

**N- and P-Channel 20V (D-S) MOSFET**

**GENERAL DESCRIPTION**

The ME3587 is the N- and P-Channel logic enhancement mode power field effect transistors are produced using high cell density , DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage application such as cellular phone and notebook computer power management and other battery powered circuits where low in-line power loss are needed in a very small outline surface mount package.

**FEATURES**

- $R_{DS(ON)} \leq 45m\Omega @ V_{GS}=4.5V$  (N-Ch)
- $R_{DS(ON)} \leq 68m\Omega @ V_{GS}=2.5V$  (N-Ch)
- $R_{DS(ON)} \leq 120m\Omega @ V_{GS}=1.8V$  (N-Ch)
- $R_{DS(ON)} \leq 110m\Omega @ V_{GS}=-4.5V$  (P-Ch)
- $R_{DS(ON)} \leq 130m\Omega @ V_{GS}=-2.5V$  (P-Ch)
- $R_{DS(ON)} \leq 170m\Omega @ V_{GS}=-1.8V$  (P-Ch)
- Super high density cell design for extremely low  $R_{DS(ON)}$
- Exceptional on-resistance and maximum DC current capability

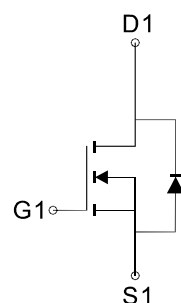
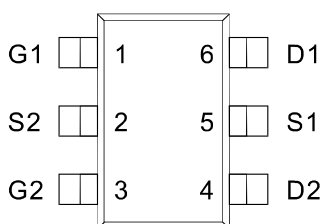
**APPLICATIONS**

- Power Management in Note book
- Portable Equipment
- Battery Powered System
- Load Switch
- DSC
- LCD Display inverter

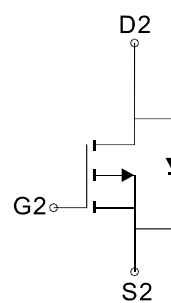
**PIN CONFIGURATION**

(TSOP-6)

Top View



N-Channel MOSFET



P-Channel MOSFET

Ordering Information: ME3587 (Pb-free)

ME3587-G (Green product-Halogen free)

**Absolute Maximum Ratings (TA=25°C Unless Otherwise Noted)**

| Parameter                               | Symbol          | N-channel Maximum Ratings | P-channel Maximum Ratings | Unit         |
|---|-----------------|---------------------------|---------------------------|--------------|
| Drain-Source Voltage                    | $V_{DS}$        | 20                        | -20                       | V            |
| Gate-Source Voltage                     | $V_{GS}$        | $\pm 8$                   | $\pm 8$                   | V            |
| Continuous Drain Current *              | $I_D$           | $T_A=25^\circ C$          | -2                        | A            |
|   |                 | $T_A=70^\circ C$          | -1.6                      |              |
| Pulsed Drain Current                    | $I_{DM}$        | 14                        | -8                        | A            |
| Maximum Power Dissipation               | $P_D$           | $T_A=25^\circ C$          | 0.7                       | W            |
|   |                 | $T_A=70^\circ C$          | 0.5                       |              |
| Operating Junction Temperature          | $T_J$           | -55 to 150                | -55 to 150                | $^\circ C$   |
| Thermal Resistance-Junction to Ambient* | $R_{\theta JA}$ | 150                       | 175                       | $^\circ C/W$ |

\* The device mounted on 1in<sup>2</sup> FR4 board with 2 oz copper



## N- and P-Channel 20V (D-S) MOSFET

### N-Channel Mosfet Electrical Characteristics (TA = 25°C Unless Otherwise Specified)

| Symbol               | Parameter                               | Limit  | Min | Typ | Max  | Unit |
|----------------------|---|--|-----|-----|------|------|
| <b>STATIC</b>        |   |  |     |     |      |      |
| V <sub>(BR)DSS</sub> | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μA  | 20  |     |      | V    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA                              | 0.5 |     | 1.2  | V    |
| I <sub>GSS</sub>     | Gate Leakage Current                    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±8V  |     |     | ±100 | nA   |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current         | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V  |     |     | 1    | μA   |
| R <sub>DS(ON)</sub>  | Drain-Source On-Resistance <sup>a</sup> | V <sub>GS</sub> =4.5V, I <sub>D</sub> = 3.4A   |     | 37  | 45   | mΩ   |
|                      |   | V <sub>GS</sub> =2.5V, I <sub>D</sub> = 3A   |     | 52  | 68   |      |
|                      |   | V <sub>GS</sub> =1.8V, I <sub>D</sub> = 2A   |     | 92  | 120  |      |
| V <sub>SD</sub>      | Diode Forward Voltage                   | I <sub>S</sub> =1A, V <sub>GS</sub> =0V  |     | 0.7 |      | V    |
| <b>DYNAMIC</b>       |   |  |     |     |      |      |
| Q <sub>g</sub>       | Total Gate Charge                       | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =2.1A                      |     | 5.3 |      | nC   |
| Q <sub>gs</sub>      | Gate-Source Charge                      |  |     | 1.7 |      |      |
| Q <sub>gd</sub>      | Gate-Drain Charge                       |  |     | 1.4 |      |      |
| R <sub>g</sub>       | Gate resistance                         | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                       |     | 1.2 |      | Ω    |
| C <sub>iss</sub>     | Input Capacitance                       | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                                      |     | 340 |      | pF   |
| C <sub>oss</sub>     | Output Capacitance                      |  |     | 50  |      |      |
| C <sub>rss</sub>     | Reverse Transfer Capacitance            |  |     | 15  |      |      |
| t <sub>d(on)</sub>   | Turn-On Delay Time                      | V <sub>DS</sub> =10V, R <sub>L</sub> =10Ω<br>R <sub>GEN</sub> =3Ω, V <sub>GS</sub> =5V |     | 11  |      | ns   |
| t <sub>r</sub>       | Turn-On Rise Time                       |  |     | 17  |      |      |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                     |  |     | 30  |      |      |
| t <sub>f</sub>       | Turn-Off Fall time                      |  |     | 3   |      |      |

Notes: a. Pulse test; pulse width ≤ 300us, duty cycle ≤ 2%

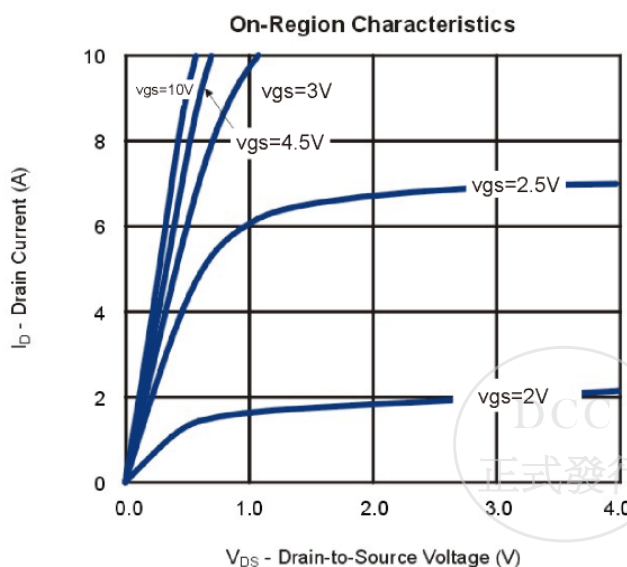
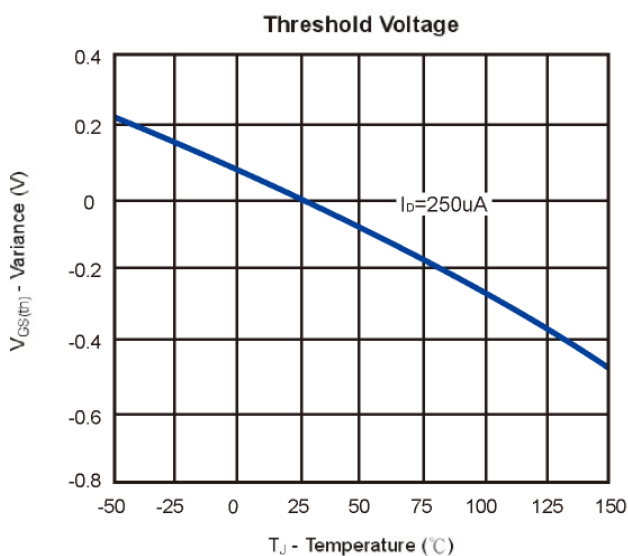
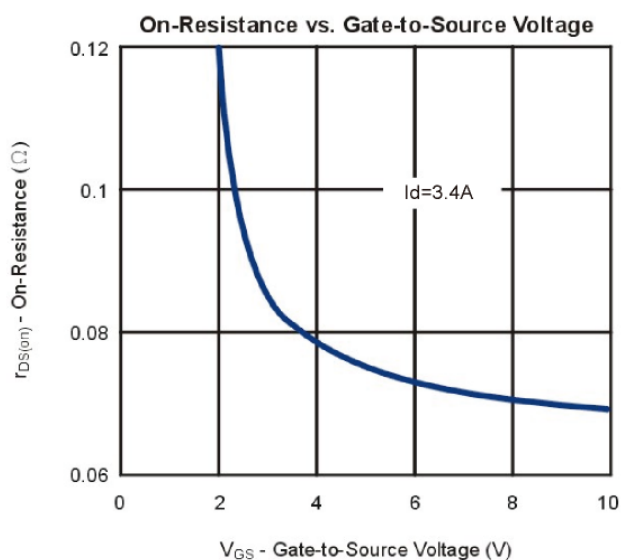
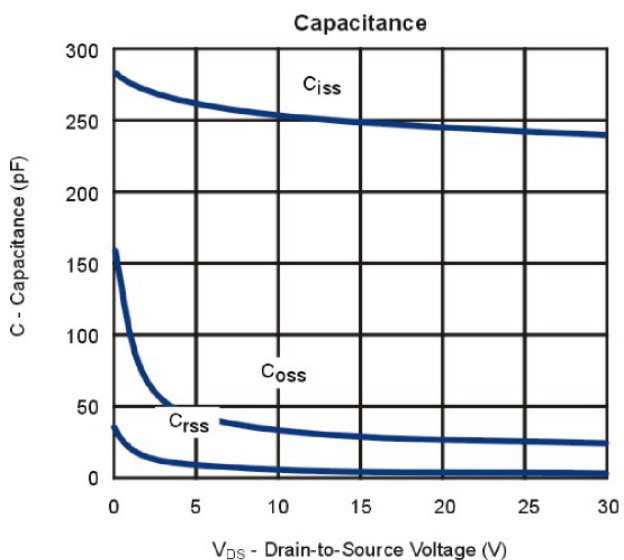
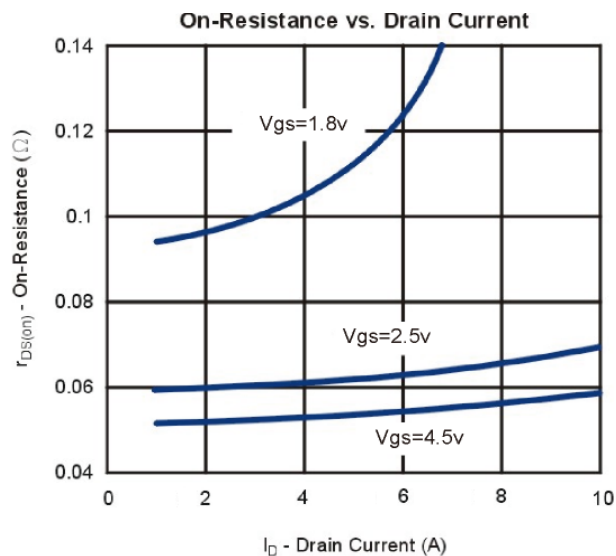
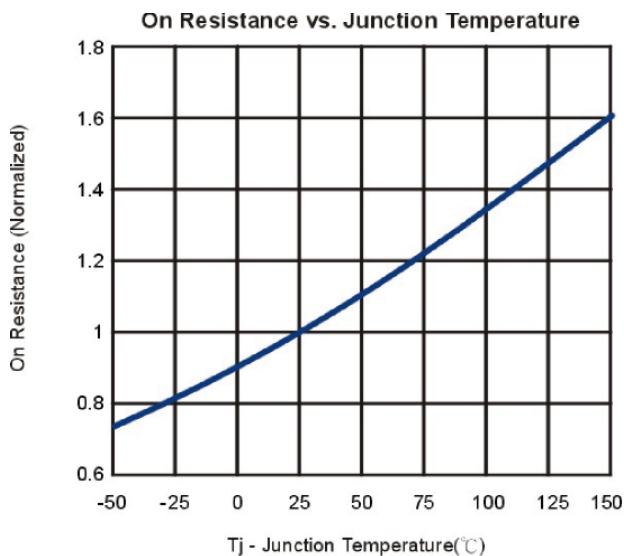
b. Matsuki Electric/ Force mos reserves the right to improve product design, functions and reliability without notice.



**N- and P-Channel 20V (D-S) MOSFET**

**Typical Characteristics (T<sub>J</sub> = 25°C Noted)**

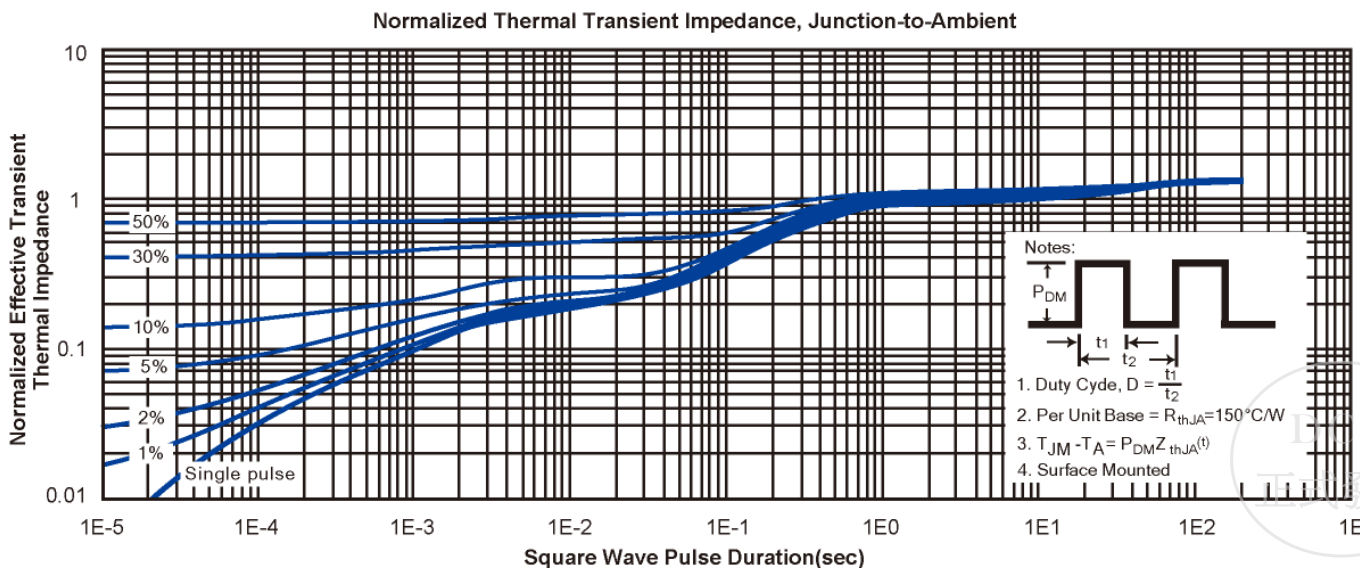
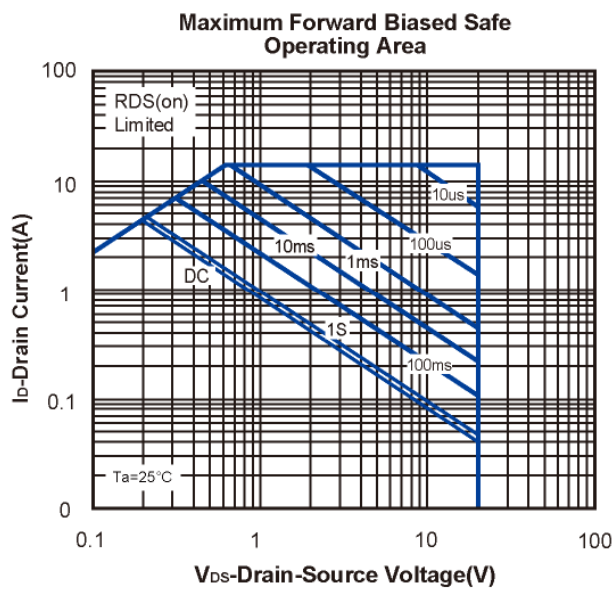
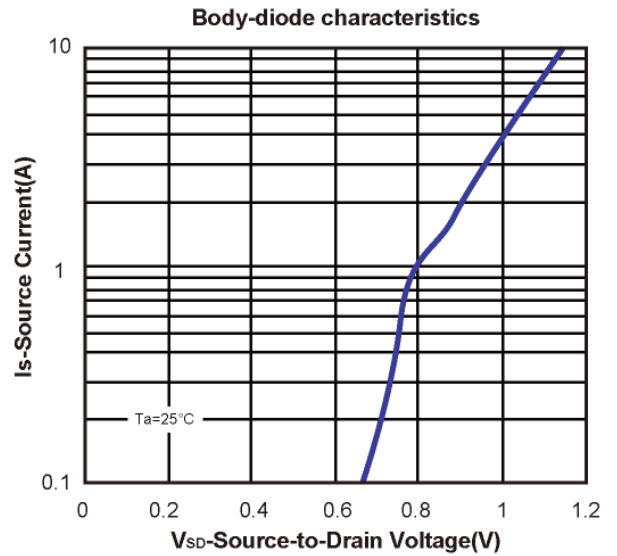
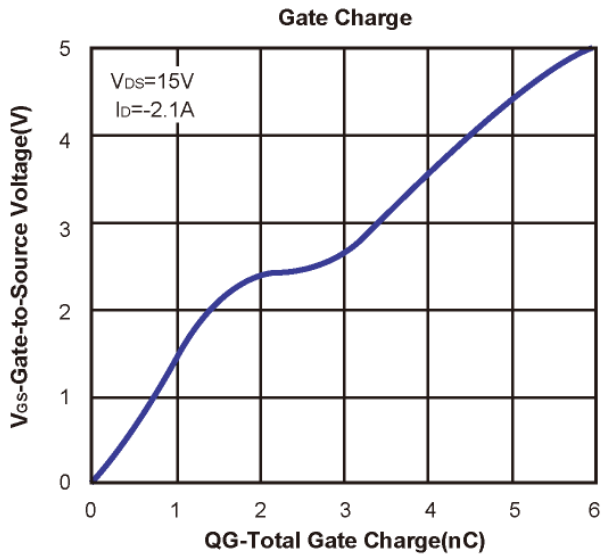
**N-Channel**



**N- and P-Channel 20V (D-S) MOSFET**

**Typical Characteristics (T<sub>J</sub> =25°C Noted)**

**N-Channel**



## N- and P-Channel 20V (D-S) MOSFET

### P-Channel Electrical Characteristics (TA = 25°C Unless Otherwise Specified)

| Symbol               | Parameter                               | Limit  | Min  | Typ  | Max  | Unit |
|----------------------|---|--|------|------|------|------|
| <b>STATIC</b>        |   |  |      |      |      |      |
| V <sub>(BR)DSS</sub> | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =-250 μA   | -20  |      |      | V    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 μA                               | -0.4 |      | -1   | V    |
| I <sub>GSS</sub>     | Gate Leakage Current                    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±8V  |      |      | ±100 | nA   |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current         | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V   |      |      | -1   | μA   |
| R <sub>DS(ON)</sub>  | Drain-Source On-Resistance <sup>a</sup> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> = -2.8A   |      | 85   | 110  | mΩ   |
|                      |   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> = -2A   |      | 110  | 130  |      |
|                      |   | V <sub>GS</sub> =-1.8V, I <sub>D</sub> = -1A   |      | 130  | 170  |      |
| V <sub>SD</sub>      | Diode Forward Voltage                   | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V   |      | -0.7 | -1.4 | V    |
| <b>DYNAMIC</b>       |   |  |      |      |      |      |
| Q <sub>g</sub>       | Total Gate Charge                       | V <sub>DS</sub> =-6V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2.8A                      |      | 7.2  |      | nC   |
| Q <sub>gs</sub>      | Gate-Source Charge                      |  |      | 2.2  |      |      |
| Q <sub>gd</sub>      | Gate-Drain Charge                       |  |      | 1.2  |      |      |
| C <sub>iss</sub>     | Input Capacitance                       | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                       |      | 480  |      | pF   |
| C <sub>oss</sub>     | Output Capacitance                      |  |      | 46   |      |      |
| C <sub>rss</sub>     | Reverse Transfer Capacitance            |  |      | 10   |      |      |
| t <sub>d(on)</sub>   | Turn-On Delay Time                      | V <sub>DS</sub> =-6V, R <sub>L</sub> =6Ω<br>R <sub>GEN</sub> =6Ω, V <sub>GS</sub> =-4.5V |      | 50   |      | ns   |
| t <sub>r</sub>       | Turn-On Rise Time                       |  |      | 30   |      |      |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                     |  |      | 40   |      |      |
| t <sub>f</sub>       | Turn-Off Fall time                      |  |      | 11   |      |      |

Notes: a. Pulse test; pulse width ≤ 300us, duty cycle ≤ 2%

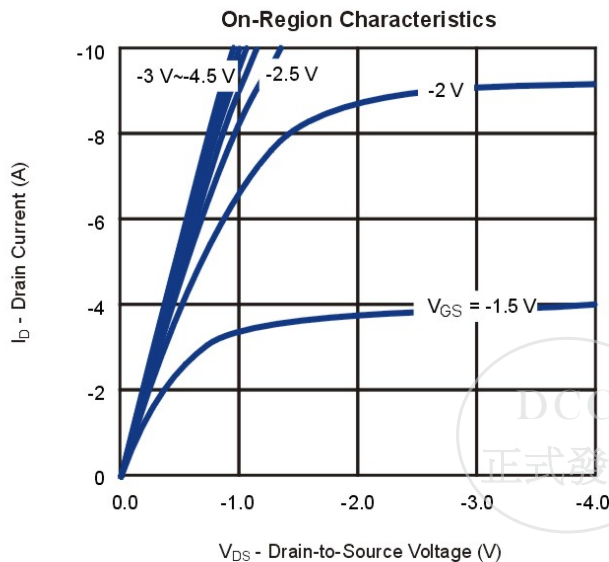
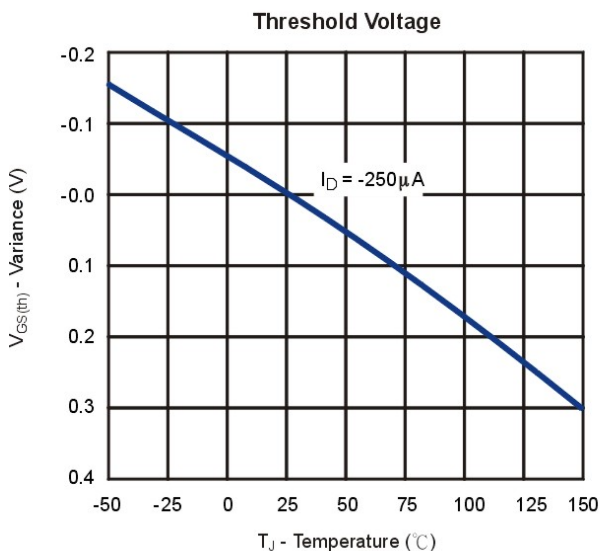
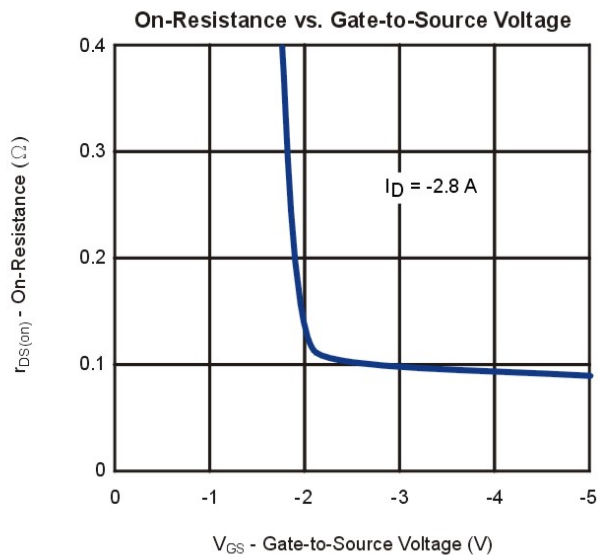
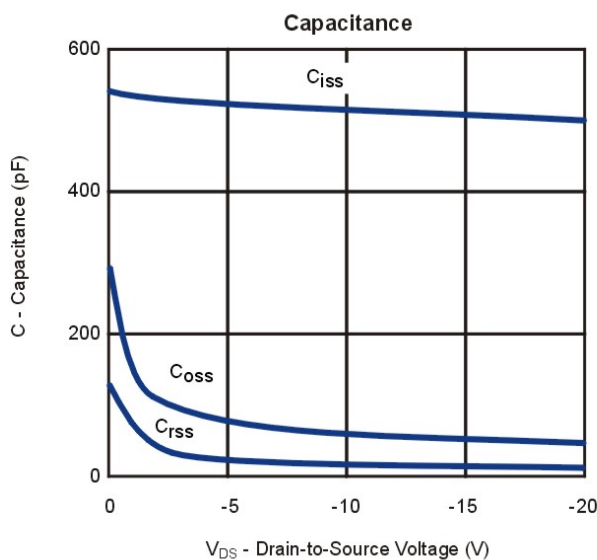
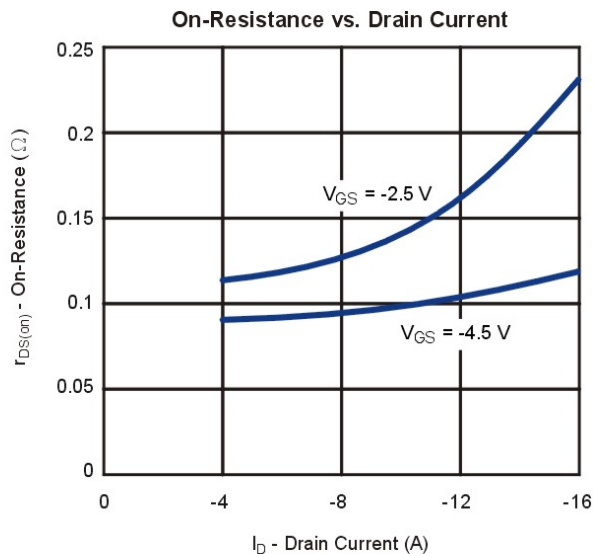
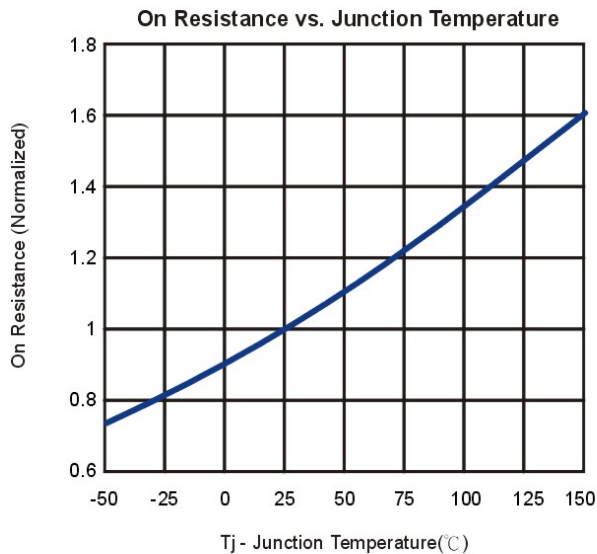
b. Matsuki Electric/ Force mos reserves the right to improve product design, functions and reliability without notice.



**N- and P-Channel 20V (D-S) MOSFET**

**Typical Characteristics (T<sub>J</sub> = 25°C Noted)**

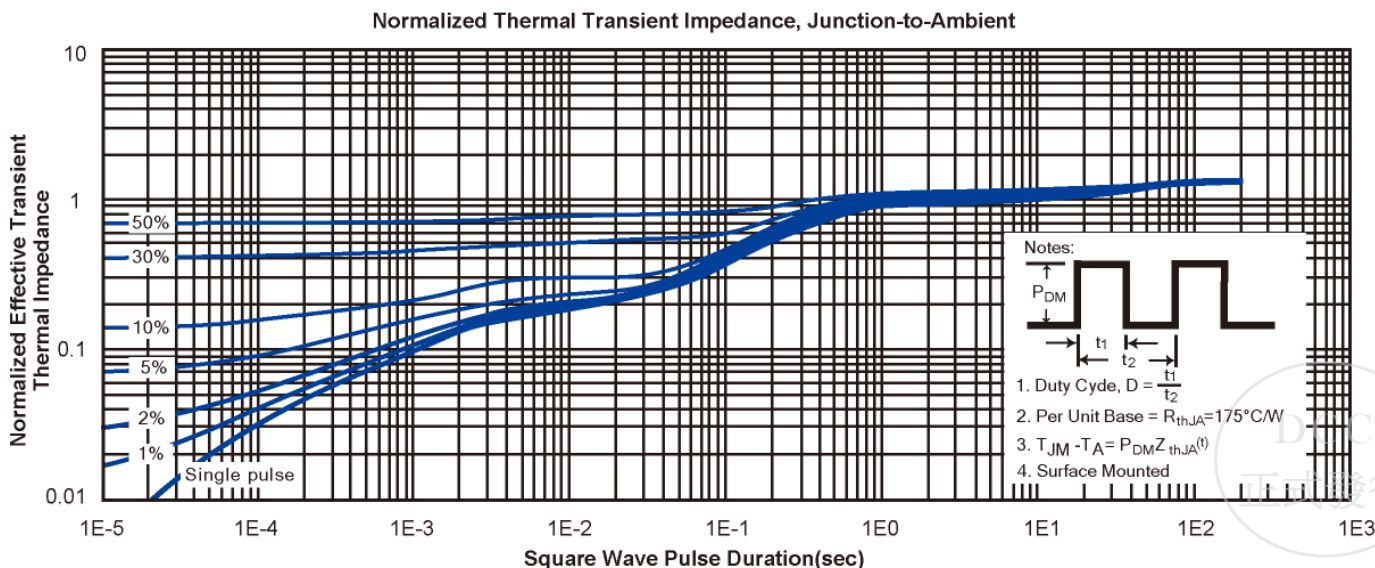
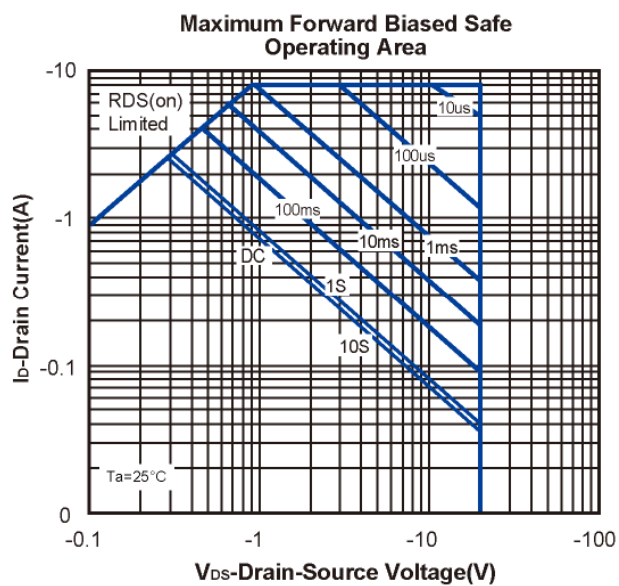
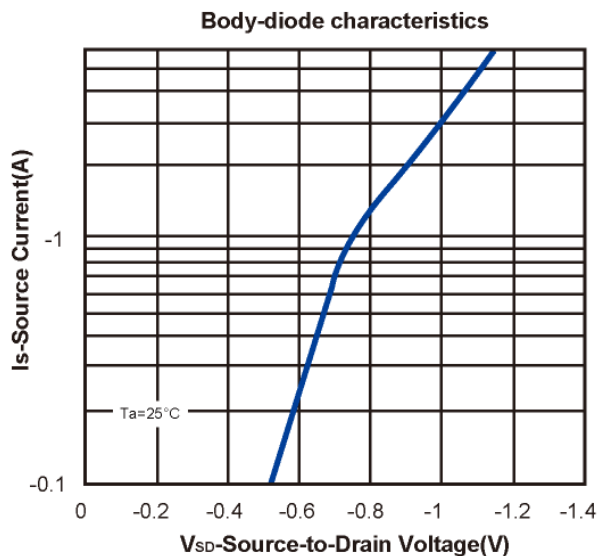
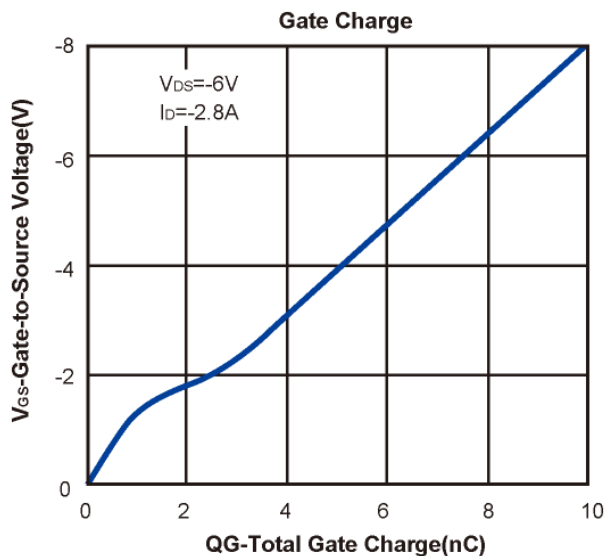
**P-Channel**



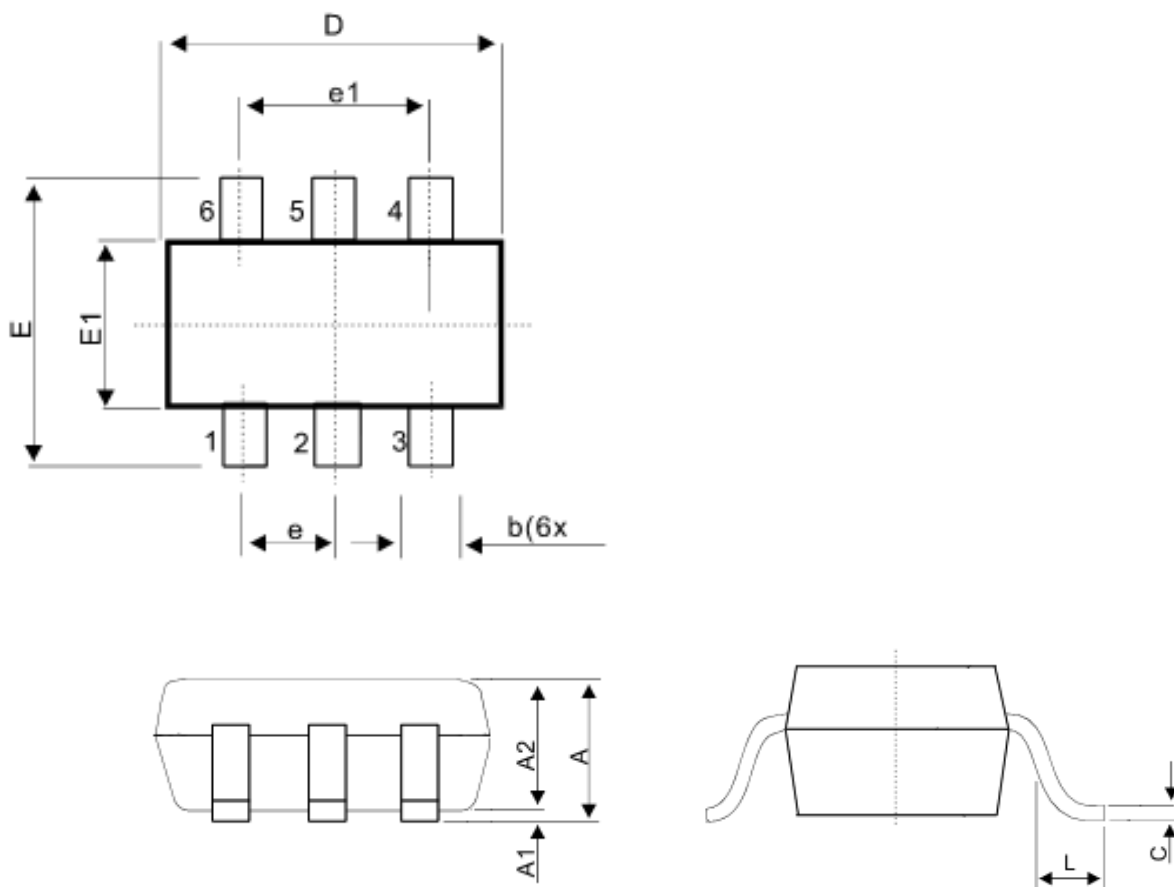
**N- and P-Channel 20V (D-S) MOSFET**

**Typical Characteristics (T<sub>J</sub> =25°C Noted)**

**P-Channel**



**TSOP-6 Package Outline**



| SYMBOL | MILLIMETERS (mm) |      |
|--------|------------------|------|
|        | MIN              | MAX  |
| A      | 0.90             | 1.20 |
| A1     | 0.01             | 0.10 |
| A2     | 0.90             | 1.15 |
| b      | 0.25             | 0.50 |
| C      | 0.10             | 0.20 |
| D      | 2.80             | 3.10 |
| E      | 2.60             | 3.00 |
| E1     | 1.50             | 1.70 |
| e      | 0.95 BSC         |      |
| e1     | 1.90 BSC         |      |
| L      | 0.30             | 0.60 |

