

Switching

SP8M9

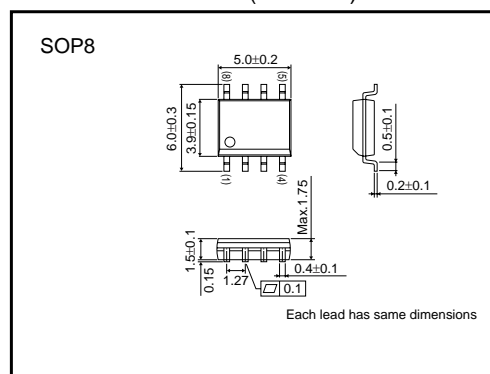
●Features

- 1) Low on-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small and Surface Mount Package (SOP8).

●Application

Power switching, DC / DC converter.

●External dimensions (Unit : mm)



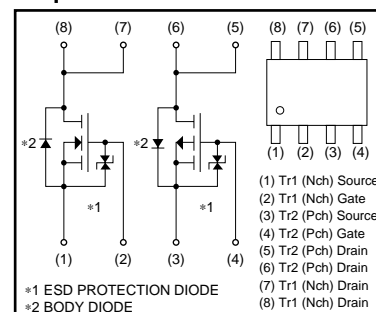
●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits		Unit
		Nchannel	Pchannel	
Drain-source voltage	V_{DS}	30	-30	V
Gate-source voltage	V_{GS}	20	-20	V
Drain current	Continuous	I_D	± 9.0	A
	Pulsed	I_{DP}	± 36	A *1
Source current (Body diode)	Continuous	I_S	1.6	A
	Pulsed	I_{SP}	36	A *1
Total power dissipation	P_D	2		W *2
Channel temperature	T_{ch}	150		°C
Storage temperature	T_{stg}	-55 to +150		°C

*1 $P_w \leq 10 \mu s$, Duty cycles 1%

*2 MOUNTED ON A CERAMIC BOARD.

●Equivalent circuit



*A protection diode is included between the gate and the source terminals to protect the diode against static electricity when the product is in use. Use the protection circuit when the fixed voltages are exceeded.

●Thermal resistance (Ta=25°C)

Parameter	Symbol	Limits	Unit
Channel to ambient	$R_{th} (ch-a)$	62.5	°C / W *

*MOUNTED ON A CERAMIC BOARD.

Transistors

N-ch

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	—	—	10	μA	$V_{GS}=20V, V_{DS}=0V$
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	$V_{GS(th)}$	1.0	—	2.5	V	$V_{DS}=10V, I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}$	—	12	18	m Ω	$I_D=9.0A, V_{GS}=10V$ *
		—	16	24		$I_D=9.0A, V_{GS}=4.5V$ *
		—	17	25		$I_D=9.0A, V_{GS}=4V$ *
Forward transfer admittance	$ Y_{fs} $	7.0	—	—	S	$I_D=9.0A, V_{DS}=10V$ *
Input capacitance	C_{iss}	—	1190	—	pF	$V_{DS}=10V$
Output capacitance	C_{oss}	—	340	—	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	—	190	—	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	$I_D=4.5A, V_{DD} \approx 15V$ *
Rise time	t_r	—	15	—	ns	$V_{GS}=10V$ *
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	$R_L=3.33\Omega$ *
Fall time	t_f	—	22	—	ns	$R_G=10\Omega$ *
Total gate charge	Q_g	—	15	21	nC	$V_{DD} \approx 15V$ *
Gate-source charge	Q_{gs}	—	3.0	—	nC	$V_{GS}=5V$ *
Gate-drain charge	Q_{gd}	—	6.1	—	nC	$I_D=9.0A$ *

*Pulsed

●Body diode characteristics (Source-Drain Characteristics) (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}	—	—	1.2	V	$I_S=6.4A, V_{GS}=0V$ *

*Pulsed

Transistors

P-ch

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	—	—	−10	μA	$V_{GS} = -20V, V_{DS} = 0V$
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	$V_{GS(th)}$	−1.0	—	−2.5	V	$V_{DS} = -10V, I_D = -1mA$
Static drain-source on-state resistance	$R_{DS(on)}$	—	30	42	mΩ	$I_D = -5.0A, V_{GS} = -10V$ *
		—	40	56		$I_D = -2.5A, V_{GS} = -4.5V$ *
		—	45	63		$I_D = -2.5A, V_{GS} = -4.0V$ *
Forward transfer admittance	$ Y_{fs} $	4.5	—	—	S	$I_D = -2.5A, V_{DS} = -10V$ *
Input capacitance	C_{iss}	—	1400	—	pF	$V_{DS} = -10V$
Output capacitance	C_{oss}	—	300	—	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	—	230	—	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}$	—	15	—	ns	$I_D = -2.5A, V_{DD} \doteq -15V$ *
Rise time	t_r	—	30	—	ns	$V_{GS} = -10V$ *
Turn-off delay time	$t_{d(off)}$	—	80	—	ns	$R_L = 6\Omega$ *
Fall time	t_f	—	40	—	ns	$R_G = 10\Omega$ *
Total gate charge	Q_g	—	16	—	nC	$V_{DD} \doteq -15V$ *
Gate-source charge	Q_{gs}	—	3.5	—	nC	$V_{GS} = -5V$ *
Gate-drain charge	Q_{gd}	—	6.5	—	nC	$I_D = -5.0A$ *

*Pulsed

●Body diode characteristics (Source-Drain Characteristics) (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}	—	—	−1.2	V	$I_S = -1.6A, V_{GS} = 0V$ *

*Pulsed

Transistors

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●Electrical characteristic curves

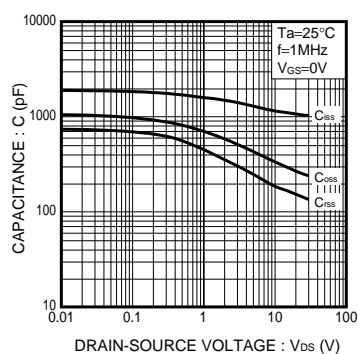


Fig.1 Typical Capacitance vs. Drain-Source Voltage

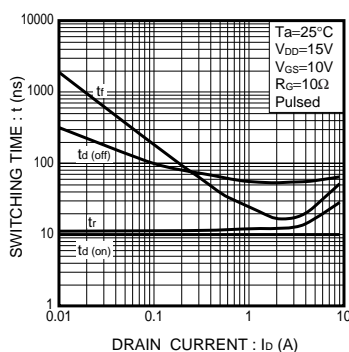


Fig.2 Switching Characteristics

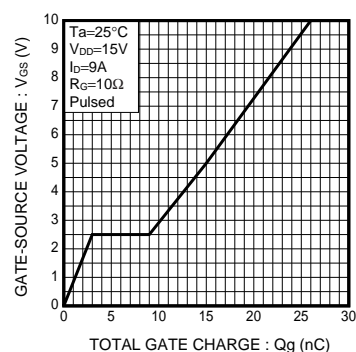


Fig.3 Dynamic Input Characteristics

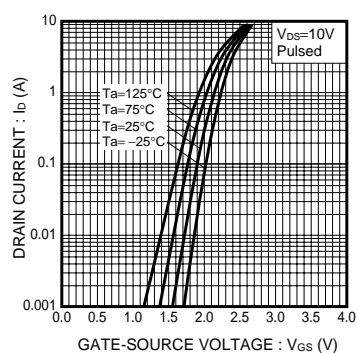


Fig.4 Typical Transfer Characteristics

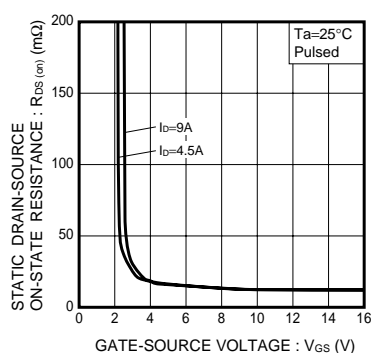


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

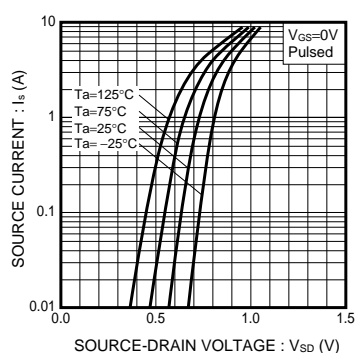


Fig.6 Source Current vs. Source-Drain Voltage

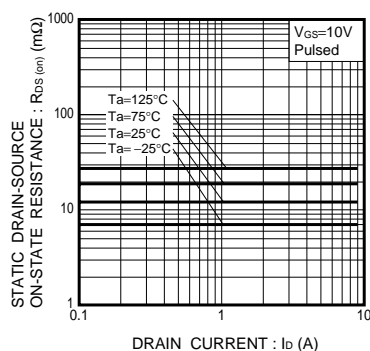


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

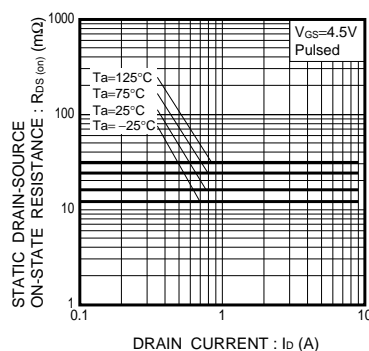


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

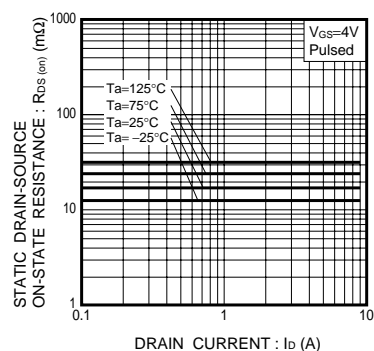


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

Transistors

P-ch

●Electrical characteristic curves

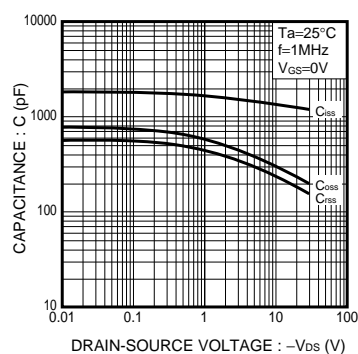


Fig.1 Typical Capacitance vs. Drain-Source Voltage

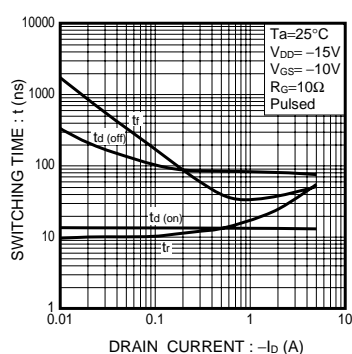


Fig.2 Switching Characteristics

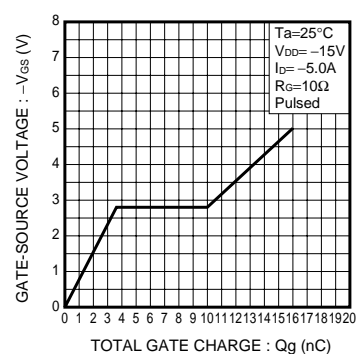


Fig.3 Dynamic Input Characteristics

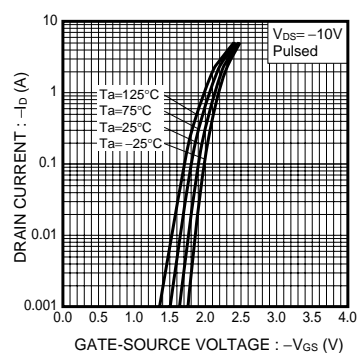


Fig.4 Typical Transfer Characteristics

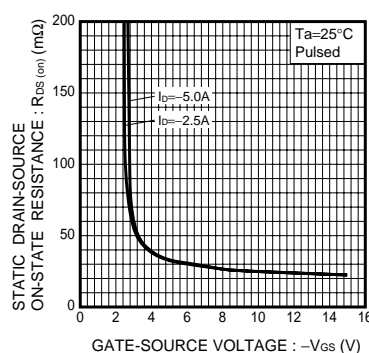


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

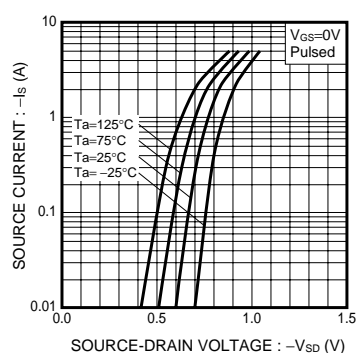


Fig.6 Source Current vs. Source-Drain Voltage

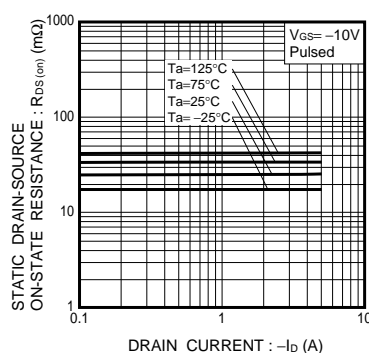


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

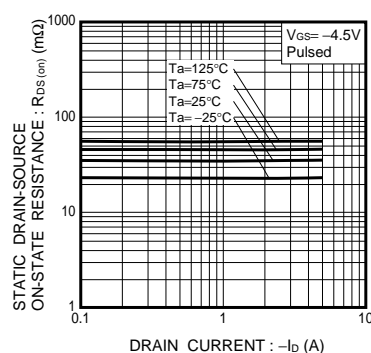


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

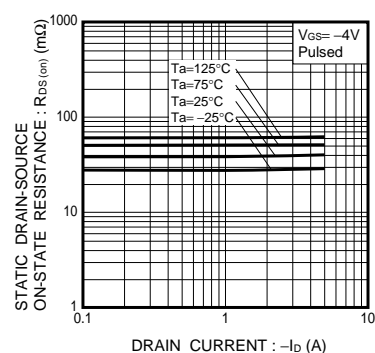


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

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