



EMH2604

Power MOSFET

20V, 4A, 45mΩ, -20V, -3A, 85mΩ, Complementary Dual EMH8

ON Semiconductor®

<http://onsemi.com>

Features

- Nch + Pch MOSFET
- ON-resistance Nch : $R_{DS(on)1}=34m\Omega(\text{typ.})$
Pch : $R_{DS(on)1}=65m\Omega(\text{typ.})$
- 1.8V drive
- Halogen free compliance

Specifications

Absolute Maximum Ratings at $T_a=25^\circ\text{C}$

| Parameter | Symbol | Conditions | N-channel | P-channel | Unit |
|-----------------------------|-----------|---|-------------|-----------|------|
| Drain-to-Source Voltage | V_{DSS} | | 20 | -20 | V |
| Gate-to-Source Voltage | V_{GSS} | | ± 10 | ± 10 | V |
| Drain Current (DC) | I_D | | 4 | -3 | A |
| Drain Current (Pulse) | I_{DP} | $PW \leq 10\mu\text{s}$, duty cycle $\leq 1\%$ | 20 | -20 | A |
| Allowable Power Dissipation | P_D | When mounted on ceramic substrate (900mm ² x 0.8mm) 1 unit | 1.0 | | W |
| Total Dissipation | P_T | When mounted on ceramic substrate (900mm ² x 0.8mm) | 1.2 | | W |
| Channel Temperature | T_{ch} | | 150 | | °C |
| Storage Temperature | T_{stg} | | -55 to +150 | | °C |

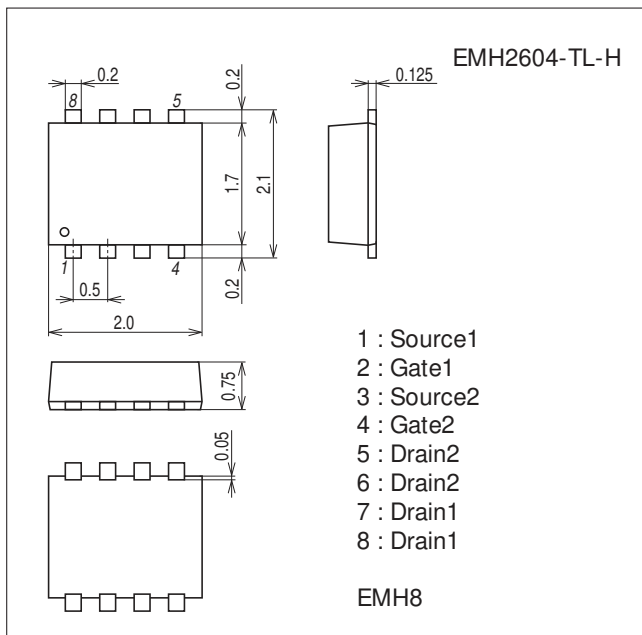
This product is designed to "ESD immunity < 200V**", so please take care when handling.

* Machine Model

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Package Dimensions

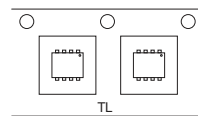
unit : mm (typ)
7045-002



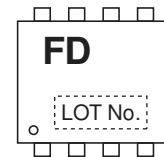
Product & Package Information

- Package : EMH8
- JEITA, JEDEC : -
- Minimum Packing Quantity : 3,000 pcs./reel

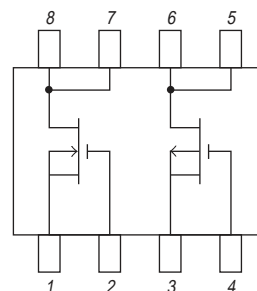
Packing Type : TL



Marking



Electrical Connection



EMH2604

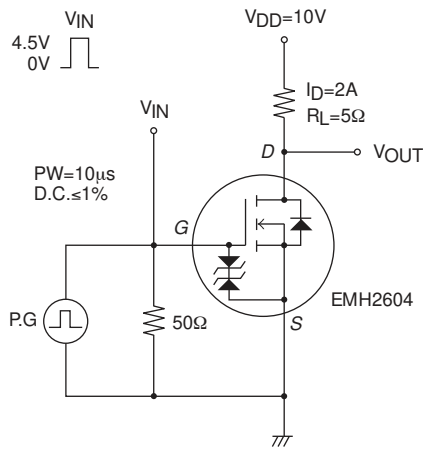
Electrical Characteristics at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|---------------|--------------------------------------|-----------------------------|------|----------|-----------|
| | | | min | typ | max | |
| [N-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 | μA |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{GS}=\pm 8V, V_{DS}=0V$ | | | ± 10 | μA |
| Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}=10V, I_D=1mA$ | 0.4 | | 1.3 | V |
| Forward Transfer Admittance | $ y_{fs} $ | $V_{DS}=10V, I_D=2A$ | | 3.4 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$ | $I_D=4A, V_{GS}=4.5V$ | | 34 | 45 | $m\Omega$ |
| | $R_{DS(on)2}$ | $I_D=1A, V_{GS}=2.5V$ | | 49 | 67 | $m\Omega$ |
| | $R_{DS(on)3}$ | $I_D=0.5A, V_{GS}=1.8V$ | | 74 | 115 | $m\Omega$ |
| Input Capacitance | C_{iss} | $V_{DS}=10V, f=1MHz$ | | 345 | | pF |
| Output Capacitance | C_{oss} | | | 67 | | pF |
| Reverse Transfer Capacitance | C_{rss} | | | 52 | | pF |
| Turn-ON Delay Time | $t_d(on)$ | | See specified Test Circuit. | | 9.2 | |
| Rise Time | t_r | | | 60 | | ns |
| Turn-OFF Delay Time | $t_d(off)$ | | | 30 | | ns |
| Fall Time | t_f | | | 38 | | ns |
| Total Gate Charge | Q_g | $V_{DS}=10V, V_{GS}=4.5V, I_D=4A$ | | | 4.7 | |
| Gate-to-Source Charge | Q_{gs} | | | 0.65 | | nC |
| Gate-to-Drain "Miller" Charge | Q_{gd} | | | 1.6 | | nC |
| Diode Forward Voltage | V_{SD} | | $I_S=4A, V_{GS}=0V$ | | 0.8 | 1.2 |
| [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 | μA |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{GS}=\pm 8V, V_{DS}=0V$ | | | ± 10 | μA |
| Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}=-10V, I_D=-1mA$ | -0.4 | | -1.3 | V |
| Forward Transfer Admittance | $ y_{fs} $ | $V_{DS}=-10V, I_D=-1.5A$ | | 3.6 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)1}$ | $I_D=-3A, V_{GS}=-4.5V$ | | 65 | 85 | $m\Omega$ |
| | $R_{DS(on)2}$ | $I_D=-1A, V_{GS}=-2.5V$ | | 98 | 137 | $m\Omega$ |
| | $R_{DS(on)3}$ | $I_D=-0.5A, V_{GS}=-1.8V$ | | 155 | 235 | $m\Omega$ |
| Input Capacitance | C_{iss} | $V_{DS}=-10V, f=1MHz$ | | 320 | | pF |
| Output Capacitance | C_{oss} | | | 66 | | pF |
| Reverse Transfer Capacitance | C_{rss} | | | 50 | | pF |
| Turn-ON Delay Time | $t_d(on)$ | | See specified Test Circuit. | | 7.1 | |
| Rise Time | t_r | | | 21 | | ns |
| Turn-OFF Delay Time | $t_d(off)$ | | | 37 | | ns |
| Fall Time | t_f | | | 32 | | ns |
| Total Gate Charge | Q_g | $V_{DS}=-10V, V_{GS}=-4.5V, I_D=-3A$ | | | 4.0 | |
| Gate-to-Source Charge | Q_{gs} | | | 0.6 | | nC |
| Gate-to-Drain "Miller" Charge | Q_{gd} | | | 1.1 | | nC |
| Diode Forward Voltage | V_{SD} | | $I_S=-3A, V_{GS}=0V$ | | -0.83 | -1.2 |

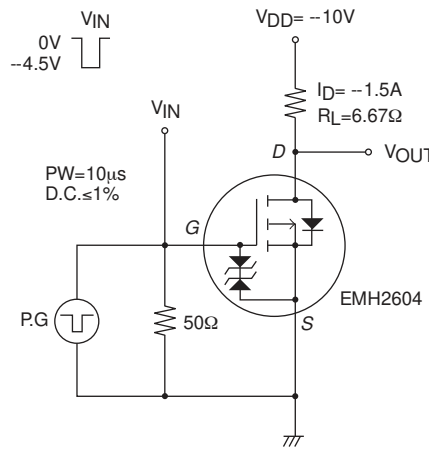
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Switching Time Test Circuit

[N-channel]

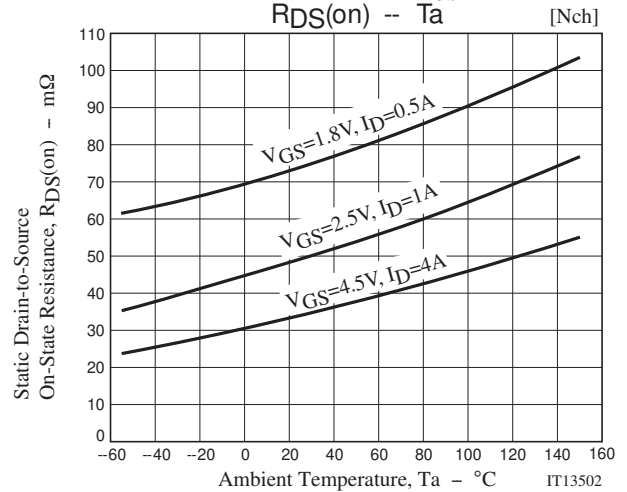
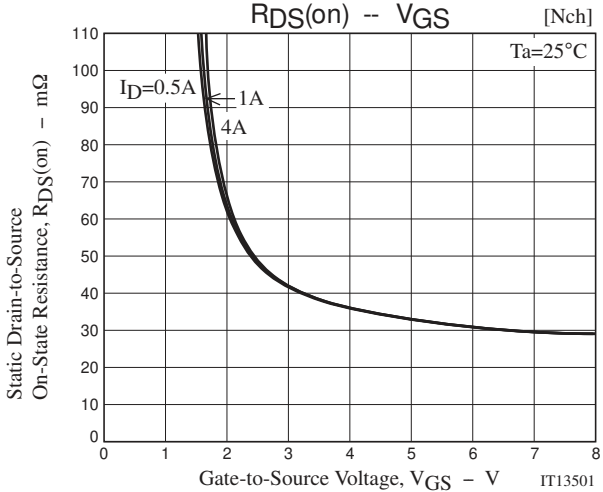
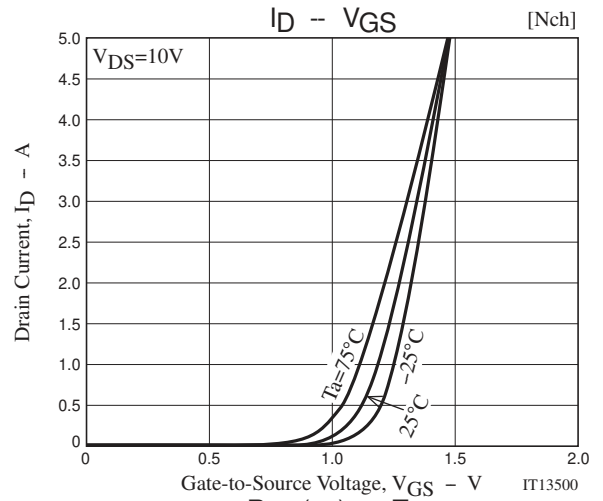
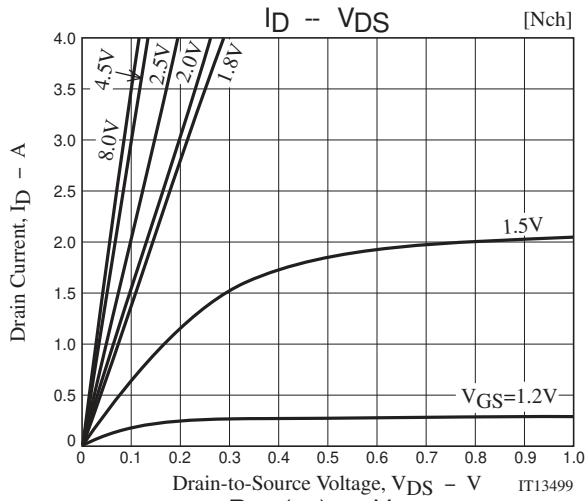


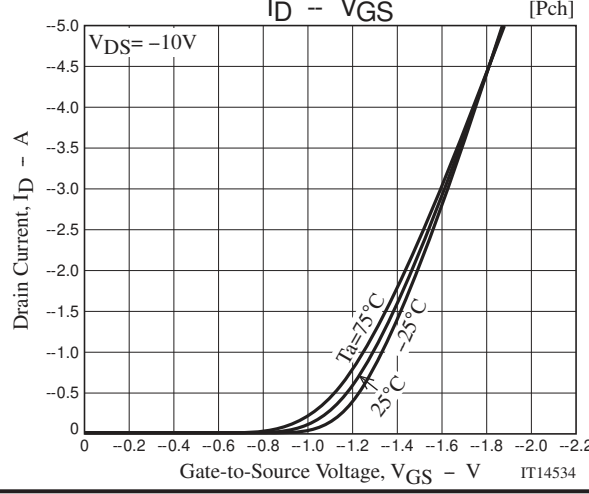
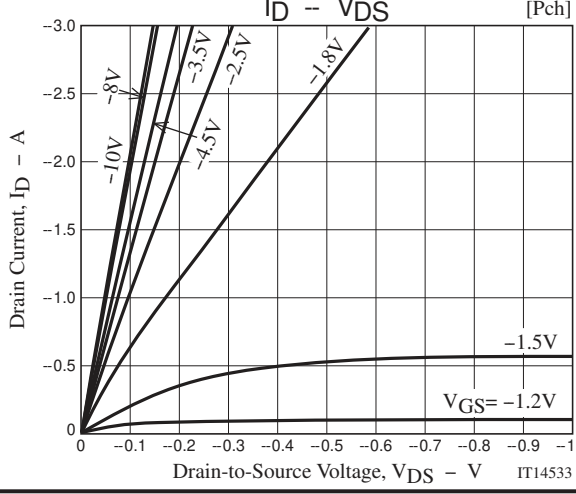
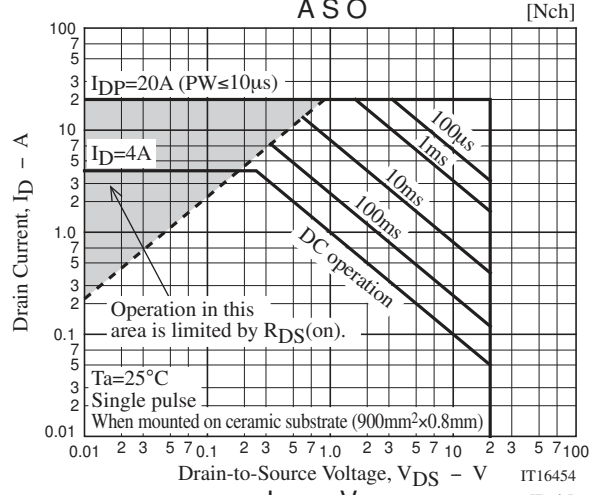
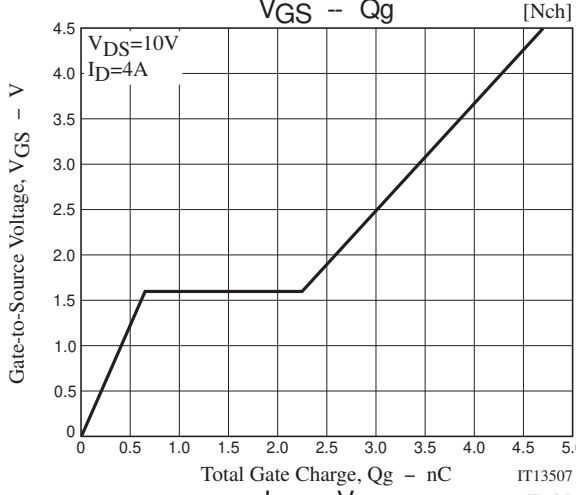
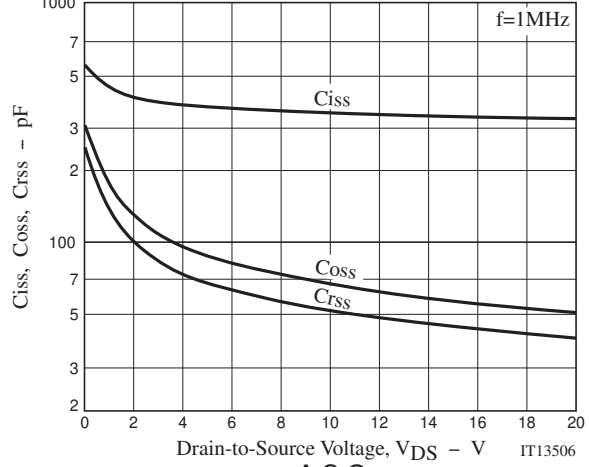
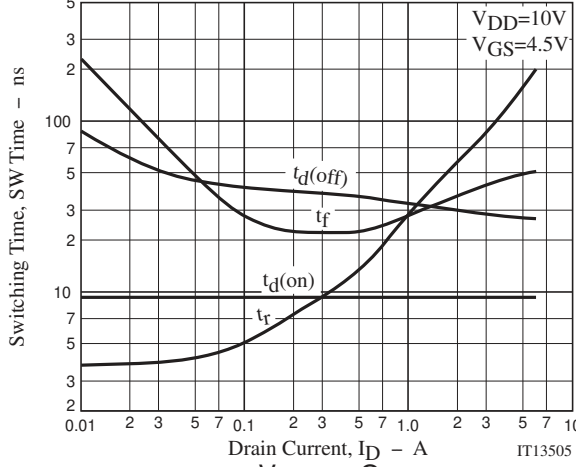
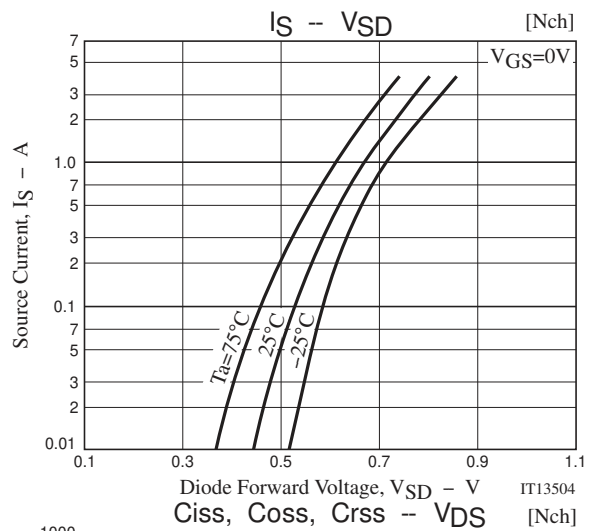
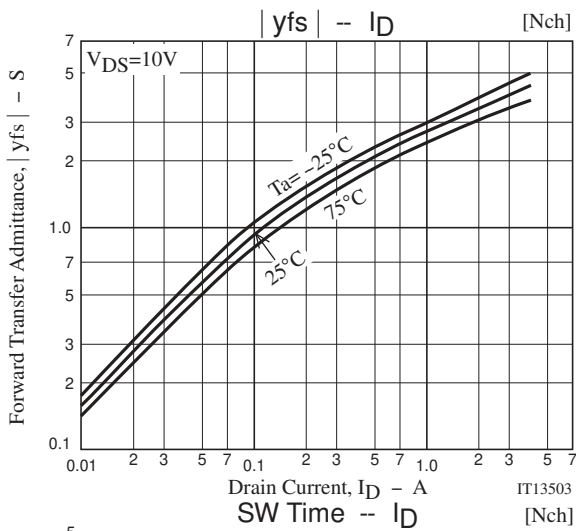
[P-channel]

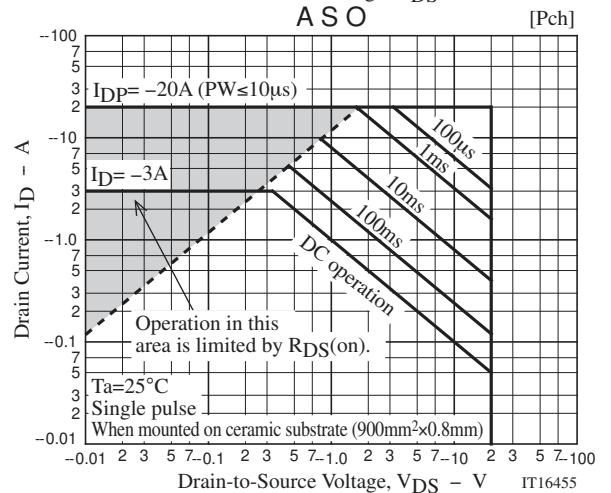
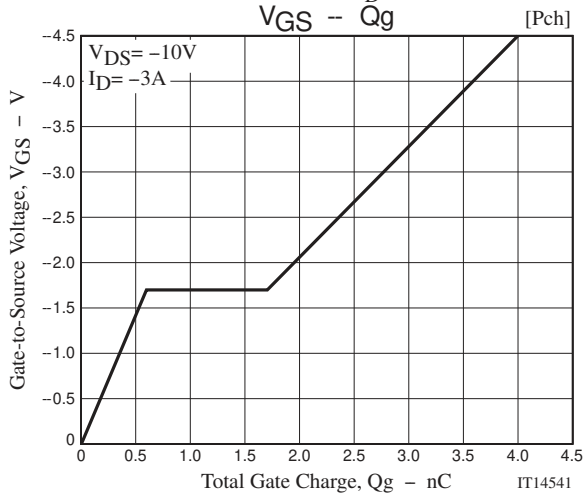
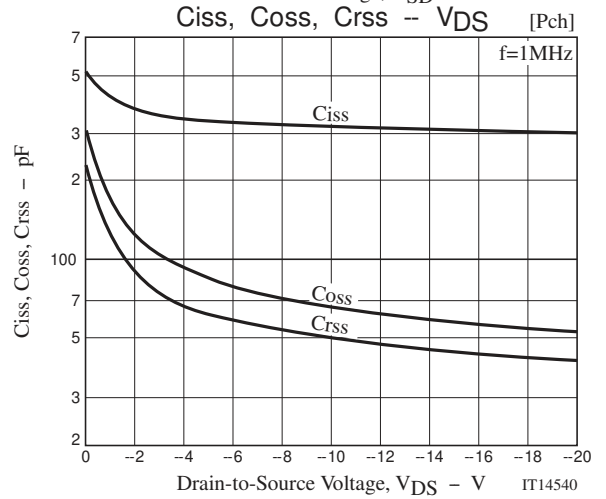
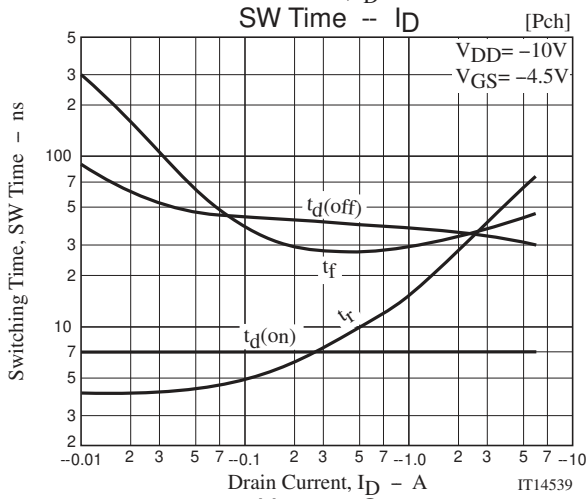
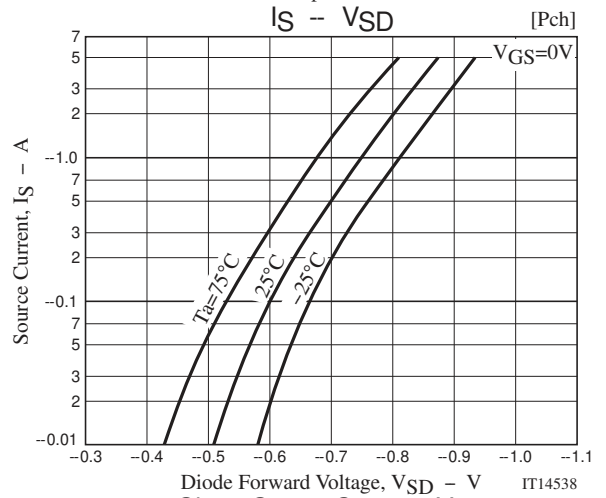
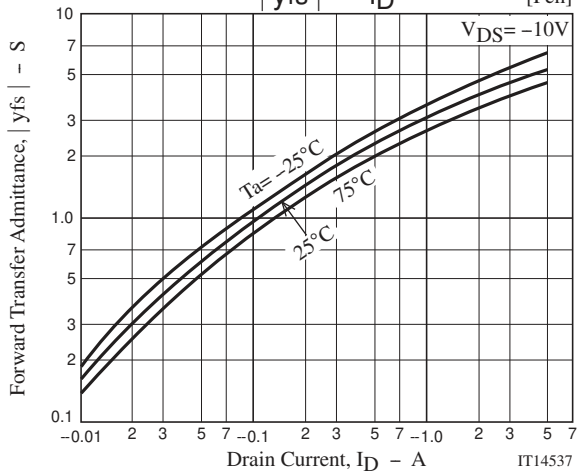
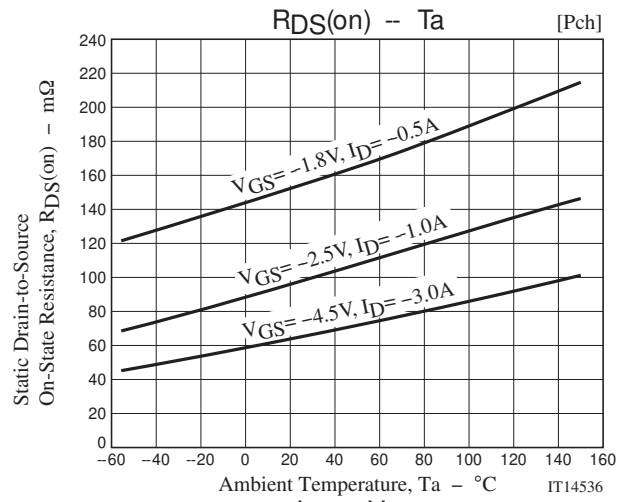
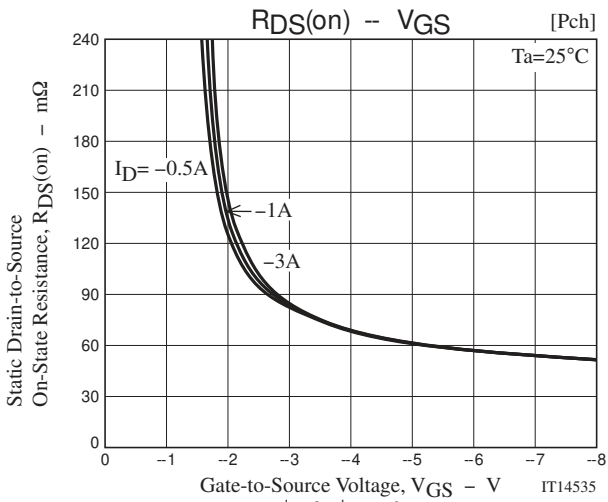


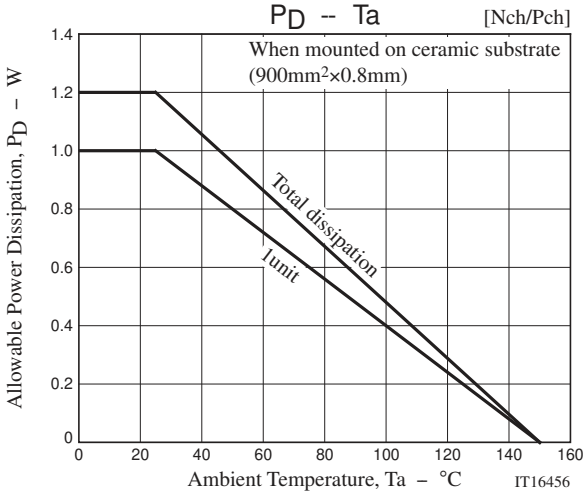
Ordering Information

| Device | Package | Shipping | memo |
|--------------|---------|----------------|--------------------------|
| EMH2604-TL-H | EMH8 | 3,000pcs./reel | Pb Free and Halogen Free |









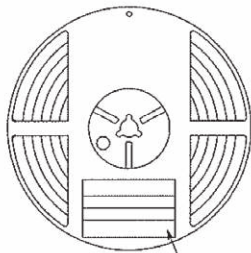
Embossed Taping Specification

EMH2604-TL-H

1. Packing Format

| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) | | | Packing format | |
|--------------|-------------------|---|-----------|-----------|---|--|
| | | Reel | Inner box | Outer box | Inner BOX (C-1) | Outer BOX (A-7) |
| EMH8 | MCP4 | 3,000 | 15,000 | 90,000 | 5 reels contained Dimensions:mm (external) 183×72×185 | 6 inner boxes contained Dimensions:mm (external) 440×195×210 |

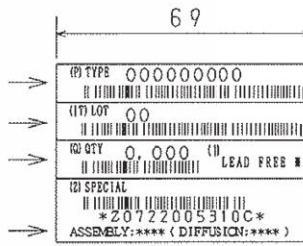
Packing method



Reel label

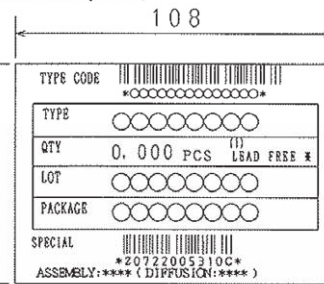
Type No. →
 LOT No. →
 Quantity →
 Origin →

Reel label, Inner box label (unit:mm)



Outer box label

It is a label at the time of factory shipments. The form of a label may change in physical distribution process.



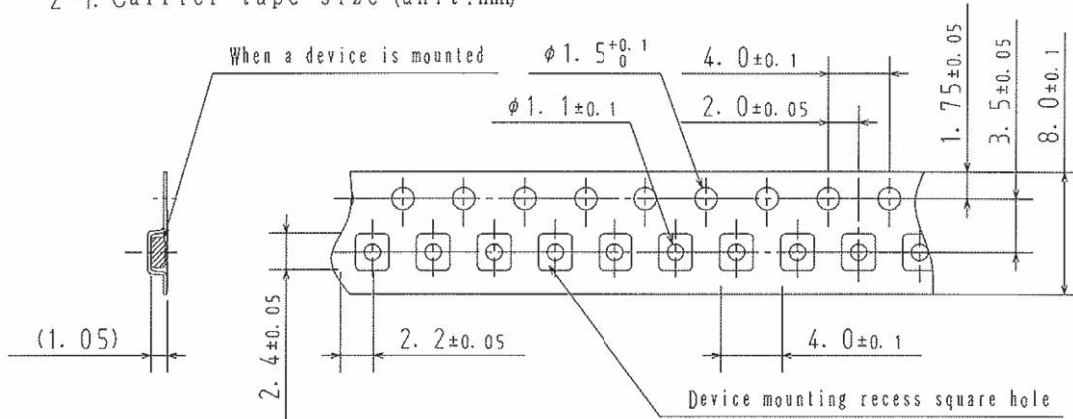
NOTE (1)

The LEAD FREE * description shows that the surface treatment of the terminal is lead free.

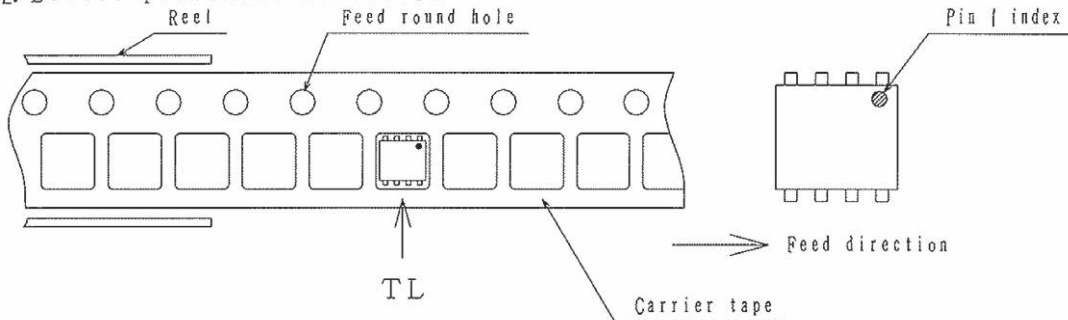
| Label | JEITA Phase |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3 |

2. Taping configuration

2-1. Carrier tape size (unit:mm)



2-2. Device placement direction

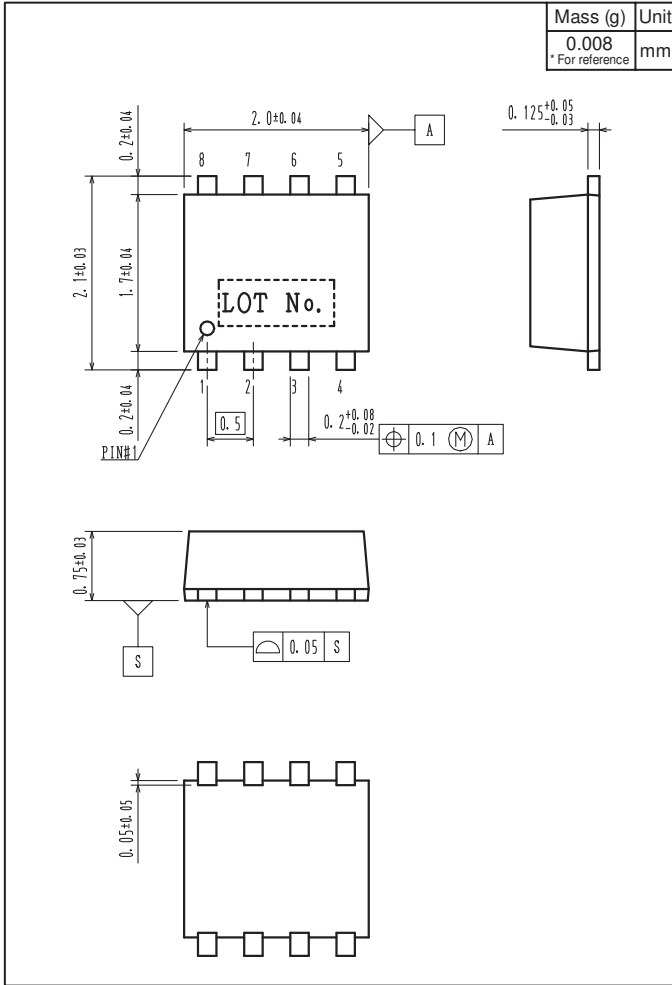


Those with pin 1 index on the feed hole side.....TL

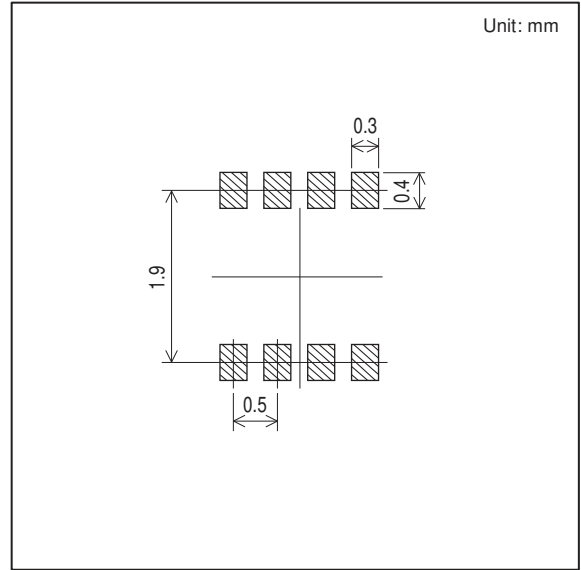
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Outline Drawing

EMH2604-TL-H



Land Pattern Example



Note on usage : Since the EMH2604 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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