BORN SEMICONDUCTOR

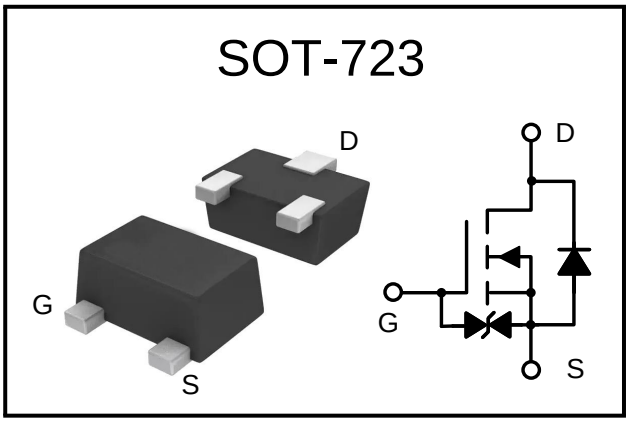
# BM138KE

**N-Channel MOSFET**

## Features

- $BV_{DSS}$=50V
- $I_D$=0.5A
- $R_{DS(ON)}$ @$V_{GS}$=10V, TYP=1.1Ω
- $R_{DS(ON)}$ @$V_{GS}$=4.5V, TYP=1.5Ω

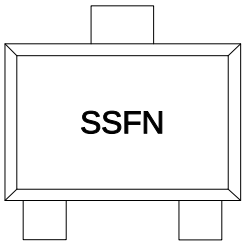
## Package




## Description

- Advanced Trench Process Technology
- High Density Cell Design For Ultra Low On-Resistance
- SOT-723 for Surface Mount Package
- HMB ESD Protection 2KV

## Marking




## Ordering information

| Order code | Package | Marking | Base qty | Delivery mode |
|---|---|---|---|---|
| BM138KE | SOT-723 | SSFN | 8K | Tape and reel |

## Absolute Maximum Ratings (@$T_A$=25°C unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | | 50 | V |
| $V_{GS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current $V_{GS}$ =4.5V | $T_A$ = 25°C | 0.5 | A |
| | | $T_A$ = 70°C | 0.3 | A |
| $I_{DM}$ | Pulsed Drain Current (1) | $T_A$ = 25°C | 1.6 | A |
| $P_D$ | Power Dissipation | $T_A$ = 25°C | 0.9 | W |
| | | $T_A$ = 70°C | 0.8 | W |
| $T_J$ | Junction Temperature Range | | 150 | °C |
| $T_{stg}$ | Storage Temperature Range | | -55 to 150 | °C |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | | 125 | °C/W |

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**Electrical Characteristics @$T_A$=25°C unless otherwise noted**

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics @$T_J$ = 25°C(unless otherwise stated)** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | 50 | – | – | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 50V, $V_{GS}$ = 0V | – | – | 0.5 | uA |
| $I_{GSS}$ | Gate Body Leakage | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | – | – | ±10 | uA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | 0.6 | 1.0 | 1.5 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}$ = 10V, $I_D$ = 0.5A | – | 1.1 | 2.5 | Ω |
| | | $V_{GS}$ = 4.5V, $I_D$ =0.2A | – | 1.5 | 3 | |
| **Dynamic Electrical Characteristics @$T_J$ = 25°C(unless otherwise stated)** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 30V, | – | 23.8 | – | pF |
| $C_{oss}$ | Output Capacitance | $V_{GS}$ = 0V, | – | 3.9 | – | |
| $C_{rss}$ | Reverse Transfer Capacitance | f = 1.0MHZ | – | 1.5 | – | |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 30V | – | 0.93 | – | nC |
| $Q_{gs}$ | Gate-Source Charge | $I_D$ =0.4A, | – | 0.18 | – | |
| $Q_{gd}$ | Gate-Drain Charge | $V_{GS}$ = 10V | – | 0.31 | – | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 30V, | – | 6 | – | ns |
| $t_r$ | Turn-On Rise Time | $V_{GS}$ = 10V, | – | 3.5 | – | |
| $t_{d(off)}$ | Turn-Off Delay Time | $R_G$ = 3.3Ω, | – | 20 | – | |
| $t_f$ | Turn-Off Fall Time | $I_D$ = 0.3A | – | 5.9 | – | |
| **Source Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Diode Forward Voltage | $I_S$ = 0.5A,$V_{GS}$ = 0V,$T_J$ = 25°C | – | 0.90 | 1.2 | V |

Notes:(1)Pulse test pulse width <=300us,duty cycle <= 2%.

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## Typical Performance Characteristics ($T_J$=25 °C, unless otherwise noted)

**Figure 1:Typical Output Characteristics**

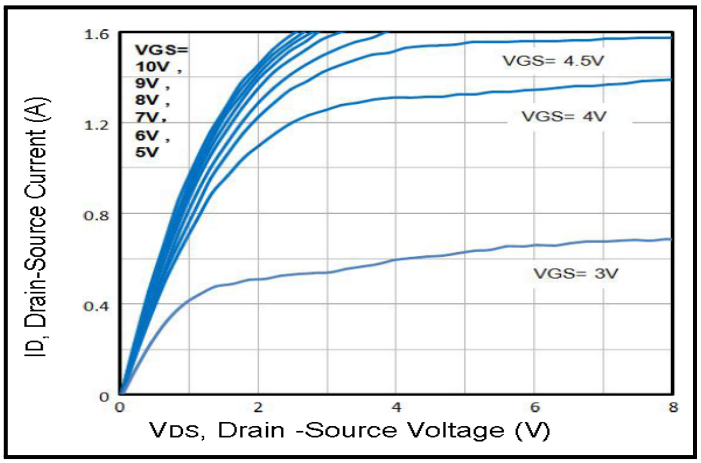



**Figure 2:Normalized Threshold Voltage Vs. Temperature**

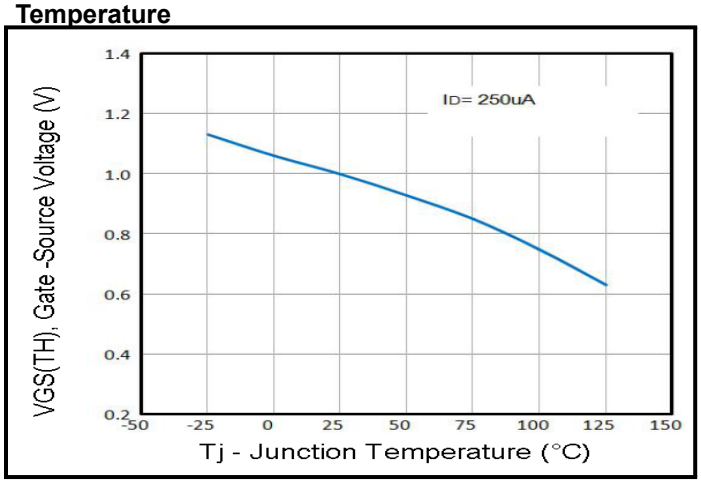



**Figure 3:Typical Transfer Characteristics**

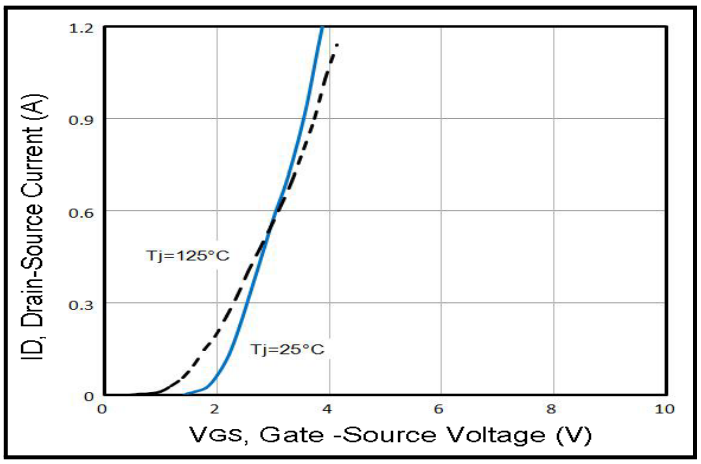



**Figure 4:Maximum Safe Operating Area**

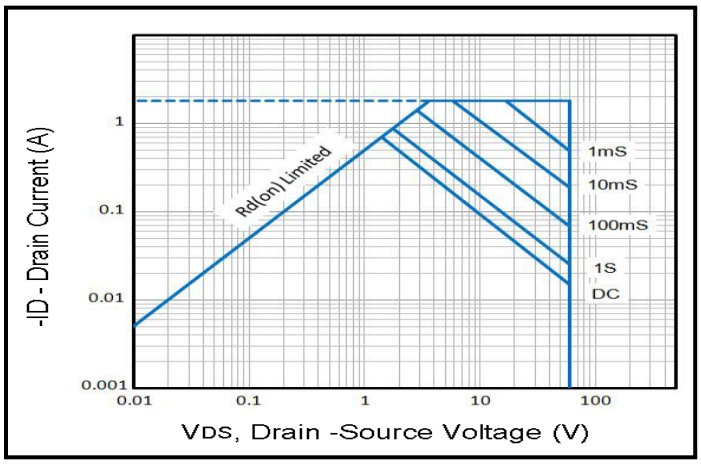



**Figure 5:Typical Capacitance Vs. Drain-Source Voltage**

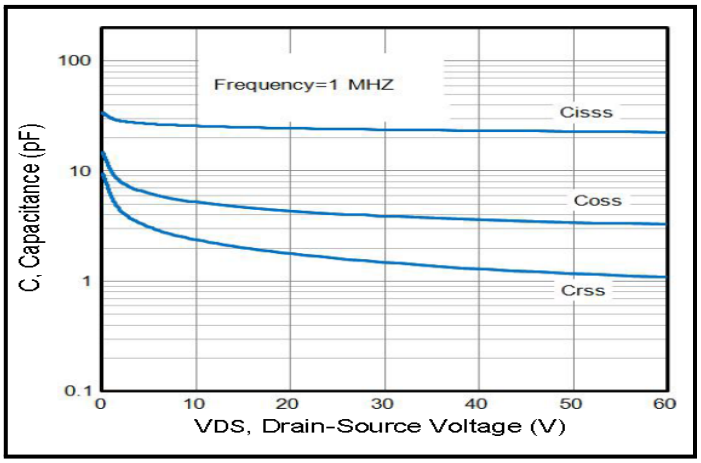
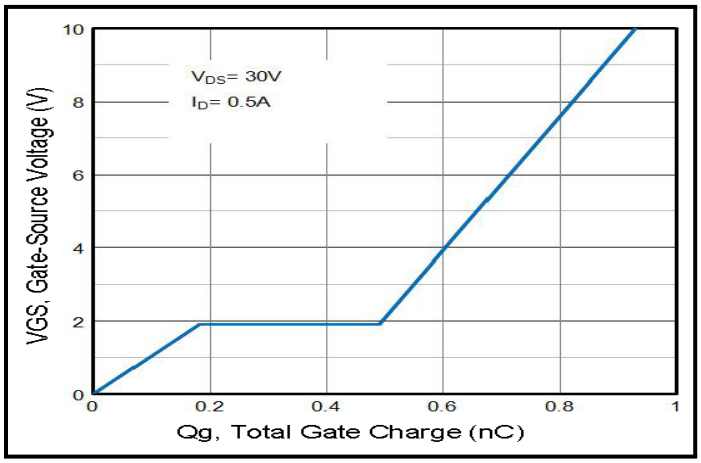



**Figure 6:Typical Gate Charge Vs. Gate-Source Voltage**



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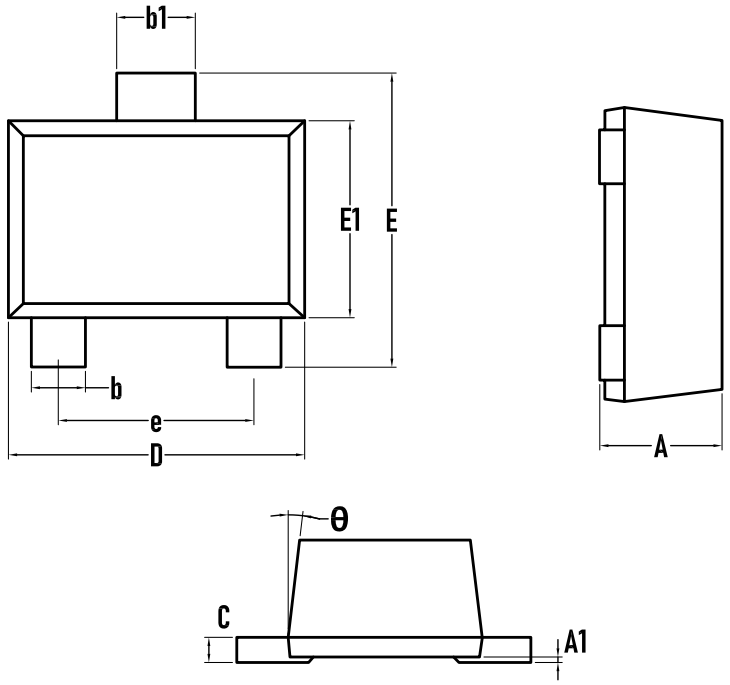
## Outline Drawing – SOT-723




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN. | Typ. | MAX. |
| A | 0.430 | – | 0.500 |
| A1 | 0.000 | – | 0.050 |
| b | 0.170 | 0.220 | 0.270 |
| b1 | 0.270 | – | 0.370 |
| C | 0.080 | – | 0.150 |
| D | 1.150 | – | 1.250 |
| E | 1.150 | – | 1.250 |
| E1 | 0.750 | – | 0.850 |
| e | 0.800TYP. | | |
| θ | 7°REF. | | |