



## UTT50P04

Preliminary

Power MOSFET

### -40V, -60A P-CHANNEL POWER MOSFET

#### DESCRIPTION

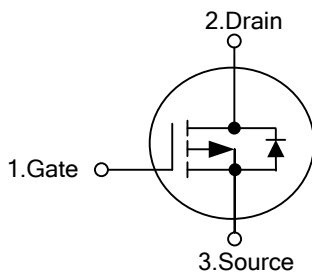
The UTC **UTT50P04** is a P-channel power MOSFET using UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance, and it can also withstand high energy in the avalanche.

This UTC **UTT50P04** is suitable for motor drivers, high-side switch and 12V board net, etc.

#### FEATURES

- \*  $V_{DS} = -40V$ ,
- \*  $I_D = -60A$
- \*  $R_{DS(ON)} = 0.0105\Omega @ V_{GS} = -10V, I_D = -30A$
- \* High Switching Speed

#### SYMBOL

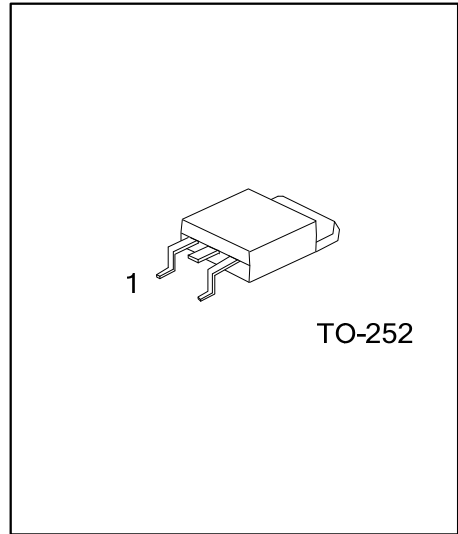


#### ORDERING INFORMATION

| Ordering Number |                 | Package | Pin Assignment |   |   | Packing   |
|-----------------|-----------------|---------|----------------|---|---|-----------|
| Lead Free       | Halogen Free    |         | 1              | 2 | 3 |           |
| UTT50P04L-TN3-R | UTT50P04G-TN3-R | TO-252  | G              | D | S | Tape Reel |

Note: Pin Assignment: G: Gate D: Drain S: Source

|                     |  |
|---------------------|--|
| UTT50P04L-TN3-R<br> | (1) R: Tape Reel<br>(2) TN3: TO-252<br>(3) G: Halogen Free, L: Lead Free |
|---------------------|--|



■ ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                                    |                        | SYMBOL    | RATINGS                 | UNIT             |   |
|--|------------------------|-----------|-------------------------|------------------|---|
| Drain-Source Voltage                         |                        | $V_{DSS}$ | -40                     | V                |   |
| Gate-Source Voltage                          |                        | $V_{GSS}$ | $\pm 20$                | V                |   |
| Drain Current                                | Continuous<br>(Note 2) | $I_D$     | $T_C=25^\circ\text{C}$  | -60 (Note 3)     | A |
|  |                        |           | $T_C=100^\circ\text{C}$ | -43              | A |
|  | Pulsed                 | $I_{DM}$  | -100                    | A                |   |
| Continuous Source Current (Diode Conduction) |                        | $I_S$     | -60 (Note 3)            | A                |   |
| Avalanche Current                            |                        | $I_{AR}$  | -40                     | A                |   |
| Avalanche Energy                             |                        | $E_{AS}$  | 80                      | mJ               |   |
| Power Dissipation (Note 2)                   | $T_C=25^\circ\text{C}$ | $P_D$     | 93.7 (Note 2)           | W                |   |
|  | $T_A=25^\circ\text{C}$ |           | 3 (Note 1)              | W                |   |
| Junction Temperature                         |                        | $T_J$     | -55~175                 | $^\circ\text{C}$ |   |
| Storage Temperature                          |                        | $T_{STG}$ | -55~175                 | $^\circ\text{C}$ |   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL CHARACTERISTICS

| PARAMETER                    |                          | SYMBOL        | RATINGS | UNIT               |
|------------------------------|--------------------------|---------------|---------|--------------------|
| Junction to Ambient (Note 1) | $t \leq 10 \text{ sec.}$ | $\theta_{JA}$ | 18      | $^\circ\text{C/W}$ |
|                              | Steady State             |               | 50      |                    |
| Junction to Case             |                          | $\theta_{JC}$ | 1.6     |                    |

- Notes:
1. Surface Mounted on 1"x1" FR4 Board.
  2. See SOA curve for voltage derating.
  3. Calculated based on maximum allowable Junction Temperature. Package limitation current is 50A.

■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise noted)

| PARAMETER   | SYMBOL              | TEST CONDITIONS   | MIN  | TYP    | MAX   | UNIT |
|---|---------------------|---|------|--------|-------|------|
| <b>OFF CHARACTERISTICS</b>  |                     |   |      |        |       |      |
| Drain-Source Breakdown Voltage  | BV <sub>DSS</sub>   | I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V   | -40  |        |       | V    |
| Drain-Source Leakage Current  | I <sub>DSS</sub>    | V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V  |      |        | -1    | μA   |
|   |                     | V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C   |      |        | -50   |      |
| Gate- Source Leakage Current  | Forward             | I <sub>GSS</sub>  |      |        |       | nA   |
|   | Reverse             |   |      |        |       |      |
|   |                     | V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V  |      |        | -100  | nA   |
| <b>ON CHARACTERISTICS</b>   |                     |   |      |        |       |      |
| Gate Threshold Voltage  | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA   | -1.0 |        | -3.0  | V    |
| Static Drain-Source On-State Resistance (Note 1)                            | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-30A   |      | 0.0105 | 0.013 | Ω    |
|   |                     | V <sub>GS</sub> =-10V, I <sub>D</sub> =-30A, T <sub>J</sub> =125°C  |      |        | 0.020 |      |
|   |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A  |      | 0.017  | 0.022 |      |
| Forward Transconductance (Note 1)   | g <sub>FS</sub>     | V <sub>DS</sub> =-15V, I <sub>D</sub> =-30A   | 15   |        |       | S    |
| On State Drain Current (Note 1)   | I <sub>D(ON)</sub>  | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V   | -50  |        |       | A    |
| <b>DYNAMIC PARAMETERS (Note 2)</b>  |                     |   |      |        |       |      |
| Input Capacitance   | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, f=1MHz  |      | 3120   |       | pF   |
| Output Capacitance  | C <sub>OSS</sub>    |   |      | 440    |       | pF   |
| Reverse Transfer Capacitance  | C <sub>RSS</sub>    |   |      | 320    |       | pF   |
| Gate Resistance   | R <sub>G</sub>      | f=1.0MHz  |      | 4.3    |       | Ω    |
| <b>SWITCHING PARAMETERS (Note 2)</b>  |                     |   |      |        |       |      |
| Total Gate Charge (Note 3)  | Q <sub>G</sub>      | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, I <sub>D</sub> =-50A  |      | 63     | 95    | nC   |
| Gate to Source Charge (Note 3)  | Q <sub>GS</sub>     |   |      | 13     |       | nC   |
| Gate to Drain Charge (Note 3)   | Q <sub>GD</sub>     |   |      | 16     |       | nC   |
| Turn-ON Delay Time (Note 3)   | t <sub>D(ON)</sub>  | V <sub>DD</sub> =-20V, V <sub>GEN</sub> =-10V, I <sub>D</sub> ≈-50A,<br>R <sub>L</sub> =0.4 Ω, R <sub>g</sub> =2.5Ω |      | 15     | 25    | ns   |
| Rise Time (Note 3)  | t <sub>R</sub>      |   |      | 18     | 30    | ns   |
| Turn-OFF Delay Time (Note 3)  | t <sub>D(OFF)</sub> |   |      | 60     | 90    | ns   |
| Fall-Time (Note 3)  | t <sub>F</sub>      |   | 47   | 70     | ns    |      |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS (T<sub>C</sub>=25°C)</b> |                     |   |      |        |       |      |
| Maximum Body-Diode Pulsed Current   | I <sub>SM</sub>     |   |      |        | -100  | A    |
| Drain-Source Diode Forward Voltage (Note 1)                                 | V <sub>SD</sub>     | I <sub>F</sub> =-50A, V <sub>GS</sub> =0V   |      | -1.0   | -1.5  | V    |
| Body Diode Reverse Recovery Time  | t <sub>RR</sub>     | I <sub>F</sub> =-50A, di/dt=100A/μs   |      | 36     | 55    | ns   |

- Notes: 1. Pulse test; pulse width≤300μs, duty cycles≤2%.  
 2. Guaranteed by design, not subject to production testing.  
 3. Independent of operating temperature.

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