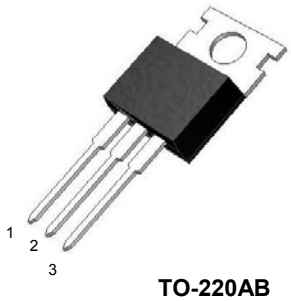
TAK CHEONG®

Preliminary Data Sheet

TFP5N60

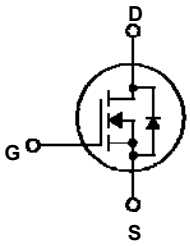
# N-Channel Power MOSFET

## 4.5A, 600V, 2.4Ω




1 = Gate
2 = Drain
3 = Source

**TO-220AB**




### General Description

The N-Channel MOSFET is used an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance. This device is well suited for high efficiency switched mode power suppliers, active power factor correction, electronic lamp ballasts based half bridge topology.

### Features

- Robust high voltage termination
- Avalanche energy specified
- Diode is characterized for use in bridge circuits
- Source to Drain diode recovery time comparable to a discrete fast recovery diode.

**DEVICE MARKING DESIGNATION:**
Line 1 = TC Brand
Line 2 = Device Type

### ABSOLUTE MAXIMUM RATINGS ($T_C$ =25°C, unless otherwise noted )

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain- Source Voltage | | 600 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±30 | V |
| $I_D$ | Drain Current | | 4.5 | A |
| $I_{DM}$ | Drain Current Pulsed | | 18 | A |
| $P_D$ | Power Dissipation | (Note 2) | 100 | W |
| | Derating factor above 25℃ | | 0.8 | W/℃ |
| $E_{AS}$ | Single Pulsed Avalanche Energy | (Note 1) | 216 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy | (Note 2) | 10 | mJ |
| $T_J$ | Operating Junction Temperature | | 150 | ℃ |
| $T_{stg}$ | Storage Temperature Range | | - 55 to +150 | ℃ |

**Notes:**

1. L=20mH, $I_{AS}$=4.5A, $V_{DD}$=50V, $R_G$=50Ω, Starting $T_J$=25℃
2. Repetitive Rating: Pulse width limited by maximum junction temperature.

### THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 1.26 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | ℃/W |

## ELECTRICAL CHARACTERISTICS

### Off Characteristics ($T_A$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Sounce Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | 600 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 600V, $V_{GS}$ = 0V | -- | -- | 10 | uA |
| $I_{GSSF}$ | Gate-Body Leakage Current, Forward | $V_{GS}$ = 30V, $V_{DS}$ = 0V | -- | -- | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current, Reverse | $V_{GS}$ = -30V, $V_{DS}$ = 0V | -- | -- | -100 | nA |

### On Characteristics ($T_A$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS\ (th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ , $I_D$ = 250uA | 2.0 | -- | 4.0 | V |
| $R_{DS(ON)}$ | On-Resistance | $V_{GS}$ = 10V, $I_D$ = 2.25A | -- | 1.9 | 2.4 | Ω |

### Dynamic Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Ciss | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz | -- | 592 | 737 | pF |
| Coss | Output Capacitance | | -- | 55 | 75 | pF |
| Crss | Reverse Transfer Capacitance | | -- | 13 | 16 | pF |

### Switching Characteristics

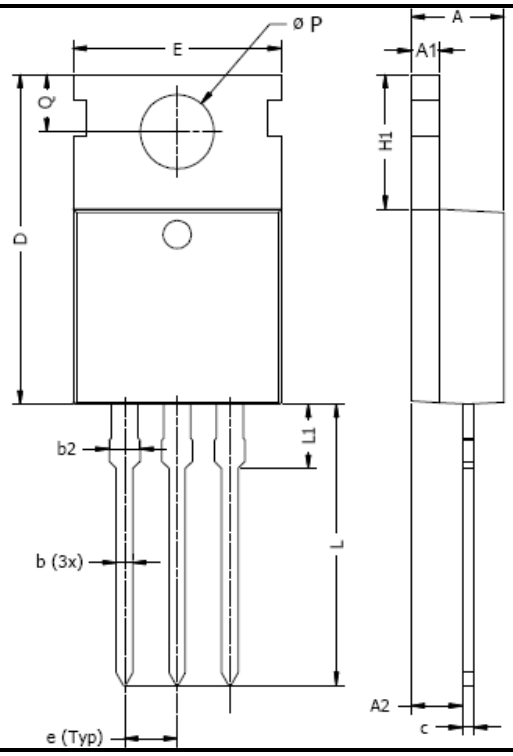
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 300V, $I_D$ = 4.5A, $R_G$ = 25 Ω (Note 3 & 4) | -- | 12 | 34 | nS |
| tr | Turn-On Rise Time | | -- | 45 | 100 | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 40 | 90 | nS |
| tr | Turn-Off Fall Time | | -- | 50 | 110 | nS |
| Qg | Total Gate Charge | $V_{DS}$ = 480V, $I_D$ = 4.5A, $V_{GS}$ = 10V (Note 3 & 4) | -- | 19 | 28 | nC |
| Qgs | Gate-Source Charge | | -- | 3 | -- | nC |
| Qgd | Gate-Drain Charge | | -- | 8 | -- | nC |

### Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Test Conditions | Min. | Typ, | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 4.5 | A |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 22 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 4.5A | -- | -- | 1.5 | V |
| Trr | Reverse Recovery Time | $V_{GS}$ = 0V, $I_S$ = 4.5A, $dI_F$ / dt = 100A/uS (Note 3) | -- | 392 | -- | nS |
| Qrr | Reverse Recovery Charge | | -- | 1.57 | -- | uC |

**Notes:**
3. Pulse Test: Pulse width < 300us, Duty cycle ≤ 2%.
4. Basically not affected by working temperature.

## TO220AB PACKAGE OUTLINE




| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 3.6 | 4.8 | 0.142 | 0.189 |
| A1 | 1.2 | 1.4 | 0.047 | 0.055 |
| A2 | 2.0 | 2.9 | 0.079 | 0.114 |
| b | 0.4 | 1.0 | 0.016 | 0.039 |
| b2 | 1.2 | 1.8 | 0.047 | 0.071 |
| c | 0.36 | 0.6 | 0.014 | 0.024 |
| D | 14.2 | 16.5 | 0.559 | 0.650 |
| e | 2.34 | 2.74 | 0.092 | 0.108 |
| E | 9.7 | 10.6 | 0.382 | 0.417 |
| H1 | 5.8 | 6.85 | 0.228 | 0.270 |
| L | 12.7 | 14.7 | 0.500 | 0.579 |
| L1 | 2.7 | 3.3 | 0.106 | 0.130 |
| ØP | 3.5 | 4.0 | 0.138 | 0.157 |
| Q | 2.54 | 3.4 | 0.100 | 0.134 |

NOTE: Above package outline conforms to JEDEC TO-220AB

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