

### General Description

The TF060P03K combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is ideal for load switch and battery protection applications.

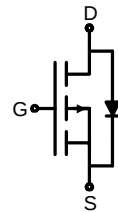
### Features

Advance high cell density Trench technology  
Low  $R_{DS(ON)}$  to minimize conductive loss  
Low Gate Charge for fast switching  
Low Thermal resistance

### Application

MB/VGA Vcore  
SMPS 2<sup>nd</sup> Synchronous Rectifier  
POL application  
BLDC Motor driver

### Product Summary



$V_{DS} = -30V$   $I_D = -70A$   
 $R_{DS(ON)}(-10V \text{ typ}) = 6.5m\Omega$   
 $R_{DS(ON)}(-4.5V \text{ typ}) = 8.5m\Omega$



TO-251



TO-252

### Ordering Information:

|           |                                                     |
|-----------|-----------------------------------------------------|
| Part NO.  | TF060P03K                                           |
| Marking 1 | 060P03K:TF060P03K                                   |
| Marking 2 | Logo:tuofeng; Y:year code; XX:Week; AA:device code; |
| MOQ       | TO-251:50/PCS TO-252:2500/PCS                       |

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ )

| Parameter                      | Symbol                    | Rating     | Unit       |
|--------------------------------|---------------------------|------------|------------|
| Drain-Source Voltage           | $V_{DS}$                  | -30        | V          |
| Gate-Source Voltage            | $V_{GS}$                  | $\pm 20$   | V          |
| Continuous Drain Current       | $I_D @ T_C = 25^\circ C$  | -70        | A          |
|                                | $I_D @ T_C = 75^\circ C$  | -49        | A          |
|                                | $I_D @ T_C = 100^\circ C$ | -42        | A          |
| Pulsed Drain Current ①         | $I_{DM}$                  | -160       | A          |
| Total Power Dissipation        | $P_D @ T_C = 25^\circ C$  | 50         | W          |
| Total Power Dissipation        | $P_D @ T_A = 25^\circ C$  | 2.0        | W          |
| Operating Junction Temperature | $T_J$                     | -55 to 150 | $^\circ C$ |
| Storage Temperature            | $T_{STG}$                 | -55 to 150 | $^\circ C$ |

Note: ① Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$  ;

|                                                     |                                 |                                                                              |      |        |       |      |
|-----------------------------------------------------|---------------------------------|------------------------------------------------------------------------------|------|--------|-------|------|
| Single Pulse Avalanche Energy                       | E <sub>AS</sub>                 | 120                                                                          |      |        | mJ    |      |
| Avalanche Current                                   | I <sub>AS</sub> I <sub>AR</sub> | -20                                                                          |      |        | A     |      |
| ●Thermal resistance                                 |                                 |                                                                              |      |        |       |      |
| Parameter                                           | Symbol                          | Min.                                                                         | Typ. | Max.   | Unit  |      |
| Thermal resistance, junction - case                 | R <sub>thJC</sub>               | -                                                                            | -    | 4.5    | ° C/W |      |
| Thermal resistance, junction - ambient              | R <sub>thJA</sub>               | -                                                                            | -    | 47     | ° C/W |      |
| Soldering temperature, wave soldering for 8s        | T <sub>sold</sub>               | -                                                                            | -    | 265    | ° C   |      |
| ●Electronic Characteristics                         |                                 |                                                                              |      |        |       |      |
| Parameter                                           | Symbol                          | Condition                                                                    | Min. | Typ    | Max.  | Unit |
| Drain-Source Breakdown Voltage                      | BV <sub>DSS</sub>               | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                   | -30  |        |       | V    |
| Gate Threshold Voltage                              | V <sub>GS(TH)</sub>             | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                     | -1.0 | -1.5   | -2.1  | V    |
| Drain-Source Leakage Current                        | I <sub>DSS</sub>                | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V                                   |      |        | -1.0  | uA   |
| Gate- Source Leakage Current                        | I <sub>GSS</sub>                | V <sub>GS</sub> =±20V ,V <sub>DS</sub> =0V                                   |      |        | ±100  | nA   |
| Static Drain-source On Resistance                   | R <sub>DS(ON)</sub>             | V <sub>GS</sub> =-10V, I <sub>D</sub> =-30A                                  |      | 6.5    | 7.5   | mΩ   |
|                                                     |                                 | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A                                 |      | 8.5    | 9.5   | mΩ   |
| Forward Transconductance                            | g <sub>FS</sub>                 | V <sub>DS</sub> =-15V, I <sub>D</sub> =-30A                                  |      | 15     |       | S    |
| Source-drain voltage                                | V <sub>SD</sub>                 | I <sub>S</sub> =-20A                                                         |      |        | 1.20  | V    |
| ●Electronic Characteristics                         |                                 |                                                                              |      |        |       |      |
| Parameter                                           | Symbol                          | Condition                                                                    | Min. | Typ    | Max.  | Unit |
| Input capacitance                                   | C <sub>iss</sub>                | V <sub>ds</sub> =-15V,V <sub>gs</sub> =0V<br>f = 1MHz                        | -    | 3521.5 | -     | pF   |
| Output capacitance                                  | C <sub>oss</sub>                |                                                                              | -    | 417.1  | -     |      |
| Reverse transfer capacitance                        | C <sub>rss</sub>                |                                                                              | -    | 378.3  | -     |      |
| ●Gate Charge characteristics(T <sub>a</sub> = 25°C) |                                 |                                                                              |      |        |       |      |
| Parameter                                           | Symbol                          | Condition                                                                    | Min. | Typ    | Max.  | Unit |
| Gate Resistance                                     | R <sub>g</sub>                  | f = 1MHz                                                                     |      | 1.5    |       | Ω    |
| Total gate charge                                   | Q <sub>g</sub>                  | V <sub>DD</sub> = - 15V<br>I <sub>D</sub> = -20A<br>V <sub>GS</sub> = -10V   | -    | 78.6   | -     | nC   |
| Gate - Source charge                                | Q <sub>gs</sub>                 |                                                                              | -    | 10.7   | -     |      |
| Gate - Drain charge                                 | Q <sub>gd</sub>                 |                                                                              | -    | 19.7   | -     |      |
| Turn-ON Delay time                                  | t <sub>D(on)</sub>              | V <sub>GS</sub> =-10V ,V <sub>DS</sub> =-10V<br>R <sub>G</sub> =3.0Ω, I=-20A |      | 9.84   |       | ns   |
| Turn-ON Rise time                                   | t <sub>r</sub>                  |                                                                              |      | 117.3  |       | ns   |
| Turn-Off Delay time                                 | t <sub>D(off)</sub>             |                                                                              |      | 122.9  |       | ns   |
| Turn-Off Fall time                                  | t <sub>f</sub>                  |                                                                              |      | 70.4   |       | ns   |

Fig.1 Power Dissipation

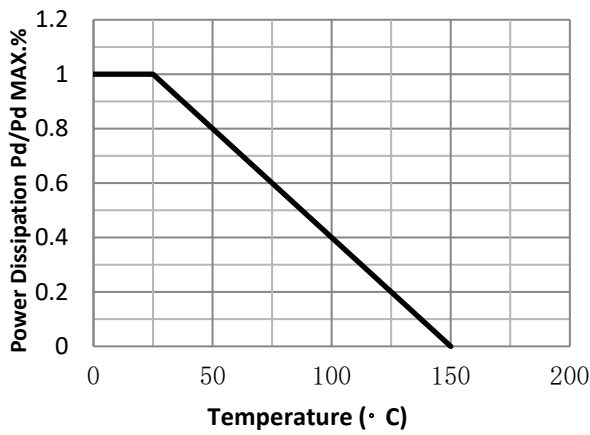


Fig.2 Typical output Characteristics

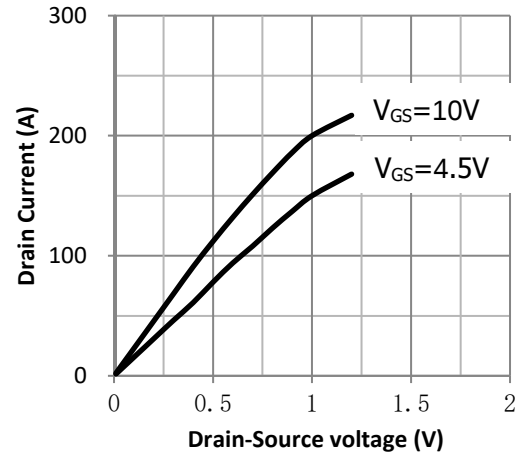


Fig.3 Threshold Voltage V.S Junction Temperature

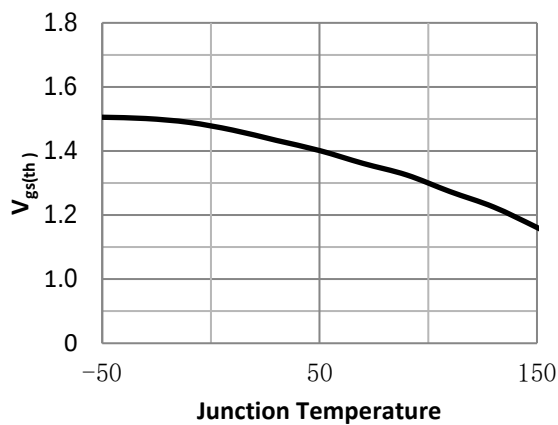


Fig.4 Resistance V.S Drain Current

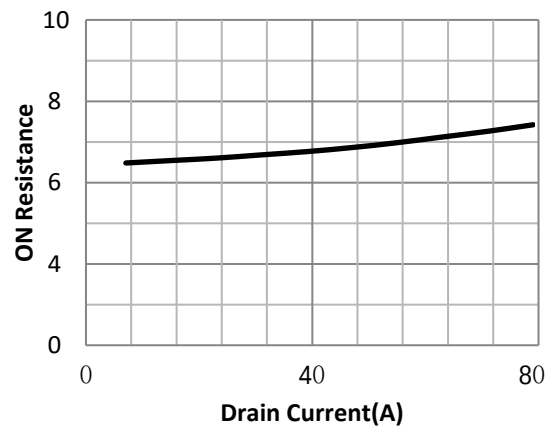


Fig.5 On-Resistance VS Drain Current

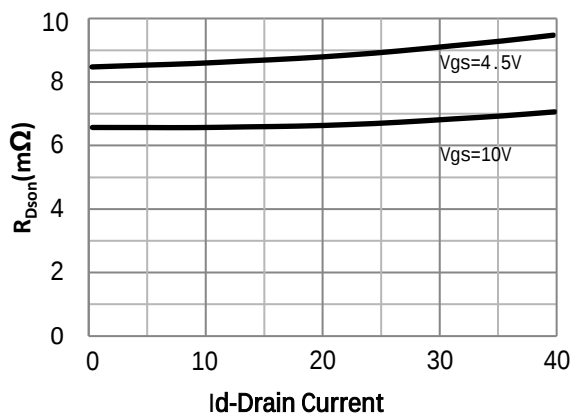


Fig.6 On-Resistance V.S Junction Temperature

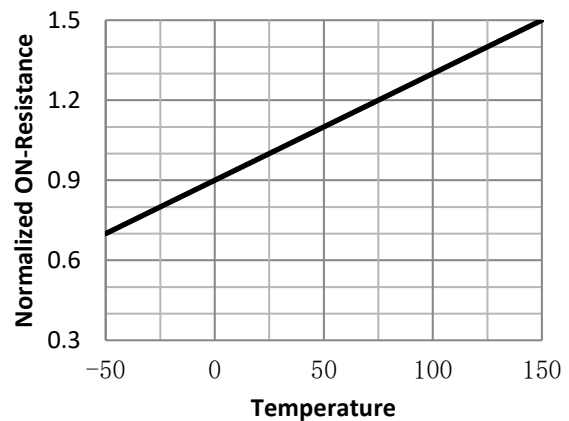


Fig.7 Switching Time Measurement Circuit

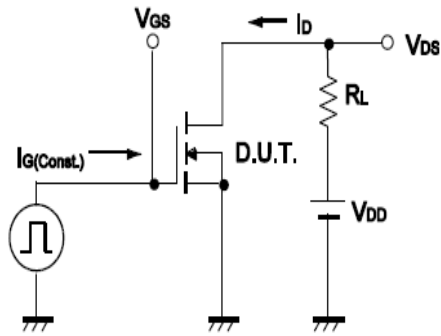


Fig.8 Gate Charge Waveform

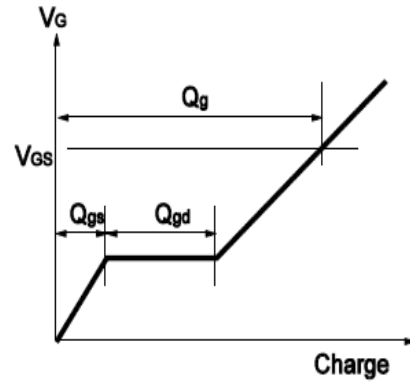


Fig.9 Switching Time Measurement Circuit

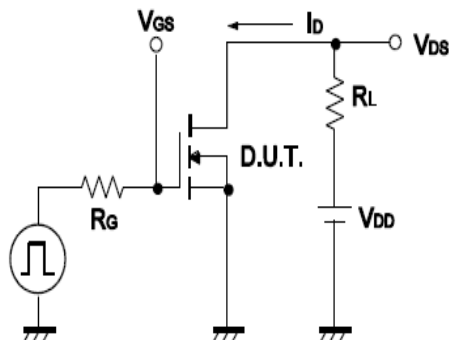


Fig.10 Gate Charge Waveform

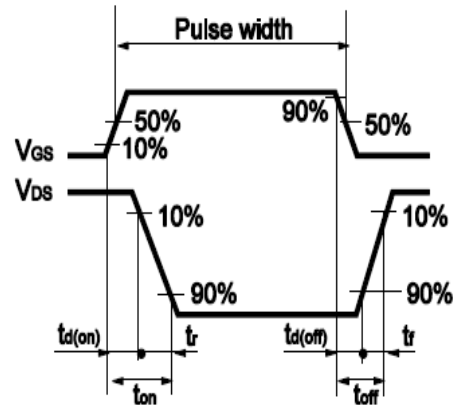


Fig.11 Avalanche Measurement Circuit

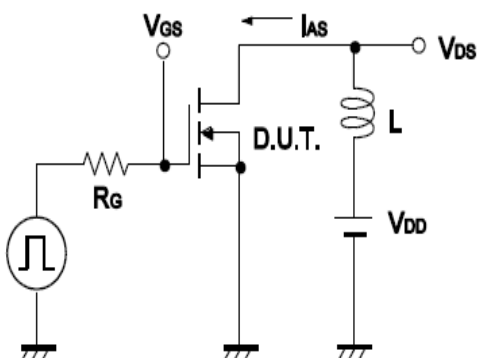
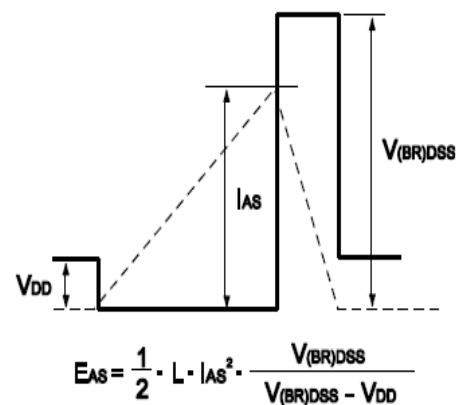
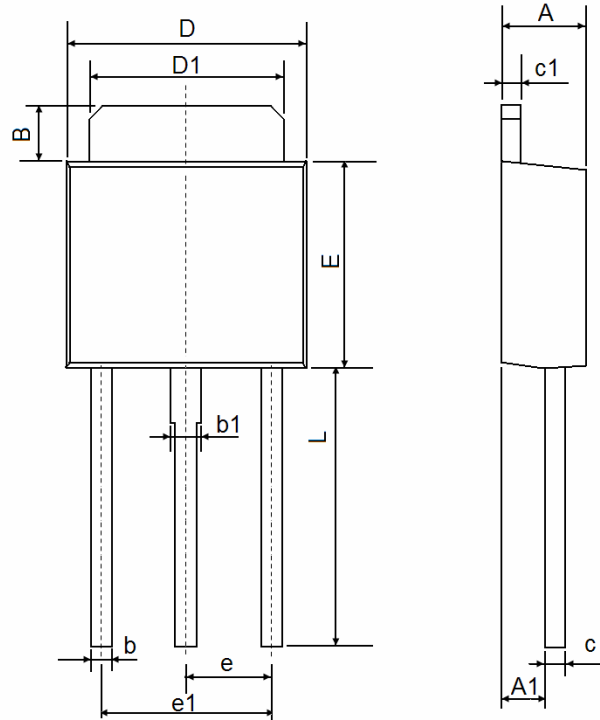


Fig.12 Avalanche Waveform



## Package Information

TO-251



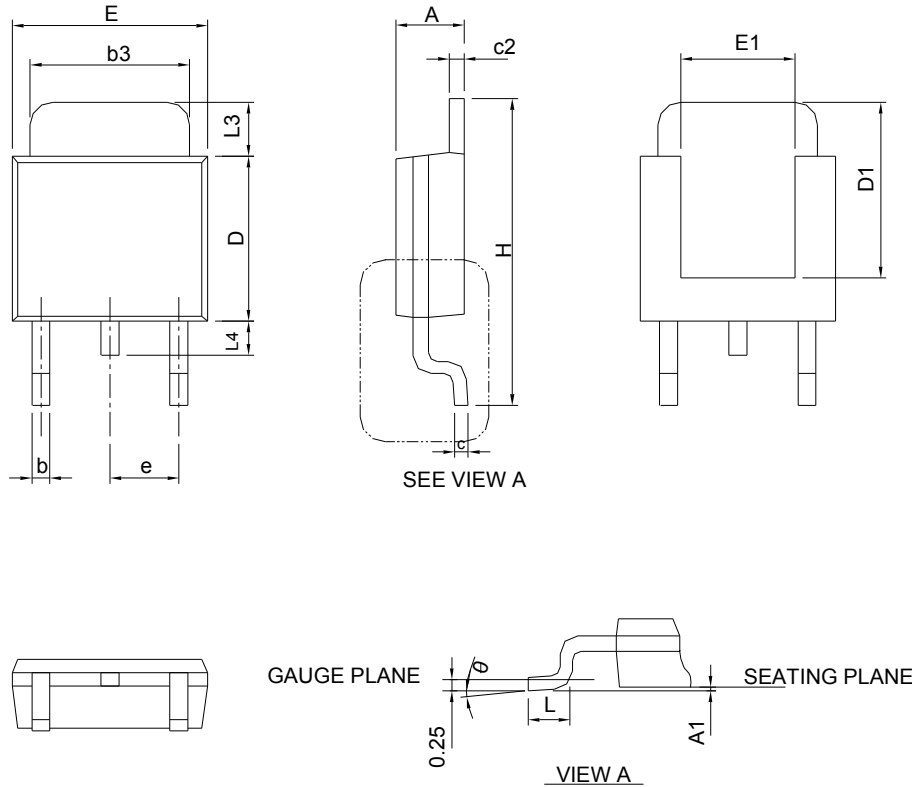
| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 2.200                     | 2.400 | 0.087                | 0.094 |
| A1     | 1.050                     | 1.350 | 0.042                | 0.054 |
| B      | 0.700                     | 1.000 | 0.028                | 0.040 |
| b      | 0.500                     | 0.700 | 0.020                | 0.028 |
| b1     | 0.700                     | 0.900 | 0.028                | 0.035 |
| c      | 0.430                     | 0.580 | 0.017                | 0.023 |
| c1     | 0.430                     | 0.580 | 0.017                | 0.023 |
| D      | 6.350                     | 6.650 | 0.250                | 0.262 |
| D1     | 5.200                     | 5.400 | 0.205                | 0.213 |
| E      | 5.400                     | 6.000 | 0.213                | 0.237 |
| e      | 2.300 TYP.                |       | 0.091 TYP.           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 4.900                     | 9.400 | 0.194                | 0.372 |

### Notes

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact

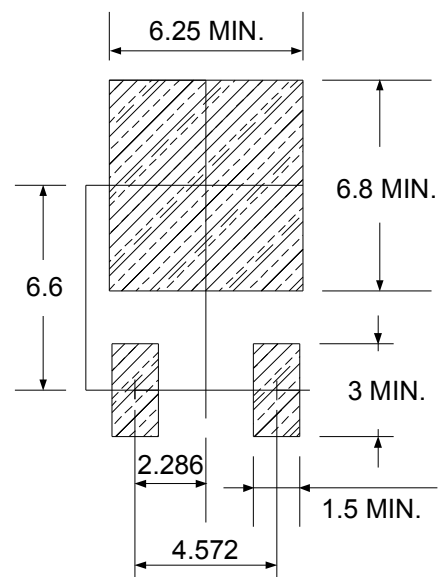
## Package Information

TO-252



| DIMENSIONS | TO-252      |       |           |       |
|------------|-------------|-------|-----------|-------|
|            | MILLIMETERS |       | INCHES    |       |
|            | MIN.        | MAX.  | MIN.      | MAX.  |
| A          | 2.18        | 2.39  | 0.086     | 0.094 |
| A1         |             | 0.13  |           | 0.005 |
| b          | 0.50        | 0.89  | 0.020     | 0.035 |
| b3         | 4.95        | 5.46  | 0.195     | 0.215 |
| c          | 0.46        | 0.61  | 0.018     | 0.024 |
| c2         | 0.46        | 0.89  | 0.018     | 0.035 |
| D          | 5.33        | 6.22  | 0.210     | 0.245 |
| D1         | 4.57        | 6.00  | 0.180     | 0.236 |
| E          | 6.35        | 6.73  | 0.250     | 0.265 |
| E1         | 3.81        | 6.00  | 0.150     | 0.236 |
| e          | 2.29 BSC    |       | 0.090 BSC |       |
| H          | 9.40        | 10.41 | 0.370     | 0.410 |
| L          | 0.90        | 1.78  | 0.035     | 0.070 |
| L3         | 0.89        | 2.03  | 0.035     | 0.080 |
| L4         |             | 1.02  |           | 0.040 |
| $\theta$   | 0°          | 8°    | 0°        | 8°    |

### RECOMMENDED LAND PATTERN



UNIT: mm