

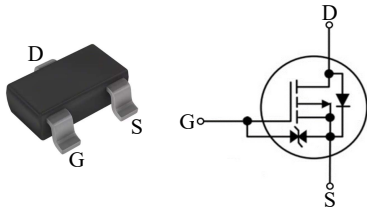


MMBT7002KH

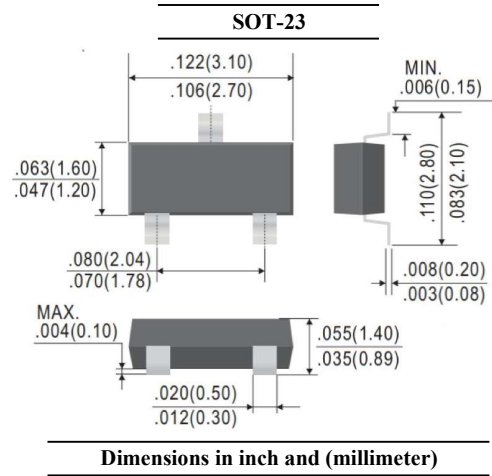
N-Channel Enhancement Mode Field Effect Transistor

FEATURES

- ESD Protection HBM \geq 2kV
- Suffix "H" indicates Halogen-free parts, ex. MMBT7002KH



| | |
|---|--------|
| D | Drain |
| G | Gate |
| S | Source |



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

| Parameter | Symbol | Value | Unit |
|--|-----------------|---------------|---------------------------|
| Drain-Source Voltage | V_{DSS} | 60 | V |
| Gate-Source Voltage | V_{GSS} | ± 20 | V |
| Continuous Drain Current | I_D | 300 | mA |
| Pulsed Drain Current (Pulse width $\leq 10\mu\text{s}$) | I_{DM} | 1.5 | A |
| Power Dissipation (Note 1) | P_D | 350 | mW |
| Thermal Resistance from Junction to Ambient (Note 1) | $R_{\theta JA}$ | 357 | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range | T_J, T_{stg} | - 55 to + 150 | $^\circ\text{C}$ |

Note :

1. Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.



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

| Parameter | Conditions | Symbol | Min. | Typ. | Max. | Unit |
|------------------------------------|---|--------------|------|------|----------|---------------|
| Static | | | | | | |
| Drain Source Breakdown Voltage | $I_D = 10\mu\text{A}$ | V_{DSS} | 60 | - | - | V |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | $V_{GS(th)}$ | 1.0 | - | 2.5 | V |
| Zero Gate Voltage Drain Current | $V_{DS} = 60\text{V}$ | I_{DSS} | - | - | 1 | μA |
| Gate-Body Leakage Current | $V_{GS} = \pm 20\text{V}$ | I_{GSS} | - | - | ± 10 | μA |
| Drain-Source On-State Resistance | $V_{GS} = 10\text{V}, I_D = 500\text{mA}$ | $R_{DS(on)}$ | - | - | 3 | Ω |
| | $V_{GS} = 4.5\text{V}, I_D = 200\text{mA}$ | | - | - | 4 | |
| Forward Transfer Admittance | $V_{DS} = 10\text{V}, I_D = 200\text{mA}$ | g_{FS} | 80 | - | - | mS |
| Dynamic | | | | | | |
| Gate resistance | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$ | R_g | - | 200 | - | Ω |
| Total Gate Charge | $V_{DS} = 10\text{V}, I_D = 0.5\text{A}, V_{GS} = 4.5\text{V}$ | Q_g | - | 0.44 | - | nC |
| Gate-Source Charge | | Q_{gs} | - | 0.20 | - | |
| Gate-Drain Charge | | Q_{gd} | - | 0.10 | - | |
| Input Capacitance | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ | C_{iss} | - | 22.5 | 50.0 | pF |
| Output Capacitance | | C_{oss} | - | 12.0 | 25.0 | |
| Reverse Transfer Capacitance | | C_{rss} | - | 0.5 | 10.0 | |
| Turn-On Delay Time | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, R_g = 25\Omega, I_D = 0.5\text{A}$ | $t_{d(on)}$ | - | 2.7 | - | ns |
| Turn-On Rise Time | | t_r | - | 2.5 | - | |
| Turn-Off Delay Time | | $t_{d(off)}$ | - | 13.0 | - | |
| Turn-Off Fall Time | | t_f | - | 8.0 | - | |
| Drain-Source Body Diode | | | | | | |
| Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 0.5\text{A}$ | V_{SD} | - | 0.85 | - | V |
| Diode Continuous Forward Current | - | I_S | - | - | 300 | mA |
| Reverse Recovery Time | $I_S = 0.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | t_{rr} | - | 30 | - | ns |
| Reverse Recovery Charge | | Q_{rr} | - | 29 | - | nC |



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RATINGS AND CHARACTERISTIC CURVES

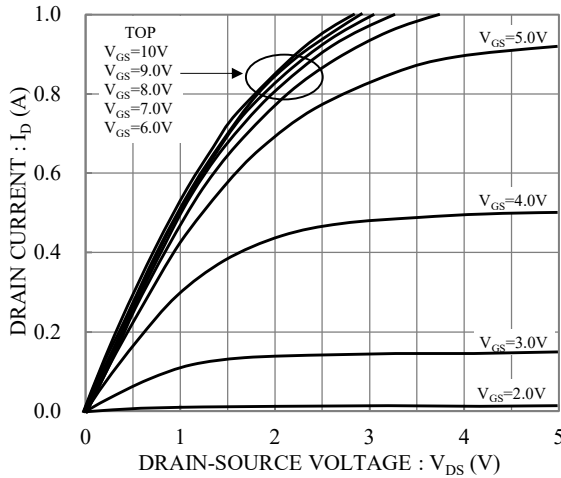


Fig.1 Typical Output Characteristics

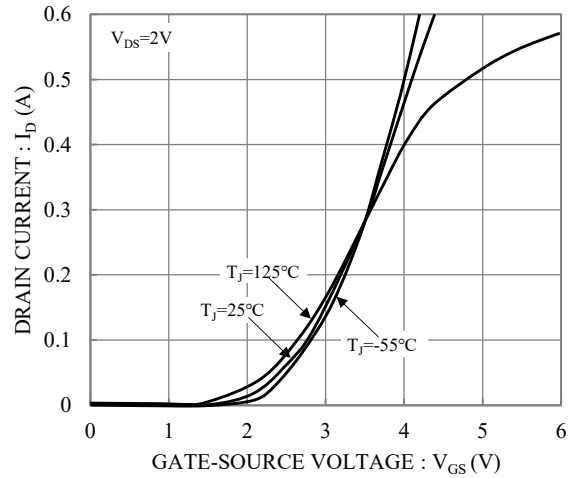


Fig.2 Typical Transfer Characteristics

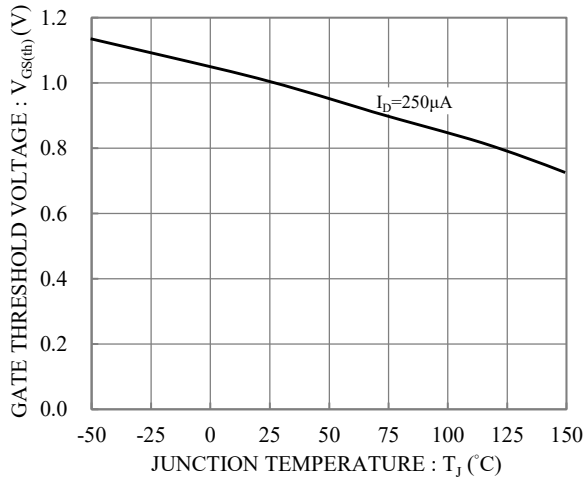


Fig.3 Gate Threshold Voltage vs. Junction Temperature

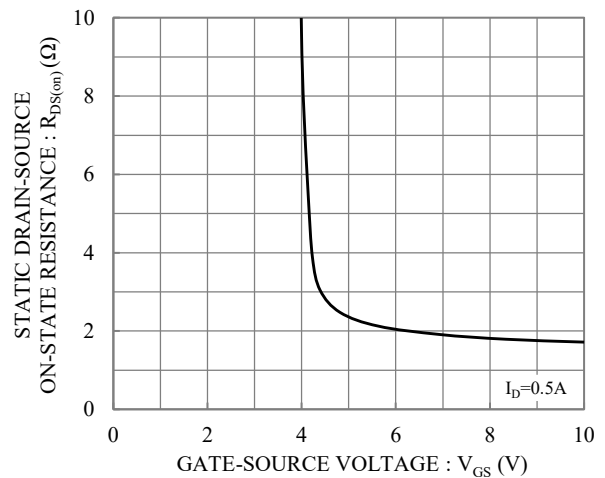


Fig.4 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

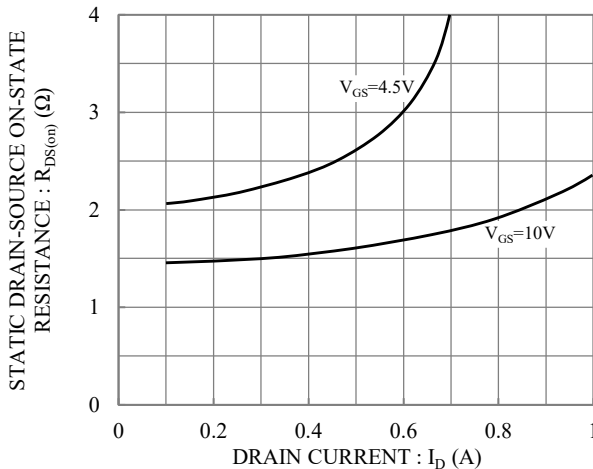


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

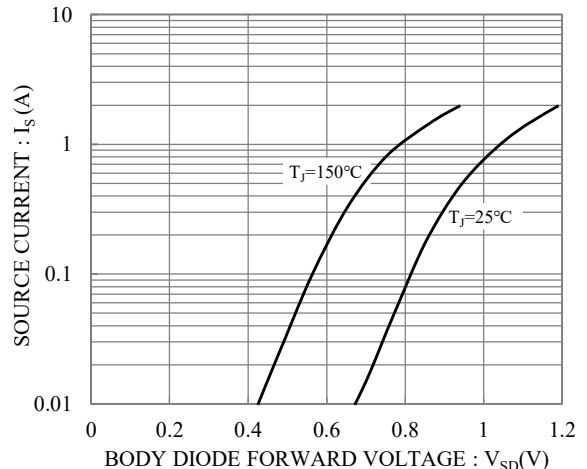


Fig.6 Body Diode Forward Voltage vs. Source Current



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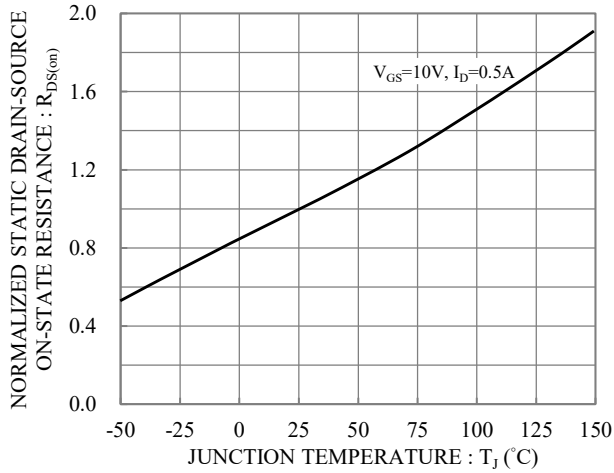


Fig.7 Drain-Source On-State Resistance vs Junction Temperature

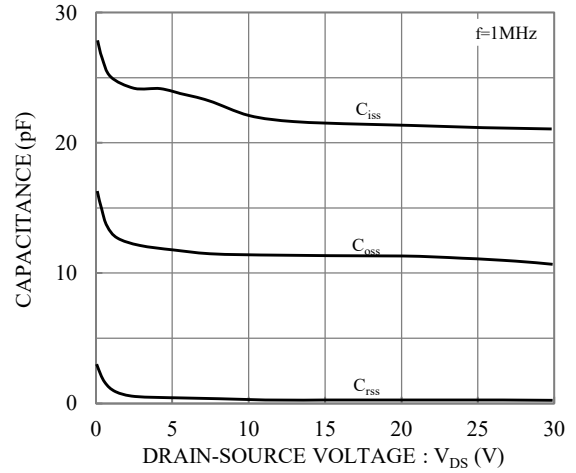


Fig.8 Capacitance vs Drain-Source Voltage

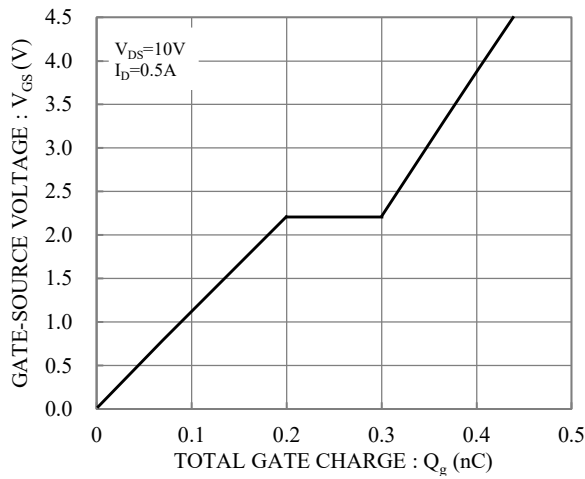


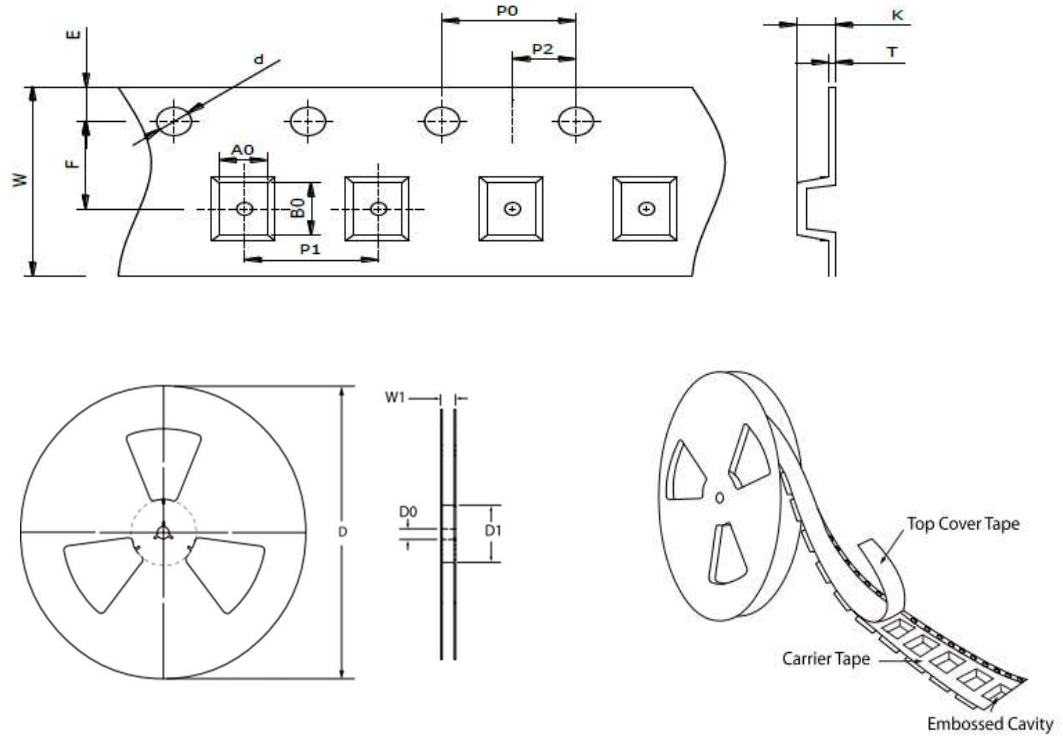
Fig.9 Gate Charge



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TAPE & REEL SPECIFICATION



| Item | Symbol | SOT-23 |
|------------------------|----------------|---------------|
| Carrier width | A ₀ | 3.30 ± 0.10 |
| Carrier length | B ₀ | 3.00 ± 0.10 |
| Carrier depth | K | 1.70 ± 0.10 |
| Sprocket hole | d | 1.50 ± 0.10 |
| Reel outside diameter | D | 178.00 ± 2.00 |
| Feed hole width | D ₀ | 13.00 ± 0.50 |
| Reel inner diameter | D ₁ | MIN. 50.00 |
| Sprocket hole position | E | 1.75 ± 0.10 |
| Punch hole position | F | 3.50 ± 0.10 |
| Sprocket hole pitch | P ₀ | 4.00 ± 0.10 |
| Punch hole pitch | P ₁ | 4.00 ± 0.10 |
| Embossment center | P ₂ | 2.00 ± 0.10 |
| Overall tape thickness | T | 0.20 ± 0.05 |
| Tape width | W | 8.00 ± 0.20 |
| Reel width | W1 | MAX. 14.50 |

ORDER INFORMATION

| Package | Reel Size | Quantity |
|---------|-----------|----------|
| SOT-23 | 7" | 3,000 |

MARKING CODE

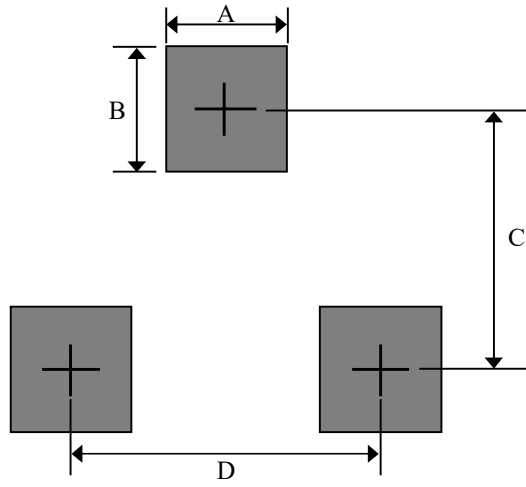
| Part Number | Marking Code |
|-------------|--------------|
| MMBT7002KH | K72 |



MMBT7002KH

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SUGGESTED SOLDER PAD LAYOUT



Unit : mm

| PACKAGE | A | B | C | D |
|---------|------|------|------|------|
| SOT-23 | 0.80 | 1.00 | 2.40 | 1.90 |