



SANYO Semiconductors

## DATA SHEET

N-Channel and P-Channel Silicon MOSFETs

# EMH2603 — General-Purpose Switching Device Applications

## Features

- The EMH2603 incorporates an N-channel MOSFET and a P-channel MOSFET that feature low ON-resistance and ultrahigh-speed switching, thereby enabling high-density mounting.
- Nch: 2.5V drive.
- Pch: 1.8V drive.

## Specifications

Absolute Maximum Ratings at Ta=25°C

| Parameter                   | Symbol           | Conditions                                      | N-channel   | P-channel | Unit |
|-----------------------------|------------------|-------------------------------------------------|-------------|-----------|------|
| Drain-to-Source Voltage     | V <sub>DSS</sub> |                                                 | 30          | -20       | V    |
| Gate-to-Source Voltage      | V <sub>GSS</sub> |                                                 | ±10         | ±10       | V    |
| Drain Current (DC)          | I <sub>D</sub>   |                                                 | 0.15        | -2        | A    |
| Drain Current (Pulse)       | I <sub>DP</sub>  | PW≤10μs, duty cycle≤1%                          | 0.6         | -8        | A    |
| Allowable Power Dissipation | P <sub>D</sub>   | Mounted on a ceramic board (900mm²×0.8mm) 1unit | 0.6         | 1.1       | W    |
| Total Dissipation           | P <sub>T</sub>   | Mounted on a ceramic board (900mm²×0.8mm)       | 1.2         |           | W    |
| Channel Temperature         | T <sub>ch</sub>  |                                                 | 150         |           | °C   |
| Storage Temperature         | T <sub>stg</sub> |                                                 | -55 to +150 |           | °C   |

Electrical Characteristics at Ta=25°C

| Parameter                         | Symbol   | Conditions        | Ratings |      |     | Unit |
|-----------------------------------|----------|-------------------|---------|------|-----|------|
|                                   |          |                   | min     | typ  | max |      |
| [N-channel]                       |          |                   |         |      |     |      |
| Drain-to-Source Breakdown Voltage | V(BR)DSS | ID=1mA, VGS=0V    | 30      |      |     | V    |
| Zero-Gate Voltage Drain Current   | IDSS     | VDS=30V, VGS=0V   |         |      | 1   | μA   |
| Gate-to-Source Leakage Current    | IGSS     | VGS=±8V, VDS=0V   |         |      | ±10 | μA   |
| Cutoff Voltage                    | VGS(off) | VDS=10V, ID=100μA | 0.4     |      | 1.3 | V    |
| Forward Transfer Admittance       | yfs      | VDS=10V, ID=80mA  | 0.13    | 0.22 |     | S    |

Marking : FC

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SANYO Semiconductor Co., Ltd.

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# EMH2603

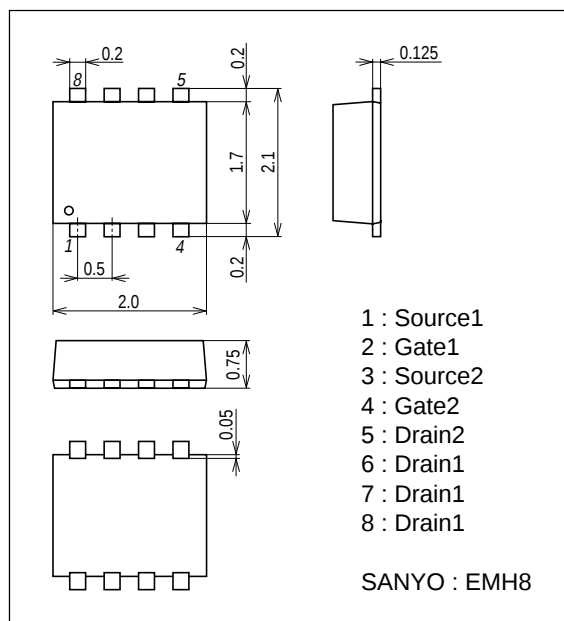
Continued from preceding page.

| Parameter                                  | Symbol        | Conditions                          | Ratings |       |          | Unit       |
|--------------------------------------------|---------------|-------------------------------------|---------|-------|----------|------------|
|                                            |               |                                     | min     | typ   | max      |            |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$ | $I_D=80mA, V_{GS}=4V$               |         | 2.9   | 3.7      | $\Omega$   |
|                                            | $R_{DS(on)2}$ | $I_D=40mA, V_{GS}=2.5V$             |         | 3.7   | 5.2      | $\Omega$   |
|                                            | $R_{DS(on)3}$ | $I_D=10mA, V_{GS}=1.5V$             |         | 6.4   | 12.8     | $\Omega$   |
| Input Capacitance                          | $C_{iss}$     | $V_{DS}=10V, f=1MHz$                |         | 7.0   |          | pF         |
| Output Capacitance                         | $C_{oss}$     | $V_{DS}=10V, f=1MHz$                |         | 5.9   |          | pF         |
| Reverse Transfer Capacitance               | $C_{rss}$     | $V_{DS}=10V, f=1MHz$                |         | 2.3   |          | pF         |
| Turn-ON Delay Time                         | $t_d(on)$     | See specified Test Circuit.         |         | 19    |          | ns         |
| Rise Time                                  | $t_r$         | See specified Test Circuit.         |         | 65    |          | ns         |
| Turn-OFF Delay Time                        | $t_d(off)$    | See specified Test Circuit.         |         | 155   |          | ns         |
| Fall Time                                  | $t_f$         | See specified Test Circuit.         |         | 120   |          | ns         |
| Total Gate Charge                          | $Q_g$         | $V_{DS}=10V, V_{GS}=10V, I_D=150mA$ |         | 1.58  |          | nC         |
| Gate-to-Source Charge                      | $Q_{gs}$      | $V_{DS}=10V, V_{GS}=10V, I_D=150mA$ |         | 0.26  |          | nC         |
| Gate-to-Drain "Miller" Charge              | $Q_{gd}$      | $V_{DS}=10V, V_{GS}=10V, I_D=150mA$ |         | 0.31  |          | nC         |
| Diode Forward Voltage                      | $V_{SD}$      | $I_S=150mA, V_{GS}=0V$              |         | 0.87  | 1.2      | V          |
| [P-channel]                                |               |                                     |         |       |          |            |
| Drain-to-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D=-1mA, V_{GS}=0V$               | -20     |       |          | V          |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS}=-20V, V_{GS}=0V$            |         |       | -1       | $\mu A$    |
| Gate-to-Source Leakage Current             | $I_{GSS}$     | $V_{GS}=\pm 8V, V_{DS}=0V$          |         |       | $\pm 10$ | $\mu A$    |
| Cutoff Voltage                             | $V_{GS(off)}$ | $V_{DS}=-10V, I_D=-1mA$             | -0.4    |       | -1.4     | V          |
| Forward Transfer Admittance                | $ y_{fs} $    | $V_{DS}=-10V, I_D=-1A$              | 1.9     | 3.2   |          | S          |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$ | $I_D=-1A, V_{GS}=-4V$               |         | 115   | 150      | m $\Omega$ |
|                                            | $R_{DS(on)2}$ | $I_D=-0.5A, V_{GS}=-2.5V$           |         | 165   | 235      | m $\Omega$ |
|                                            | $R_{DS(on)3}$ | $I_D=-0.3A, V_{GS}=-1.8V$           |         | 260   | 520      | m $\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{DS}=-10V, f=1MHz$               |         | 420   |          | pF         |
| Output Capacitance                         | $C_{oss}$     | $V_{DS}=-10V, f=1MHz$               |         | 73    |          | pF         |
| Reverse Transfer Capacitance               | $C_{rss}$     | $V_{DS}=-10V, f=1MHz$               |         | 60    |          | pF         |
| Turn-ON Delay Time                         | $t_d(on)$     | See specified Test Circuit.         |         | 11.8  |          | ns         |
| Rise Time                                  | $t_r$         | See specified Test Circuit.         |         | 33    |          | ns         |
| Turn-OFF Delay Time                        | $t_d(off)$    | See specified Test Circuit.         |         | 48    |          | ns         |
| Fall Time                                  | $t_f$         | See specified Test Circuit.         |         | 43    |          | ns         |
| Total Gate Charge                          | $Q_g$         | $V_{DS}=-10V, V_{GS}=-4V, I_D=-2A$  |         | 4.7   |          | nC         |
| Gate-to-Source Charge                      | $Q_{gs}$      | $V_{DS}=-10V, V_{GS}=-4V, I_D=-2A$  |         | 0.75  |          | nC         |
| Gate-to-Drain "Miller" Charge              | $Q_{gd}$      | $V_{DS}=-10V, V_{GS}=-4V, I_D=-2A$  |         | 1.6   |          | nC         |
| Diode Forward Voltage                      | $V_{SD}$      | $I_S=-2A, V_{GS}=0V$                |         | -0.83 | -1.2     | V          |

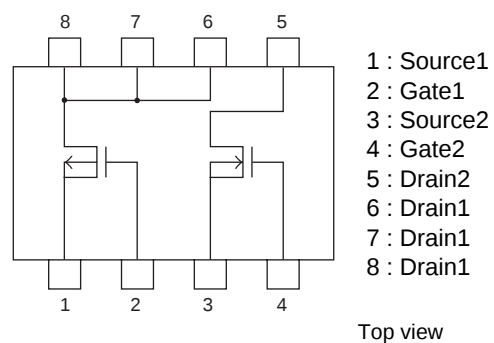
## Package Dimensions

unit : mm (typ)

7045-005



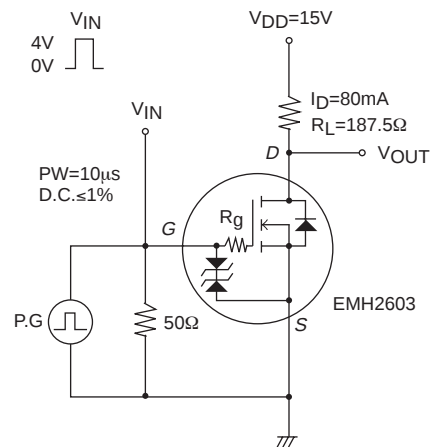
## Electrical Connection



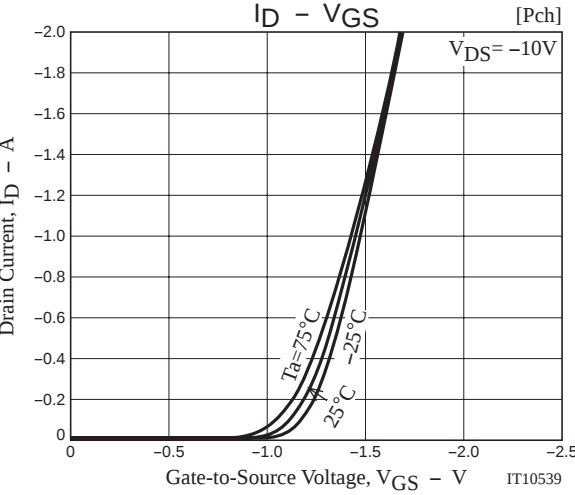
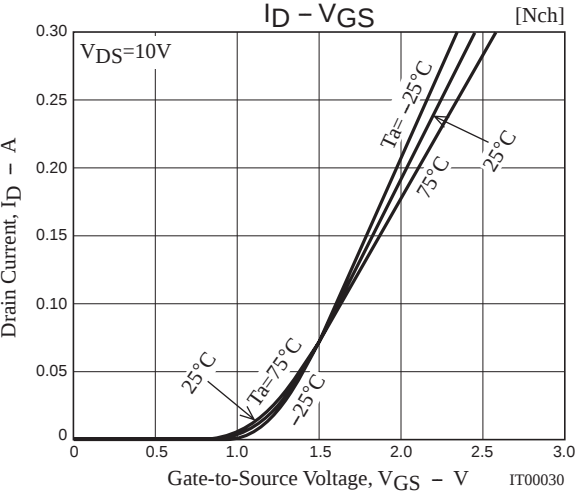
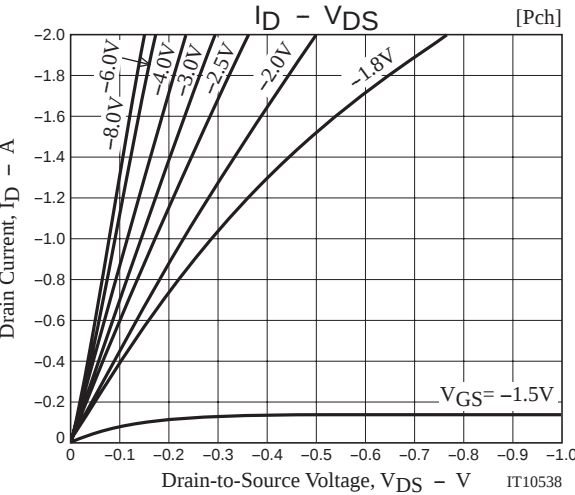
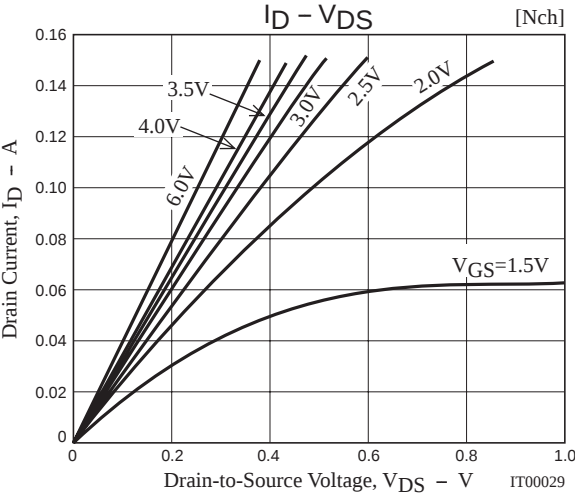
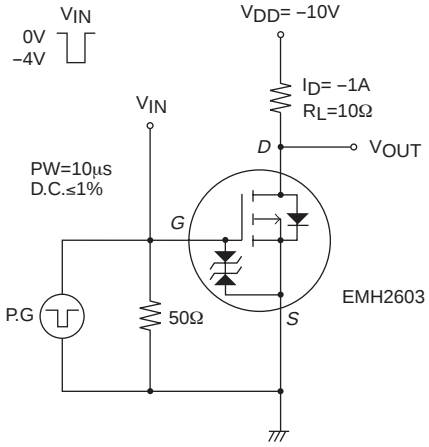
Top view

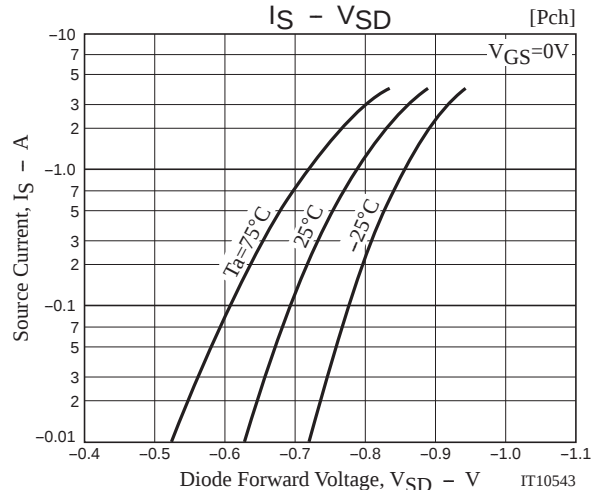
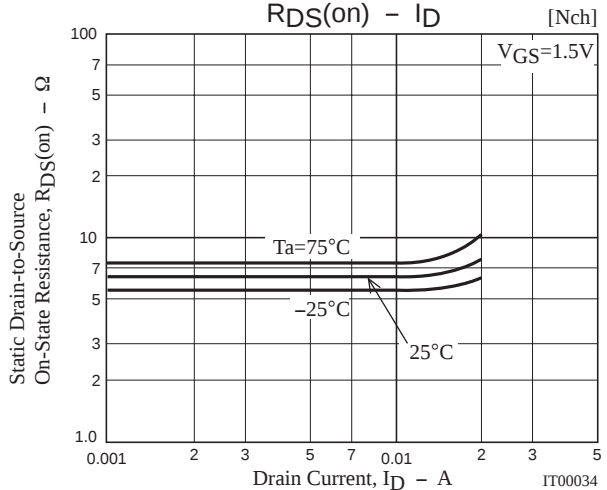
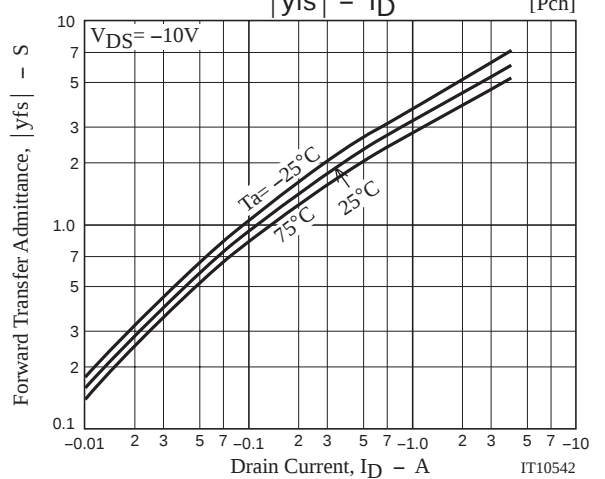
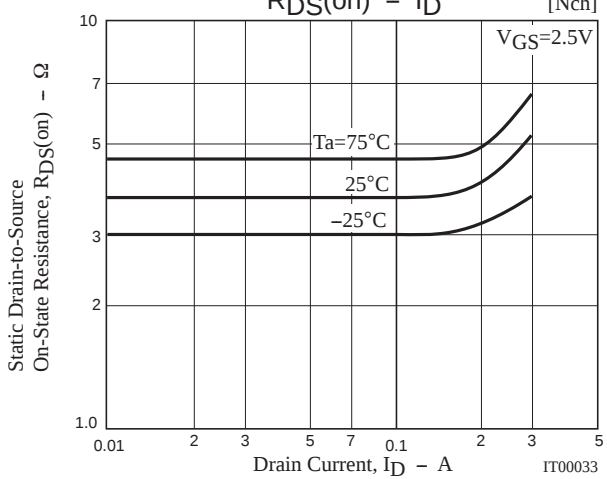
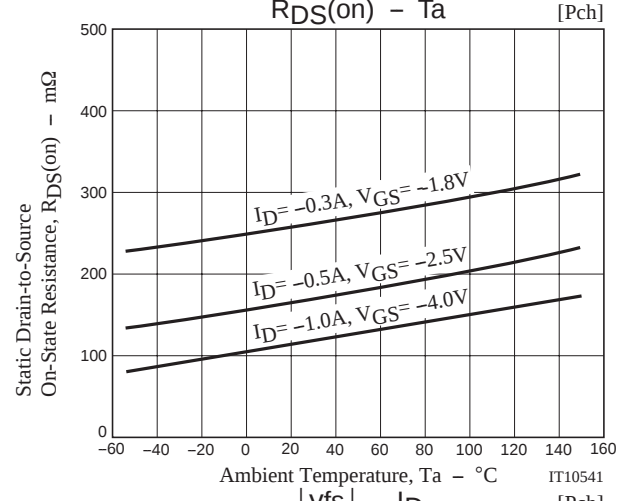
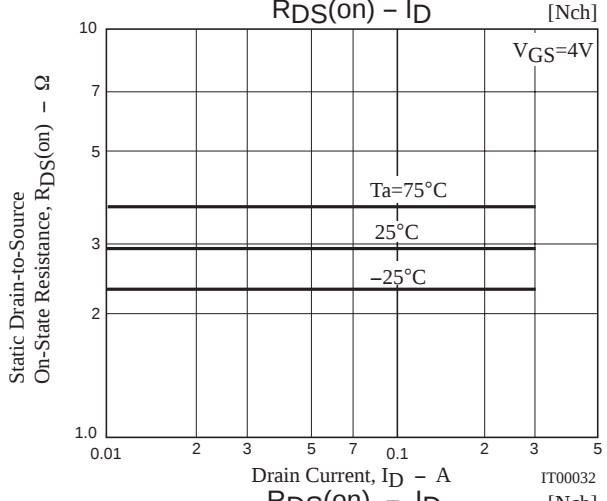
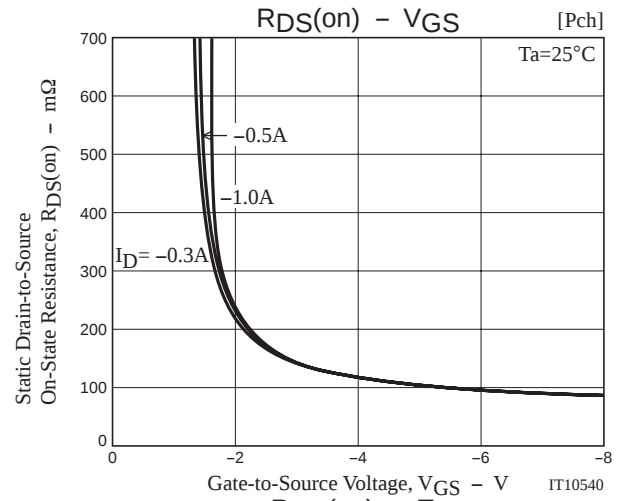
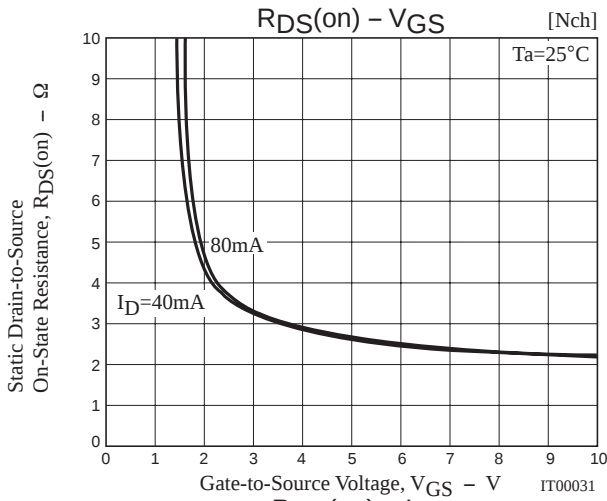
Switching Time Test Circuit

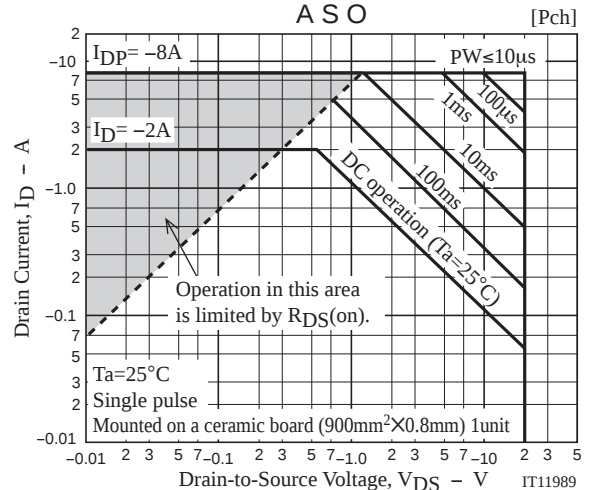
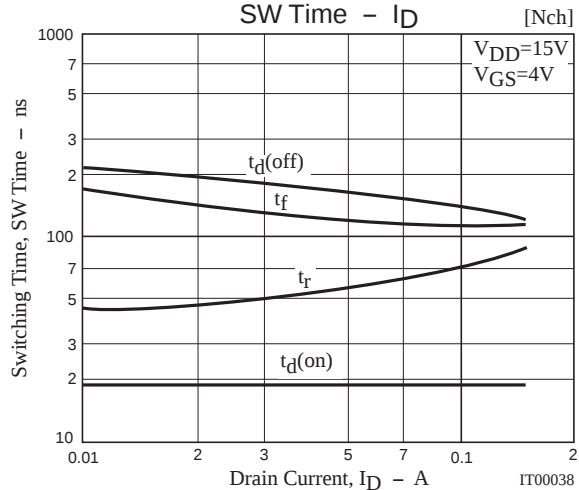
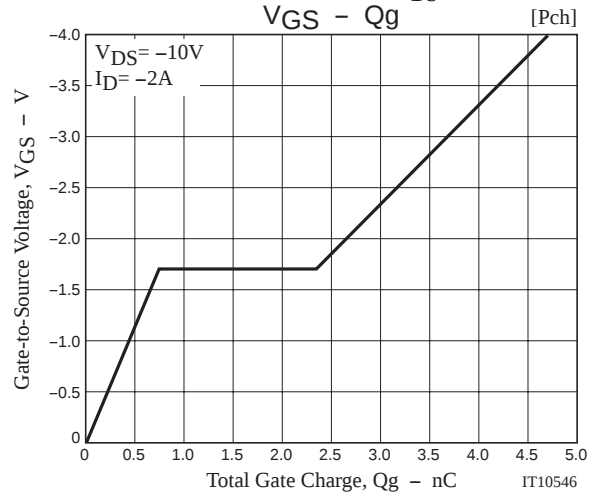
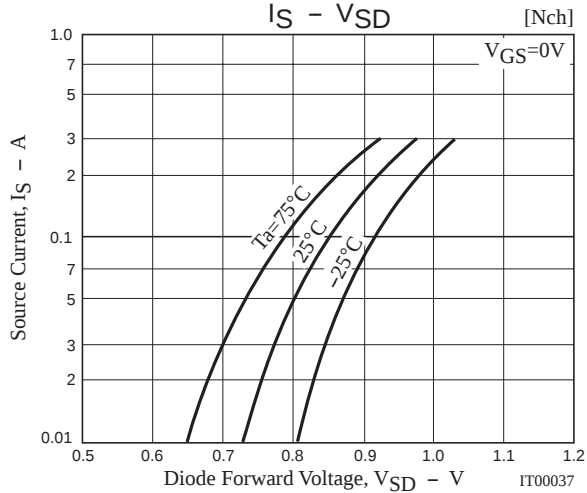
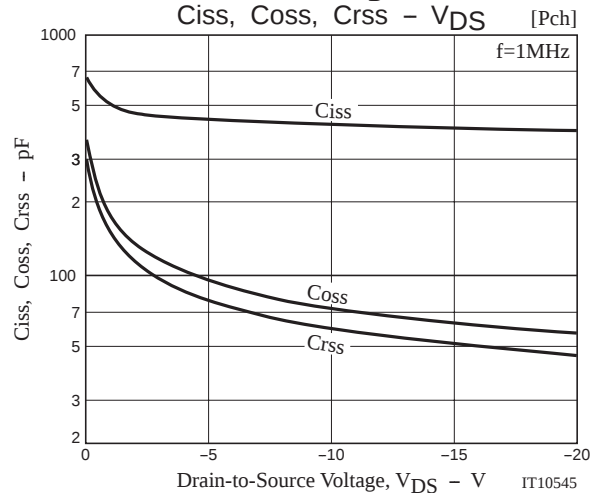
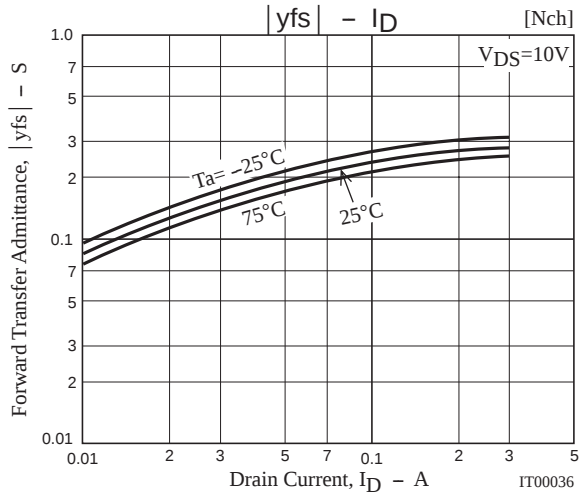
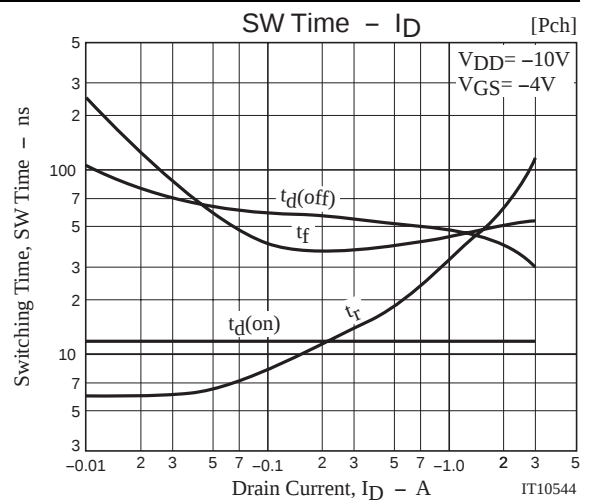
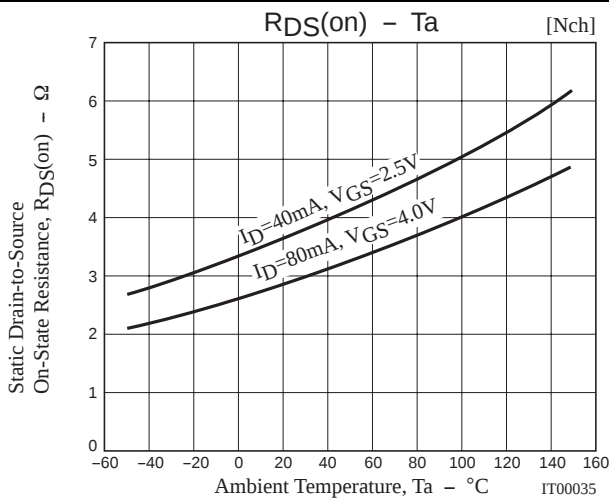
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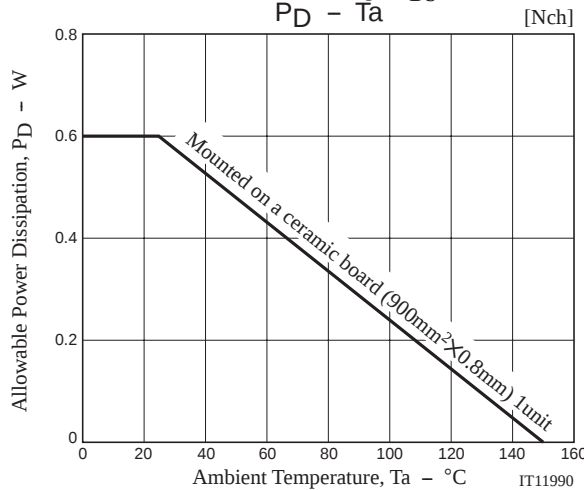
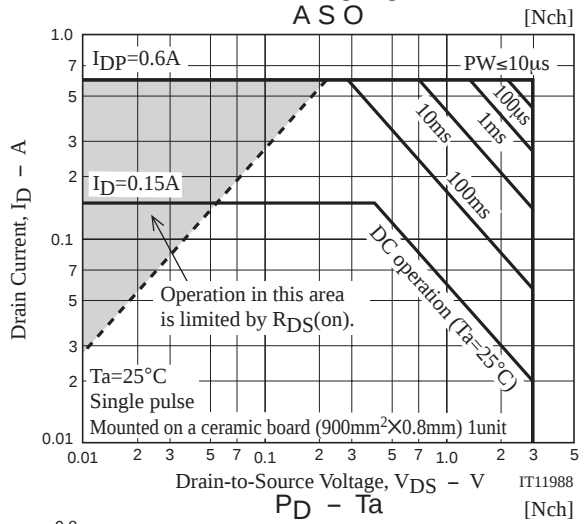
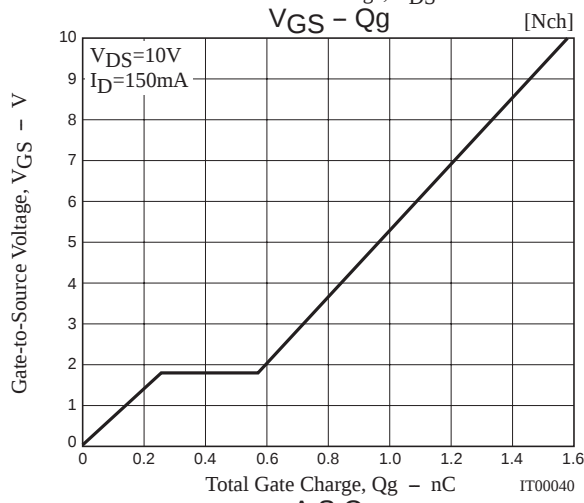
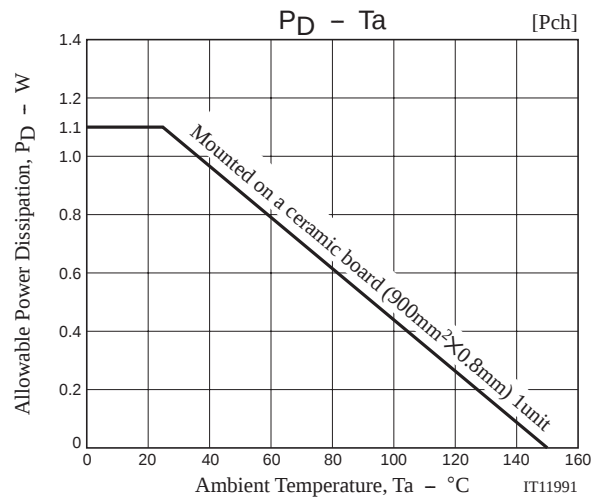
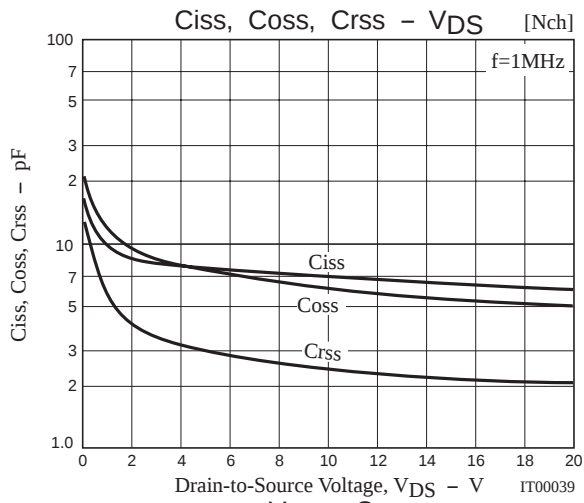


[P-channel]









Note on usage : Since the EMH2603 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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