

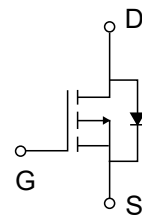
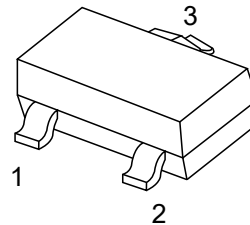
## 1.1 Features

- $V_{DS(V)} = -12V$
- $R_{DS(ON)} < 50m\Omega (V_{GS} = -4.5V)$
- $R_{DS(ON)} < 85m\Omega (V_{GS} = -2.5V)$
- $R_{DS(ON)} < 125m\Omega (V_{GS} = -1.8V)$

## 2. Pinning information

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | G      | GATE        |
| 2   | S      | SOURCE      |
| 3   | D      | DRAIN       |

### SOT-23



## 3. Maximum ratings ( $T_A = 25^\circ C$ unless otherwise noted)

| Parameter                                       |                      | Symbol          | Value | Units |
|-------------------------------------------------|----------------------|-----------------|-------|-------|
| Drain-Source Voltage                            |                      | V <sub>DS</sub> | -12   | V     |
| Gate-Source Voltage                             |                      | V <sub>GS</sub> | ±8    |       |
| Continuous Drain Current, V <sub>GS</sub> =4.5V | T <sub>A</sub> =25°C | I <sub>D</sub>  | -4.3  | A     |
| Continuous Drain Current, V <sub>GS</sub> =4.5V | T <sub>A</sub> =70°C |                 | -3.4  |       |
| Pulsed Drain Current <sup>a</sup>               |                      | I <sub>DM</sub> | -34   |       |
| Power Dissipation                               | T <sub>A</sub> =25°C | P <sub>D</sub>  | 1.3   | W     |
| Power Dissipation                               | T <sub>A</sub> =70°C |                 | 0.8   |       |
| Single Pulse Avalanche Energy <sup>b</sup>      |                      | E <sub>AS</sub> | 33    | mJ    |



|                                         |            |            |      |
|-----------------------------------------|------------|------------|------|
| Thermal Resistance.Junction- to-Ambient | $R_{thJA}$ | 100        | °C/W |
| Linera Derating Factor                  |            | 0.01       | W/°C |
| Junction Temperature                    | $T_J$      | 150        | °C   |
| Junction and Storage Temperature Range  | $T_{STG}$  | -55 to 150 |      |

Notes:

- a.Repetitive Rating :Pulse width limited by maximum junction temperature.
- b.Starting  $T_J=25^{\circ}\text{C}$ ,  $L=3.5\text{mH}$ ,  $R_G=25\Omega$ ,  $I_{AS}=-4.3\text{A}$ .

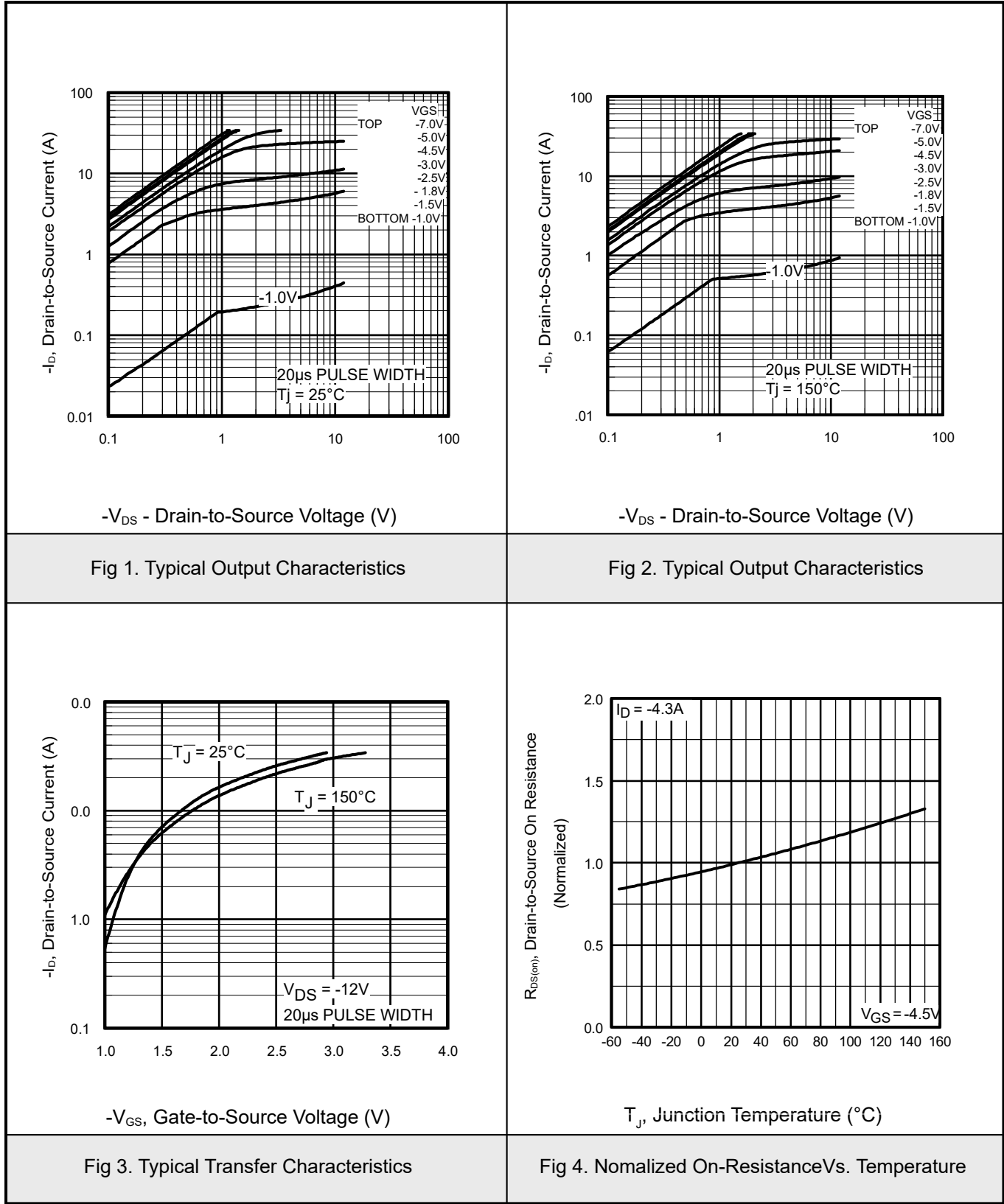


#### 4. Electrical Characteristics $T_A=25^\circ\text{C}$

| Parameter                             | Symbol       | Conditions                                                                   | Min  | Typ   | Max       | Units         |
|---------------------------------------|--------------|------------------------------------------------------------------------------|------|-------|-----------|---------------|
| Drain-Source Breakdown Voltage        | $V_{DSS}$    | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                                    | -12  |       |           | V             |
| Zero Gate Voltage Drain Current       | $I_{DSS}$    | $V_{DS}=-12\text{V}$ , $V_{GS}=0\text{V}$                                    |      |       | -1        | $\mu\text{A}$ |
|                                       |              | $V_{DS}=-9.6\text{V}$ , $V_{GS}=0\text{V}$ , $T_J=55^\circ\text{C}$          |      |       | -25       |               |
| Gate-Body leakage current             | $I_{GSS}$    | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 8\text{V}$                                  |      |       | $\pm 100$ | nA            |
| Gate Threshold Voltage                | $V_{GS(th)}$ | $V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$                                      | -0.4 | -0.55 | -0.95     | V             |
| Static Drain-Source On-Resistance     | $R_{DS(on)}$ | $V_{GS}=-4.5\text{V}$ , $I_D=-4.3\text{A}$                                   |      |       | 50        | m $\Omega$    |
|                                       |              | $V_{GS}=-2.5\text{V}$ , $I_D=-2.5\text{A}$                                   |      |       | 85        |               |
|                                       |              | $V_{GS}=-1.8\text{V}$ , $I_D=-2\text{A}$                                     |      |       | 125       | m $\Omega$    |
| Forward Transconductance              | $g_{FS}$     | $I_D=-4.3\text{A}$ , $V_{DS}=-10\text{V}$                                    | 8.6  |       |           | S             |
| Input Capacitance                     | $C_{iss}$    | $V_{GS}=0\text{V}$ , $V_{DS}=-10\text{V}$ , $f=1\text{MHz}$                  |      | 830   |           | pF            |
| Output Capacitance                    | $C_{oss}$    |                                                                              |      | 180   |           | pF            |
| Reverse Transfer Capacitance          | $C_{rss}$    |                                                                              |      | 125   |           | pF            |
| Total Gate Charge                     | $Q_g$        | $V_{GS}=-5\text{V}$                                                          |      | 10    | 15        | nC            |
| Gate Source Charge                    | $Q_{gs}$     | $V_{DS}=-10\text{V}$                                                         |      | 1.4   | 2.1       | nC            |
| Gate Drain Charge                     | $Q_{gd}$     | $I_D=-4.3\text{A}$                                                           |      | 2.6   | 3.9       | nC            |
| Turn-On DelayTime                     | $t_{D(on)}$  | $I_D=-1\text{A}$ , $V_{DS}=-6\text{V}$<br>$R_L=6\Omega$ , $R_{GEN}=89\Omega$ |      | 11    |           | ns            |
| Turn-On Rise Time                     | $t_r$        |                                                                              |      | 32    |           | ns            |
| Turn-Off DelayTime                    | $t_{D(off)}$ |                                                                              |      | 250   |           | ns            |
| Turn-Off Fall Time                    | $t_f$        |                                                                              |      | 210   |           | ns            |
| Body Diode Reverse Recovery Time      | $t_{rr}$     | $I_F=-1.3\text{A}$ , $dI/dt=-100\text{A}/\mu\text{s}$                        |      | 22    | 33        | ns            |
| Body Diode Reverse Recovery Charge    | $Q_{rr}$     | $I_F=-1.3\text{A}$ , $dI/dt=-100\text{A}/\mu\text{s}$                        |      | 8     | 12        | nC            |
| Maximum Body-Diode Continuous Current | $I_S$        |                                                                              |      |       | 1.3       | A             |
| Diode Forward Voltage                 | $V_{SD}$     | $I_S=-1.3\text{A}$ , $V_{GS}=0\text{V}$                                      |      |       | -1.2      | V             |

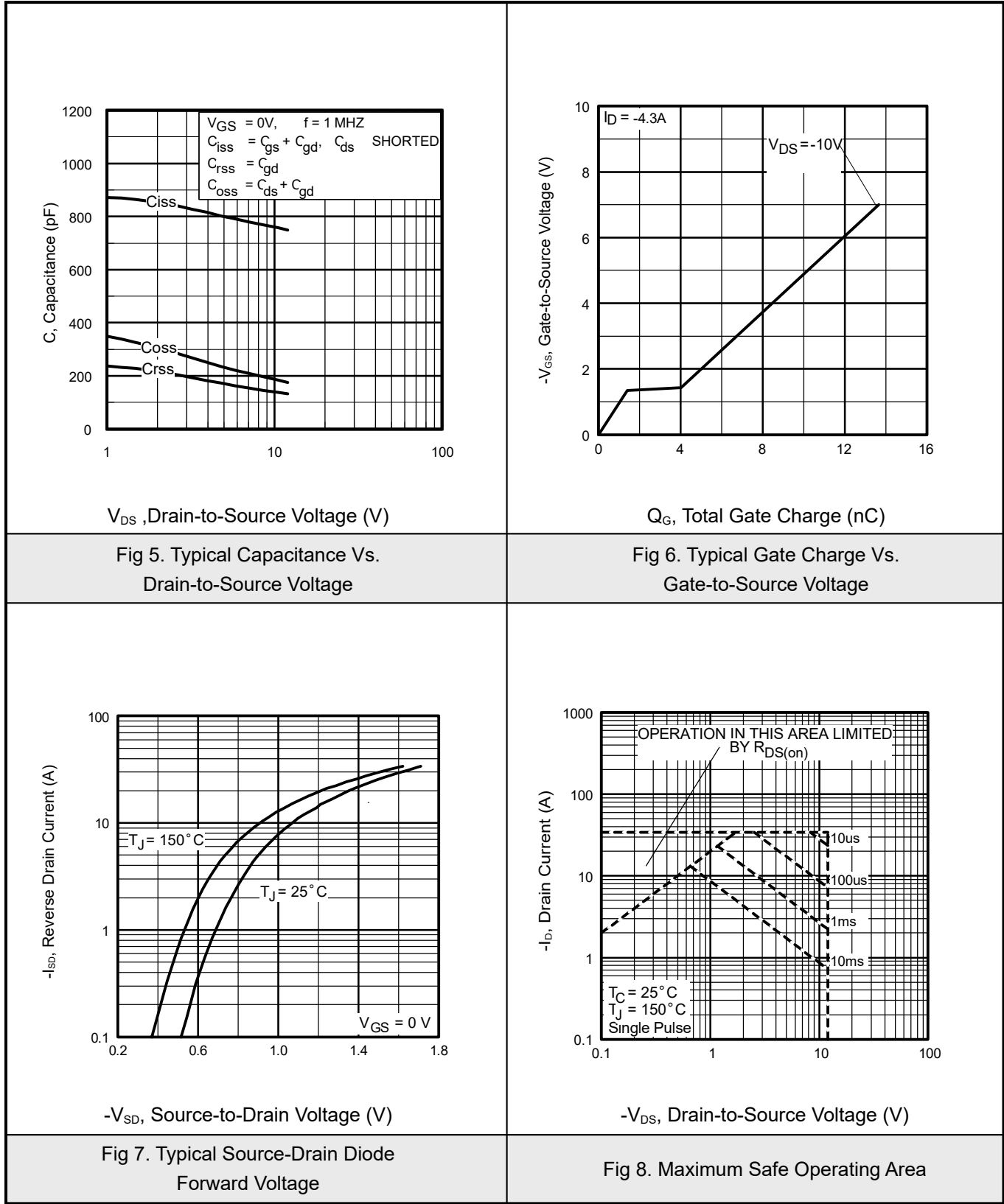


5.1 Typical Characteristics



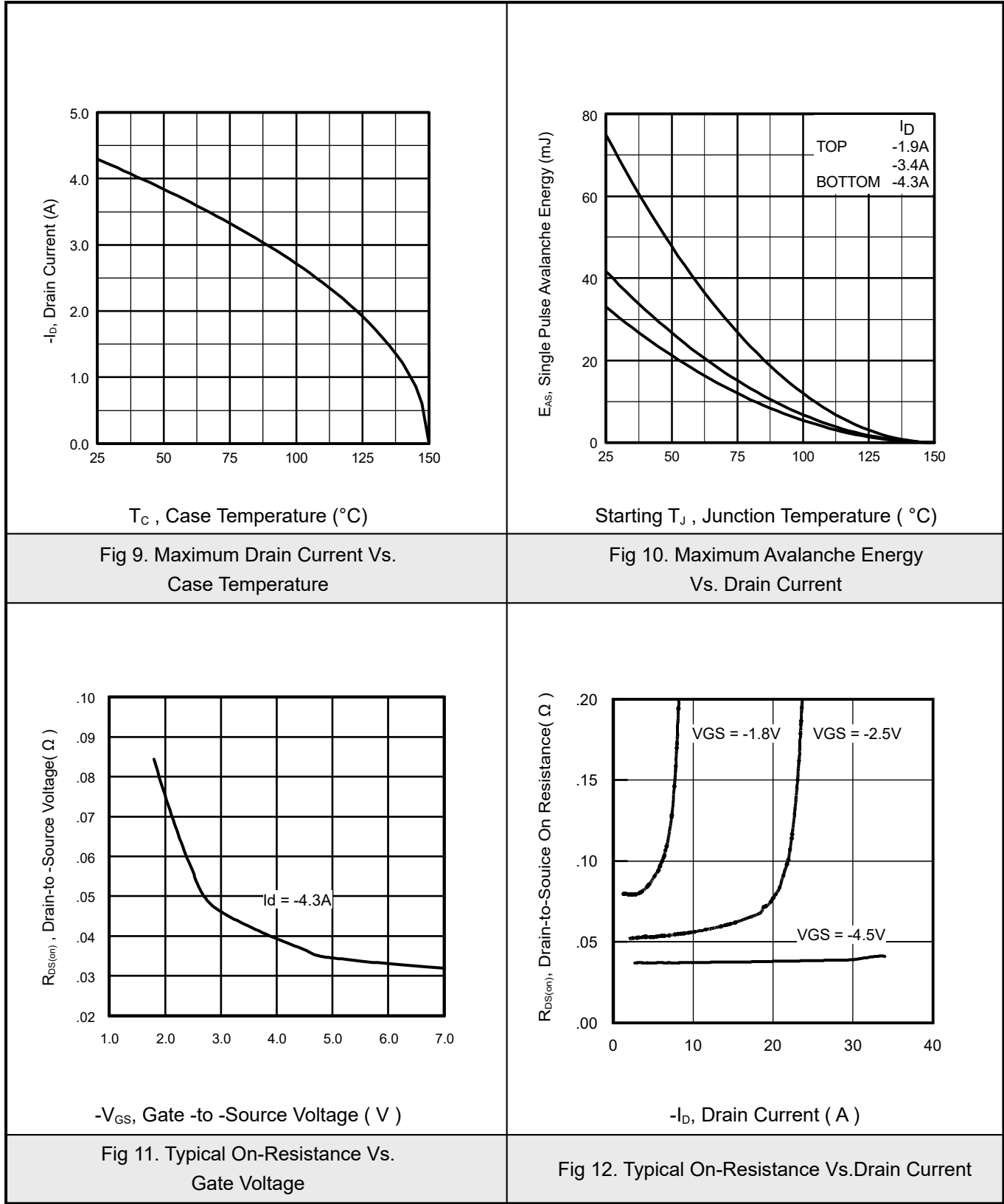


5.2Typical Characteristics





5.3Typical Characterisitics





5.4Typical Characteristics

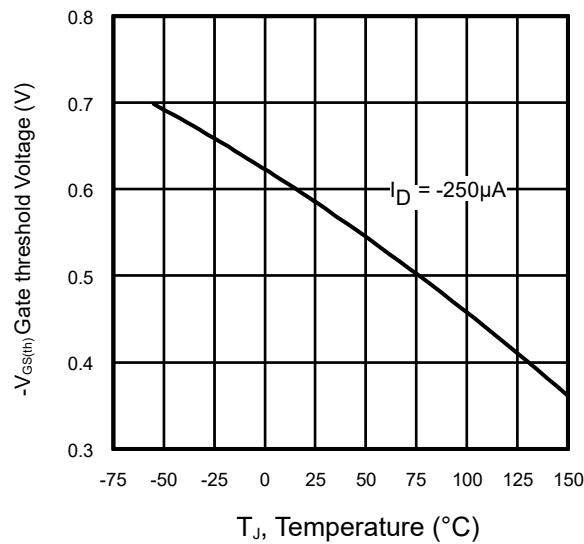


Fig 13. Typical Threshold Voltage Vs. JunctionTemperature

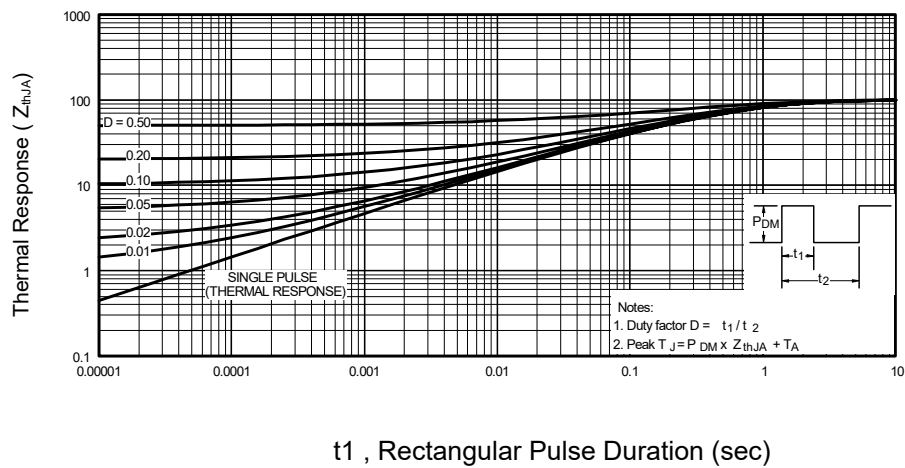
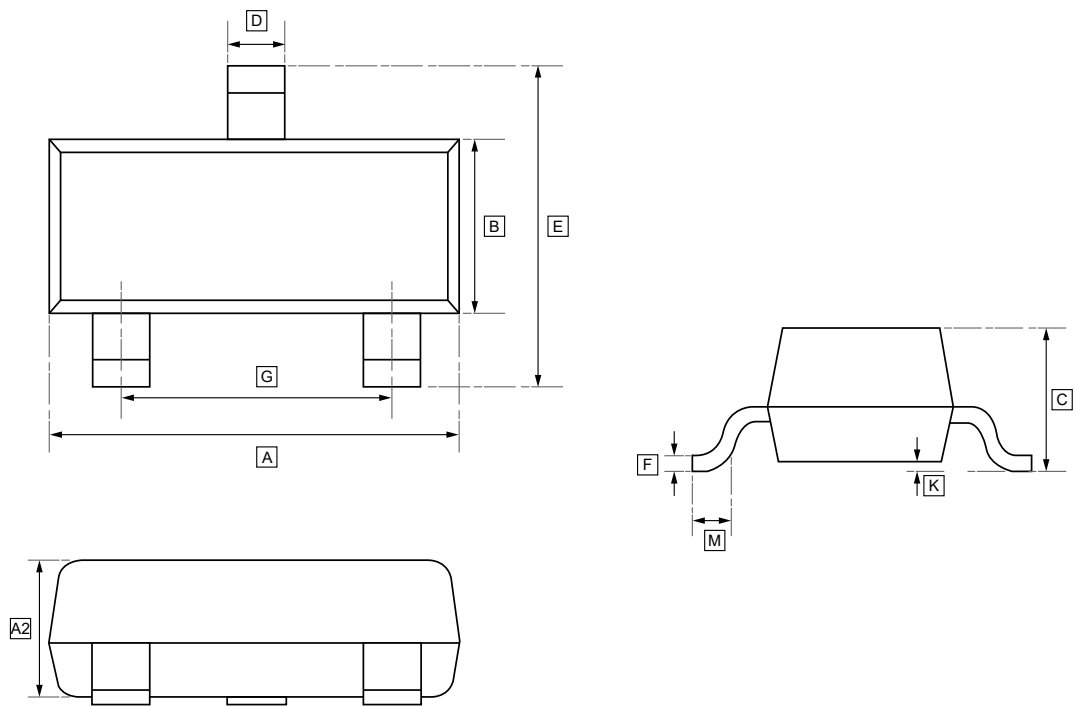


Fig 14. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



6.SOT-23 Package Outline Dimensions

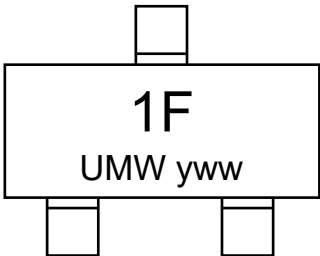


DIMENSIONS (mm are the original dimensions)

| Symbol | A    | B    | C    | D    | E    | G    | K    | M    | A2   | F     |
|--------|------|------|------|------|------|------|------|------|------|-------|
| Min    | 2.85 | 1.20 | 0.90 | 0.40 | 2.25 | 1.80 | 0.00 | 0.30 | 0.95 | 0.095 |
| Max    | 3.04 | 1.40 | 1.10 | 0.50 | 2.55 | 2.00 | 0.10 | -    | 1.05 | 0.115 |



7.Ordering information



yww: Batch Code

| Order Code      | Package | Base QTY | Delivery Mode |
|-----------------|---------|----------|---------------|
| UMW IRLML6401TR | SOT-23  | 3000     | Tape and reel |



## 8.Disclaimer

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