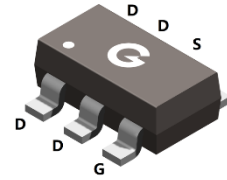
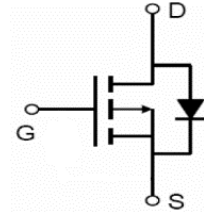


## Features

- Advanced trench technology
- Low on-resistance
- Fast switching speed
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

HF



SOT-23-6L

## Mechanical Data

- Case: SOT-23-6L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208

## Ordering Information

| Part Number  | Package   | Shipping Quantity      | Marking Code |
|--------------|-----------|------------------------|--------------|
| TBL600P04-6L | SOT-23-6L | 3000 pcs / Tape & Reel | 600P04       |

## Maximum Ratings (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                                                                 | Symbol    | Value      | Unit             |
|---------------------------------------------------------------------------|-----------|------------|------------------|
| Drain-to-Source Voltage                                                   | $V_{DS}$  | -40        | V                |
| Gate-to-Source Voltage                                                    | $V_{GS}$  | $\pm 20$   | V                |
| Continuous Drain Current ( $T_C = 25^\circ\text{C}$ )                     | $I_D$     | -7         | A                |
| Continuous Drain Current ( $T_A = 25^\circ\text{C}$ ) <sup>*1</sup>       |           | -4.2       | A                |
| Continuous Drain Current ( $T_A = 70^\circ\text{C}$ ) <sup>*1</sup>       |           | -3.3       | A                |
| Pulsed Drain Current ( $t_p = 10\mu\text{s}$ , $T_A = 25^\circ\text{C}$ ) | $I_{DM}$  | -40        | A                |
| Single Pulse Avalanche Energy <sup>*3</sup>                               | $E_{AS}$  | 20         | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )                            | $P_D$     | 5          | W                |
| Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>*1</sup>              |           | 1.8        | W                |
| Operating Junction Temperature Range                                      | $T_J$     | -55 ~ +150 | $^\circ\text{C}$ |
| Storage Temperature Range                                                 | $T_{STG}$ | -55 ~ +150 | $^\circ\text{C}$ |

## Thermal Characteristics

| Parameter                                        | Symbol          | Min. | Typ. | Max. | Unit               |
|--------------------------------------------------|-----------------|------|------|------|--------------------|
| Thermal Resistance Junction-to-Case              | $R_{\theta JC}$ | -    | -    | 25   | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-to-Air <sup>*1</sup> | $R_{\theta JA}$ | -    | -    | 70   | $^\circ\text{C/W}$ |

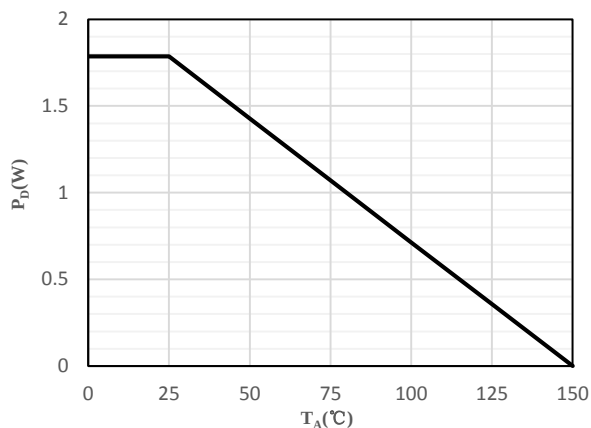
### Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol                             | Parameter                       | Test Condition                                              | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------------------|-------------------------------------------------------------|------|------|------|------|
| Static Characteristics             |                                 |                                                             |      |      |      |      |
| V <sub>DS</sub>                    | Drain-Source Breakdown Voltage  | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA               | -40  | -    | -    | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current | V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V                | -    | -    | -1   | μA   |
| I <sub>GSS</sub>                   | Gate-Body Leakage Current       | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                | -    | -    | ±100 | nA   |
| On Characteristics                 |                                 |                                                             |      |      |      |      |
| R <sub>DS(ON)</sub>                | Drain-Source On-resistance *2   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A                | -    | 50   | 60   | mΩ   |
|                                    |                                 | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A               | -    | 60   | 75   | mΩ   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage          | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA | -1   | -1.5 | -2.5 | V    |
| R <sub>G</sub>                     | Gate Resistance                 | V <sub>GS</sub> = 0V, f = 1MHz                              | -    | 7.5  | -    | Ω    |
| Dynamic Characteristics            |                                 |                                                             |      |      |      |      |
| C <sub>ISS</sub>                   | Input Capacitance               | V <sub>GS</sub> = 0V                                        | -    | 882  | -    | pF   |
| C <sub>OSS</sub>                   | Output Capacitance              | V <sub>DS</sub> = -20V                                      | -    | 70   | -    |      |
| C <sub>RSS</sub>                   | Reverse Transfer Capacitance    | f = 1.0MHz                                                  | -    | 60   | -    |      |
| Switching Characteristics          |                                 |                                                             |      |      |      |      |
| t <sub>d(ON)</sub>                 | Turn-on Delay Time *4           | V <sub>GS</sub> = -10V                                      | -    | 7.2  | -    | ns   |
| t <sub>r</sub>                     | Turn-on Rise Time *4            | V <sub>DD</sub> = -20V                                      | -    | 14   | -    |      |
| t <sub>d(OFF)</sub>                | Turn-Off Delay Time *4          | I <sub>D</sub> = -5A                                        | -    | 21   | -    |      |
| t <sub>f</sub>                     | Turn-Off Fall Time *4           | R <sub>G</sub> = 2.5Ω                                       | -    | 8.1  | -    |      |
| Q <sub>G</sub>                     | Total Gate-Charge               | V <sub>DD</sub> = -20V                                      | -    | 19.3 | -    | nC   |
| Q <sub>GS</sub>                    | Gate to Source Charge           | V <sub>GS</sub> = -10V                                      | -    | 3    | -    |      |
| Q <sub>GD</sub>                    | Gate to Drain (Miller) Charge   | I <sub>D</sub> = -5A                                        | -    | 2.9  | -    |      |
| Source-Drain Diode Characteristics |                                 |                                                             |      |      |      |      |
| V <sub>SD</sub>                    | Diode Forward Voltage *2        | I <sub>SD</sub> = -5A, V <sub>GS</sub> = 0V                 | -    | -0.9 | -1.2 | V    |
| t <sub>rr</sub>                    | Reverse Recovery Time           | I <sub>S</sub> = -5A, V <sub>GS</sub> = 0V                  | -    | 35   | -    | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge         | di/dt = 100A/μs                                             | -    | 22   | -    | nC   |

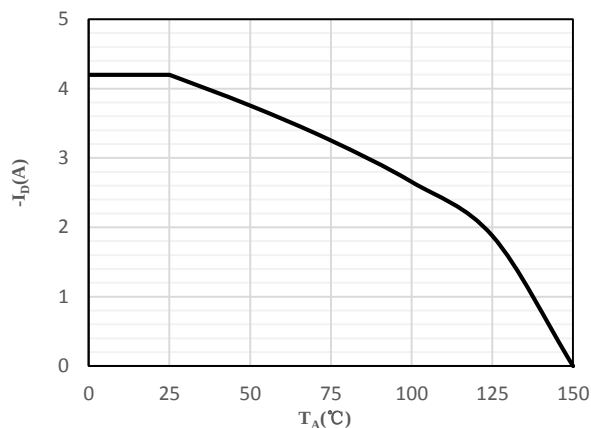
Notes:

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The  $E_{AS}$  data shows Max. rating. The test condition is  $V_{DD} = -20V, V_{GS} = -10V, L = 0.5mH$
- Guaranteed by design, not subject to production

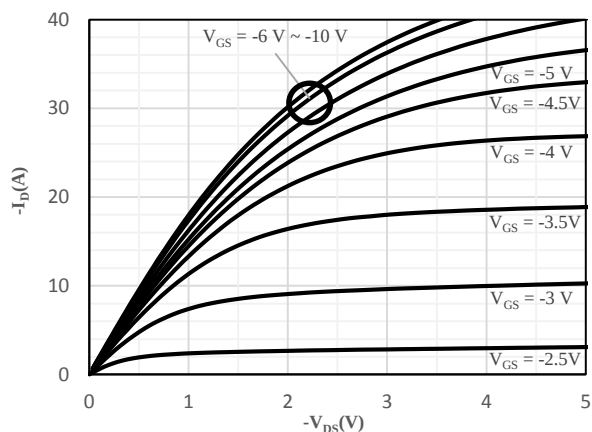
**Ratings and Characteristics Curves** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



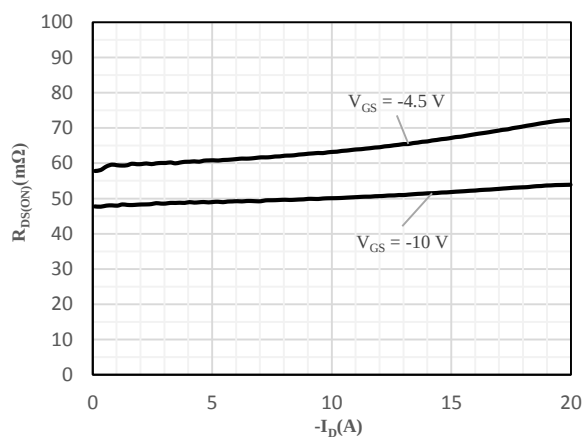
**Fig 1 Power Dissipation**



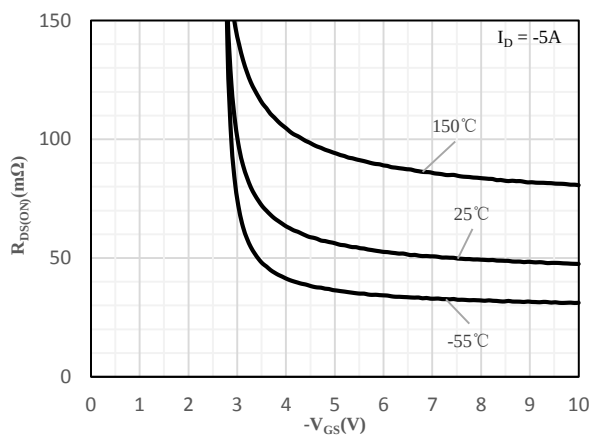
**Fig 2 Drain Current**



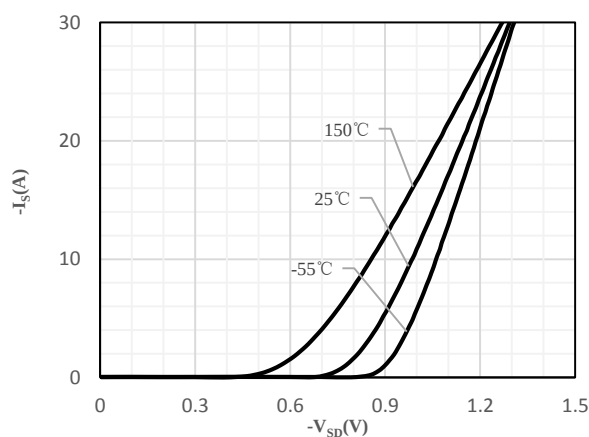
**Fig 3 Typical Output Characteristics**



**Fig 4 On-Resistance vs. Drain Current and Gate Voltage**



**Fig 5 On-Resistance vs. Gate-Source Voltage**



**Fig 6 Body-Diode Characteristics**

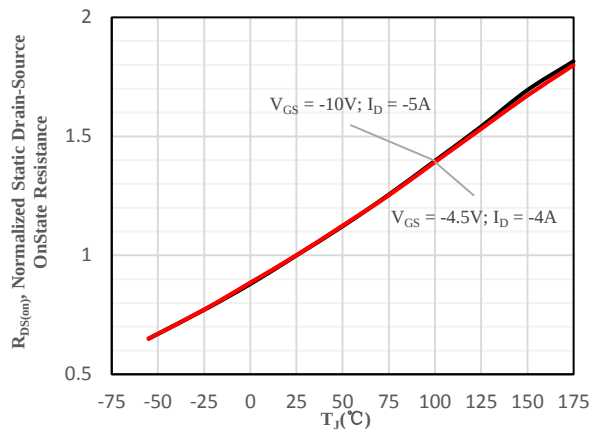


Fig 7 Normalized On-Resistance vs. Junction Temperature

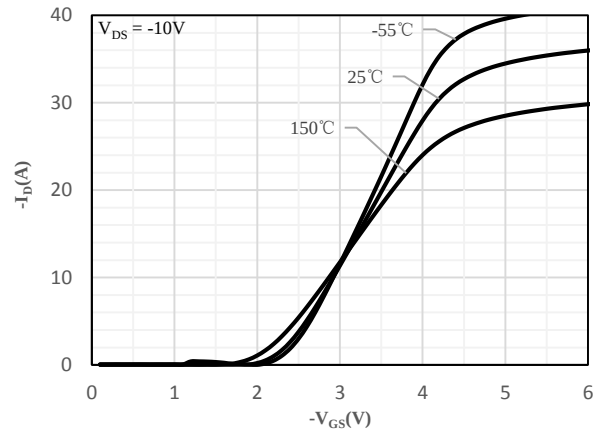


Fig 8 Transfer Characteristics

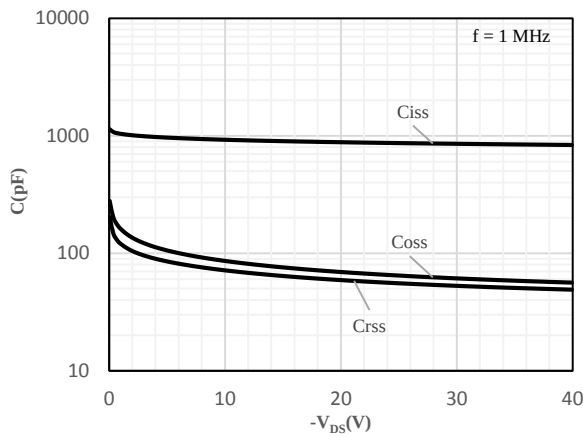


Fig 9 Capacitance Characteristics

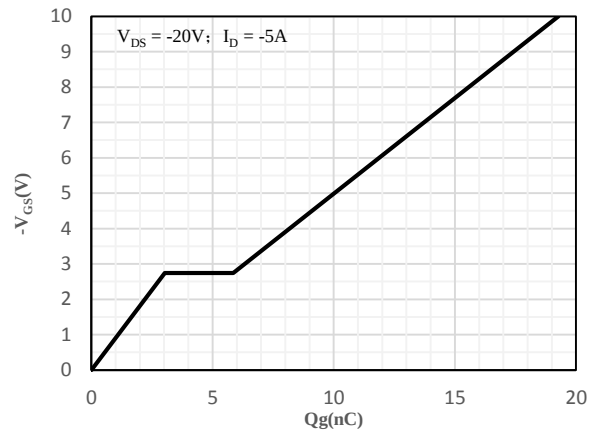


Fig 10 Gate-Charge Characteristics

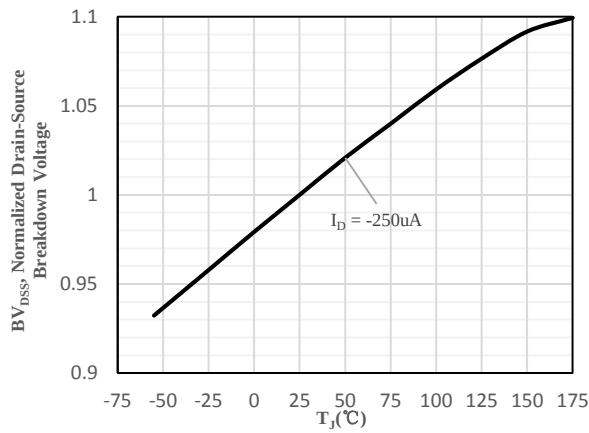


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

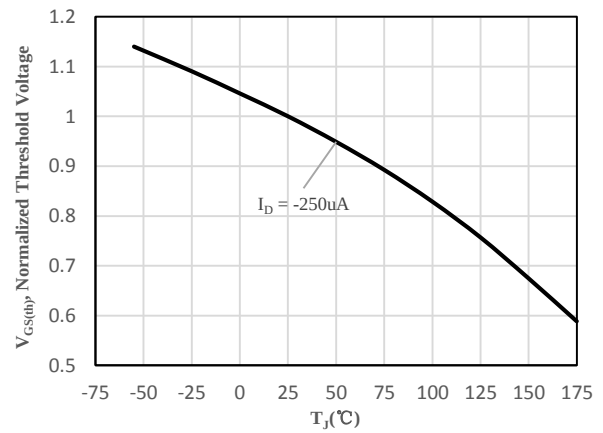
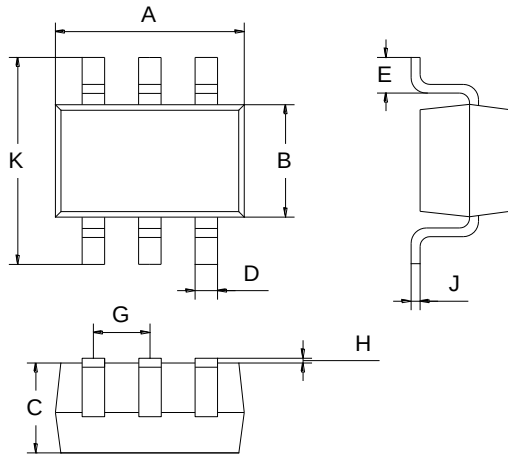


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

**Package Outline Dimensions** (Unit: mm)



| SOT-23-6L |      |      |
|-----------|------|------|
| Dimension | Min. | Max. |
| A         | 2.80 | 3.00 |
| B         | 1.50 | 1.70 |
| C         | 1.00 | 1.20 |
| D         | 0.35 | 0.45 |
| E         | 0.35 | 0.55 |
| G         | 0.90 | 1.00 |
| H         | 0.02 | 0.10 |
| J         | 0.10 | 0.20 |
| K         | 2.60 | 3.00 |

**Mounting Pad Layout** (Unit: mm)

**SOT-23-6L**

