

Transistors

2.5V Drive Nch+Pch MOSFET

QS6M4

●Structure

Silicon P-channel MOSFET
Silicon N-channel MOSFET

●Features

- 1) The QS6M4 combines Pch MOSFET with a Nch MOSFET in a single TSMT6 package.
- 2) Low on-state resistance with a fast switching.
- 3) Low voltage drive (2.5V).

●Applications

Load switch, inverter

●Packaging specifications

| | | |
|-------|------------------------------|--------|
| Type | Package | Taping |
| | Code | TR |
| | Basic ordering unit (pieces) | 3000 |
| QS6M4 | | ○ |

●Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Limits | | Unit |
|-----------------------------|-------------------|--------------------|-------------|-------------|
| | | Nchannel | Pchannel | |
| Drain-source voltage | V _{DSS} | 30 | -20 | V |
| Gate-source voltage | V _{GSS} | ±12 | ±12 | V |
| Drain current | Continuous | I _D | ±1.5 | A |
| | Pulsed | I _{DP} *1 | ±6.0 | A |
| Source current (Body diode) | Continuous | I _S | 0.8 | A |
| | Pulsed | I _{SP} *1 | 6.0 | A |
| Total power dissipation | P _D *2 | | 1.25 | W / TOTAL |
| | | | 0.9 | W / ELEMENT |
| Channel temperature | T _{ch} | | 150 | °C |
| Storage temperature | T _{stg} | | -55 to +150 | °C |

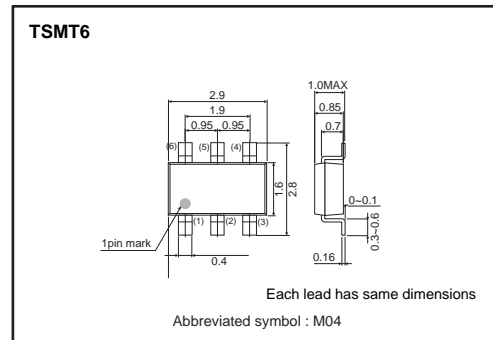
*1 Pw≤10μs, Duty cycle≤1%
*2 Mounted on a ceramic board

●Thermal resistance

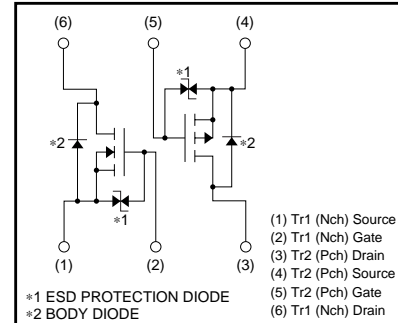
| Parameter | Symbol | Limits | Unit |
|--------------------|--------------------------|--------|------------------|
| Channel to ambient | R _{th} (ch-a) * | 100 | °C / W / TOTAL |
| | | 139 | °C / W / ELEMENT |

* Mounted on a ceramic board

●Dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Electrical characteristics (Ta=25°C)

<Tr1. N-ch MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|-----------------------|------|------|------|------|--|
| Gate-source leakage | I _{GSS} | – | – | ±10 | μA | V _{GS} =±12V / V _{DS} =0V |
| Drain-source breakdown voltage | V _{(BR) DSS} | 30 | – | – | V | I _D =1mA / V _{GS} =0V |
| Zero gate voltage drain current | I _{DSS} | – | – | 1 | μA | V _{DS} =30V / V _{GS} =0V |
| Gate threshold voltage | V _{GS(th)} | 0.5 | – | 1.5 | V | V _{DS} =10V / I _D =1mA |
| Static drain-source on-state resistance | R _{DS(on)} * | – | 170 | 230 | mΩ | I _D =1.5A / V _{GS} =4.5V |
| | | – | 180 | 245 | | I _D =1.5A / V _{GS} =4.0V |
| | | – | 260 | 360 | | I _D =1.0A / V _{GS} =2.5V |
| Forward transfer admittance | Y _{fs} * | 1.0 | – | – | S | V _{DS} =10V / I _D =1.0A |
| Input capacitance | C _{iss} | – | 80 | – | pF | V _{DS} =10V |
| Output capacitance | C _{oss} | – | 25 | – | pF | V _{GS} =0V |
| Reverse transfer capacitance | C _{rss} | – | 15 | – | pF | f=1MHz |
| Turn-on delay time | t _{d(on)} * | – | 7 | – | ns | I _D =1A, V _{DD} ≐15V |
| Rise time | t _r * | – | 18 | – | ns | V _{GS} =4.5V |
| Turn-off delay time | t _{d(off)} * | – | 15 | – | ns | R _L =15Ω / R _G =10Ω |
| Fall time | t _f * | – | 15 | – | ns | |
| Total gate charge | Q _g * | – | 1.6 | – | nC | V _{DD} ≐15V R _L =10Ω |
| Gate-source charge | Q _{gs} * | – | 0.5 | – | nC | V _{GS} =4.5V R _G =10Ω |
| Gate-drain charge | Q _{gd} * | – | 0.9 | – | nC | I _D =1.5A |

*Pulsed

●Body diode characteristics (Source-Drain)

<Tr1. N-ch MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|-----------------|-------------------|------|------|------|------|--|
| Forward voltage | V _{SD} * | – | – | 1.2 | V | I _S =3.2A / V _{GS} =0V |

*Pulsed

Transistors

●Electrical characteristics (Ta=25°C)

<Tr2. P-ch MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|-----------------------|------|------|------|------|---|
| Gate-source leakage | I _{GSS} | – | – | ±10 | μA | V _{GS} = ±12V / 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)} | –0.7 | – | –2.0 | V | V _{DS} = –10V / I _D =–1mA |
| Static drain-source on-state resistance | R _{DS(on)} * | – | 155 | 215 | mΩ | I _D = –1.5A / V _{GS} = –4.5V |
| | | – | 170 | 235 | | I _D = –1.5A / V _{GS} = –4.0V |
| | | – | 310 | 430 | | I _D = –0.75A / V _{GS} = –2.5V |
| Forward transfer admittance | Y _{fs} * | 1.0 | – | – | S | V _{DS} = –10V / I _D = –0.75A |
| Input capacitance | C _{iss} | – | 270 | – | pF | V _{DS} = –10V |
| Output capacitance | C _{oss} | – | 40 | – | pF | V _{GS} =0V |
| Reverse transfer capacitance | C _{rss} | – | 35 | – | pF | f=1MHz |
| Turn-on delay time | t _{d(on)} * | – | 10 | – | ns | I _D = –0.75A, V _{DD} ≐ –15V |
| Rise time | t _r * | – | 12 | – | ns | V _{GS} = –4.5V |
| Turn-off delay time | t _{d(off)} * | – | 45 | – | ns | R _L =20Ω / R _G =10Ω |
| Fall time | t _f * | – | 20 | – | ns | |
| Total gate charge | Q _g * | – | 3.0 | – | nC | V _{DD} ≐ –15V R _L =10Ω |
| Gate-source charge | Q _{gs} * | – | 0.8 | – | nC | V _{GS} = –4.5V R _G =10Ω |
| Gate-drain charge | Q _{gd} * | – | 0.85 | – | nC | I _D = –1.5A |

*Pulsed

●Body diode characteristics (Source-Drain)

<Tr2. P-ch MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|-----------------|-----------------|------|------|------|------|---|
| Forward voltage | V _{SD} | – | – | –1.2 | V | I _S = –0.75A / V _{GS} =0V |

Transistors

N-ch

●Electrical characteristic curves

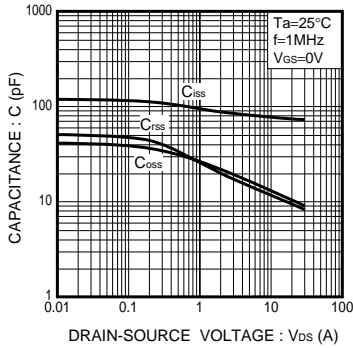


Fig.1 Typical Capacitance vs. Drain-Source Voltage

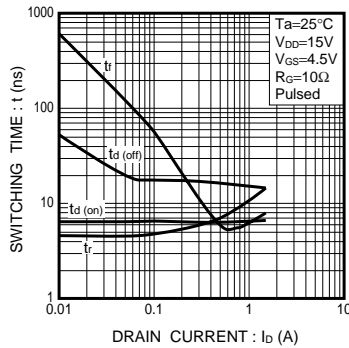


Fig.2 Switching Characteristics

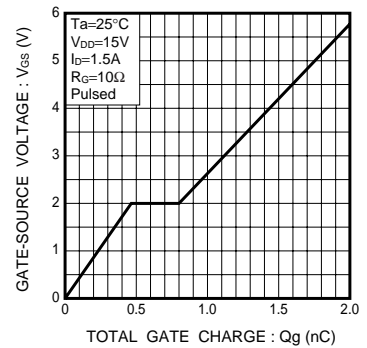


Fig.3 Dynamic Input Characteristics

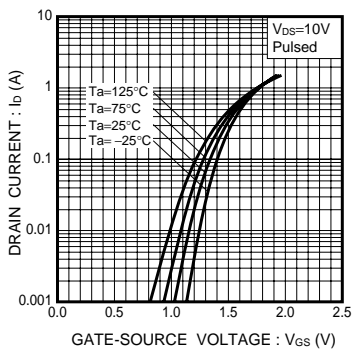


Fig.4 Typical Transfer Characteristics

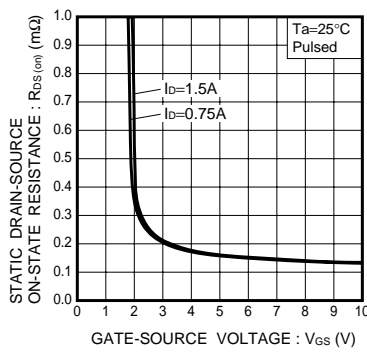


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

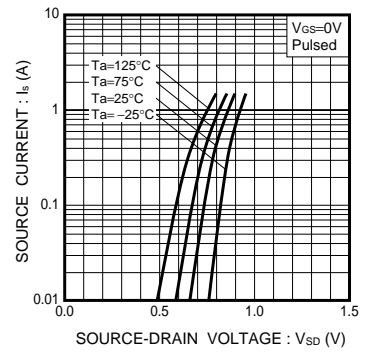


Fig.6 Source Current vs. Source-Drain Voltage

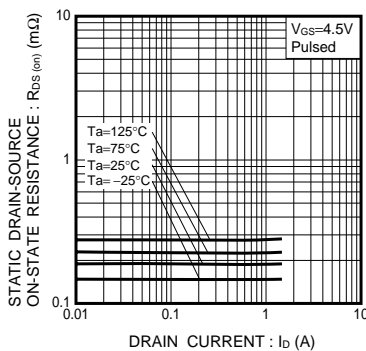


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

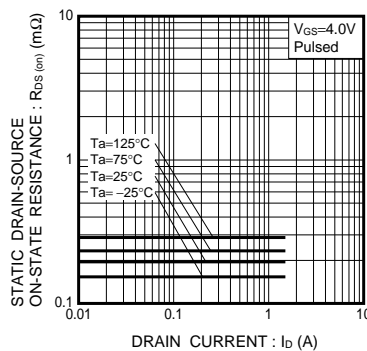


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

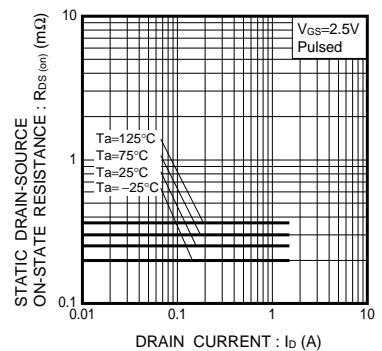


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

Transistors

P-ch

●Electrical characteristic curves

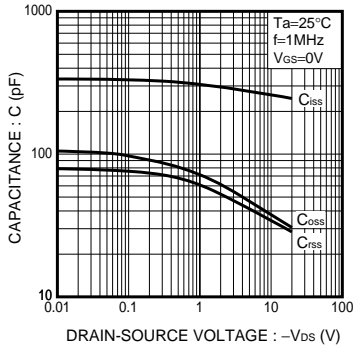


Fig.1 Typical Capacitance vs. Drain-Source Voltage

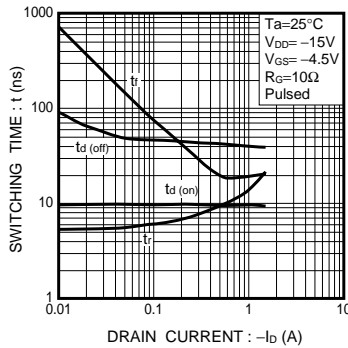


Fig.2 Switching Characteristics

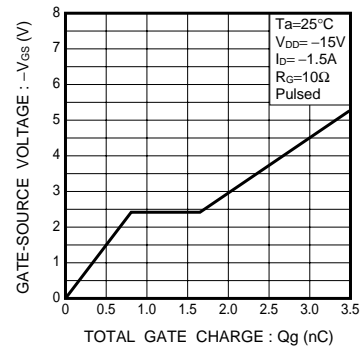


Fig.3 Dynamic Input Characteristics

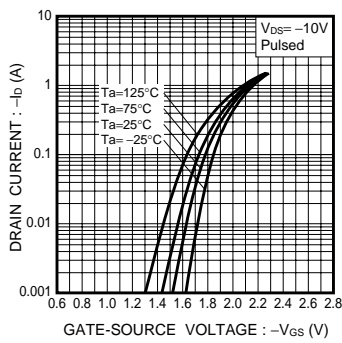


Fig.4 Typical Transfer Characteristics

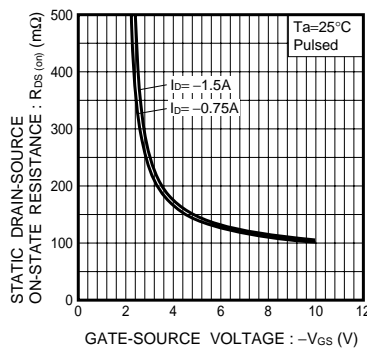


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

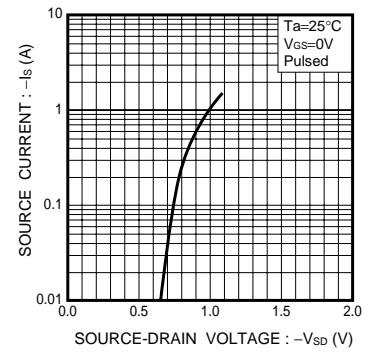


Fig.6 Source Current vs. Source-Drain Voltage

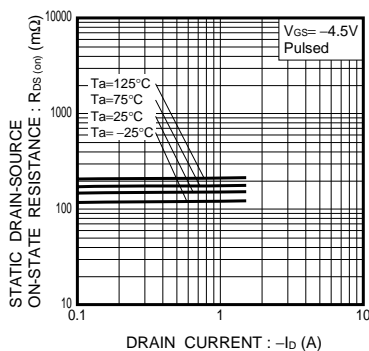


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

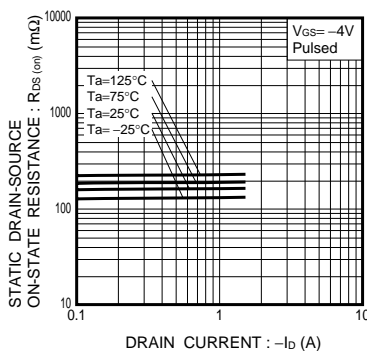


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

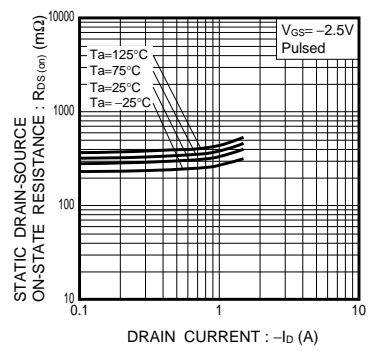


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

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