# 1.2V Drive Nch+Pch MOSFET

## EM6M2

### ●Structure
Silicon N-channel MOSFET /
Silicon P-channel MOSFET

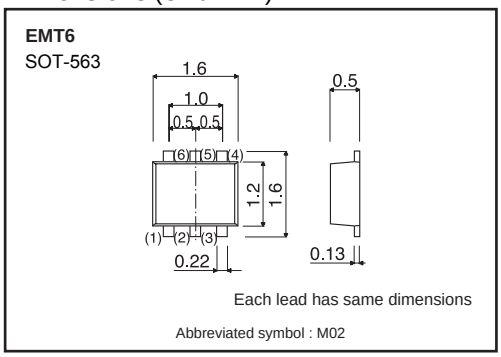
### ●Features
1) Nch MOSFET and Pch MOSFET are put in EMT6 package.
2) High-speed switching.
3) Low voltage drive (1.2V drive).
4) Built-in G-S Protection Diode.

### ●Applications
Switching

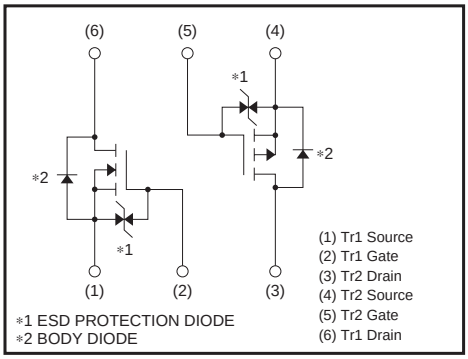
### ●Packaging specifications

| | | |
|---|---|---|
| Type | Package | Taping |
| | Code | T2R |
| | Basic ordering unit (pieces) | 8000 |
| EM6M2 | | ◯ |

### ●Dimensions (Unit : mm)




### ●Inner circuit




### ●Absolute maximum ratings (Ta=25°C)

| Parameter | | Symbol | Limits | | Unit |
|---|---|---|---|---|---|
| | | | Tr1 : N-ch | Tr2 : P-ch | |
| Drain-source voltage | | $V_{DSS}$ | 20 | −20 | V |
| Gate-source voltage | | $V_{GSS}$ | ±8 | ±10 | V |
| Drain current | Continuous | $I_D$ | ±200 | ±200 | mA |
| | Pulsed | $I_{DP}$∗1 | ±400 | ±400 | mA |
| Total power dissipation | | $P_D$∗2 | 150 | | mW / TOTAL |
| | | | 120 | | mW / ELEMENT |
| Channel temperature | | Tch | 150 | | °C |
| Range of storage temperature | | Tstg | −55 to +150 | | °C |

∗1 Pw≦10μs, Duty cycle≦1%
∗2 Each terminal mounted on a recommended land

### N-ch

**●Electrical characteristics** (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Gate-source leakage | $I_{GSS}$ | – | – | ±10 | μA | $V_{GS}$= ±8V, $V_{DS}$=0V |
| Drain-source breakdown voltage | $V_{(BR)\ DSS}$ | 20 | – | – | V | $I_D$= 1mA, $V_{GS}$=0V |
| Zero gate voltage drain current | $I_{DSS}$ | – | – | 1 | μA | $V_{DS}$= 20V, $V_{GS}$=0V |
| Gate threshold voltage | $V_{GS\ (th)}$ | 0.3 | – | 1.0 | V | $V_{DS}$= 10V, $I_D$= 1mA |
| Static drain-source on-state resistance | $R_{DS\ (on)}$ * | – | 0.7 | 1.0 | Ω | $I_D$= 200mA, $V_{GS}$= 4.0V |
| | | – | 0.8 | 1.2 | Ω | $I_D$= 200mA, $V_{GS}$= 2.5V |
| | | – | 1.0 | 1.4 | Ω | $I_D$= 200mA, $V_{GS}$= 1.8V |
| | | – | 1.2 | 2.4 | Ω | $I_D$= 40mA, $V_{GS}$= 1.5V |
| | | – | 1.6 | 4.8 | Ω | $I_D$= 20mA, $V_{GS}$= 1.2V |
| Forward transfer admittance | $\|Y_{fs}\|$ * | 0.2 | – | – | S | $V_{DS}$= 10V, $I_D$= 200mA |
| Input capacitance | $C_{iss}$ | – | 25 | – | pF | $V_{DS}$= 10V |
| Output capacitance | $C_{oss}$ | – | 10 | – | pF | $V_{GS}$= 0V |
| Reverse transfer capacitance | $C_{rss}$ | – | 10 | – | pF | f=1MHz |
| Turn-on delay time | $t_{d\ (on)}$ * | – | 5 | – | ns | $V_{DD}$≒ 10V<br>$I_D$= 150mA<br>$V_{GS}$= 4.0V<br>$R_L$ ≒ 67Ω<br>$R_G$= 10Ω |
| Rise time | $t_r$ * | – | 10 | – | ns | |
| Turn-off delay time | $t_{d\ (off)}$ * | – | 15 | – | ns | |
| Fall time | $t_f$ * | – | 10 | – | ns | |

*Pulsed

**●Body diode characteristics** (Source-drain) (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward voltage | $V_{SD}$ * | – | – | 1.2 | V | $I_S$= 100mA, $V_{GS}$=0V |

* Pulsed

### P-ch

**●Electrical characteristics** (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Gate-source leakage | $I_{GSS}$ | – | – | ±10 | μA | $V_{GS}$= ±10V, $V_{DS}$=0V |
| Drain-source breakdown voltage | $V_{(BR)\ DSS}$ | –20 | – | – | V | $I_D$= –1mA, $V_{GS}$=0V |
| Zero gate voltage drain current | $I_{DSS}$ | – | – | –1 | μA | $V_{DS}$= –20V, $V_{GS}$=0V |
| Gate threshold voltage | $V_{GS\ (th)}$ | –0.3 | – | –1.0 | V | $V_{DS}$= –10V, $I_D$= –100μA |
| Static drain-source on-state resistance | $R_{DS\ (on)}$ * | – | 0.8 | 1.2 | Ω | $I_D$= –200mA, $V_{GS}$= –4.5V |
| | | – | 1.0 | 1.5 | Ω | $I_D$= –100mA, $V_{GS}$= –2.5V |
| | | – | 1.3 | 2.2 | Ω | $I_D$= –100mA, $V_{GS}$= –1.8V |
| | | – | 1.6 | 3.5 | Ω | $I_D$= –40mA, $V_{GS}$= –1.5V |
| | | – | 2.4 | 9.6 | Ω | $I_D$= –10mA, $V_{GS}$= –1.2V |
| Forward transfer admittance | $\|Y_{fs}\|$ * | 0.2 | – | – | S | $V_{DS}$= –10V, $I_D$= –200mA |
| Input capacitance | $C_{iss}$ | – | 115 | – | pF | $V_{DS}$= –10V |
| Output capacitance | $C_{oss}$ | – | 10 | – | pF | $V_{GS}$= 0V |
| Reverse transfer capacitance | $C_{rss}$ | – | 6 | – | pF | f=1MHz |
| Turn-on delay time | $t_{d\ (on)}$ * | – | 6 | – | ns | $V_{DD}$≒ –10V<br>$I_D$= –100mA<br>$V_{GS}$= –4.5V<br>$R_L$ ≒ 100Ω<br>$R_G$= 10Ω |
| Rise time | $t_r$ * | – | 4 | – | ns | |
| Turn-off delay time | $t_{d\ (off)}$ * | – | 17 | – | ns | |
| Fall time | $t_f$ * | – | 17 | – | ns | |

*Pulsed

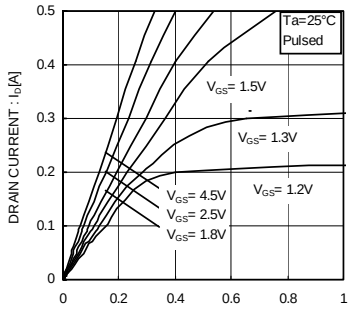
**●Body diode characteristics** (Source-drain) (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward voltage | $V_{SD}$ * | – | – | –1.2 | V | $I_S$= –200mA, $V_{GS}$=0V |

* Pulsed

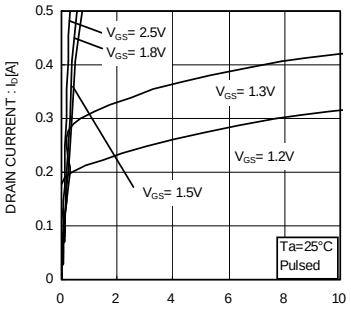
**N-ch**

**●Electrical characteristic curve**




DRAIN-SOURCE VOLTAGE : $V_{DS}$[V]

Fig.1 Typical Output Characteristics( Ⅰ )




DRAIN-SOURCE VOLTAGE : $V_{DS}$[V]

Fig.2 Typical Output Characteristics( Ⅱ )

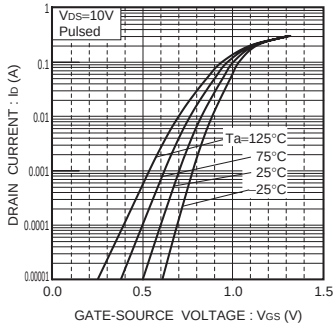
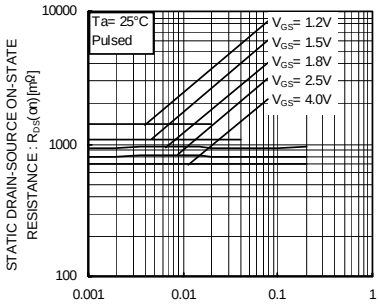
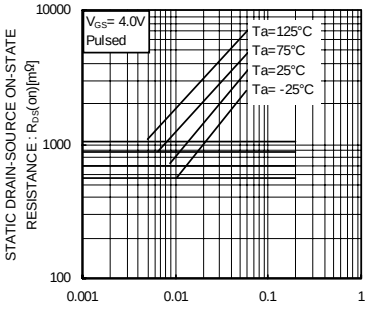



Fig.3 Typical transfer characteristics



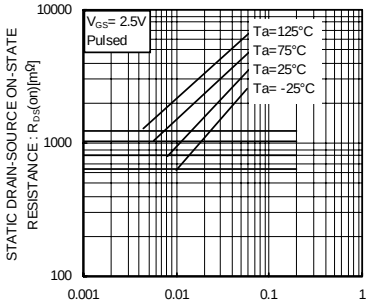

DRAIN-CURRENT : $I_D$[A]

Fig.4 Static Drain-Source On-State Resistance vs. Drain Current( Ⅰ )



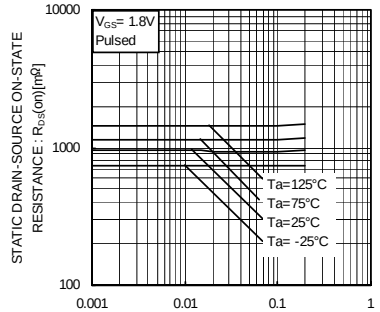

DRAIN-CURRENT : $I_D$[A]

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



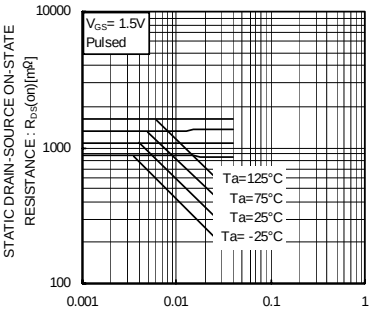

DRAIN-CURRENT : $I_D$[A]

Fig.6 Static Drain-Source On-State Resistance vs. Drain Current( Ⅱ )



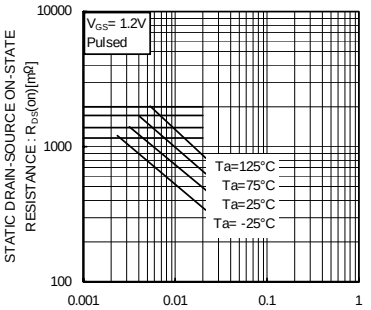

DRAIN-CURRENT : $I_D$[A]

Fig.7 Static Drain-Source On-State Resistance vs. Drain Current( Ⅲ )




DRAIN-CURRENT : $I_D$[A]

Fig.8 Static Drain-Source On-State Resistance vs. Drain Current( Ⅳ )




DRAIN-CURRENT : $I_D$[A]

Fig.9 Static Drain-Source On-State Resistance vs. Drain Current( Ⅴ )

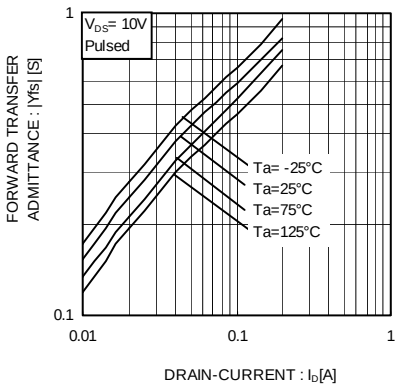



Fig.10 Forward Transfer Admittance vs. Drain Current

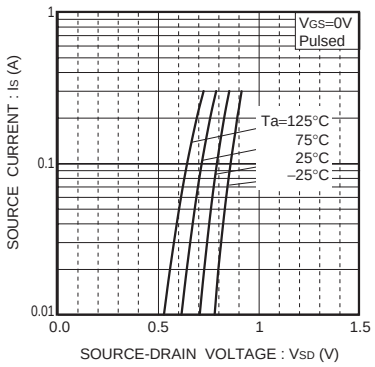



Fig.11 Source current vs. source-drain voltage

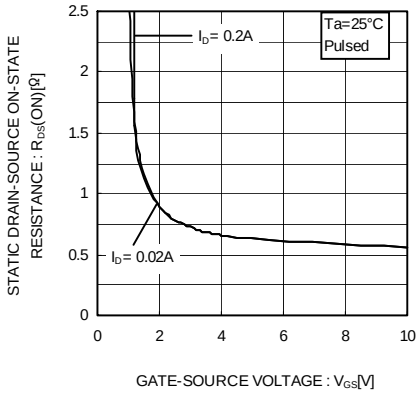



Fig.12 Static Drain-Source On-State Resistance vs. Gate Source Voltage

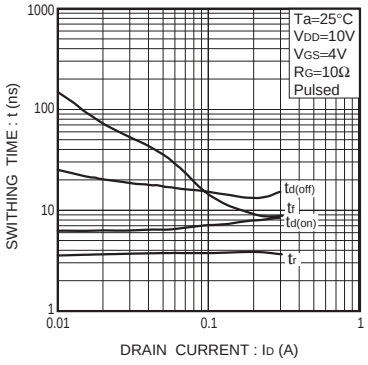



Fig.13 Switching characteristics

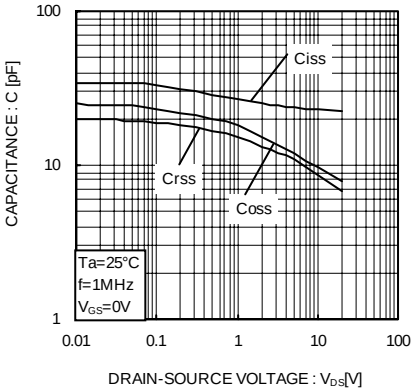



Fig.14 Typical Capacitance vs. Drain-Source Voltage

## P-ch

### ●Electrical characteristic curve

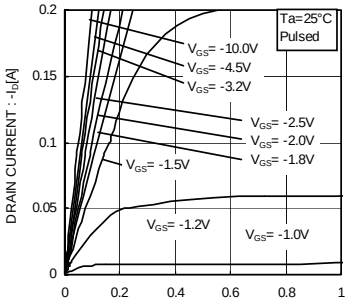



Fig.1 Typical output characteristics( Ⅰ )

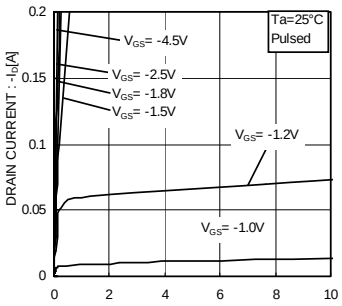



Fig.2 Typical output characteristics( Ⅱ )

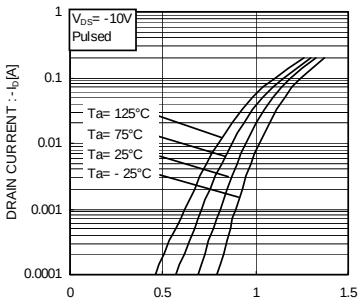



Fig.3 Typical Transfer Characteristics

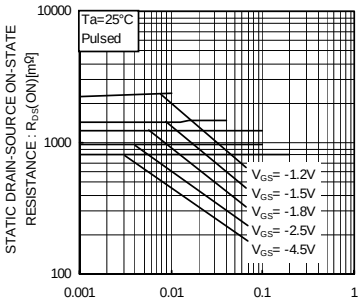



Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(Ⅰ)

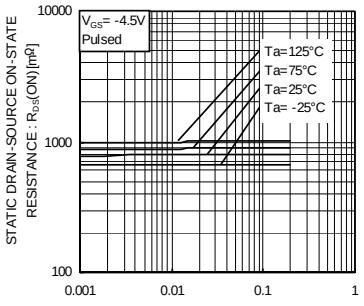



Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(Ⅱ)

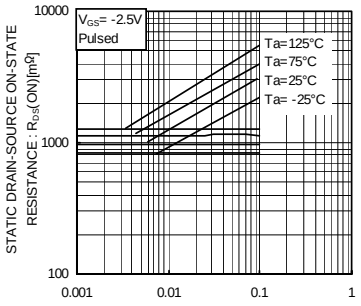



Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(Ⅲ)

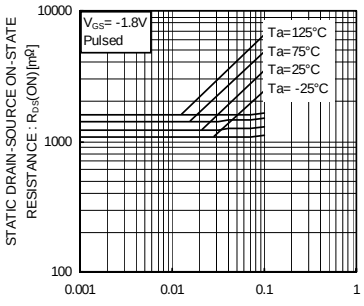



Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(Ⅳ)

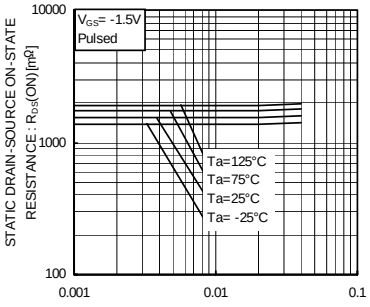



Fig.8 Static Drain-Source On-State Resistance vs. Drain Current( Ⅴ )

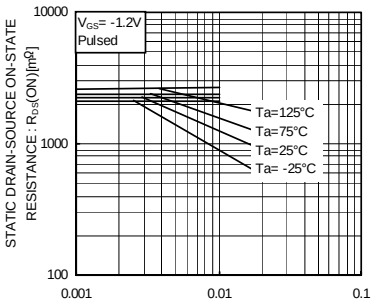



Fig.9 Static Drain-Source On-State Resistance vs. Drain Current( Ⅵ )

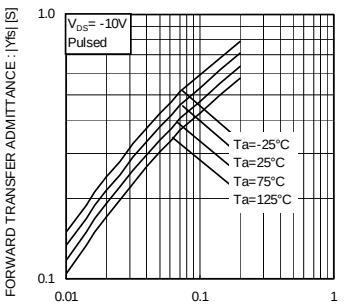



Fig.10 Forward Transfer Admittance vs. Drain Current

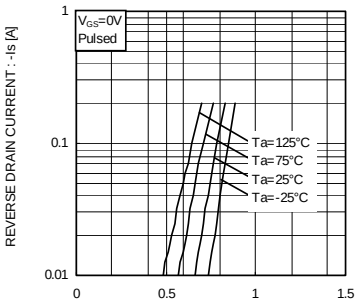



Fig.11 Reverse Drain Current vs. Sourse-Drain Voltage

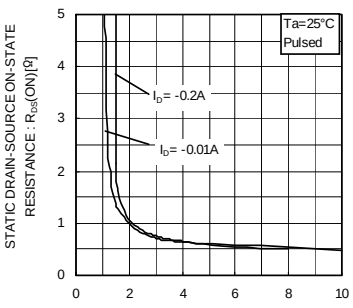



Fig.12 Static Drain-Source On-State Resistance vs. Gate Source Voltage

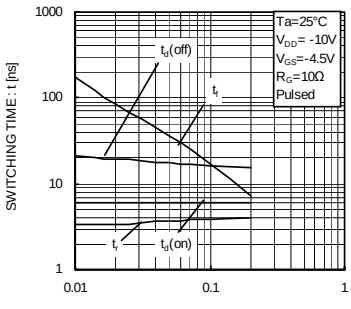



Fig.13 Switching Characteristics

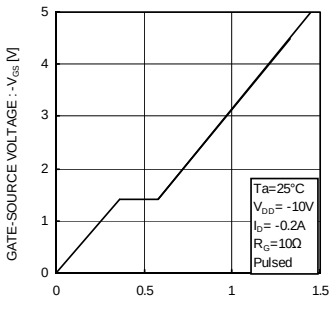



Fig.14 Dynamic Input Characteristics

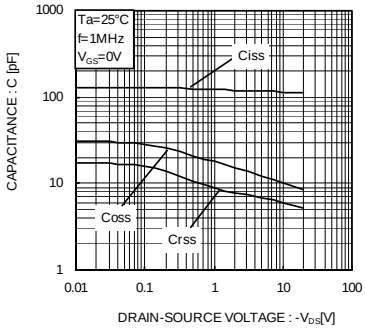



Fig.15 Typical Capacitance vs. Drain-Source Voltage

**N-ch**

**●Measurement circuit**

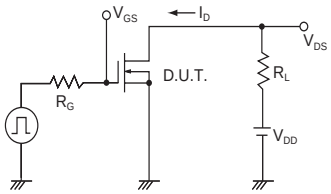



Fig.1-1 Switching Time Measurement circuit

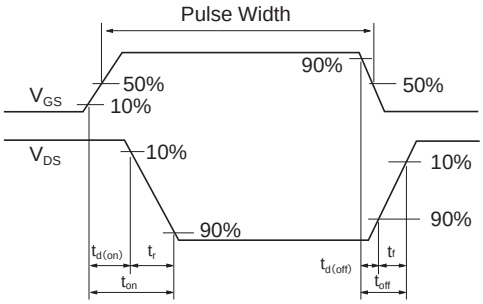



Fig.1-2 Switching Waveforms

**P-ch**

**●Measurement circuit**

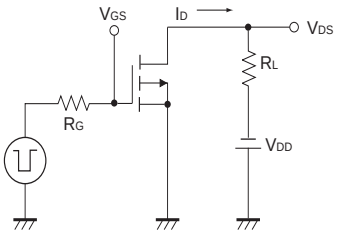



Fig.2-1 Switching Time Measurement circuit

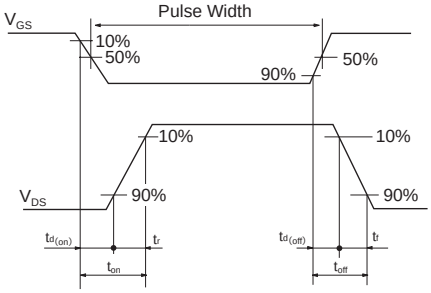



Fig.2-2 Switching Waveforms

**●Notice**

This product might cause chip aging and breakdown under the large electrified environment.
Please consider to design ESD protection circuit.

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