

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.

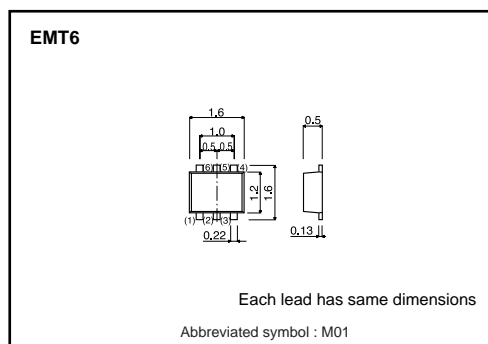
●Applications

Switching

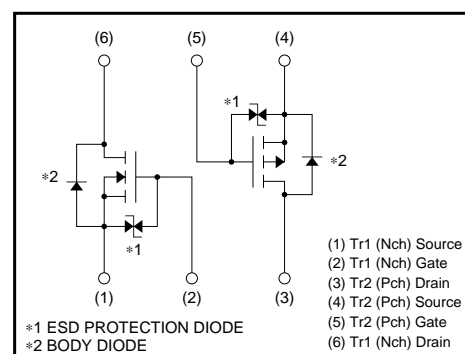
●Packaging specifications

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_{DSS}	30	-20	V
Gate-source voltage	V_{GSS}	± 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
Rise time	t _r *	–	35	–	ns	I _D =10mA
Turn-off delay time	t _{d(off)} *	–	80	–	ns	V _{GS} =5V
Fall time	t _f *	–	80	–	ns	R _L =500Ω
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
Rise time	t _r *	–	6	–	ns	I _D = –0.15A
Turn-off delay time	t _{d(off)} *	–	35	–	ns	V _{GS} = –4.5V
Fall time	t _f *	–	45	–	ns	R _L = 100Ω
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

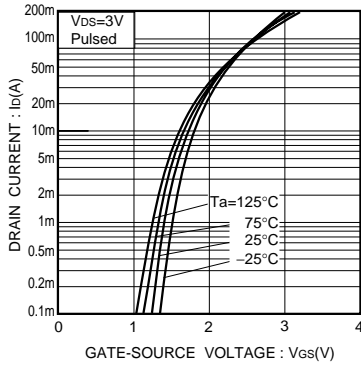


Fig.1 Typical Transfer Characteristics

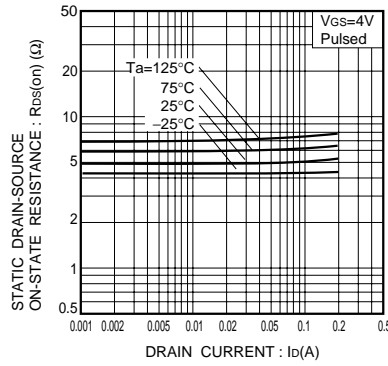


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current (I)

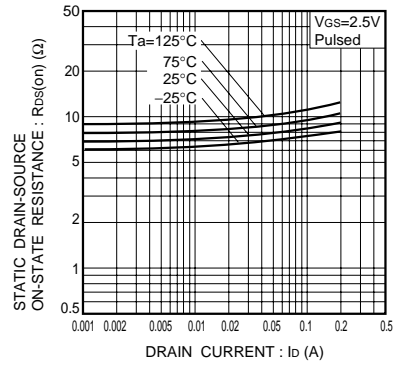


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current (II)

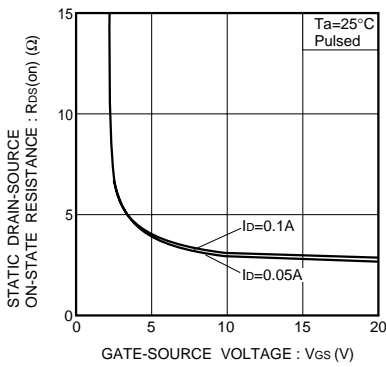


Fig.4 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

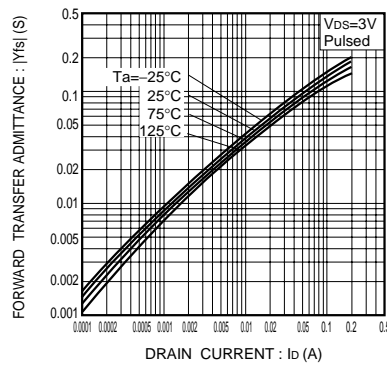


Fig.5 Forward Transfer Admittance vs. Drain Current

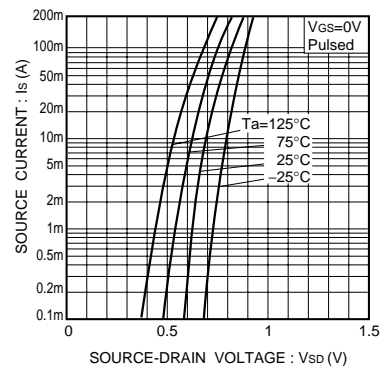


Fig.6 Reverse Drain Current vs. Source-Drain Voltage (I)

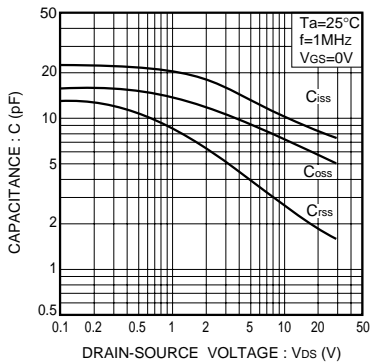


Fig.7 Typical Capacitance vs. Drain-Source Voltage

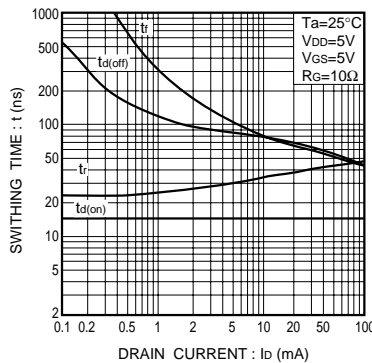


Fig.8 Switching Characteristics

Transistors

P-ch

●Electrical characteristic curve

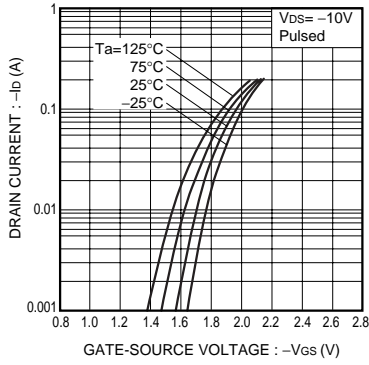


Fig.1 Typical Transfer Characteristics

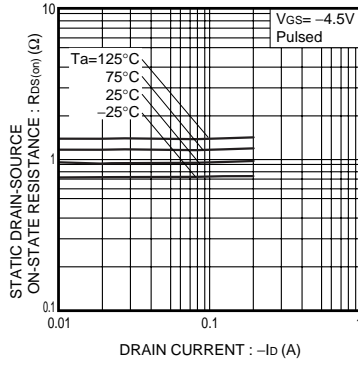


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current (I)

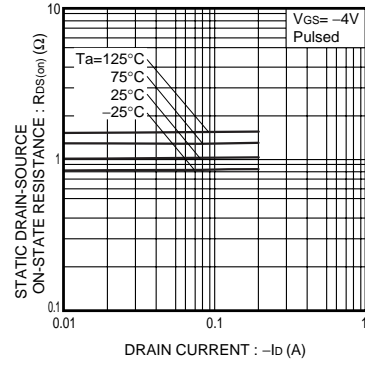


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current (II)

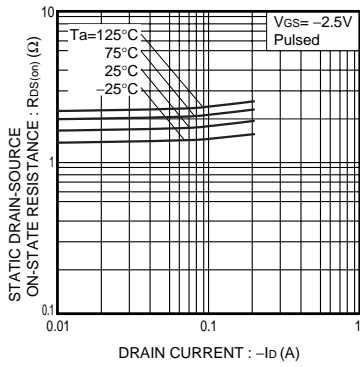


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (III)

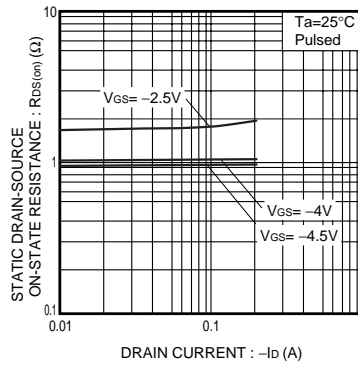


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (IV)

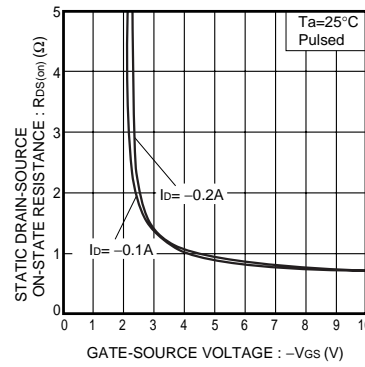


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

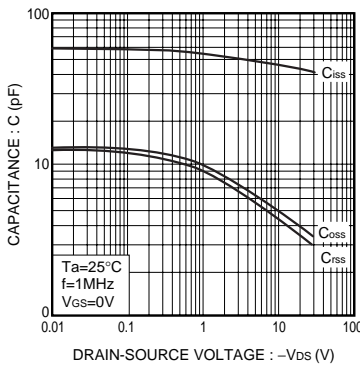


Fig.7 Typical Capacitance vs. Drain-Source Voltage

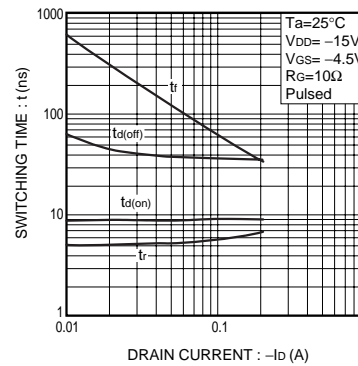


Fig.8 Switching Characteristics

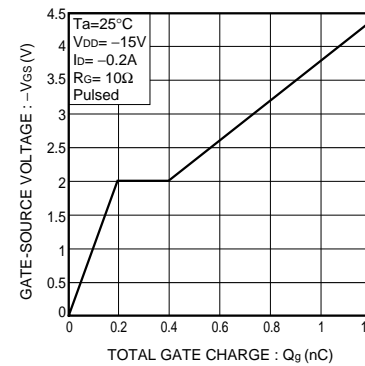


Fig.9 Dynamic Input Characteristics

Transistors

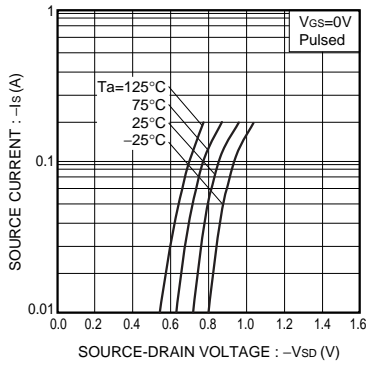


Fig.10 Source Current vs. Source-Drain Voltage

N-ch

●Measurement circuit

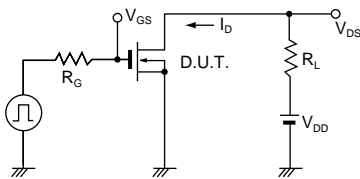


Fig.9 Switching Time Test Circuit

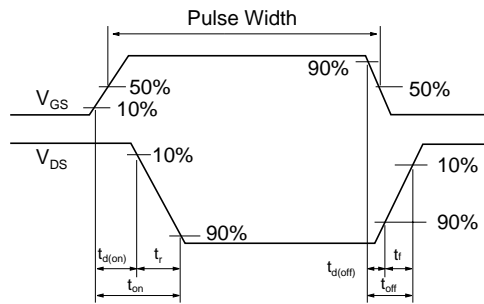


Fig.10 Switching Time Waveforms

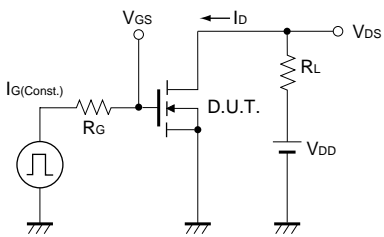


Fig.11 Gate Charge Measurement Circuit

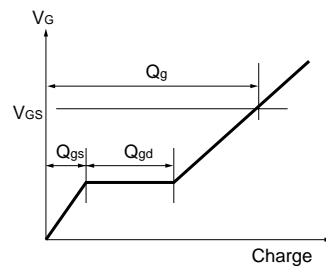


Fig.12 Gate Charge Waveform

Transistors

P-ch

●Measurement circuit

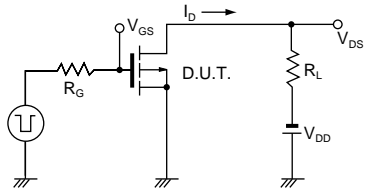


Fig.11 Switching Time Test Circuit

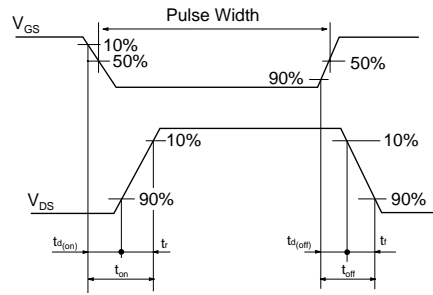


Fig.12 Switching Time Waveforms

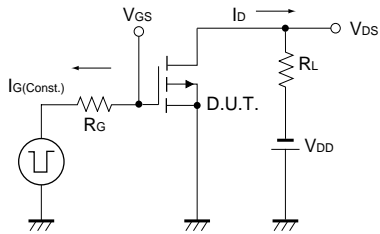


Fig.13 Gate Charge Measurement Circuit

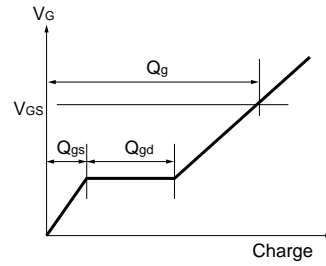


Fig.14 Gate Charge Waveform

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