

2.5V Drive Nch+Pch MOSFET

EM6M1

●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 (2.5V drive).
- 4) Built-in G-S Protection Diode.

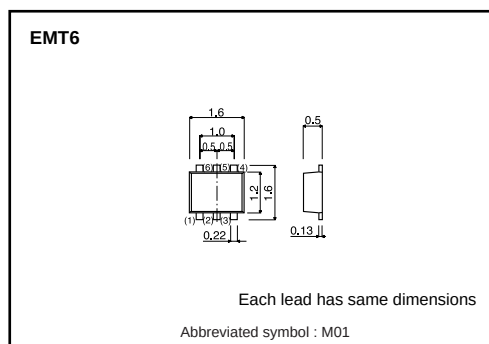
●Applications

Switching

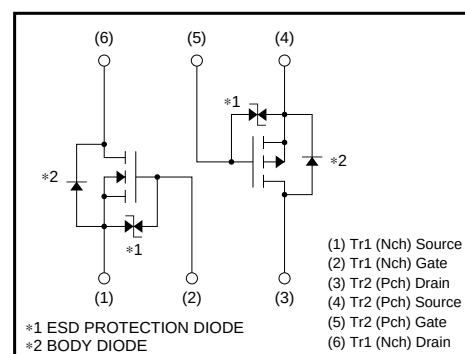
●Packaging specifications

Type	Package	Taping
	Code	T2R
	Basic ordering unit (pieces)	8000
EM6M1		○

●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_{DS}	30	-20	V
Gate-source voltage	V_{GS}	± 20	± 12	V
Drain current	Continuous	I_D	± 0.1	A
	Pulsed	I_{DP}^{*1}	± 0.4	A
Power dissipation	P_D^{*2}	150		mW / TOTAL
		120		mW / ELEMENT
Channel temperature	T_{ch}	150		°C
Range of storage temperature	T_{stg}	-55 to +150		°C

*1 $P_W \leq 10\mu s$, Duty cycle $\leq 1\%$

*2 Mounted on a ceramic board

●Notice

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

Transistors

N-ch

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I _{GSS}	—	—	±1	μA	V _{GS} = ±20V, V _{DS} =0V
Drain-source breakdown voltage	V _{(BR) DSS}	30	—	—	V	I _D =10μA, V _{GS} =0V
Zero gate voltage drain current	I _{DSS}	—	—	1	μA	V _{DS} =30V, V _{GS} =0V
Gate threshold voltage	V _{GS(th)}	0.8	—	1.5	V	V _{DS} =3V, I _D =100μA
Static drain-source on-state resistance	R _{DS(on)} *	—	5	8	Ω	I _D =10mA, V _{GS} =4V
		—	7	13	Ω	I _D =1mA, V _{GS} =2.5V
Forward transfer admittance	Y _{fs} *	20	—	—	mS	V _{DS} =3V, I _D =10mA
Input capacitance	C _{iss}	—	13	—	pF	V _{DS} =5V
Output capacitance	C _{oss}	—	9	—	pF	V _{GS} =0V
Reverse transfer capacitance	C _{rss}	—	4	—	pF	f=1MHz
Turn-on delay time	t _{d(on)} *	—	15	—	ns	V _{DD} ≐5V I _D =10mA
Rise time	t _r *	—	35	—	ns	V _{GS} =5V
Turn-off delay time	t _{d(off)} *	—	80	—	ns	R _L =500Ω
Fall time	t _f *	—	80	—	ns	R _G =10Ω
Total gate charge	Q _g *	—	0.9	—	nC	V _{DD} ≐15V, I _D =0.1A
Gate-source charge	Q _{gs} *	—	0.2	—	nC	V _{GS} =4.5V
Gate-drain charge	Q _{gd} *	—	0.2	—	nC	R _L =150Ω, R _G =10Ω

*Pulsed

P-ch

●Electrical characteristics (Ta=25°C)

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)} *	—	1.0	1.5	Ω	I _D = −0.2A, V _{GS} = −4.5V
		—	1.1	1.6	Ω	I _D = −0.2A, V _{GS} = −4V
		—	2.0	3.0	Ω	I _D = −0.2A, V _{GS} = −2.5V
Forward transfer admittance	Y _{fs} *	0.2	—	—	S	V _{DS} = −10V, I _D = −0.15A
Input capacitance	C _{iss}	—	50	—	pF	V _{DS} = −10V
Output capacitance	C _{oss}	—	5	—	pF	V _{GS} = 0V
Reverse transfer capacitance	C _{rss}	—	5	—	pF	f=1MHz
Turn-on delay time	t _{d(on)} *	—	9	—	ns	V _{DD} ≐ −15V I _D = −0.15A
Rise time	t _r *	—	6	—	ns	V _{GS} = −4.5V
Turn-off delay time	t _{d(off)} *	—	35	—	ns	R _L = 100Ω
Fall time	t _f *	—	45	—	ns	R _G = 10Ω
Total gate charge	Q _g *	—	1.2	—	nC	V _{DD} ≐ −15V, I _D = −0.2A
Gate-source charge	Q _{gs} *	—	0.2	—	nC	V _{GS} = −4.5V
Gate-drain charge	Q _{gd} *	—	0.2	—	nC	R _L = 75Ω, R _G = 10Ω

*Pulsed

Transistors

N-ch

●Electrical characteristic curve

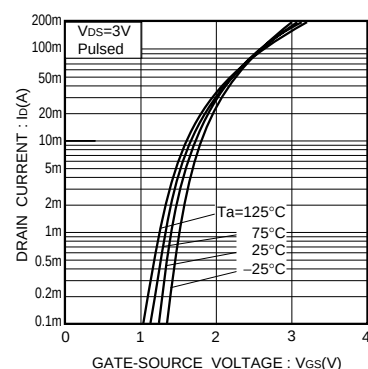


Fig.1 Typical Transfer Characteristics

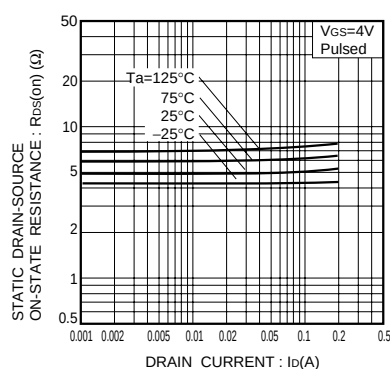


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current (I)

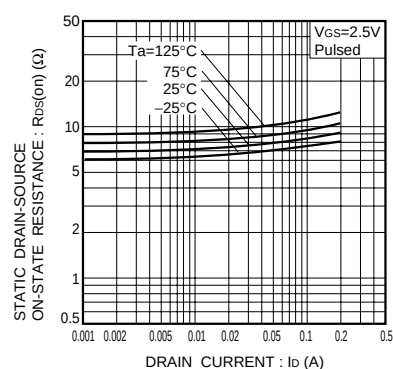


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current (II)

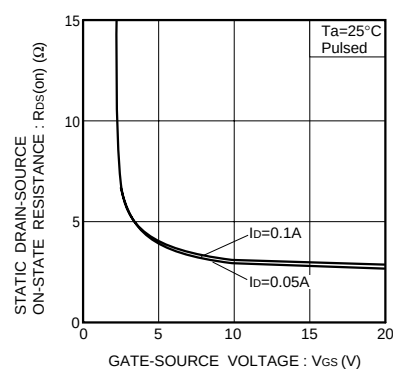


Fig.4 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

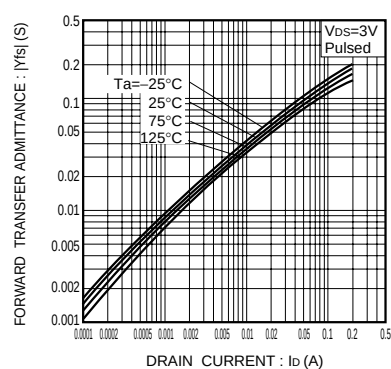


Fig.5 Forward Transfer Admittance vs. Drain Current

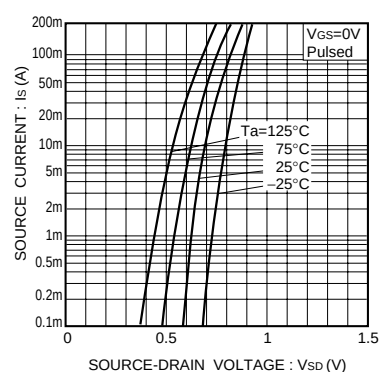


Fig.6 Reverse Drain Current vs. Source-Drain Voltage (I)

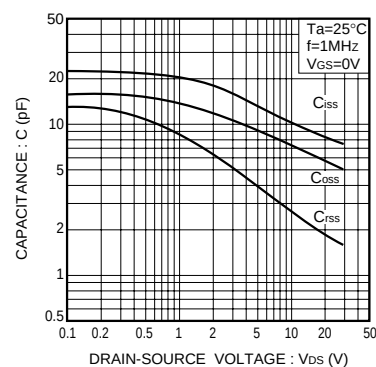


Fig.7 Typical Capacitance vs. Drain-Source Voltage

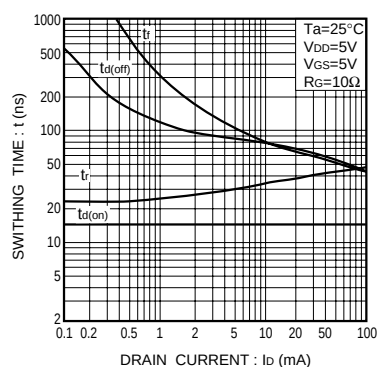


Fig.8 Switching Characteristics

Transistors

P-ch

●Electrical characteristic curve

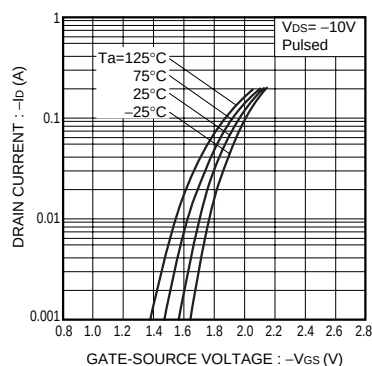


Fig.1 Typical Transfer Characteristics

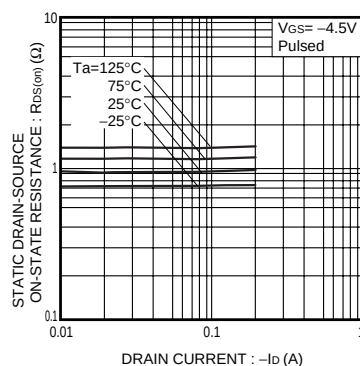


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current (I)

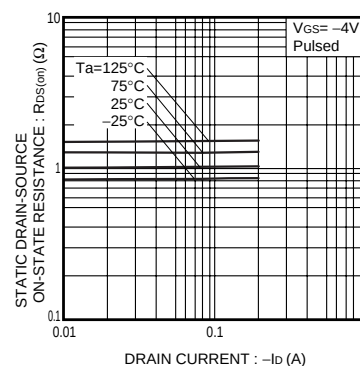


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current (II)

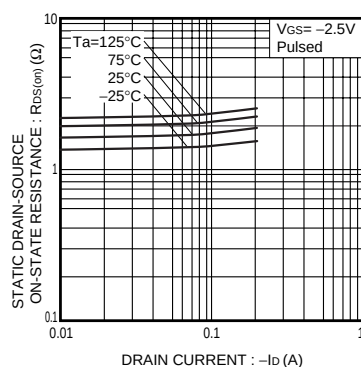


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (III)

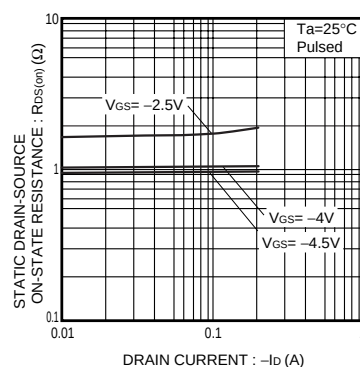


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (IV)

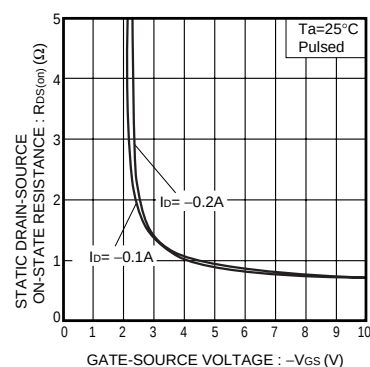


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

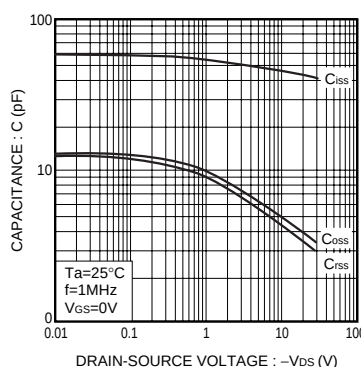


Fig.7 Typical Capacitance vs. Drain-Source Voltage

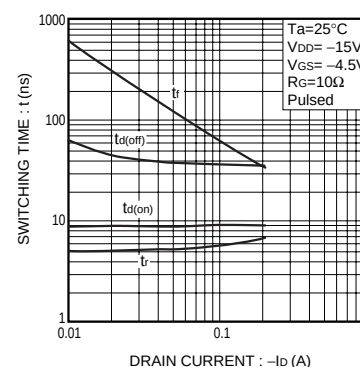


Fig.8 Switching Characteristics

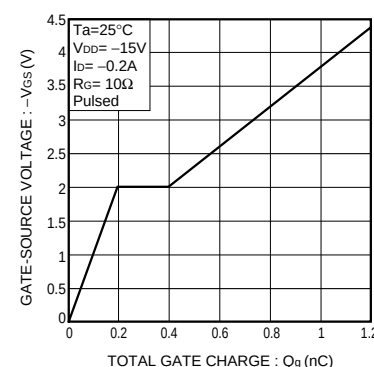


Fig.9 Dynamic Input Characteristics

Transistors

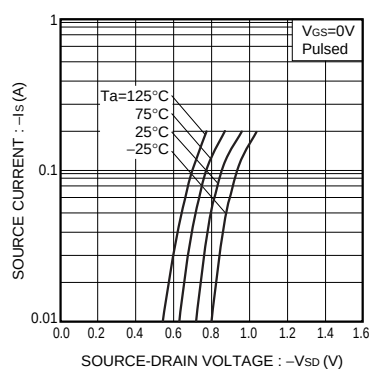


Fig.10 Source Current vs. Source-Drain Voltage

N-ch

●Measurement circuit

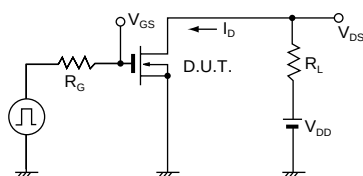


Fig.9 Switching Time Test Circuit

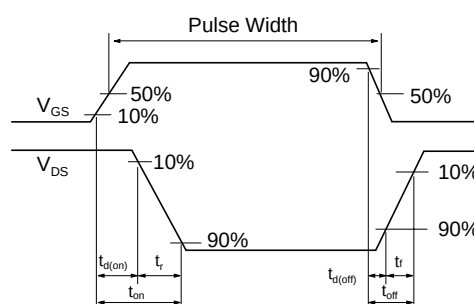


Fig.10 Switching Time Waveforms

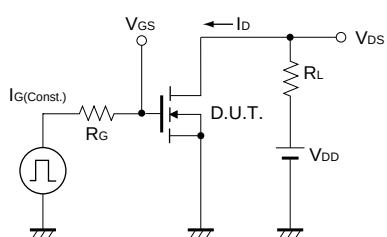


Fig.11 Gate Charge Measurement Circuit

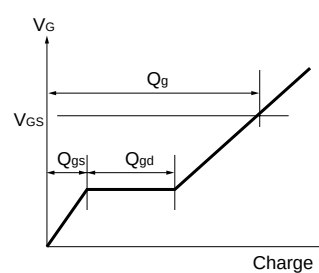


Fig.12 Gate Charge Waveform

Transistors

P-ch

●Measurement circuit

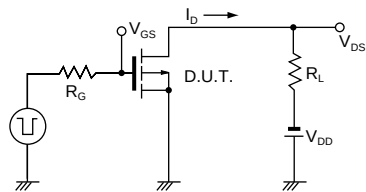


Fig.11 Switching Time Test Circuit

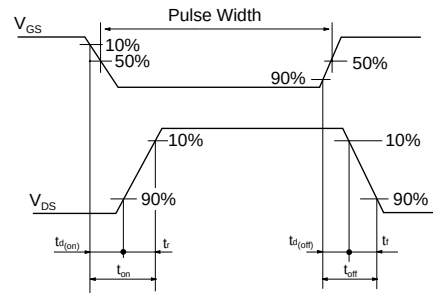


Fig.12 Switching Time Waveforms

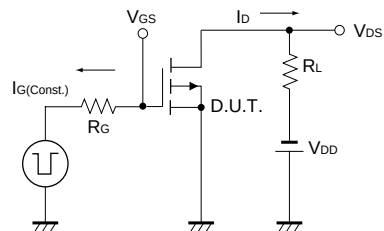


Fig.13 Gate Charge Measurement Circuit

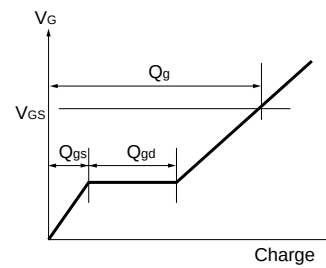


Fig.14 Gate Charge Waveform

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