

## Features

- -60V/-0.17A,  
 $R_{DS(ON)} = 4\Omega(\text{Typ.})@V_{GS} = -10V$   
 $R_{DS(ON)} = 4.5\Omega(\text{Typ.})@V_{GS} = -4.5V$
- Super High Dense Cell Design
- Voltage Controlled Small Signal Switch
- Reliable and Rugged
- ESD Protected (HBM>2000V)

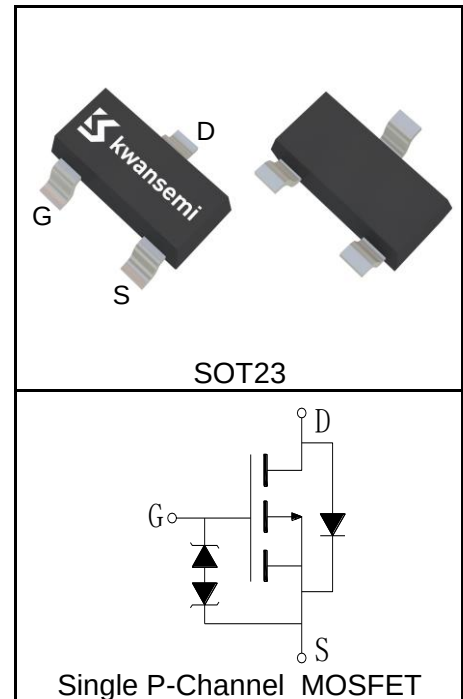
## Applications

- Switching Application



Halogen-Free

## Pin Description



## Absolute Maximum Ratings

| Symbol                                                       | Parameter                                                                 |                      | Rating     | Unit |
|--------------------------------------------------------------|---------------------------------------------------------------------------|----------------------|------------|------|
| Common Ratings (T <sub>A</sub> =25°C Unless Otherwise Noted) |                                                                           |                      |            |      |
| V <sub>DSS</sub>                                             | Drain-Source Voltage                                                      |                      | -60        | V    |
| V <sub>GSS</sub>                                             | Gate-Source Voltage                                                       |                      | ±20        |      |
| T <sub>J</sub>                                               | Maximum Junction Temperature                                              |                      | 150        | °C   |
| T <sub>J</sub> ,T <sub>STG</sub>                             | Operating and Storage Temperature Range                                   |                      | -55 to 150 | °C   |
| I <sub>S</sub>                                               | Diode Continuous Forward Current                                          | T <sub>A</sub> =25°C | -0.17      | A    |
| Mounted on Large Heat Sink                                   |                                                                           |                      |            |      |
| I <sub>DP</sub> <sup>①</sup>                                 | Pulse Drain Current                                                       | T <sub>A</sub> =25°C | -0.68      | A    |
| I <sub>D</sub> <sup>②</sup>                                  | Continuous Drain Current(V <sub>GS</sub> =-10V)                           | T <sub>A</sub> =25°C | -0.17      | A    |
|                                                              |                                                                           | T <sub>A</sub> =70°C | -0.13      |      |
| P <sub>D</sub>                                               | Maximum Power Dissipation                                                 | T <sub>A</sub> =25°C | 0.36       | W    |
|                                                              |                                                                           | T <sub>A</sub> =70°C | 0.23       |      |
| T <sub>L</sub>                                               | Maximum Lead Temperature for Soldering Purposes(1/8’’ from case for 10 s) |                      | 260        | °C   |
| R <sub>θJA</sub> <sup>③</sup>                                | Thermal Resistance-Junction to Ambient                                    |                      | 350        | °C/W |
| Drain-Source Avalanche Ratings                               |                                                                           |                      |            |      |
| E <sub>AS</sub> <sup>④</sup>                                 | Avalanche Energy, Single Pulsed                                           |                      | 0.25       | mJ   |

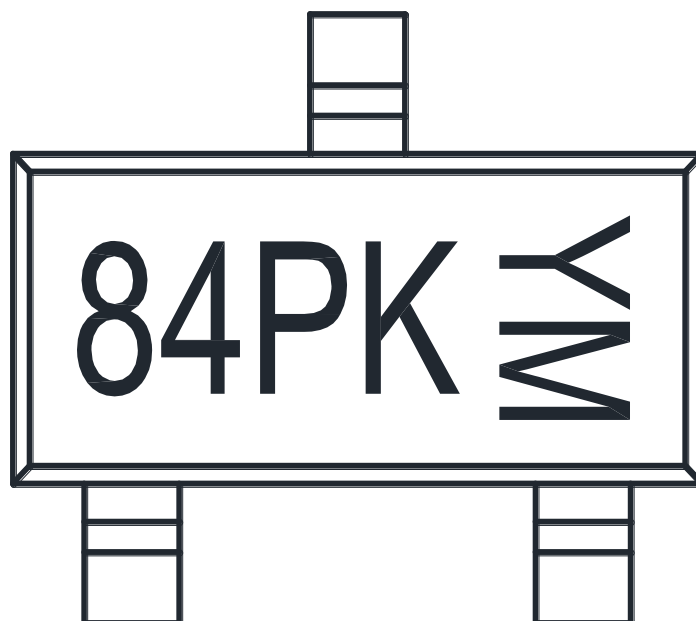
**Electrical Characteristics** ( $T_A=25^{\circ}\text{C}$  Unless Otherwise Noted)

| Symbol                                   | Parameter                        | Test Condition                                                                             | Rating |       |       | Unit |
|------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------|--------|-------|-------|------|
|                                          |                                  |                                                                                            | Min.   | Typ.  | Max.  |      |
| Static Characteristics                   |                                  |                                                                                            |        |       |       |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =-250μA                                               | -60    |       |       | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V                                                 |        |       | -1    | μA   |
|                                          |                                  | T <sub>J</sub> =125°C                                                                      |        |       | -30   |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250μA                                 | -1.3   | -1.8  | -2.3  | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                 |        |       | ±10   | μA   |
| R <sub>DS(ON)</sub> <sup>⑤</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =-10V, I <sub>DS</sub> =-0.17A                                             |        | 4     | 6     | Ω    |
|                                          |                                  | V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-0.17A                                            |        | 4.5   | 8     | Ω    |
| Diode Characteristics                    |                                  |                                                                                            |        |       |       |      |
| V <sub>SD</sub> <sup>⑤</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =-0.17A, V <sub>GS</sub> =0V                                               |        | -0.85 | -0.12 | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =-0.17A, dI <sub>SD</sub> /dt=-100A/μs                                     |        | 20    |       | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                            |        | 11    |       | nC   |
| Dynamic Characteristics <sup>⑥</sup>     |                                  |                                                                                            |        |       |       |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                           |        | 1.9   |       | KΩ   |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =-30V, Frequency=1.0MHz                               |        | 25    |       | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                            |        | 4     |       |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                            |        | 2     |       |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =-30V, I <sub>DS</sub> =-0.17A, V <sub>GEN</sub> =-10V, R <sub>G</sub> =6Ω |        | 8     |       | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                            |        | 19    |       |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                            |        | 6     |       |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                            |        | 17    |       |      |
| Gate Charge Characteristics <sup>⑥</sup> |                                  |                                                                                            |        |       |       |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V, I <sub>DS</sub> =-0.17A                      |        | 1.8   |       | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                            |        | 0.3   |       |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                            |        | 0.5   |       |      |

- Notes:
- ① Pulse width limited by safe operating area.
  - ② Calculated continuous current based on maximum allowable junction temperature.
  - ③ When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ . The value in any given application depends on the user's specific board design.
  - ④ Limited by  $T_{Jmax}$ , Starting  $T_J = 25^{\circ}\text{C}$ ,  $I_{ASmax} = -1A$ ,  $L=0.5mH$ ,  $V_{DD} = -48V$ ,  $R_G = 25\Omega$ ,  $V_{GS} = -10V$ . Part not recommended for use above this value.
  - ⑤ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
  - ⑥ Guaranteed by design, not subject to production testing.

## Ordering and Marking Information

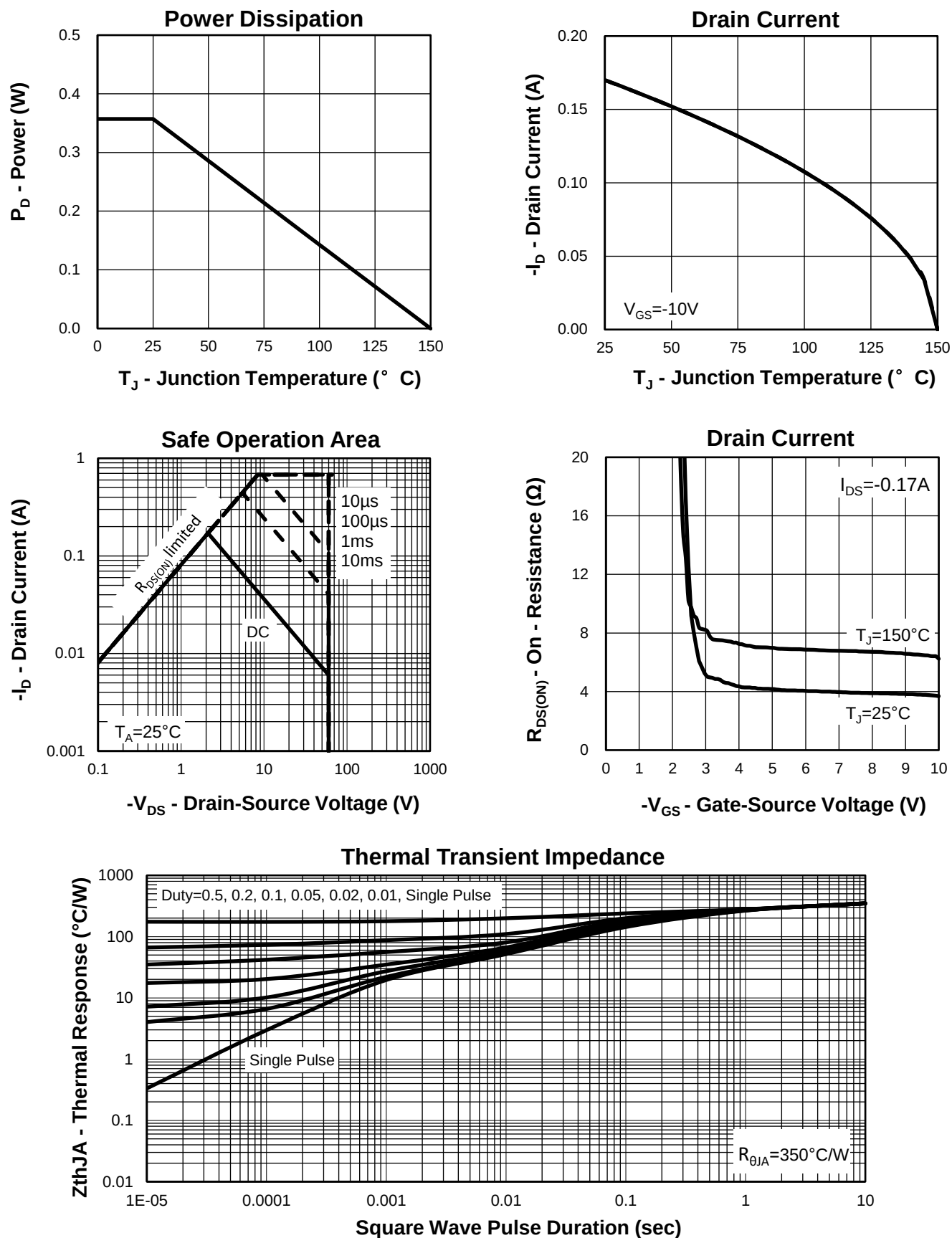
| Device  | Package | Packaging | Quantity | Reel Size | Tape width |
|---------|---------|-----------|----------|-----------|------------|
| BSS84PK | SOT23   | Tape&Reel | 3000     | 7"        | 8mm        |



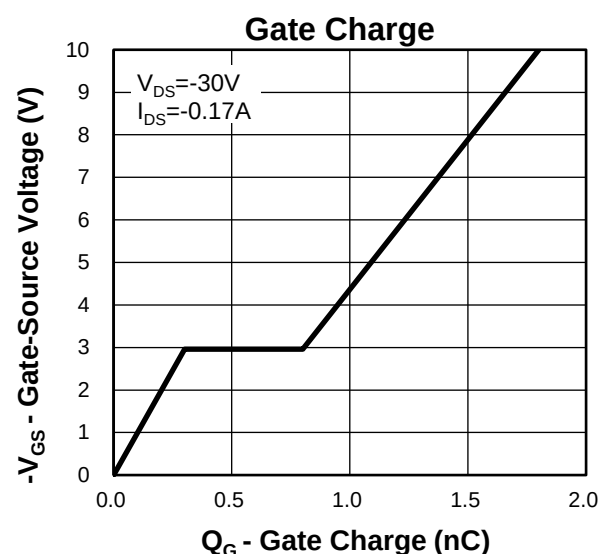
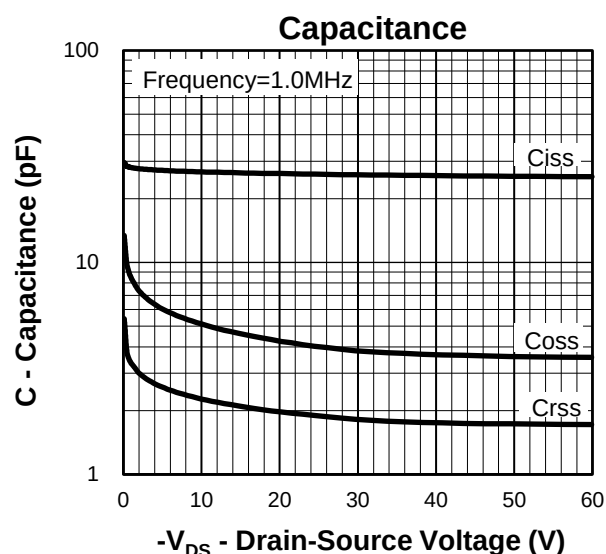
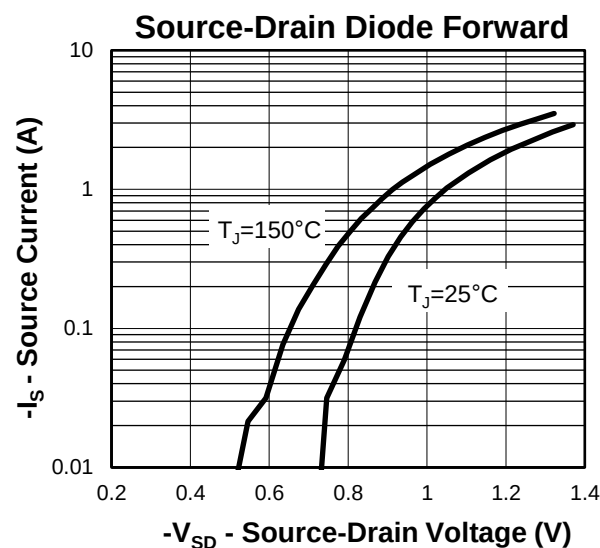
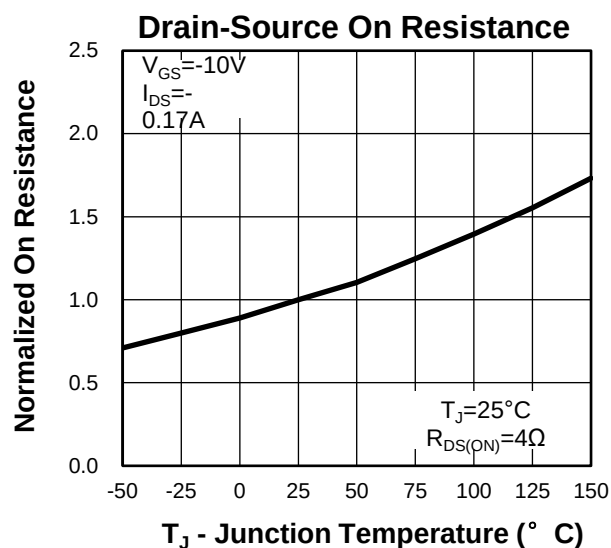
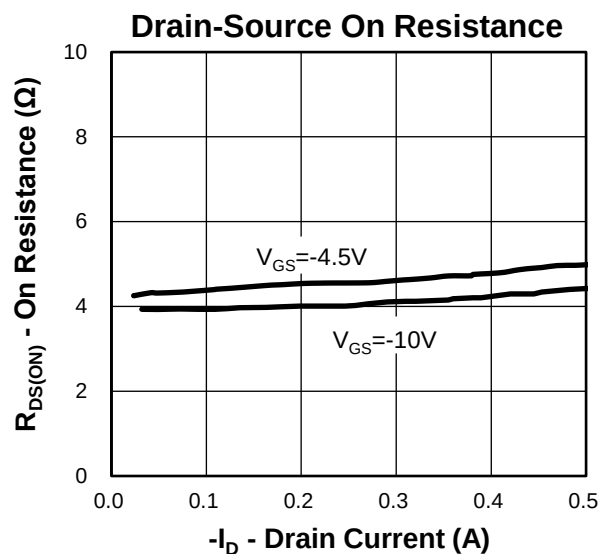
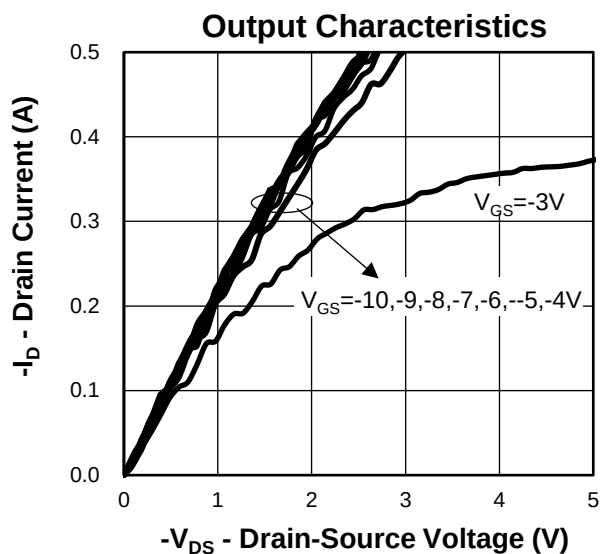
Y =Year,2017-A,2018-B,etc.

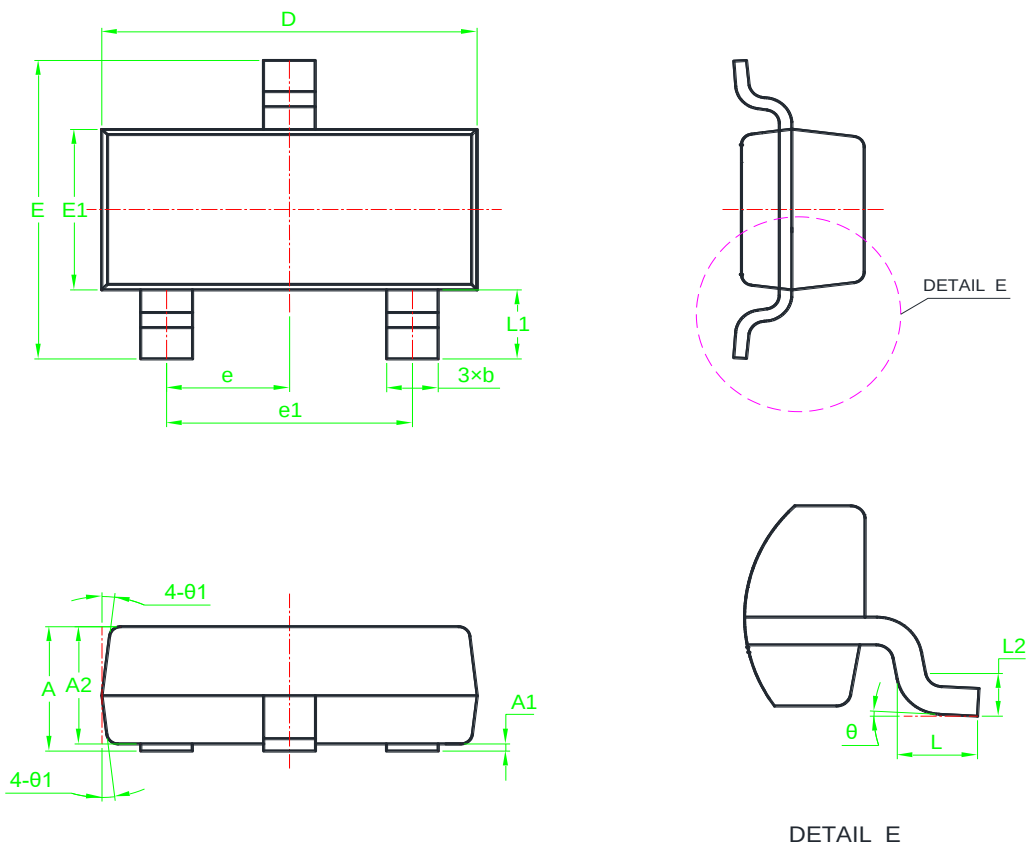
M =Month,Jan-1,Feb-2,....Sep-9,Oct-A,Nov-B,Dec-C.

## Typical Characteristics



## Typical Characteristics

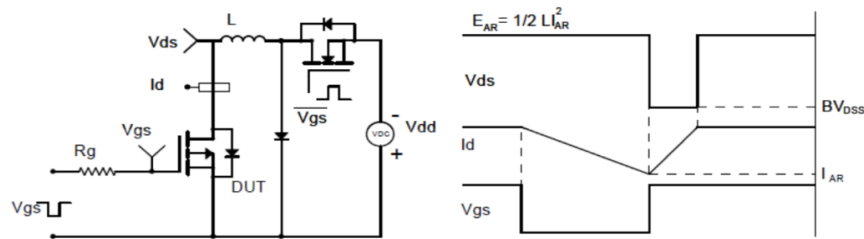


**Package Information**
**SOT23**


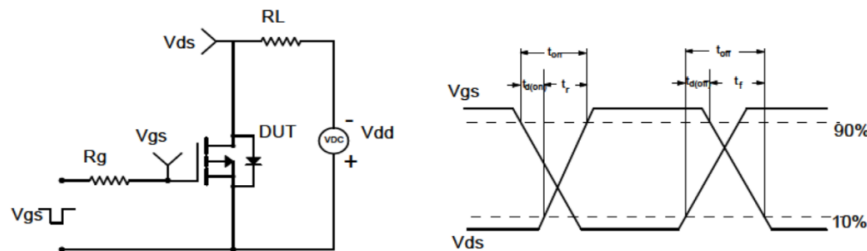
| SYMBOL | MM   |      |      | INCH  |       |       | SYMBOL | MM       |      |      | INCH     |       |       |
|--------|------|------|------|-------|-------|-------|--------|----------|------|------|----------|-------|-------|
|        | MIN  | NOM  | MAX  | MIN   | NOM   | MAX   |        | MIN      | NOM  | MAX  | MIN      | NOM   | MAX   |
| A      | 0.90 | *    | 1.12 | 0.035 | *     | 0.044 | e      | 0.95BSC  |      |      | 0.037BSC |       |       |
| A1     | 0.01 | *    | 0.10 | 0.000 | *     | 0.004 | e1     | 1.90BSC  |      |      | 0.075BSC |       |       |
| A2     | 0.80 | 0.90 | 1.02 | 0.031 | 0.035 | 0.040 | L      | 0.30     | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| b      | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 | L1     | 0.54REF  |      |      | 0.021REF |       |       |
| D      | 2.80 | 2.90 | 3.00 | 0.110 | 0.114 | 0.118 | L2     | 0.254BSC |      |      | 0.010BSC |       |       |
| E      | 2.25 | 2.40 | 2.55 | 0.089 | 0.094 | 0.100 | θ      | 0°       | *    | 8°   | 0°       | *     | 8°    |
| E1     | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 | θ 1    | 0°       | *    | 10°  | 0°       | *     | 10°   |

Note: Dimensions do not inclusive burrs and mold flash.

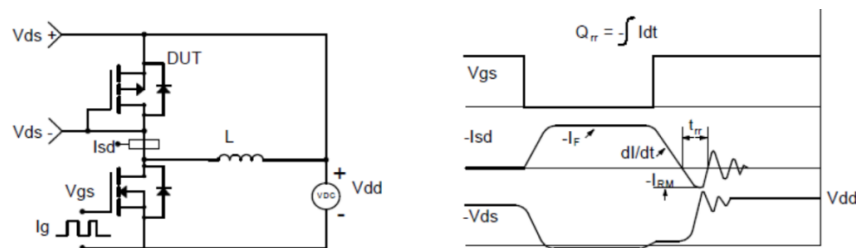
### Avalanche Test Circuit and Waveforms



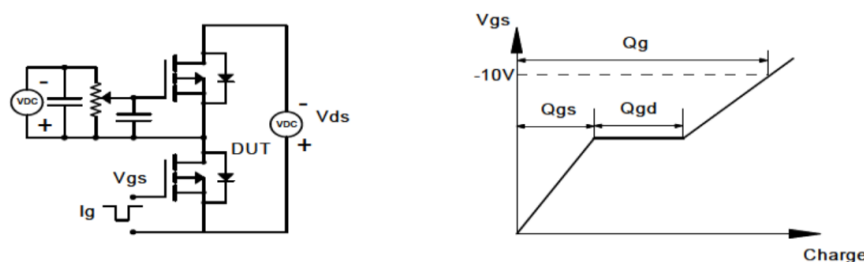
### Switching Time Test Circuit and Waveforms



### Diode Recovery Test Circuit and Waveforms



### Gate Charge Test Circuit and Waveform



### Customer Service

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