

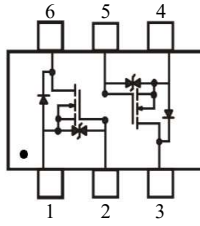


# MMBT7002KDTH

## N-Channel Enhancement Mode Field Effect Transistor

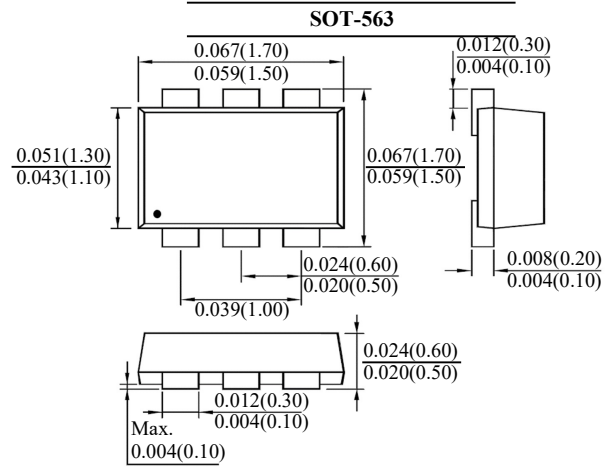
### FEATURES

- Low on resistance  $R_{DS(ON)}$
- Low gate threshold voltage
- ESD protected up to 2KV
- Suffix "H" indicates Halogen-free parts, ex. MMBT7002KDWH



Top View

1.Source 2.Gate 3.Drain  
4.Source 5.Gate 6.Drain



Dimensions in inch and (millimeter)

### 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                                  | $V_{GSS}$       | $\pm 20$      | V                         |
| Drain Current (Continuous)                           | $I_D$           | 300           | mA                        |
| Drain Current (Pulse Width $\leq 10\ \mu\text{s}$ )  | $I_{DM}$        | 1.0           | A                         |
| Total Power Dissipation (Note 1)                     | $P_{tot}$       | 223           | mW                        |
| Thermal Resistance from Junction to Ambient (Note 1) | $R_{\theta JA}$ | 560           | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range              | $T_J, T_{stg}$  | - 55 to + 150 | $^\circ\text{C}$          |

Note:

1. Device mounted on an 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          |
|------------------------------------|---|--------------|------|------|----------|---------------|
| <b>Static</b>                      |   |              |      |      |          |               |
| Drain Source Breakdown Voltage     | $I_D = 10\mu\text{A}$   | $BV_{DSS}$   | 60   | -    | -        | V             |
| Zero Gate Voltage Drain Current    | $V_{DS} = 60\text{V}$   | $I_{DSS}$    | -    | -    | 1        | $\mu\text{A}$ |
| Gate Source Leakage Current        | $V_{GS} = \pm 20\text{V}$   | $I_{GSS}$    | -    | -    | $\pm 10$ | $\mu\text{A}$ |
| Gate Threshold Voltage             | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                                       | $V_{GS(th)}$ | 1.0  | -    | 2.5      | V             |
| Static Drain Source On-Resistance  | $V_{GS} = 10\text{V}, I_D = 500\text{mA}$                                     | $R_{DS(on)}$ | -    | -    | 3        | $\Omega$      |
|                                    | $V_{GS} = 4.5\text{V}, I_D = 200\text{mA}$                                    |              | -    | -    | 4        |               |
| Forward Transconductance           | $V_{DS} = 10\text{V}, I_D = 200\text{mA}$                                     | $g_{FS}$     | 80   | -    | -        | mS            |
| <b>Dynamic</b>                     |   |              |      |      |          |               |
| Gate Resistance                    | $V_{DS} = 0\text{V}, V_{GS} = 0, f = 1\text{MHz}$                             | $R_g$        | -    | 200  | -        | $\Omega$      |
| 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                  | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                    | $C_{iss}$    | -    | 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                 | $V_{DS} = 30\text{V}, V_{GS} = 10\text{V}, I_D = 0.5\text{A}, R_g = 25\Omega$ | $t_{d(on)}$  | -    | 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  | -        |               |
| <b>Drain-Source Body Diode</b>     |   |              |      |      |          |               |
| Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 0.5\text{A}$                                       | $V_{SD}$     | -    | 0.85 | -        | V             |
| Continuous Source 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            |



### RATINGS AND CHARACTERISTIC CURVES

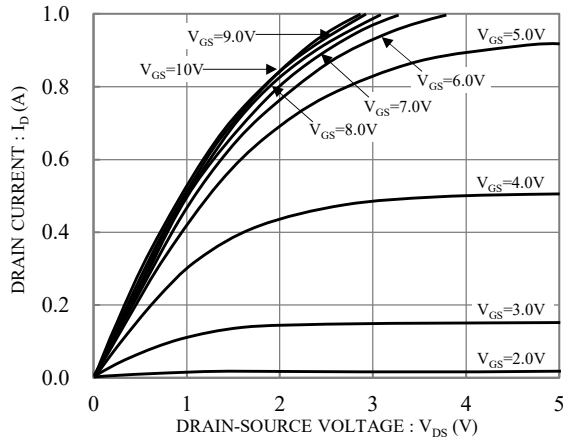


Fig.1 Typical Output Characteristics

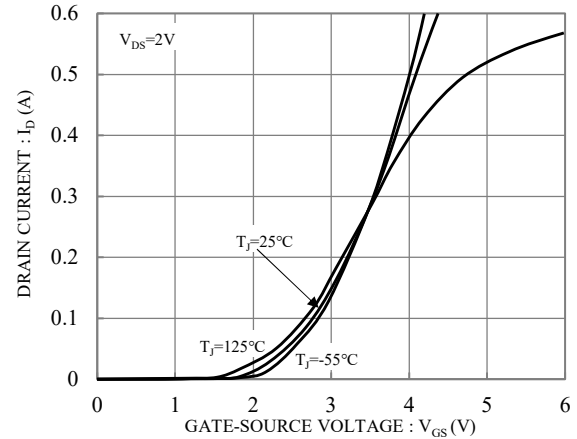


Fig.2 Typical Transfer Characteristics

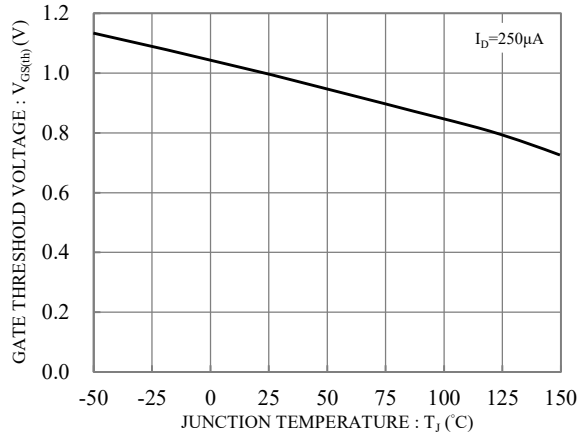


Fig.3 Gate Threshold Voltage vs. Junction Temperature

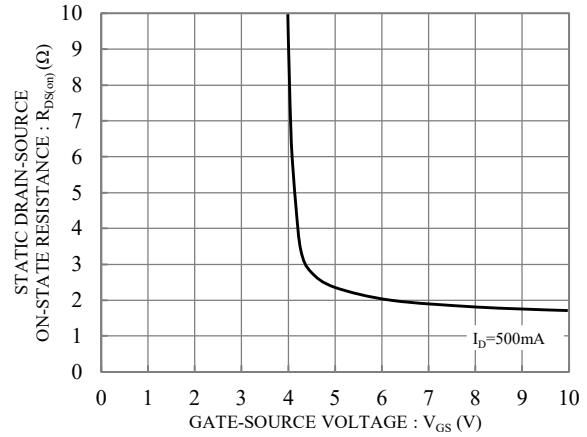


Fig.4 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

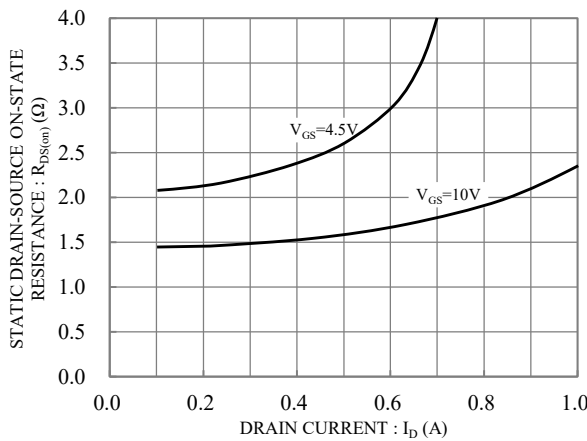


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

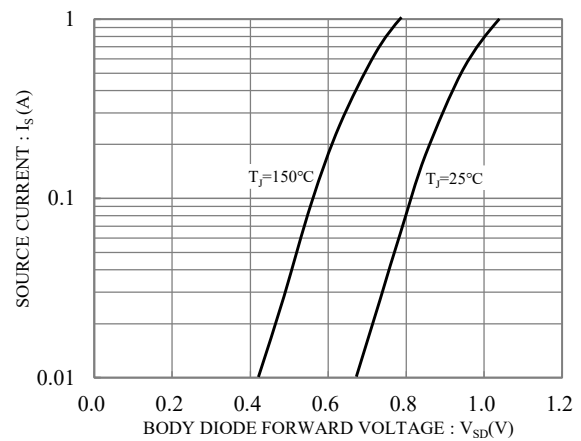
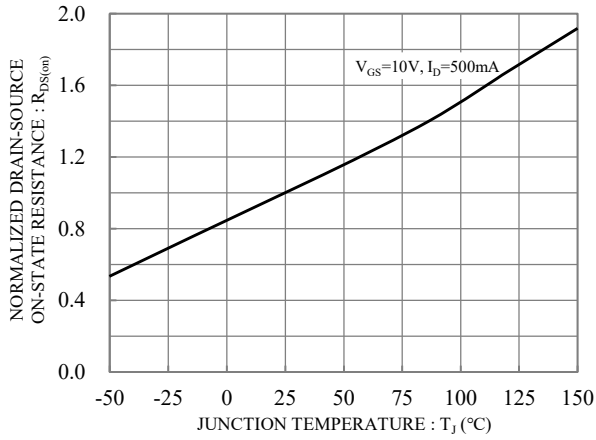


Fig.6 Body Diode Forward Voltage vs. Source Current

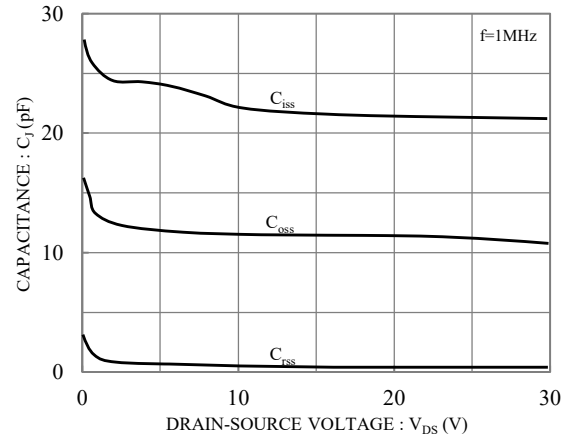


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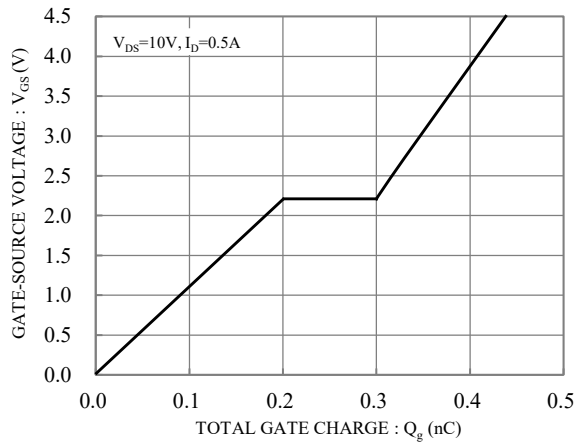
## N-Channel Enhancement Mode Field Effect Transistor



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



**Fig.8 Capacitance vs. Drain-Source Voltage**



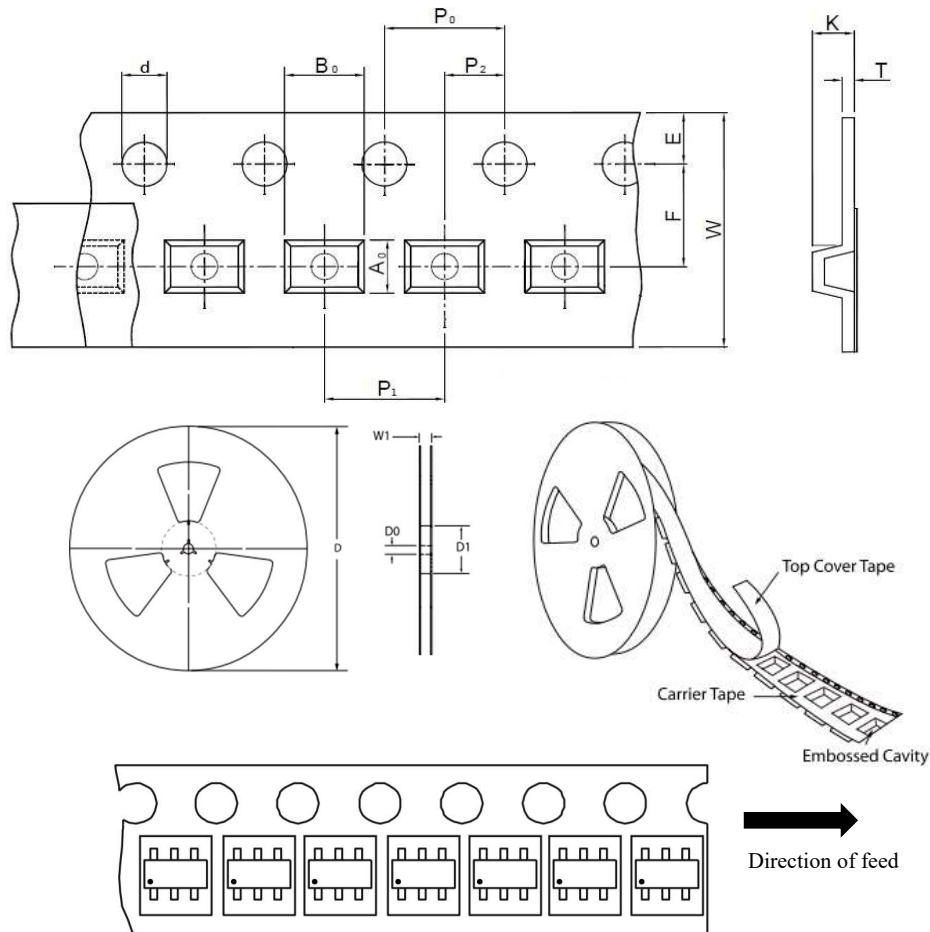
**Fig.9 Gate Charge Characteristics**



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## N-Channel Enhancement Mode Field Effect Transistor

### TAPE & REEL SPECIFICATION



| Item                   | Symbol         | SOT-563       |
|------------------------|----------------|---------------|
| Carrier width          | A <sub>0</sub> | 1.80 ± 0.05   |
| Carrier length         | B <sub>0</sub> | 1.80 ± 0.05   |
| Carrier depth          | K              | 0.70 ± 0.05   |
| Sprocket hole          | d              | 1.50 ± 0.10   |
| Reel outside diameter  | D              | 178.00 ± 2.00 |
| Feed hole width        | D <sub>0</sub> | 13.00 ± 0.50  |
| Reel inner diameter    | D <sub>1</sub> | MIN. 50.00    |
| Sprocket hole position | E              | 1.75 ± 0.10   |
| Punch hole position    | F              | 3.50 ± 0.10   |
| Sprocket hole pitch    | P <sub>0</sub> | 4.00 ± 0.10   |
| Punch hole pitch       | P <sub>1</sub> | 4.00 ± 0.10   |
| Embossment center      | P <sub>2</sub> | 2.00 ± 0.10   |
| Overall tape thickness | T              | 0.60 ± 0.05   |
| Tape width             | W              | 8.00 ± 0.30   |
| Reel width             | W <sub>1</sub> | MAX. 14.50    |

### ORDER INFORMATION

| Package | Reel Size | Quantity |
|---------|-----------|----------|
| SOT-563 | 7"        | 4,000    |

### MARKING CODE

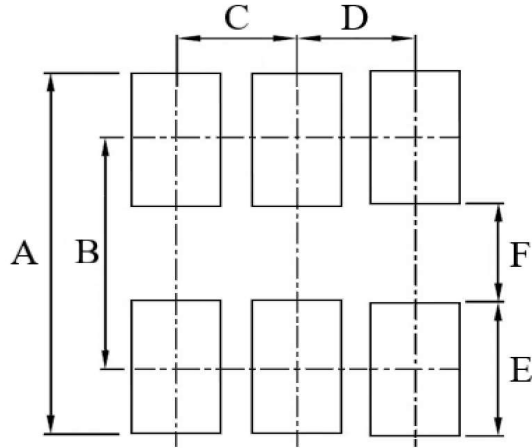
| Part Number  | Marking Code |
|--------------|--------------|
| MMBT7002KDTH | K7           |



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*N-Channel Enhancement Mode Field Effect Transistor*

## **SUGGESTED SOLDER PAD LAYOUT**



Unit : mm

| PACKAGE | A    | B    | C    | D    | E    | F    |
|---------|------|------|------|------|------|------|
| SOT-563 | 2.30 | 1.45 | 0.50 | 0.50 | 0.85 | 0.60 |