



PJT138K

**50V N-Channel Enhancement Mode MOSFET – ESD Protected**

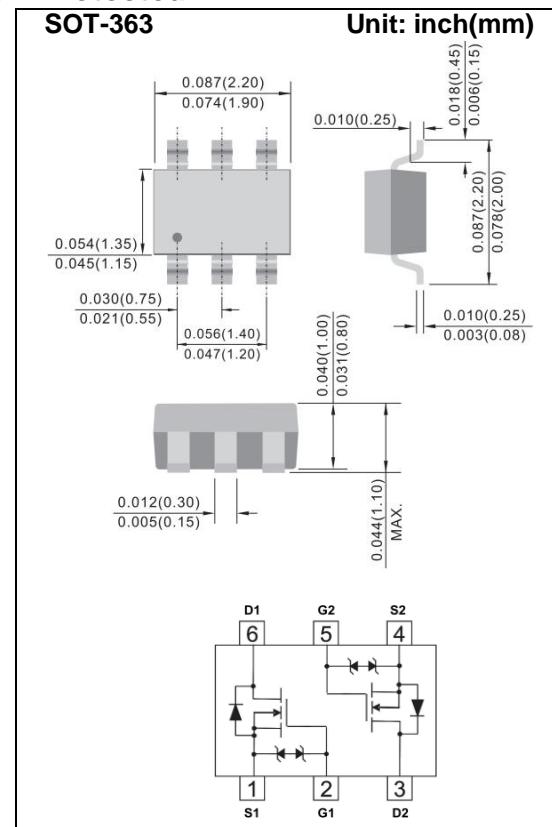
**Voltage** **50 V** **Current** **360mA**

## Features

- RDS(ON) , VGS@10V, ID@500mA<1.6Ω
  - RDS(ON) , VGS@4.5V, ID@200mA<2.5Ω
  - RDS(ON) , VGS@2.5V, ID@100mA<4.5Ω
  - Advanced Trench Process Technology
  - Specially Designed for Battery Operated Systems, Solid-State Relays Drivers: Relay, Displays, Memories, etc.
  - ESD Protected 2kV HBM
  - Lead free in compliance with EU RoHS 2011/65/EU directive
  - Green molding compound as per IEC61249 Std.  
(Halogen Free)

## Mechanical Data

- Case: SOT-363 Package
  - Terminals : Solderable per MIL-STD-750, Method 2026
  - Approx. Weight: 0.00021 ounces, 0.006 grams



#### **Maximum Ratings and Thermal Characteristics** ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| PARAMETER   | SYMBOL                          | LIMIT    | UNITS |                            |
|---|---------------------------------|----------|-------|----------------------------|
| Drain-Source Voltage  | $V_{DS}$                        | 50       | V     |                            |
| Gate-Source Voltage   | $V_{GS}$                        | $\pm 20$ | V     |                            |
| Continuous Drain Current  | $I_D$                           | 360      | mA    |                            |
| Pulsed Drain Current  | $I_{DM}$                        | 1200     | mA    |                            |
| Power Dissipation   | $T_A=25^\circ\text{C}$          | $P_D$    | 236   | mW                         |
|   | Derate above $25^\circ\text{C}$ |          | 1.89  | $\text{mW}/^\circ\text{C}$ |
| Operating Junction and Storage Temperature Range                        | $T_J, T_{STG}$                  | -55~150  | °C    |                            |
| Typical Thermal resistance<br>- Junction to Ambient <sup>(Note 3)</sup> | $R_{\theta JA}$                 | 530      | °C/W  |                            |



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## Electrical Characteristics ( $T_A=25^\circ C$ unless otherwise noted)

| PARAMETER   | SYMBOL       | TEST CONDITION   | MIN. | TYP.      | MAX.     | UNITS    |
|---|--------------|--|------|-----------|----------|----------|
| <b>Static</b>   |              |  |      |           |          |          |
| Drain-Source Breakdown Voltage                        | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$  | 50   | -         | -        | V        |
| Gate Threshold Voltage                                | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$  | 0.8  | 1.0       | 1.5      | V        |
| Drain-Source On-State Resistance                      | $R_{DS(on)}$ | $V_{GS}=10V, I_D=500mA$  | -    | 0.96      | 1.6      | $\Omega$ |
|   |              | $V_{GS}=4.5V, I_D=200mA$   | -    | 1.25      | 2.5      |          |
|   |              | $V_{GS}=2.5V, I_D=100mA$   | -    | 2.73      | 4.5      |          |
| Zero Gate Voltage Drain Current                       | $I_{DSS}$    | $V_{DS}=50V, V_{GS}=0V$  | -    | 0.01      | 1        | $\mu A$  |
| Gate-Source Leakage Current                           | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$  | -    | $\pm 3.0$ | $\pm 10$ | $\mu A$  |
| <b>Dynamic</b>  |              |  |      |           |          |          |
| Total Gate Charge                                     | $Q_g$        | $V_{DS}=25V, I_D=250mA,$<br>$V_{GS}=4.5V$ <small>(Note 1,2)</small>                  | -    | 0.63      | 1        | nC       |
| Gate-Source Charge                                    | $Q_{gs}$     |  | -    | 0.2       | -        |          |
| Gate-Drain Charge                                     | $Q_{gd}$     |  | -    | 0.23      | -        |          |
| Input Capacitance                                     | $C_{iss}$    | $V_{DS}=25V, V_{GS}=0V,$<br>$f=1.0MHz$   | -    | 25        | 50       | pF       |
| Output Capacitance                                    | $C_{oss}$    |  | -    | 9.5       | 20       |          |
| Reverse Transfer Capacitance                          | $C_{rss}$    |  | -    | 2.1       | 5        |          |
| <b>Switching</b>                                      |              |  |      |           |          |          |
| Turn-On Delay Time                                    | $t_{d(on)}$  | $V_{DD}=25V, I_D=500mA,$<br>$V_{GS}=10V,$<br>$R_G=6\Omega$ <small>(Note 1,2)</small> | -    | 2.2       | 5        | ns       |
| Turn-On Rise Time                                     | $t_r$        |  | -    | 19.2      | 38       |          |
| Turn-Off Delay Time                                   | $t_{d(off)}$ |  | -    | 6.2       | 12       |          |
| Turn-Off Fall Time                                    | $t_f$        |  | -    | 23        | 50       |          |
| <b>Drain-Source Diode</b>                             |              |  |      |           |          |          |
| Maximum Continuous Drain-Source Diode Forward Current | $I_s$        | ---  | -    | -         | 500      | mA       |
| Diode Forward Voltage                                 | $V_{SD}$     | $I_s=500mA, V_{GS}=0V$   | -    | 0.86      | 1.5      | V        |

### NOTES:

1. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$
2. Essentially independent of operating temperature typical characteristics.
3.  $R_{OJA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. mounted on a 1 inch square pad of copper



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## TYPICAL CHARACTERISTIC CURVES

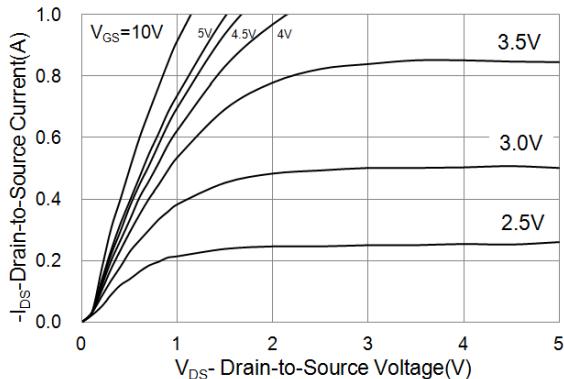


Fig.1 On-Region Characteristics

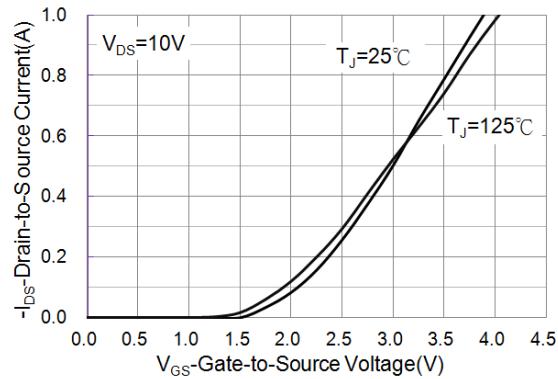


Fig.2 Transfer Characteristics

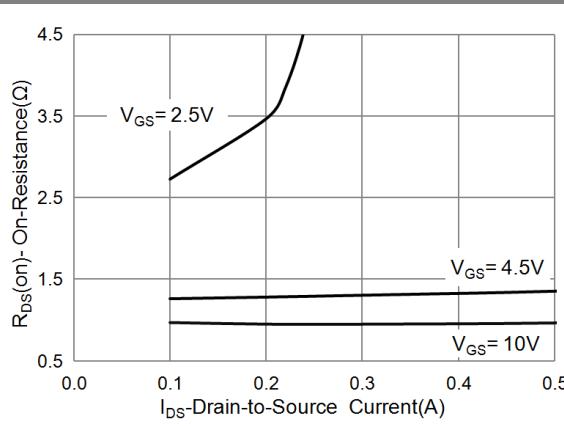


Fig.3 On-Resistance vs. Drain Current

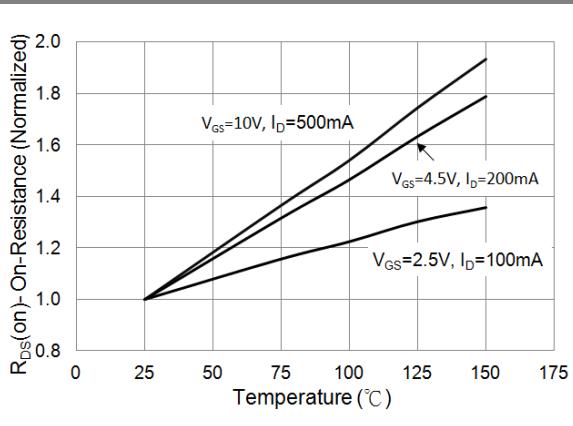


Fig.4 On-Resistance vs. Junction temperature

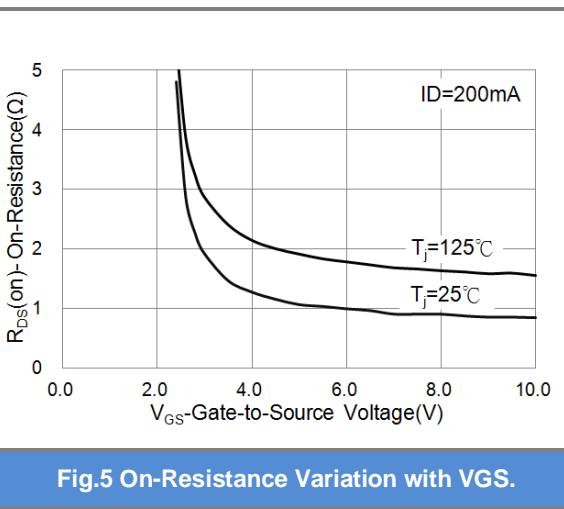


Fig.5 On-Resistance Variation with VGS.

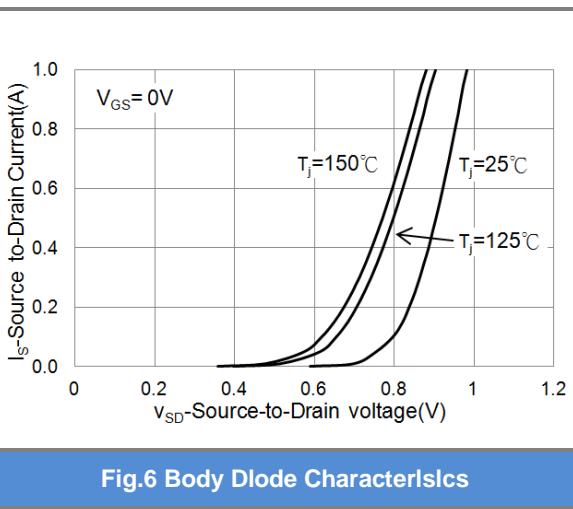


Fig.6 Body Diode Characteristics



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## TYPICAL CHARACTERISTIC CURVES

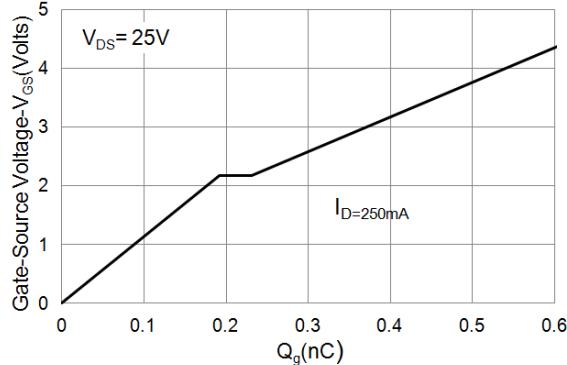


Fig.7 Gate-Charge Characteristics

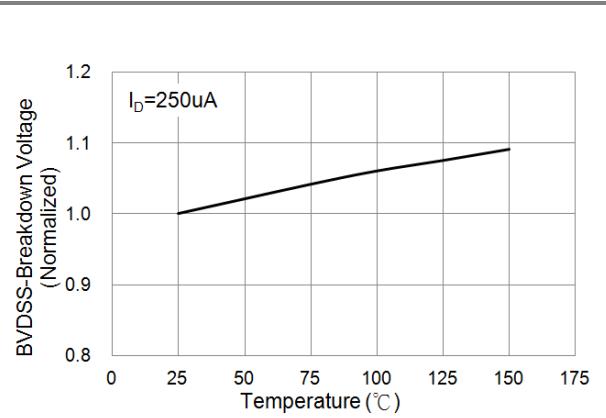


Fig.8 Breakdown Voltage Variation vs. Temperature

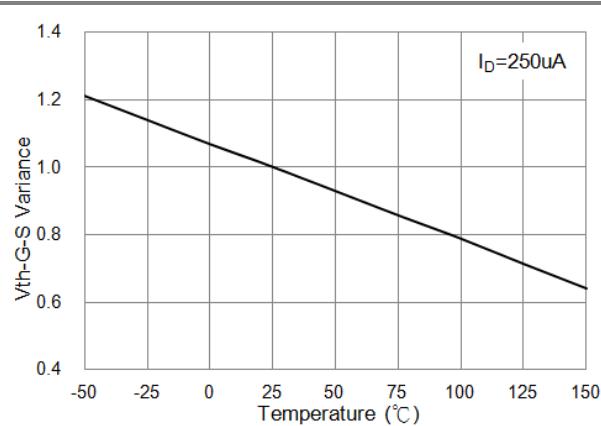


Fig.9 Threshold Voltage Variation with Temperature.

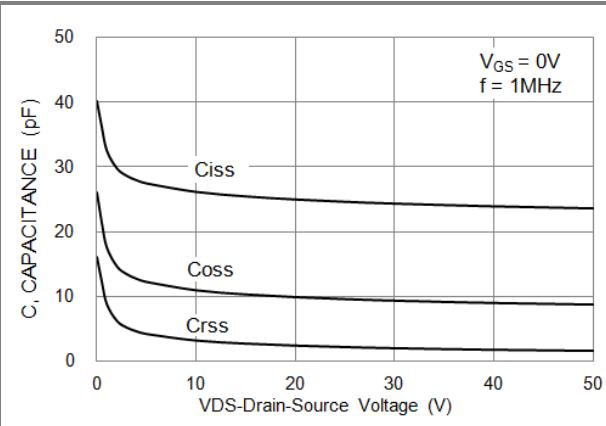


Fig.10 Capacitance vs. Drain-Source Voltage.

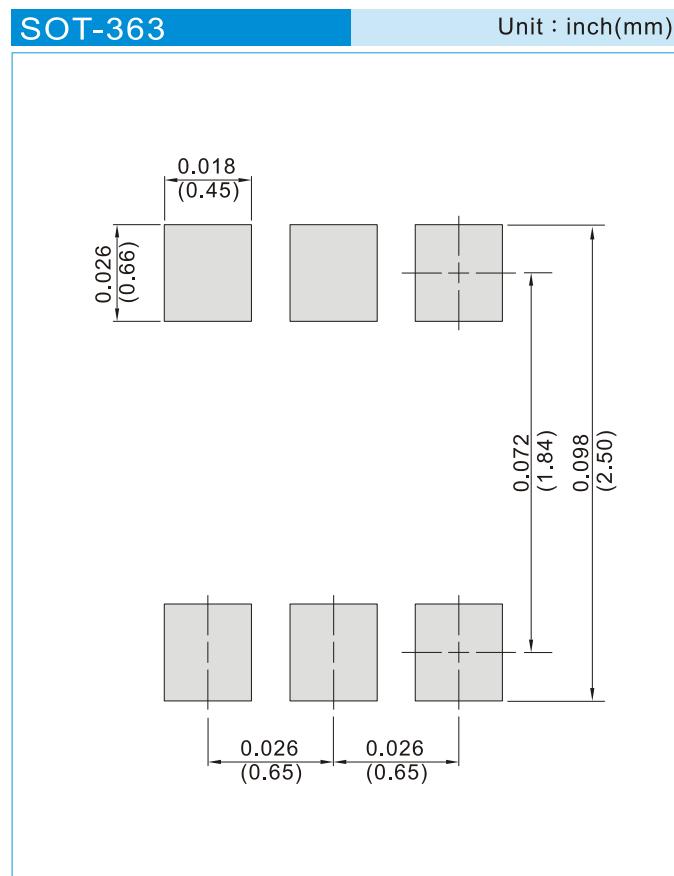


# PJT138K

## PART NO PACKING CODE VERSION

| PART NO PACKING<br>CODE VERSION | Package Type | Packing type       | Marking | Version      |
|---------------------------------|--------------|--------------------|---------|--------------|
| PJT138K_R1_00001                | SOT-363      | 3K pcs / 7" reel   | 8KD     | Halogen free |
| PJT138K_R2_00001                | SOT-363      | 10K pcs / 13" reel | 8KD     | Halogen free |

## MOUNTING PAD LAYOUT





## PJT138K

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