

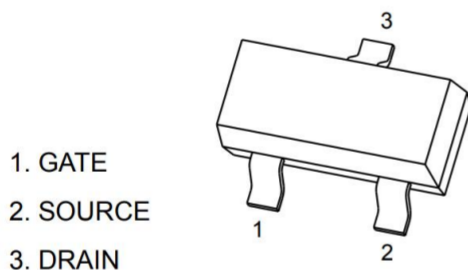
### Product Summary

- $V_{DS}$  -12 V
- $I_{DS}$  -4.1 A
- $R_{DS(ON)}$  (at  $V_{GS}=-4.5V$ ) <45m $\Omega$

### Application

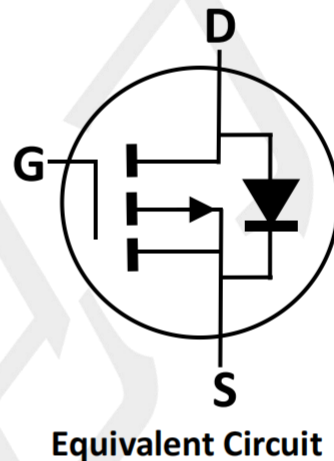
- DC/DC Converter
- Portable equipment and battery
- Load Switch

### Package and Pin Configuration



SOT-23

### Circuit diagram



### Marking : E5TPM

### Absolute Maximum Ratings (T<sub>A</sub>=25°C unless otherwise noted)

| PARAMETER                             | SYMBOL    | LIMIT       | UNIT |
|---------------------------------------|-----------|-------------|------|
| Drain-Source Voltage                  | $V_{DS}$  | -12         | V    |
| Gate-Source Voltage                   | $V_{GS}$  | ±8          | V    |
| Continuous Drain Current              | $I_D$     | -4.1        | A    |
| Continuous Source-Drain Diode Current | $I_S$     | -0.8        | A    |
| Maximum Power Dissipation             | $P_D$     | 0.35        | W    |
| Operating Junction Temperature Range  | $T_J$     | -55 to +150 | °C   |
| Storage Temperature Range             | $T_{stg}$ | -55 to +150 | °C   |

### Thermal Characteristic

| PARAMETER                                          | Symbol          | Value | Unit |
|----------------------------------------------------|-----------------|-------|------|
| Thermal Resistance from Junction to Ambient(t≤10s) | $R_{\theta JA}$ | 357   | °C/W |

Note : When mounted on 1" square PCB (FR4 material).

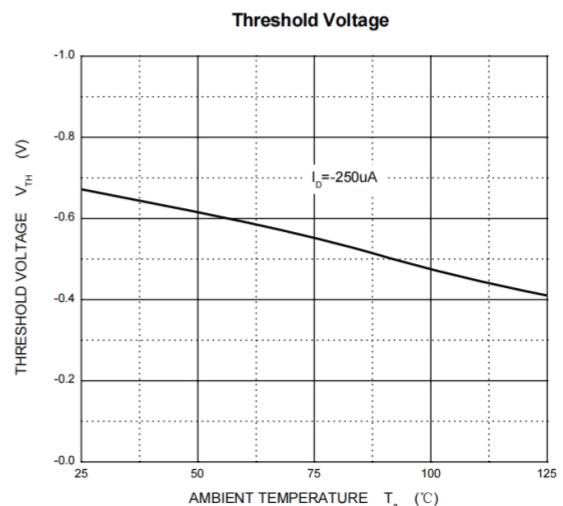
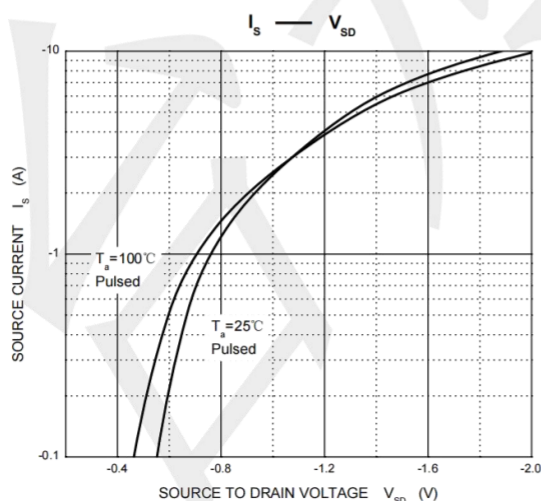
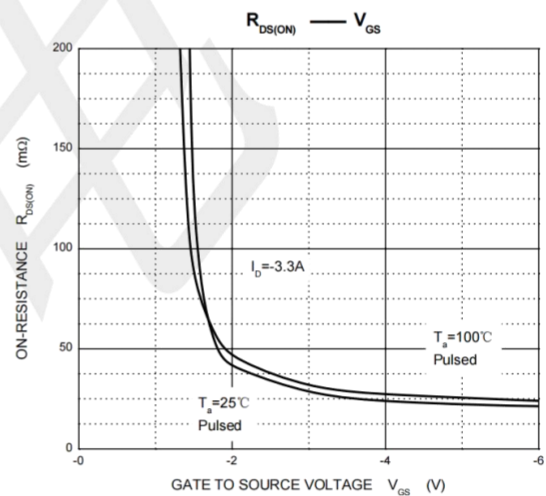
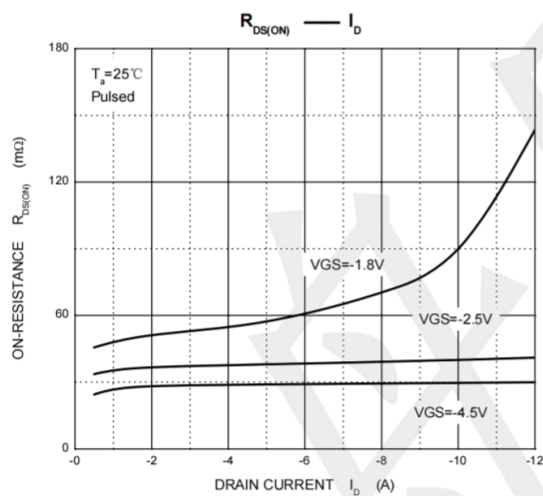
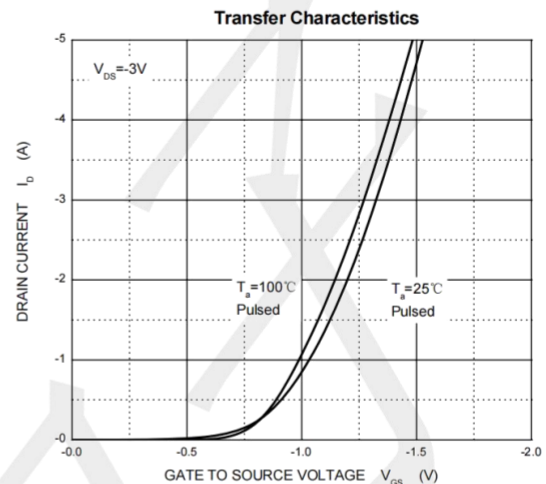
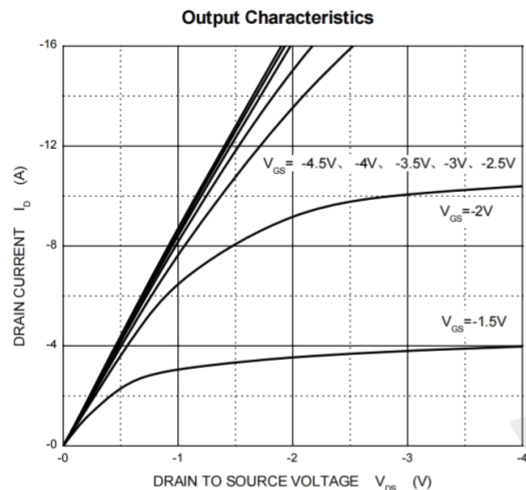
### Electrical Characteristics (T<sub>A</sub>=25 °C unless otherwise noted)

| PARAMETER                                               | CONDITIONS                                                 | SYMBOL              | MIN  | TYP   | MAX  | UNIT |
|---------------------------------------------------------|------------------------------------------------------------|---------------------|------|-------|------|------|
| Static                                                  |                                                            |                     |      |       |      |      |
| Drain-Source Breakdown Voltage                          | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                | BV <sub>DSS</sub>   | -12  | --    | --   | V    |
| Gate-Source Threshold Voltage                           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA | V <sub>GS(th)</sub> | -0.5 | --    | -1.0 | V    |
| Gate-Source Leakage                                     | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±8V                 | I <sub>GSS</sub>    | --   | --    | ±100 | nA   |
| Zero Gate Voltage Drain Current                         | V <sub>DS</sub> = -8V, V <sub>GS</sub> =0V                 | I <sub>DSS</sub>    | --   | -0.1  | -1   | μA   |
|                                                         | V <sub>DS</sub> = -8V, T <sub>J</sub> =125°C               |                     | --   | -10   | -100 | μA   |
| Drain-Source On-State Resistance (Note 1)               | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.5A            | R <sub>DS(on)</sub> | --   | 30    | 45   | mΩ   |
|                                                         | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3.0A            |                     | --   | 40    | 60   |      |
|                                                         | V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2.0A            |                     | --   | 60    | 90   |      |
| Forward Transconductance (Note 2)                       | V <sub>DS</sub> = -5V, I <sub>D</sub> = -4.1A              | g <sub>fs</sub>     | --   | 6     | --   | S    |
| Dynamic (Note 2)                                        |                                                            |                     |      |       |      |      |
| Total Gate Charge (Note 3)                              | V <sub>DS</sub> = -4V,                                     | Q <sub>g</sub>      | --   | 4.5   | --   | nC   |
| Gate-Source Charge (Note 3)                             | I <sub>D</sub> = -4.1A,                                    | Q <sub>gs</sub>     | --   | 1.2   | --   |      |
| Gate-Drain Charge (Note 3)                              | V <sub>GS</sub> = -2.5V                                    | Q <sub>gd</sub>     | --   | 1.6   | --   |      |
| Input Capacitance                                       | V <sub>DS</sub> = -4V, V <sub>GS</sub> = 0V,<br>F = 1.0MHz | C <sub>iss</sub>    | --   | 740   | --   | pF   |
| Output Capacitance                                      |                                                            | C <sub>oss</sub>    | --   | 290   | --   |      |
| Reverse Transfer Capacitance                            |                                                            | C <sub>rss</sub>    | --   | 190   | --   |      |
| Switching                                               |                                                            |                     |      |       |      |      |
| Turn-On Delay Time (Note 3)                             | V <sub>DD</sub> = -4V,                                     | t <sub>d(on)</sub>  | --   | 5     | --   | nS   |
| Rise Time (Note 3)                                      | I <sub>D</sub> = -3.3A,                                    | t <sub>r</sub>      | --   | 11    | --   |      |
| Turn-Off Delay Time (Note 3)                            | V <sub>GS</sub> = -8V,                                     | t <sub>d(off)</sub> | --   | 22    | --   |      |
| Fall Time (Note 3)                                      | R <sub>GEN</sub> = 1Ω                                      | t <sub>f</sub>      | --   | 16    | --   |      |
| Source-Drain Diode Ratings and Characteristics (Note 2) |                                                            |                     |      |       |      |      |
| Forward Voltage                                         | V <sub>GS</sub> = 0V, I <sub>F</sub> = -3.3A               | V <sub>SD</sub>     | --   | -0.76 | -1.2 | V    |
| Continuous Source Current                               | Integral reverse diode in the MOSFET                       | I <sub>S</sub>      | --   | --    | -1.4 | A    |
| Pulsed Current (Note 1)                                 |                                                            | I <sub>SM</sub>     | --   | --    | -8.2 | A    |

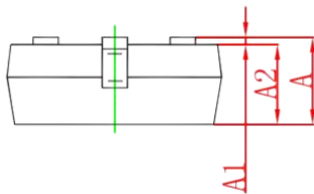
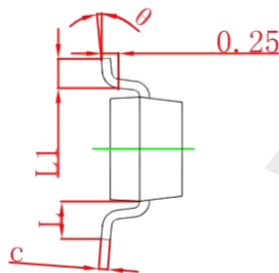
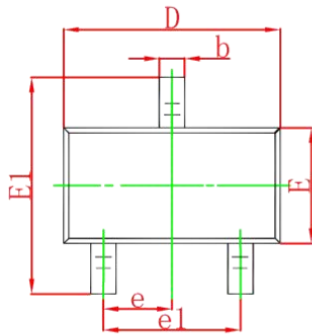
Notes:

1. Pulse test; pulse width ≤ 300 μS, duty cycle ≤ 2%.
2. Guaranteed by design, not subject to production testing.
3. Independent of operating temperature

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

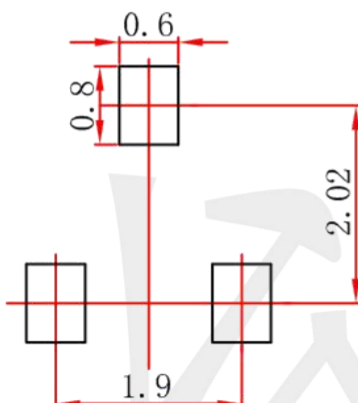


**Package Information SOT-23**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.050 | 0.035                | 0.041 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.800                     | 3.000 | 0.110                | 0.118 |
| E      | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                     | 2.550 | 0.089                | 0.100 |
| e      | 0.950 TYP                 |       | 0.037 TYP            |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.550 REF                 |       | 0.022 REF            |       |
| L1     | 0.300                     | 0.500 | 0.012                | 0.020 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

**Suggested Pad Layout**



**Note:**

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.