BF-XXM0 | Units |
|-----------------|---|------------------|------------------|-------|
|                 |   | APQ08SN50BH-XXJ0 | APQ08SN50BF-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

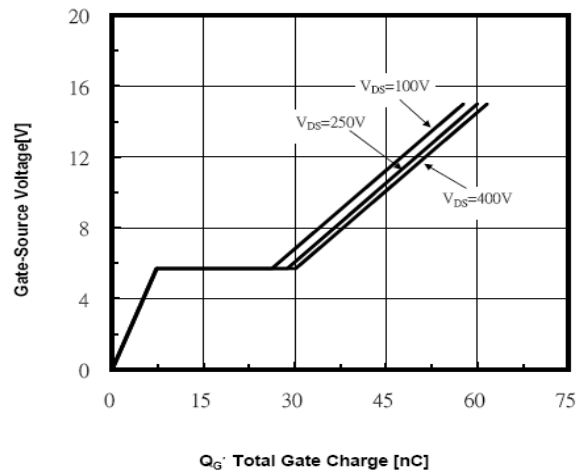
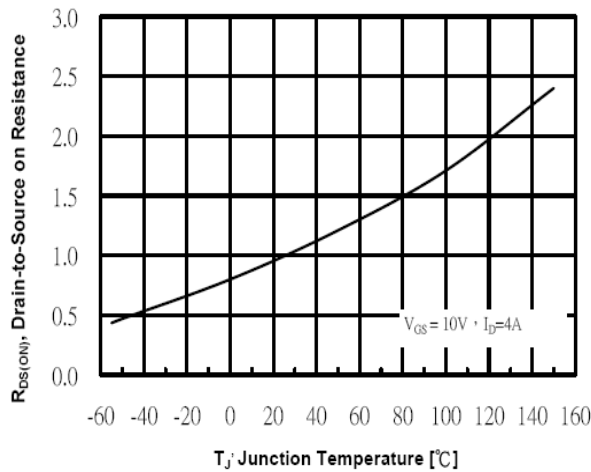
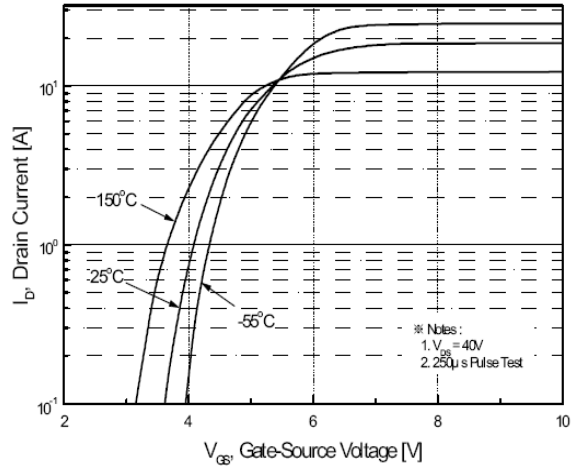
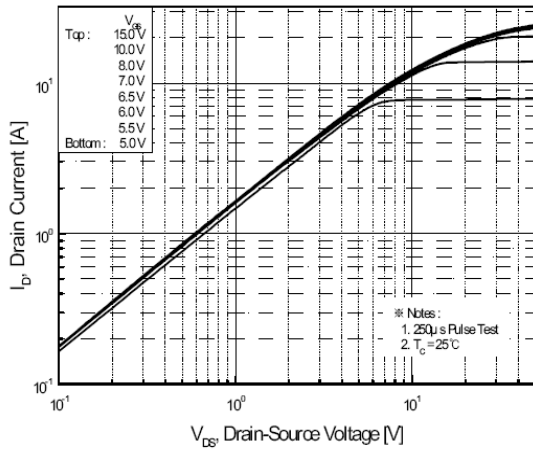
| Symbol  | Parameter   | Test Conditions  | Min | Typ  | Max  | Units         |
|---|---|--|-----|------|------|---------------|
| <b>Off Characteristics</b>                                    |   |  |     |      |      |               |
| $BV_{DSS}$  | Drain-Source Breakdown Voltage                        | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$                                    | 500 | --   | --   | V             |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$                          | Breakdown Voltage Temperature Coefficient             | $I_D = 250\ \mu\text{A}$ Referenced to $25^\circ\text{C}$                        | --  | 0.55 | --   | V/°C          |
| $I_{DSS}$   | Gate to Source leakage current                        | $V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$                                     | --  | --   | 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                     | $V_{GS} = 10\text{ V}, I_D = 4.8\text{ A}$ ④                                     | --  | 0.72 | 0.85 | $\Omega$      |
| $g_{FS}$  | Forward Transconductance                              | $V_{DS} = 15\text{ V}, I_D = 4\text{ A}$ ①                                       | --  | --   | 10   | S             |
| <b>Dynamic Characteristics</b>                                |   |  |     |      |      |               |
| $C_{iss}$   | Input Capacitance                                     | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$                  | --  | 1300 | --   | pF            |
| $C_{oss}$   | Output Capacitance                                    |  | --  | 310  | --   | pF            |
| $C_{rss}$   | Reverse Transfer Capacitance                          |  | --  | 120  | --   | pF            |
| <b>Switching Characteristics</b>                              |   |  |     |      |      |               |
| $t_{d(on)}$   | Turn-On Delay Time                                    | $V_{DD} = 250\text{ V}, I_D = 8\text{ A}, R_G = 9.1\ \Omega, R_D = 31\ \Omega$ ④ | --  | 14   | --   | ns            |
| $t_r$   | Turn-On Rise Time                                     |  | --  | 23   | --   | ns            |
| $t_{d(off)}$  | Turn-Off Delay Time                                   |  | --  | 49   | --   | ns            |
| $t_f$   | Turn-Off Fall Time                                    |  | --  | 20   | --   | ns            |
| $Q_g$   | Total Gate Charge                                     | $V_{DS} = 400\text{ V}, I_D = 8\text{ A}, V_{GS} = 10\text{ V}$ ④                | --  | 41   | 65   | nC            |
| $Q_{gs}$  | Gate-Source Charge                                    |  | --  | --   | 9.4  | nC            |
| $Q_{gd}$  | Gate-Drain Charge                                     |  | --  | --   | 33   | nC            |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |  |     |      |      |               |
| $I_S$   | Maximum Continuous Drain-Source Diode Forward Current | --   | --  | 8    | --   | A             |
| $I_{SM}$  | Maximum Pulsed Drain-Source Diode Forward Current     | --   | --  | 32   | --   | A             |

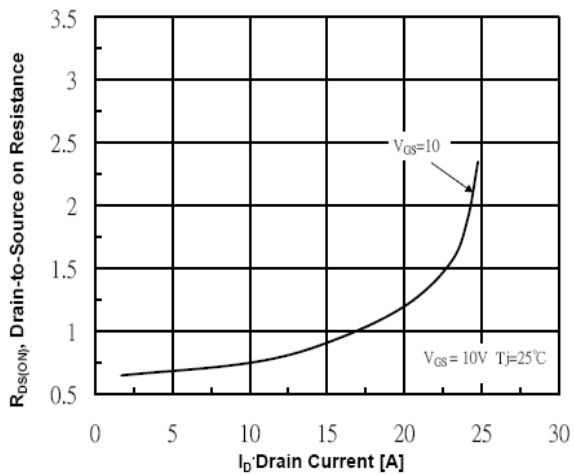
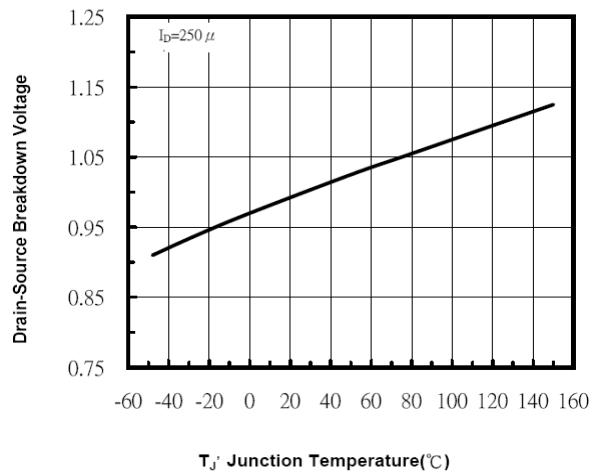
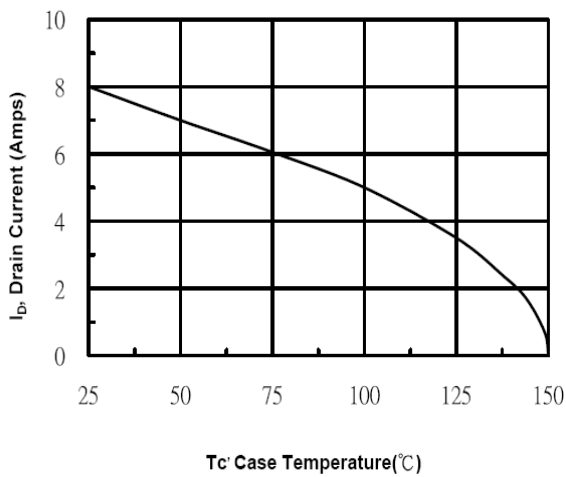
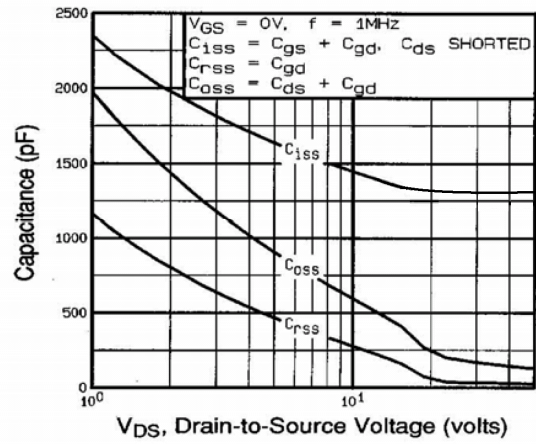
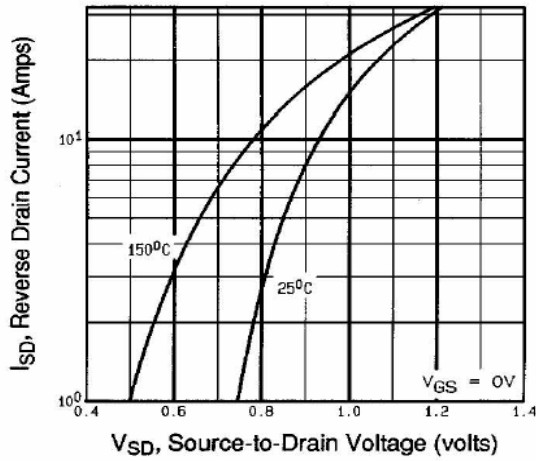
### 500V/8A N-Channel MOSFET

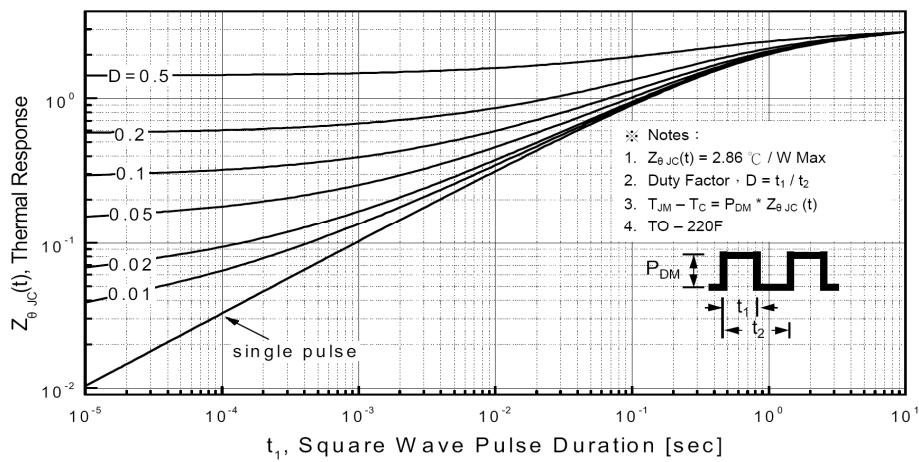
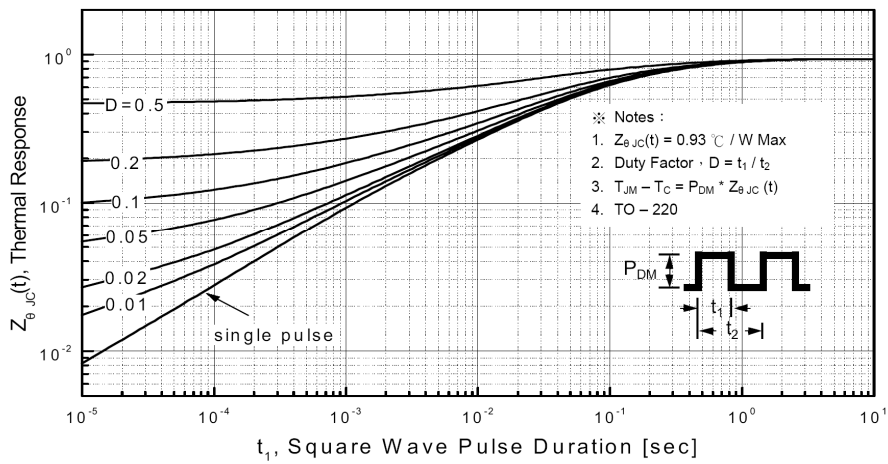
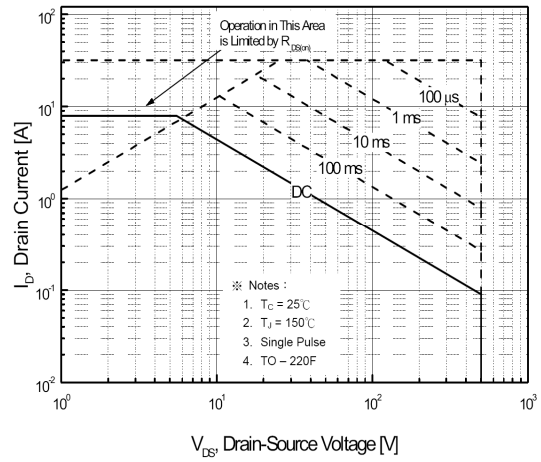
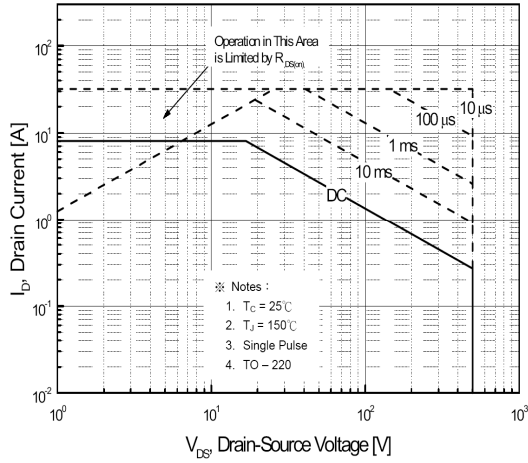
|          |                                    |   |    |     |     |               |
|----------|------------------------------------|---|----|-----|-----|---------------|
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 8\text{ A}$ | -- | --  | 1.5 | V             |
| $t_{rr}$ | Reverse Recovery Time              | $V_{GS} = 0\text{ V}, I_F = 8\text{ A}$ | -- | 460 | 970 | ns            |
| $Q_{rr}$ | Reverse Recovery Charge            | $di_F/dt = 100\text{ A}/\mu\text{s}$ ④  | -- | 4.2 | 8.9 | $\mu\text{C}$ |

**Notes:**

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 50\text{ V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 14\text{ mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 8.0\text{ A}$
- ③  $I_{SD} \leq 8.0\text{ A}$ ,  $di/dt \leq 100\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .



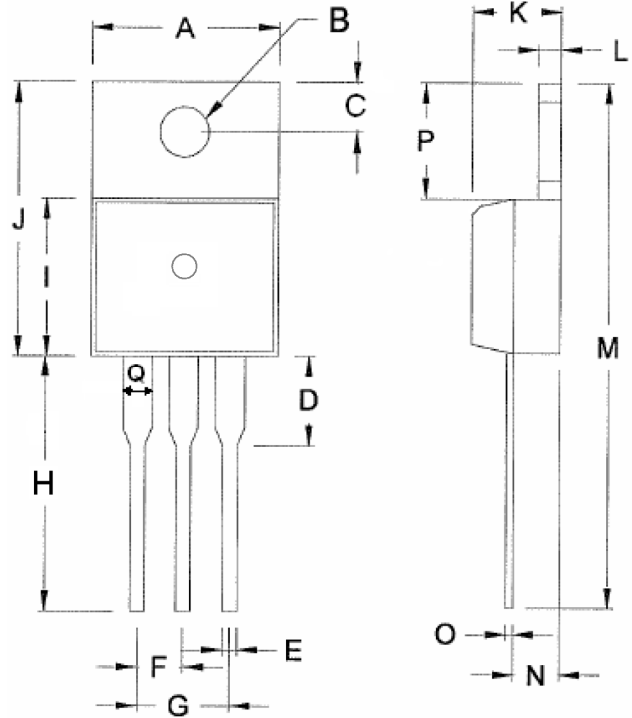




6 Package Dimensions

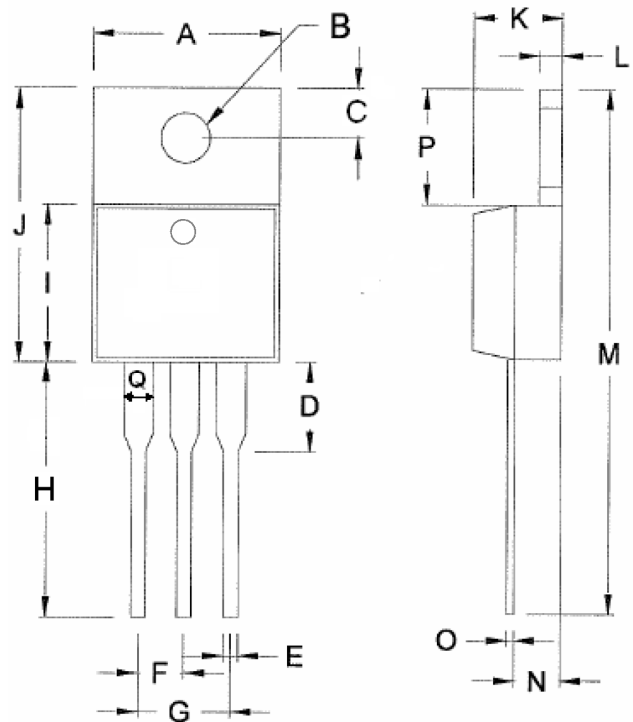
APQ08SN50BH-XXM0  
TO-220

| 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  |



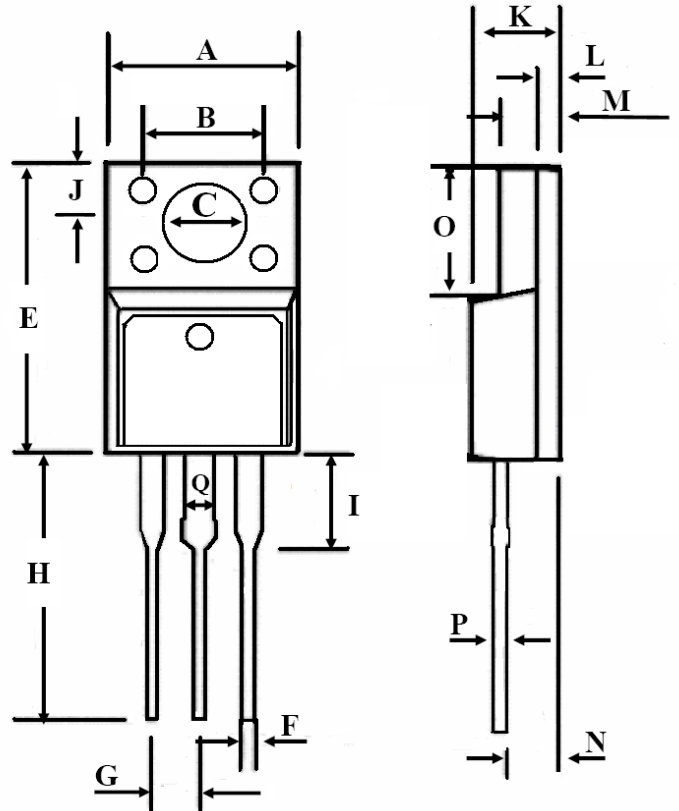
APQ08SN50BH-XXJ0  
TO-220

| 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  |



APQ08SN50BF-XXM0  
TO-220F

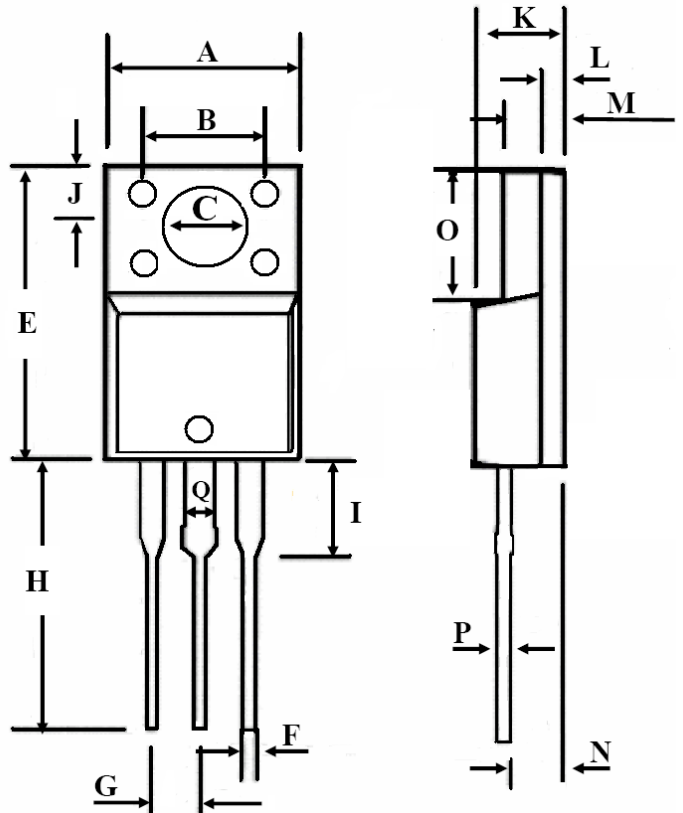
| TO-220F DIMENSION |             |       |       |
|-------------------|-------------|-------|-------|
| DIM               | MILLIMETERS |       |       |
|                   | MIN         | MAX   | TYP.  |
| A                 | 9.96        | 10.36 | 10.16 |
| B                 | 6.50 TYP.   |       | 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  |





APQ08SN50BF-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

APQ08SN50BH  
APQ08SN50BF

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500V/8A N-Channel MOSFET

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### Note

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