



# EFC4612R — N-Channel Silicon MOSFET

## General-Purpose Switching Device Applications

### Features

- 2.5V drive.
- Built-in gate protection resistor.
- Best suited for LiB charging and discharging switch.
- Common-drain type.

### Specifications

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

| Parameter                | Symbol    | Conditions   | Ratings     | Unit             |
|--------------------------|-----------|--|-------------|------------------|
| Source-to-Source Voltage | $V_{SSS}$ |  | 24          | V                |
| Gate-to-Source Voltage   | $V_{GSS}$ |  | $\pm 12$    | V                |
| Source Current (DC)      | $I_S$     |  | 6           | A                |
| Source Current (Pulse)   | $I_{SP}$  | $PW \leq 10\mu\text{s}$ , duty cycle $\leq 1\%$                | 60          | A                |
| Total Dissipation        | $P_T$     | When mounted on ceramic substrate (5000mm <sup>2</sup> ×0.8mm) | 1.6         | W                |
| Channel Temperature      | $T_{ch}$  |  | 150         | $^\circ\text{C}$ |
| Storage Temperature      | $T_{stg}$ |  | -55 to +150 | $^\circ\text{C}$ |

Electrical Characteristics at  $T_a=25^\circ\text{C}$

| Parameter                          | Symbol        | Conditions   | Ratings |     |          | Unit          |
|------------------------------------|---------------|--|---------|-----|----------|---------------|
|                                    |               |  | min     | typ | max      |               |
| Source-to-Source Breakdown Voltage | $V_{(BR)SSS}$ | $I_S=1\text{mA}$ , $V_{GS}=0\text{V}$ Test Circuit 1       | 24      |     |          | V             |
| Zero-Gate Voltage Source Current   | $I_{SSS}$     | $V_{SS}=20\text{V}$ , $V_{GS}=0\text{V}$ Test Circuit 1    |         |     | 1        | $\mu\text{A}$ |
| Gate-to-Source Leakage Current     | $I_{GSS}$     | $V_{GS}=\pm 8\text{V}$ , $V_{SS}=0\text{V}$ Test Circuit 2 |         |     | $\pm 10$ | $\mu\text{A}$ |
| Cutoff Voltage                     | $V_{GS(off)}$ | $V_{SS}=10\text{V}$ , $I_S=1\text{mA}$ Test Circuit 3      | 0.5     |     | 1.3      | V             |
| Forward Transfer Admittance        | $ y_{fs} $    | $V_{SS}=10\text{V}$ , $I_S=3\text{A}$ Test Circuit 4       |         | 3.1 |          | S             |

Marking : FN

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# EFC4612R

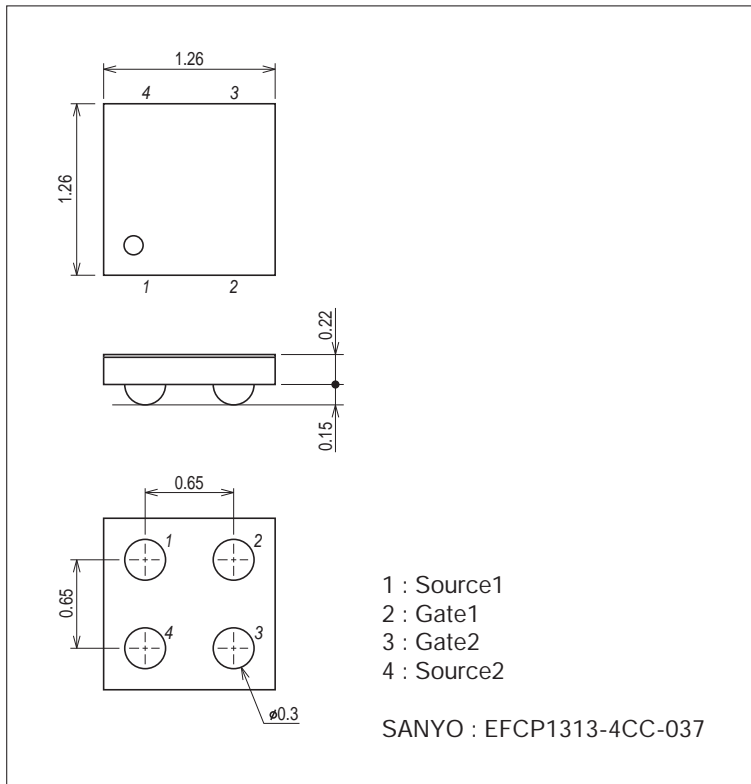
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| Parameter                                   | Symbol        | Conditions                                 | Ratings |     |     | Unit |
|---|---------------|--|---------|-----|-----|------|
|   |               |  | min     | typ | max |      |
| Static Source-to-Source On-State Resistance | $R_{SS(on)1}$ | $I_S=3A, V_{GS}=4.5V$ Test Circuit 5       | 24      | 39  | 45  | mΩ   |
|   | $R_{SS(on)2}$ | $I_S=3A, V_{GS}=4.0V$ Test Circuit 5       | 25      | 41  | 48  | mΩ   |
|   | $R_{SS(on)3}$ | $I_S=3A, V_{GS}=3.7V$ Test Circuit 5       | 27.5    | 43  | 50  | mΩ   |
|   | $R_{SS(on)4}$ | $I_S=3A, V_{GS}=3.1V$ Test Circuit 5       | 31.5    | 48  | 57  | mΩ   |
|   | $R_{SS(on)5}$ | $I_S=3A, V_{GS}=2.5V$ Test Circuit 5       | 33.5    | 58  | 72  | mΩ   |
| Turn-ON Delay Time                          | $t_{d(on)}$   | See specified Test Circuit. Test Circuit 7 |         | 20  |     | ns   |
| Rise Time                                   | $t_r$         | See specified Test Circuit. Test Circuit 7 |         | 230 |     | ns   |
| Turn-OFF Delay Time                         | $t_{d(off)}$  | See specified Test Circuit. Test Circuit 7 |         | 130 |     | ns   |
| Fall Time                                   | $t_f$         | See specified Test Circuit. Test Circuit 7 |         | 210 |     | ns   |
| Total Gate Charge                           | Qg            | $V_{SS}=10V, V_{GS}=4.5V, I_S=6A$          |         | 7   |     | nC   |
| Forward Source-to-Source Voltage            | $V_{F(S-S)}$  | $I_S=3A, V_{GS}=0V$ Test Circuit 6         |         | 0.8 | 1.2 | V    |

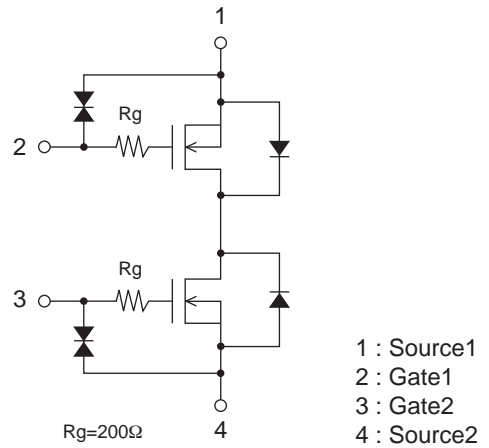
## Package Dimensions

unit : mm (typ)

7064-001



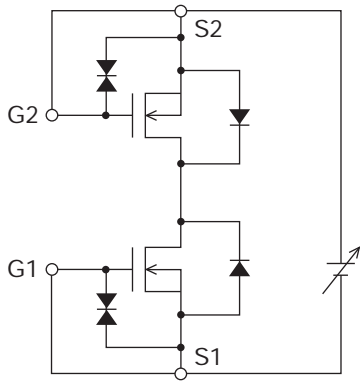
## Electrical Connection



Test circuits are example of measuring FET1 side

Test Circuit 1

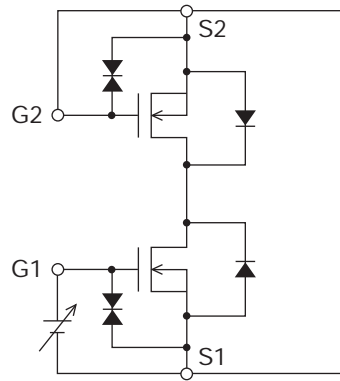
$V_{SSS} / I_{SS}$



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Test Circuit 2

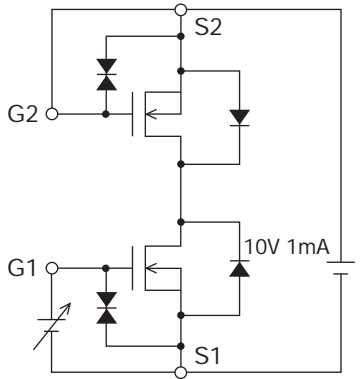
$I_{GSS(+)} / (-)$



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Test Circuit 3

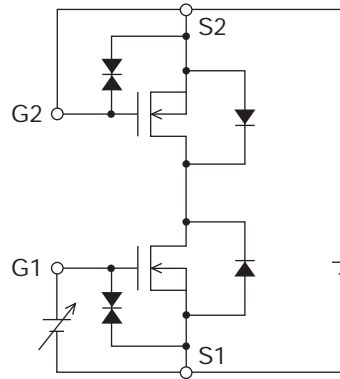
$V_{GS(off)}$



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Test Circuit 4

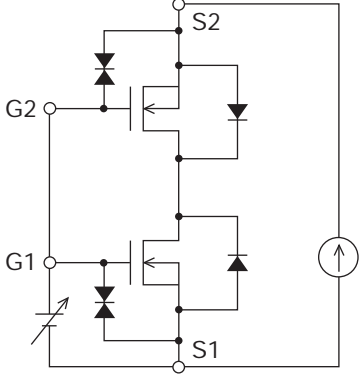
$|y_{fs}|$



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Test Circuit 5

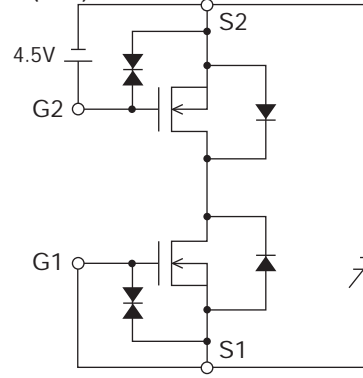
$R_{SS(on)}$



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Test Circuit 6

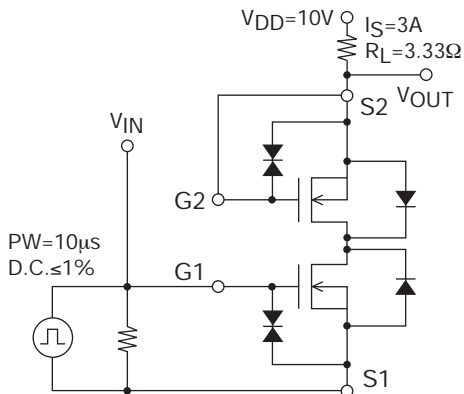
$V_{F(S-S)}$



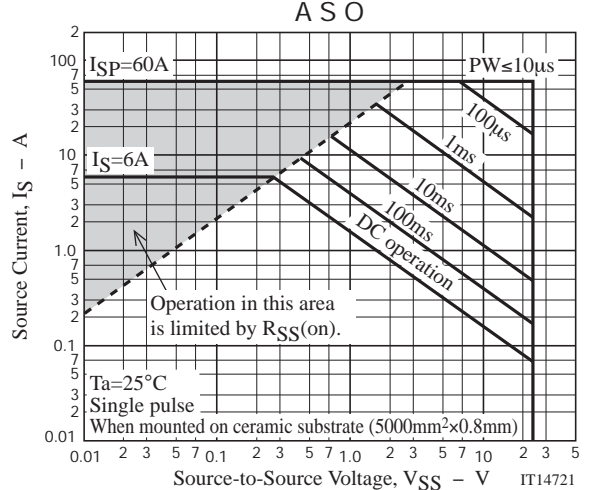
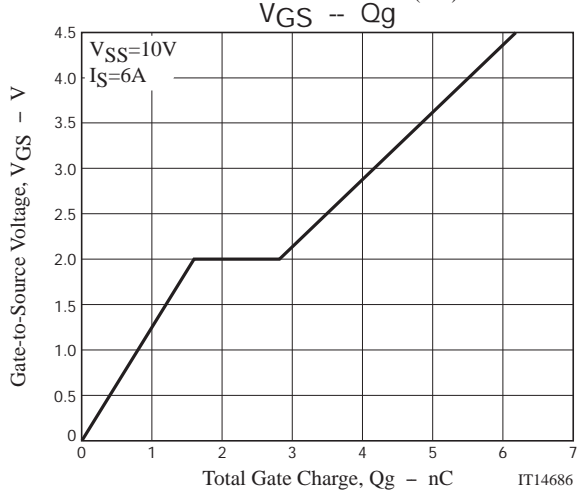
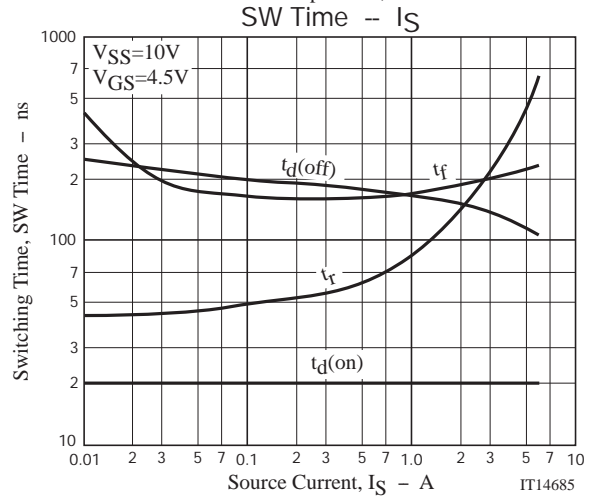
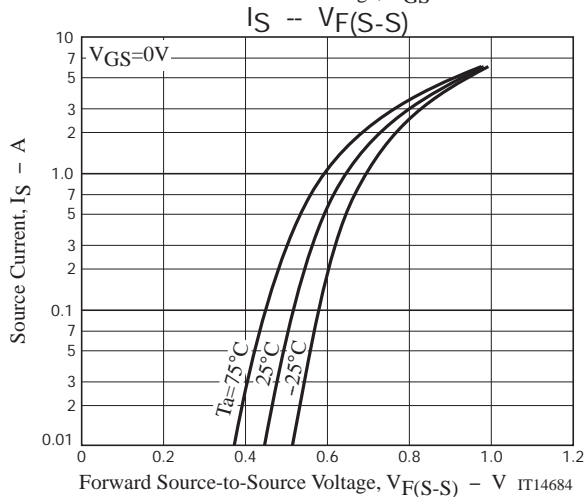
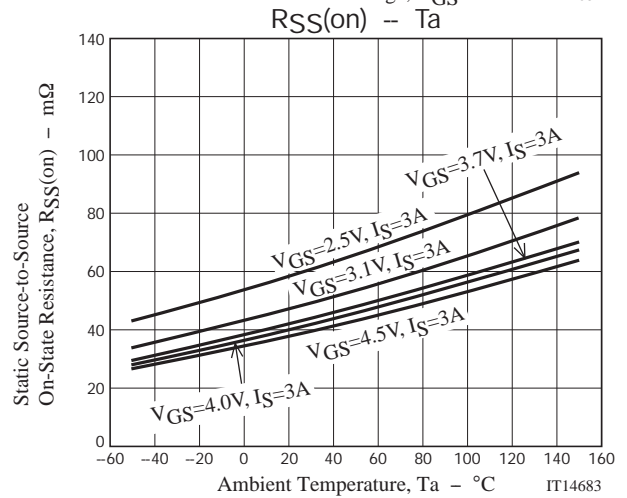
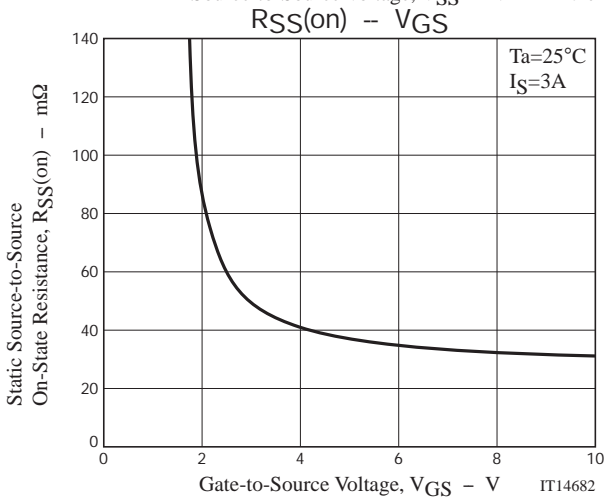
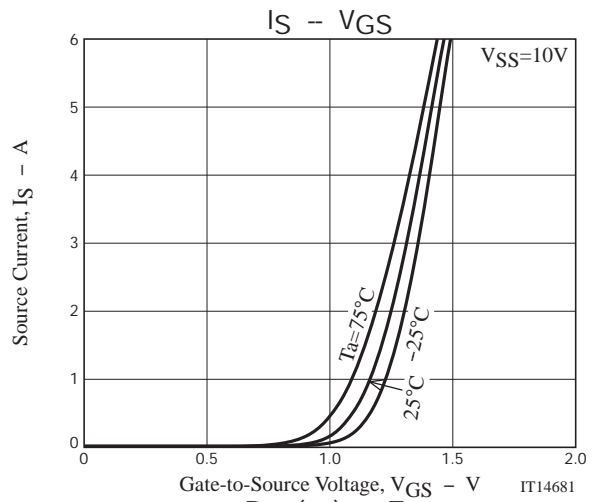
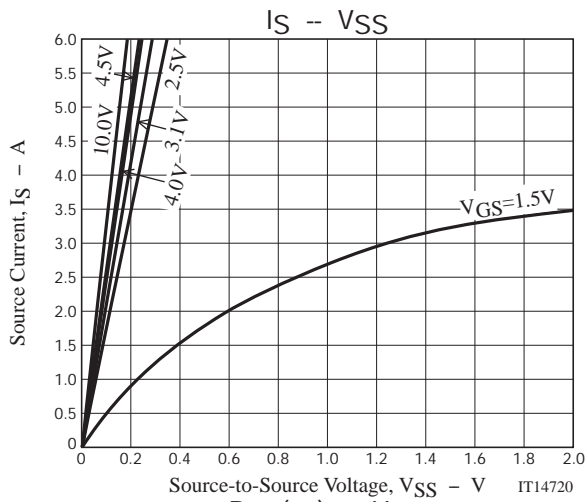
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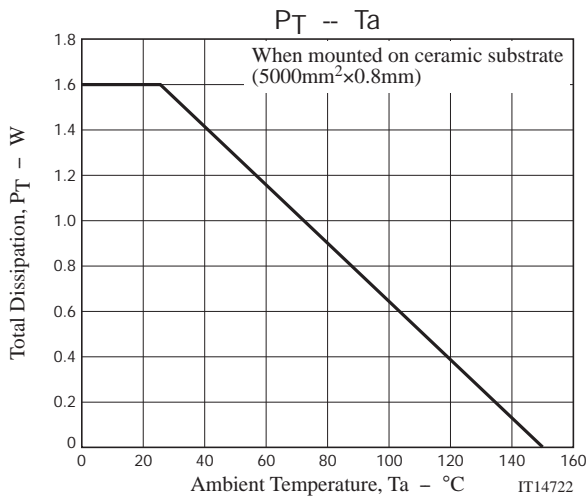
Test Circuit 7

$t_{d(on)}, t_r, t_{d(off)}, t_f$



\* Note: Connect the measurement terminal reversely if you want to measure the FET2 side.





Note on usage : Since the EFC4612R is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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