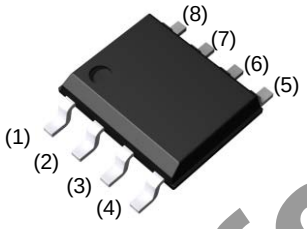
SP8M70

Dual N & Pch Power MOSFET Datasheet

Symbol	Tr1: Nch	Tr2: Pch
V_{DSS}	250V	−250V
$R_{DS(on)}$ (Max.)	1.63Ω	2.8Ω
I_D	3.0A	−2.5A
P_D	2.0W	

●Outline

SOP8



●Features

1) Low on-resistance.

2) Fast switching speed.

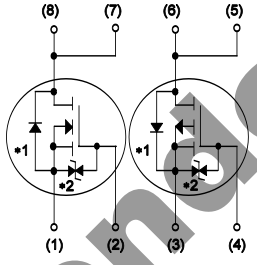
3) Drive circuits can be simple.

4) Parallel use is easy.

5) Pb-free lead plating ; RoHS compliant

6) Small Surface Mount Package (SOP8).

●Inner circuit



(1) Tr1 Source (5) Tr2 Drain
(2) Tr1 Gate (6) Tr2 Drain
(3) Tr2 Source (7) Tr1 Drain
(4) Tr2 Gate (8) Tr1 Drain

∗1 BODY DIODE
∗2 ESD PROTECTION DIODE

●Application

Switching Power Supply

●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	12
	Basic ordering unit (pcs)	2,500
	Taping code	TB1
	Marking	SP8M70

●Absolute maximum ratings (T_a = 25°C) ,unless otherwise specified

Parameter	Symbol	Value		Unit
		Tr1: Nch	Tr2: Pch	
Drain - Source voltage	V_{DSS}	250	−250	V
Continuous drain current	I_D *1	±3.0	±2.5	A
Pulsed drain current	$I_{D,pulse}$ *2	±12	±10	A
Gate - Source voltage	V_{GSS}	±30	±20	V
Power dissipation	P_D *3	2.0		W / total
		1.4		W / element
Power dissipation	P_D *4	0.65		W / total
Junction temperature	T_j	150		°C
Range of storage temperature	T_{stg}	−55 to +150		°C

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●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA} *3	-	-	62.5	°C/W
Thermal resistance, junction - ambient	R_{thJA} *4	-	-	192.3	°C/W

●Electrical characteristics (T_a = 25°C) ,unless otherwise specified

Parameter	Symbol	Type	Conditions	Values			Unit
				Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	N	V_{GS} = 0V, I_D = 1mA	250	-	-	V
		P	V_{GS} = 0V, I_D = –1mA	–250	-	-	
Zero gate voltage drain current	I_{DSS}	N	V_{DS} = 250V, V_{GS} = 0V Tj = 25°C	-	-	25	μA
		P	V_{DS} = –250V, V_{GS} = 0V Tj = 25°C	-	-	–25	
		N	V_{DS} = 250V, V_{GS} = 0V T_j = 125°C	-	-	100	
		P	V_{DS} = –250V, V_{GS} = 0V T_j = 125°C	-	-	–100	
Gate - Source leakage current	I_{GSS}	N	V_{GS} = ±25V, V_{DS} = 0V	-	-	±10	μA
		P	V_{GS} = ±15V, V_{DS} = 0V	-	-	±10	
Gate threshold voltage	$V_{GS\ (th)}$	N	V_{DS} = 10V, I_D = 1mA	2.0		4.0	V
		P	V_{DS} = –10V, I_D = –1mA	–2.0	-	–4.0	
Static drain - source on - state resistance	$R_{DS(on)}$ *5	N	V_{GS}=10V, I_D=1.5A	-	1.25	1.63	Ω
			V_{GS}=10V, I_D=1.5A T_j=125°C	-	2.50	3.30	
		P	V_{GS}=–10V, I_D=–1.25A	-	2.20	2.80	Ω
			V_{GS}=–10V, I_D=–1.25A T_j=125°C	-	3.90	5.00	
Forward transfer admittance	g_{fs} *5	N	V_{DS} = 10V, I_D = 1.5A	0.75	1.5	-	S
		P	V_{DS} = –10V, I_D = –1.25A	1.0	2.0	-	

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●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Type	Conditions	Values			Unit
				Min.	Typ.	Max.	
Input capacitance	C_{iss}	N	N V_{GS} = 0V, V_{DS} = 25V f = 1MHz P V_{GS} = 0V, V_{DS} = −25V f = 1MHz	-	180	-	pF
		P		-	250	-	
Output capacitance	C_{oss}	N		-	70	-	
		P		-	40	-	
Reverse transfer capacitance	C_{rss}	N		-	20	-	
		P		-	10	-	
Turn - on delay time	$t_{d(on)}$ *5	N	N V_{DD} ≃ 125V V_{GS} = 10V I_D = 1.5A, R_L = 83Ω R_G = 10Ω P V_{DD} ≃ −125V V_{GS} = −10V I_D = −1.25A, R_L = 100Ω R_G = 10Ω	-	10	-	ns
		P		-	9	-	
Rise time	t_r *5	N		-	20	-	
		P		-	15	-	
Turn - off delay time	$t_{d(off)}$ *5	N		-	20	-	
		P		-	30	-	
Fall time	t_f *5	N		-	25	-	
		P		-	20	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Type	Conditions	Values			Unit
				Min.	Typ.	Max.	
Total gate charge	Q_g *5	N	N V_{DD} ≃ 125V I_D = 3A V_{GS} = 10V P V_{DD} ≃ −125V I_D = −2.5A V_{GS} = −10V	-	5.2	-	nC
		P		-	8.0	-	
Gate - Source charge	Q_{gs} *5	N		-	2.1	-	
		P		-	2.5	-	
Gate - Drain charge	Q_{gd} *5	N		-	1.2	-	
		P		-	2.8	-	
Gate plateau voltage	V(plateau)	N	N V_{DD} ≃ 125V I_D = 3A	-	7.0	-	V
		P	P V_{DD} ≃ −125V I_D = −2.5A	-	6.0	-	

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●**Body diode electrical characteristics** (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Type	Conditions	Values			Unit
				Min.	Typ.	Max.	
Continuous source current	I_S *1	N	T_a = 25°C	-	-	1	A
		P		-	-	–1	
Pulsed source current	I_{SM} *2	N		-	-	12	A
		P		-	-	–10	
Forward voltage	V_{SD} *5	N	V_{GS} = 0V, I_s = 3.0A	-	-	1.5	V
		P	V_{GS} = 0V, I_s = –2.5A	-	-	–1.5	
Reverse recovery time	t_{rr} *5	N	N I_S = 1.5A di/dt = 100A / μs	-	85	-	ns
		P		-	100	-	
Reverse recovery charge	Q_{rr} *5	N	P I_S = –1.0A di/dt = 100A / μs	-	190	-	nC
		P		-	370	-	

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 Mounted on a ceramic board (3.0×3.0×0.8mm)

*4 Mounted on a epoxy PCB FR4(2.0×2.0×0.8mm)

*5 Pulsed

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

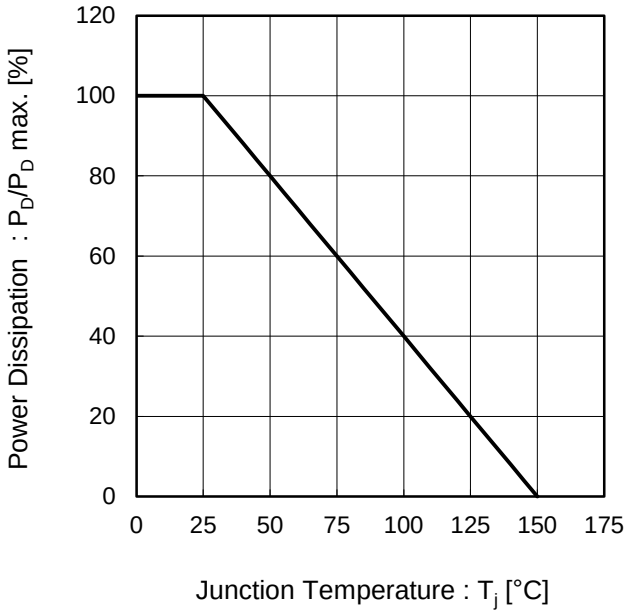


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

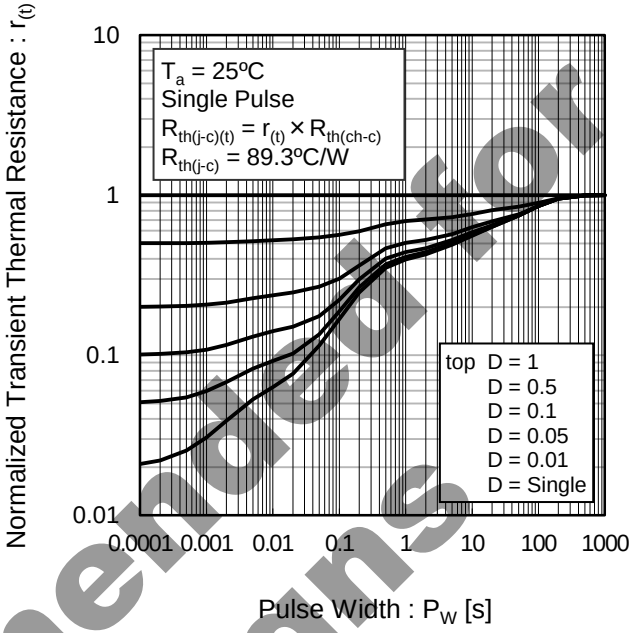
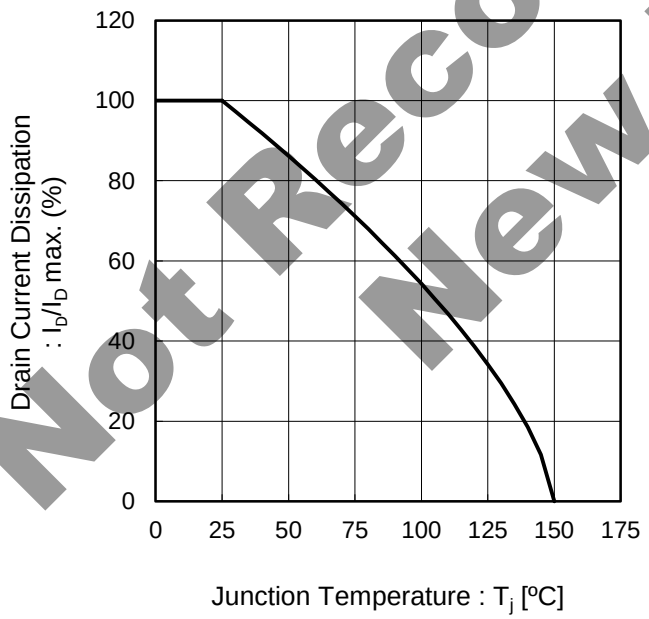


Fig.3 Drain Current Derating Curve



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●**Electrical characteristic curves** (N-channel MOSFET)

Fig.4 Typical Output Characteristics(I)

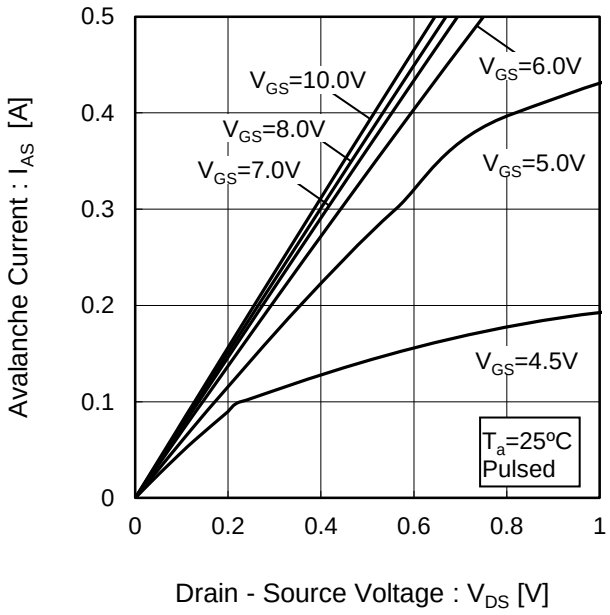
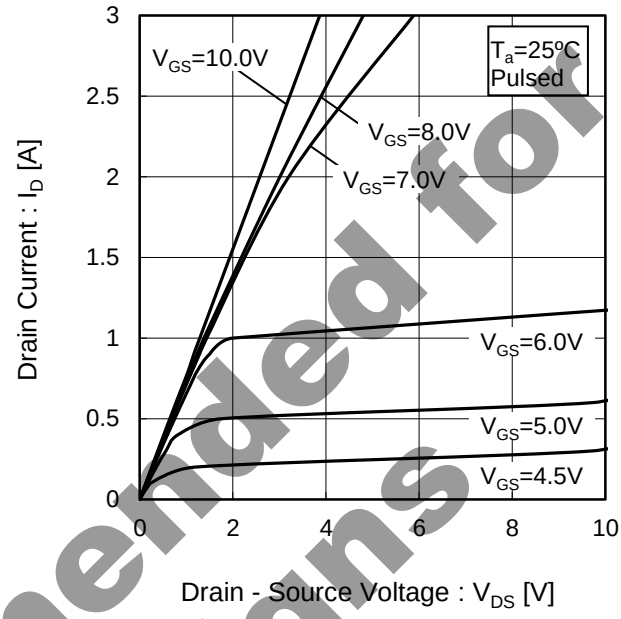


Fig.5 Typical Output Characteristics(II)



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●**Electrical characteristic curves** (N-channel MOSFET)

Fig.6 Breakdown Voltage vs. Junction Temperature

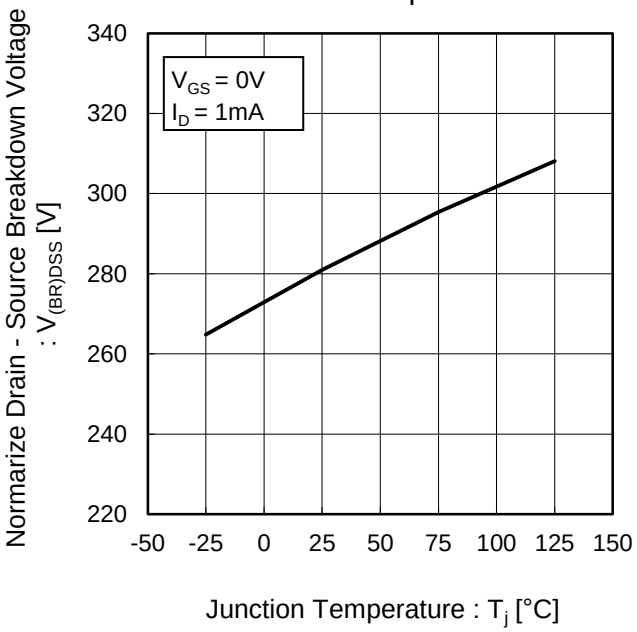


Fig.7 Typical Transfer Characteristics

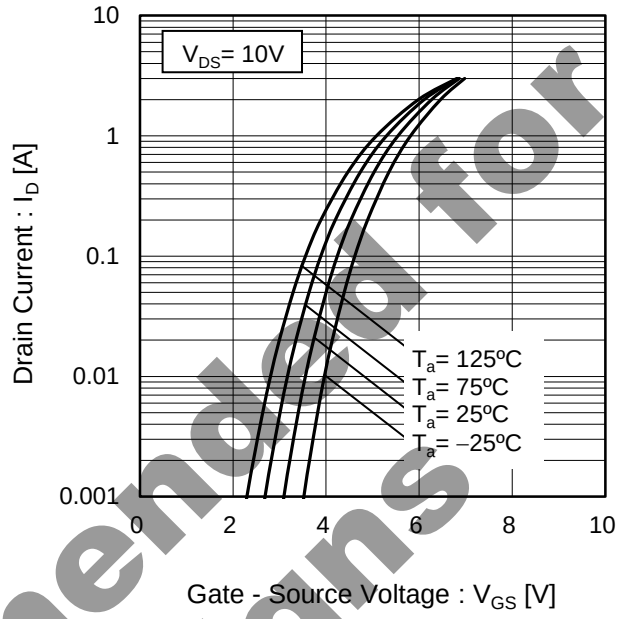


Fig.8 Gate Threshold Voltage vs. Junction Temperature

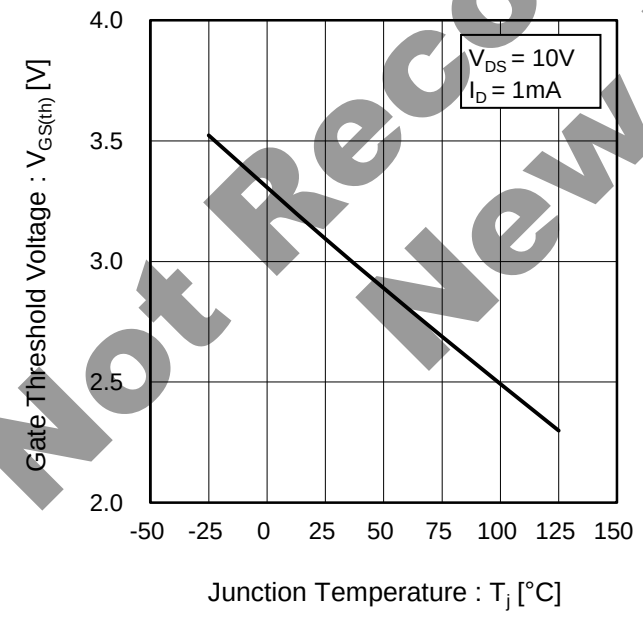
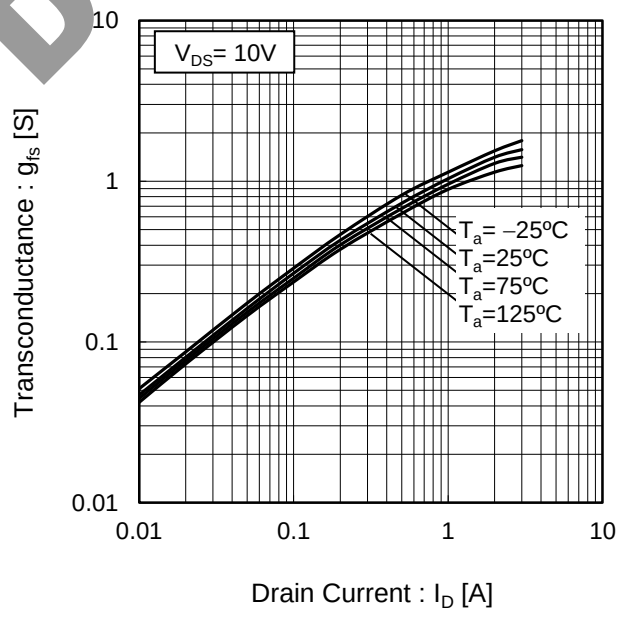


Fig.9 Transconductance vs. Drain Current



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●**Electrical characteristic curves** (N-channel MOSFET)

Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage

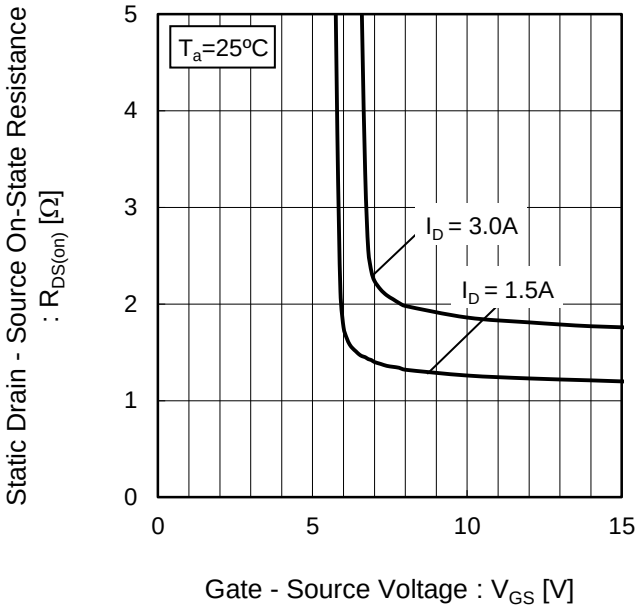


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(I)

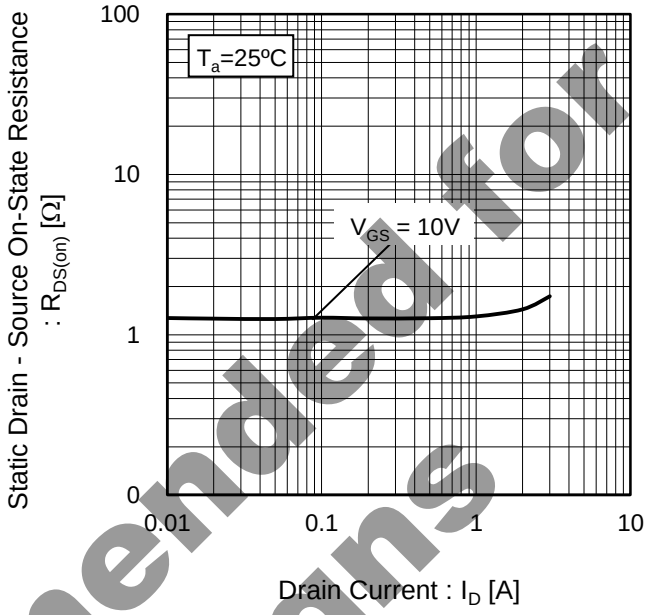


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature

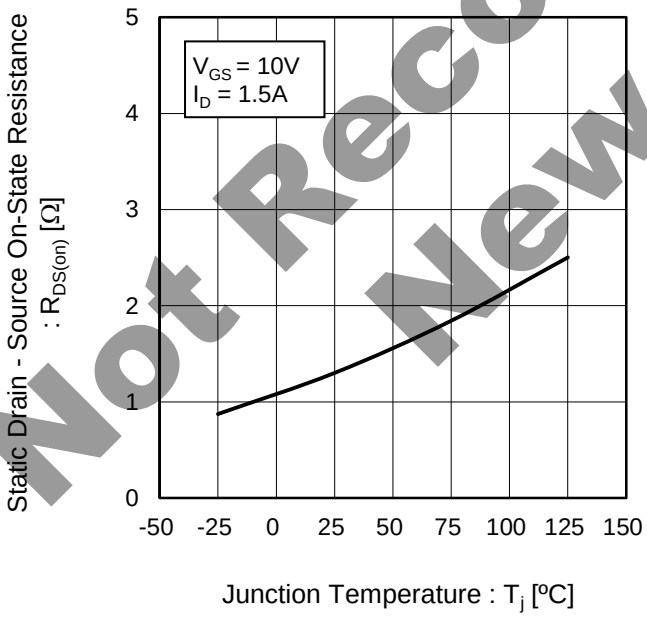
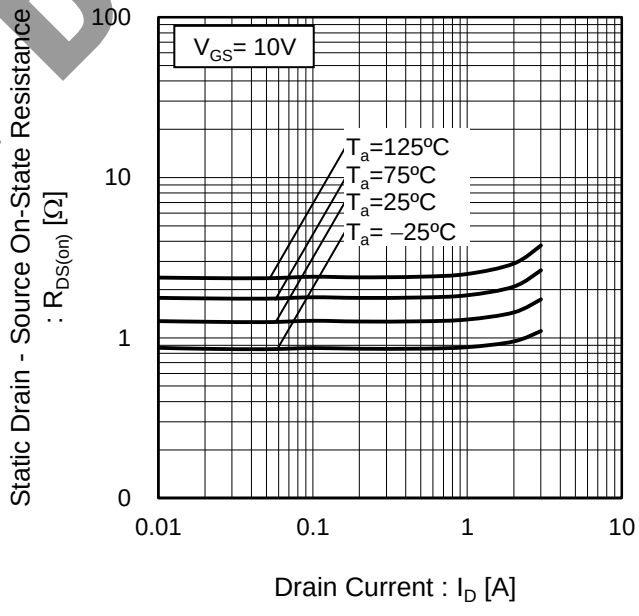


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)



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●**Electrical characteristic curves** (N-channel MOSFET)

Fig.14 Typical Capacitance vs. Drain - Source Voltage

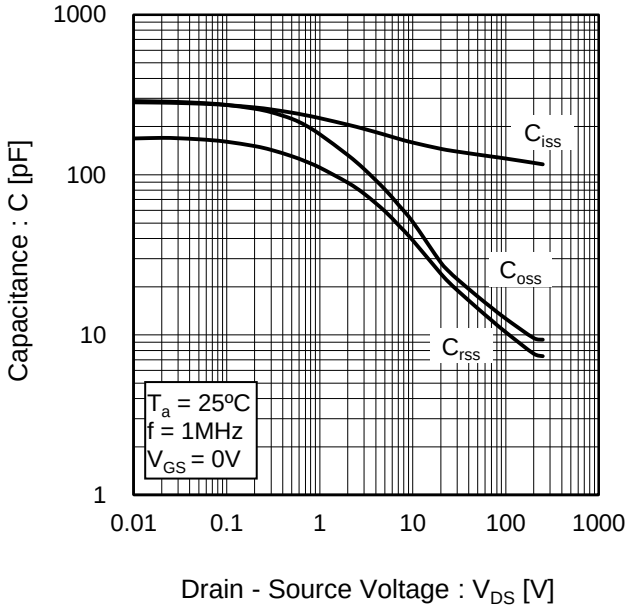


Fig.15 Switching Characteristics

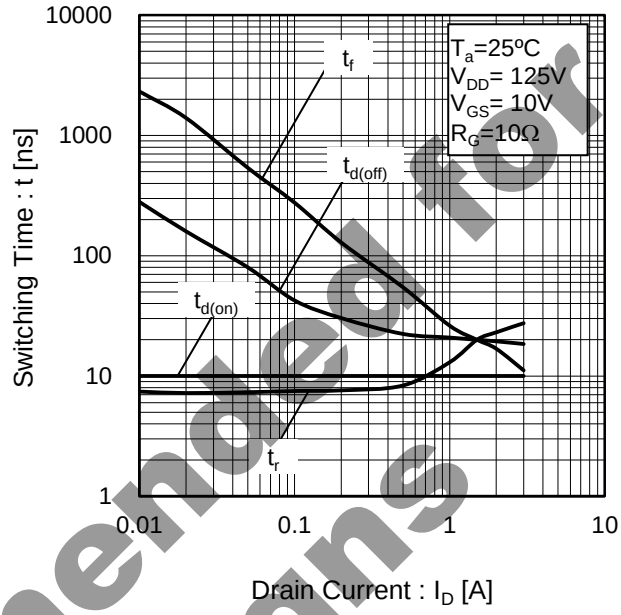
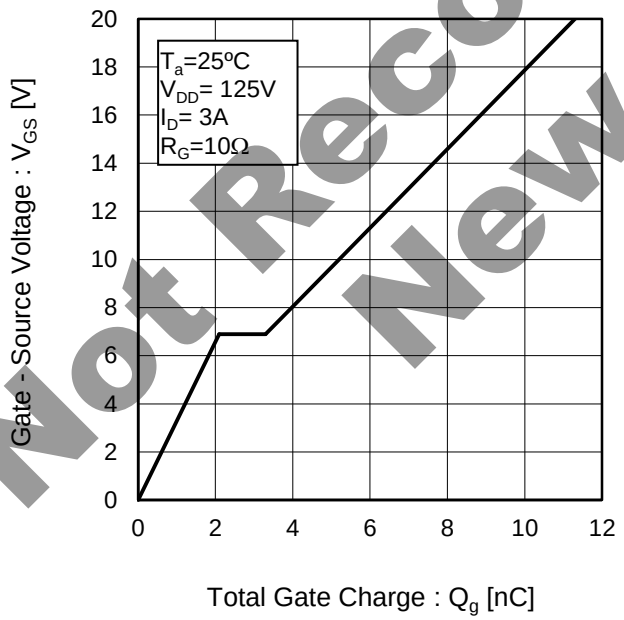


Fig.16 Dynamic Input Characteristics



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●**Electrical characteristic curves** (N-channel MOSFET)

Fig.17 Source Current vs. Source - Drain Voltage

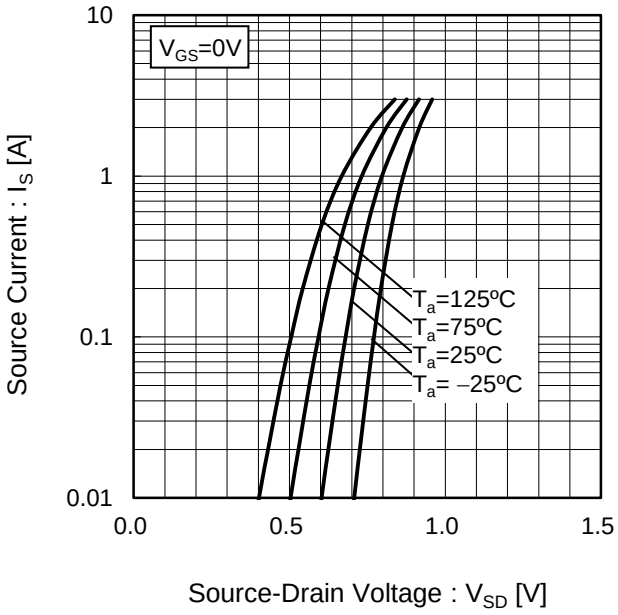
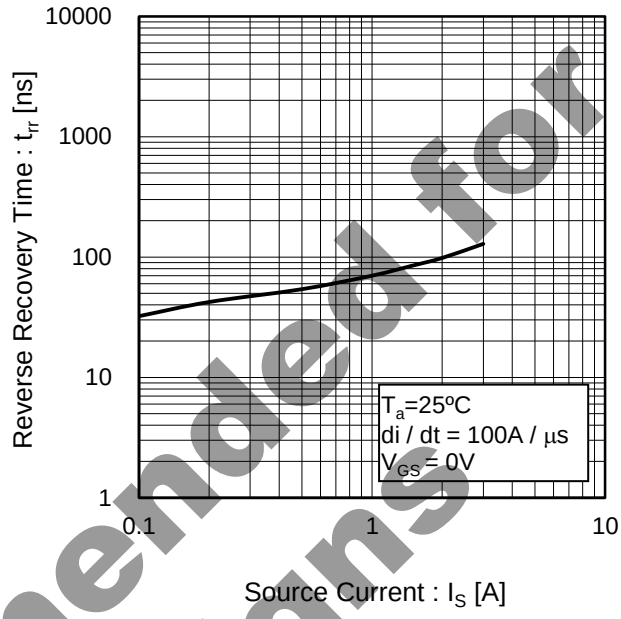


Fig.18 Reverse Recovery Time vs.Source Current



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●**Electrical characteristic curves** (P-channel MOSFET)

Fig.19 Typical Output Characteristics(I)

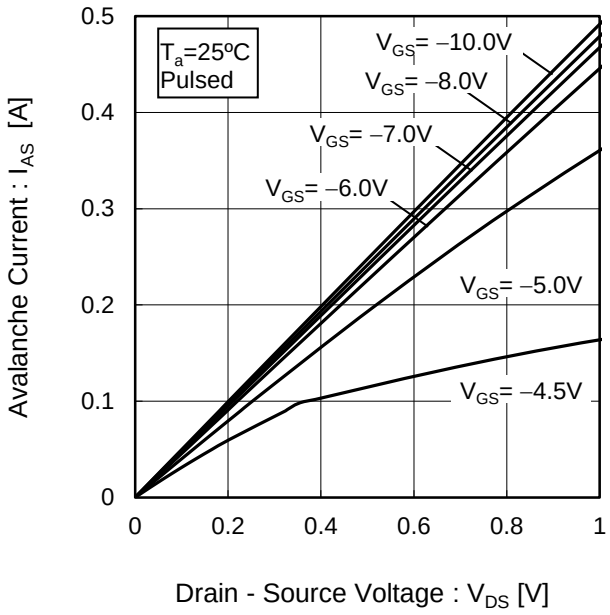
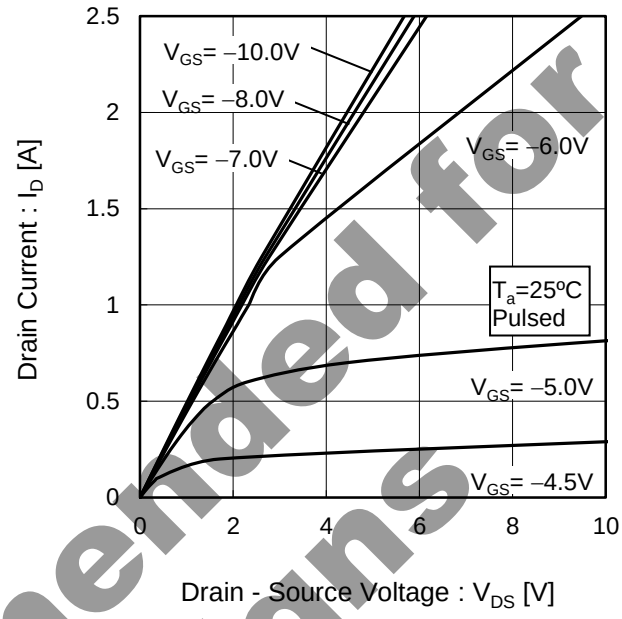


Fig.5 Typical Output Characteristics(II)



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●Electrical characteristic curves (P-channel MOSFET)

Fig.6 Breakdown Voltage vs. Junction Temperature

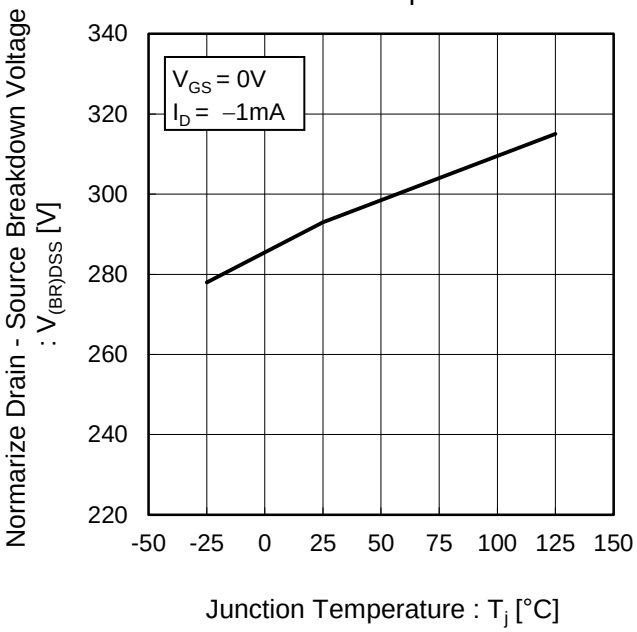


Fig.7 Typical Transfer Characteristics

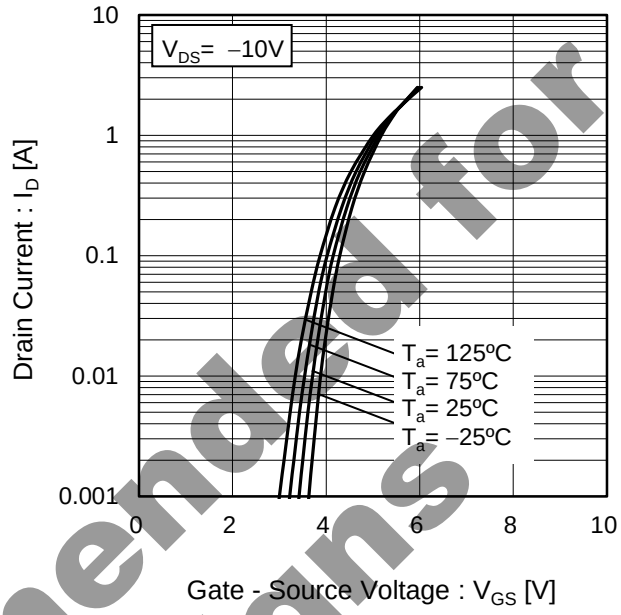


Fig.8 Gate Threshold Voltage vs. Junction Temperature

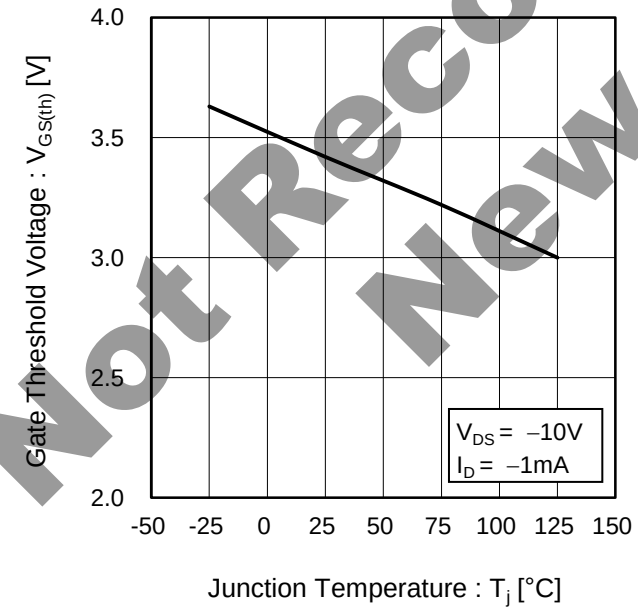
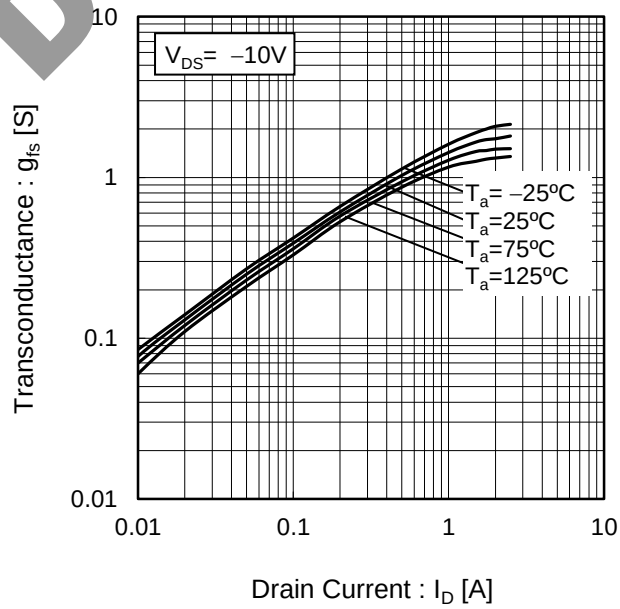


Fig.9 Transconductance vs. Drain Current



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●**Electrical characteristic curves** (P-channel MOSFET)

Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage

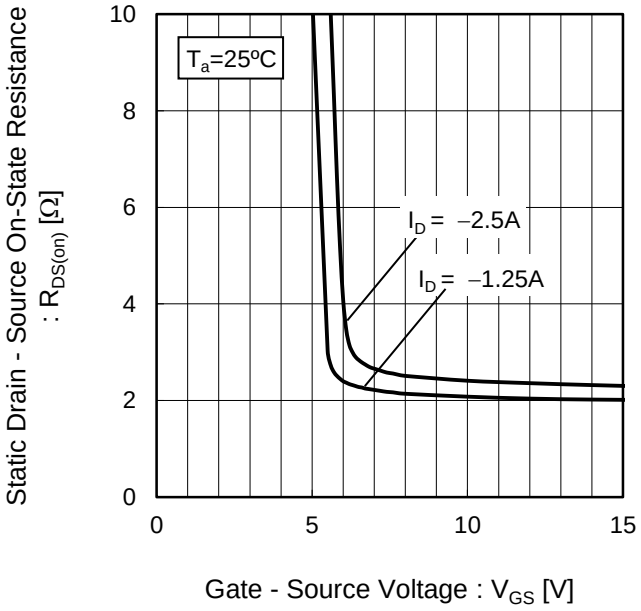


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(I)

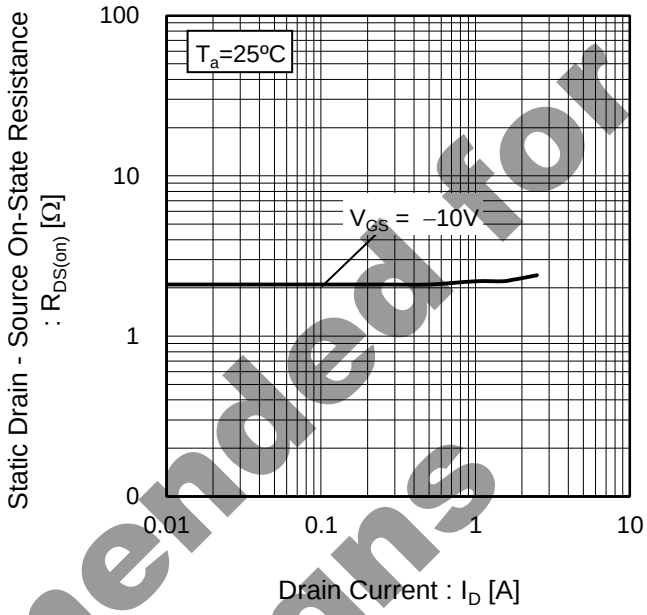


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature

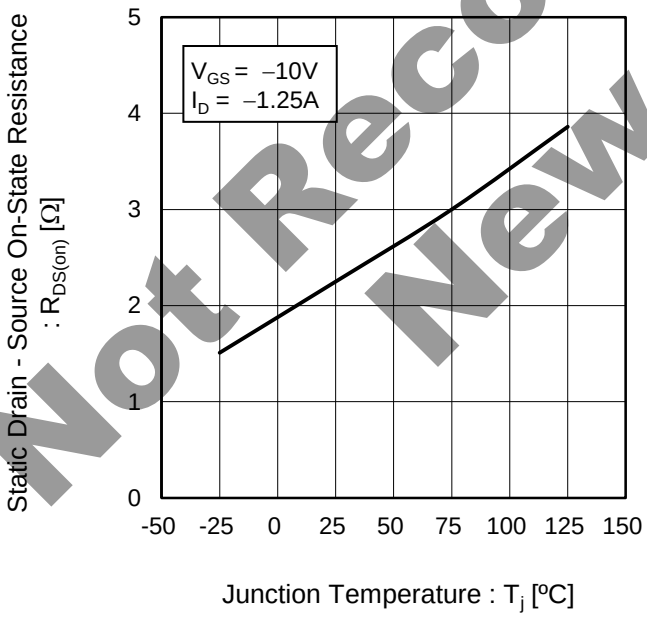
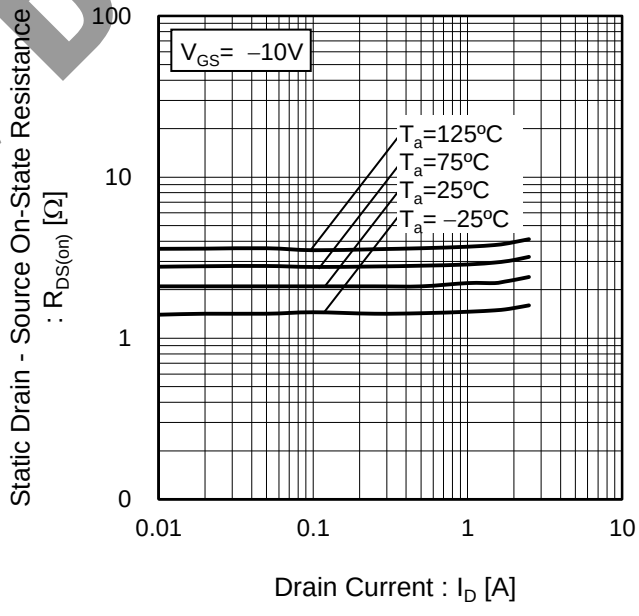


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)



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●**Electrical characteristic curves** (P-channel MOSFET)

Fig.14 Typical Capacitance vs. Drain - Source Voltage

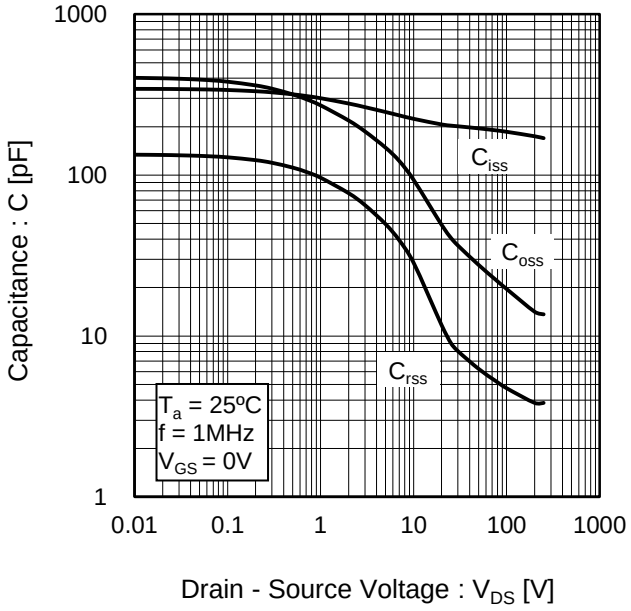


Fig.15 Switching Characteristics

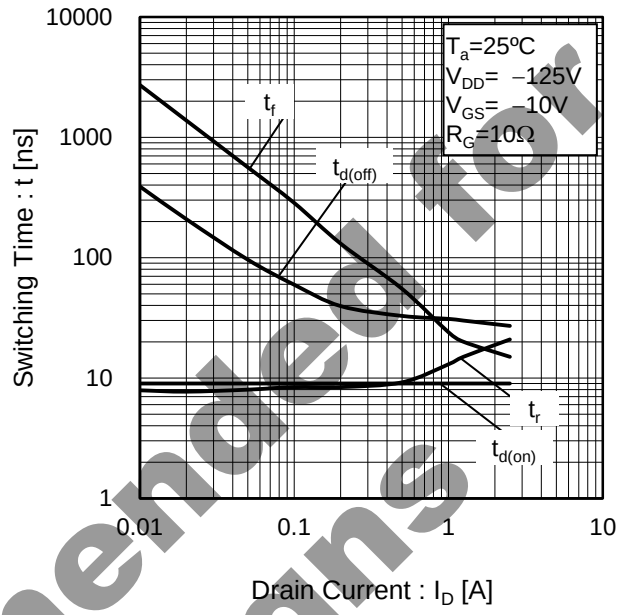
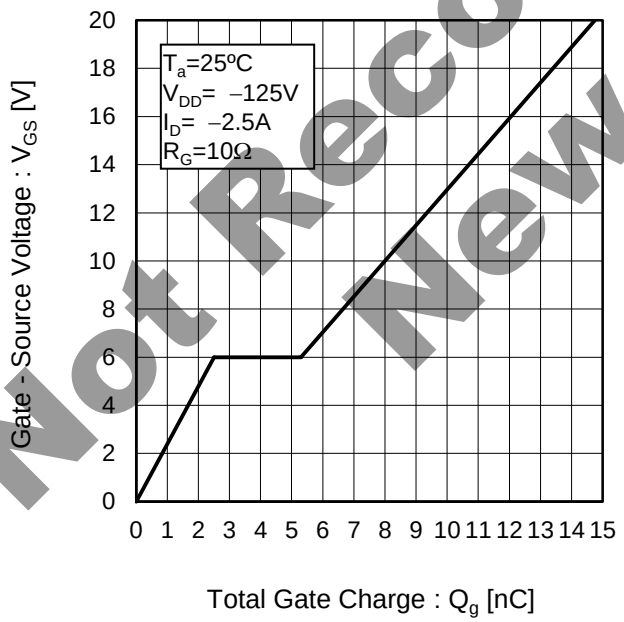


Fig.16 Dynamic Input Characteristics



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●**Electrical characteristic curves** (P-channel MOSFET)

Fig.17 Source Current vs. Source - Drain Voltage

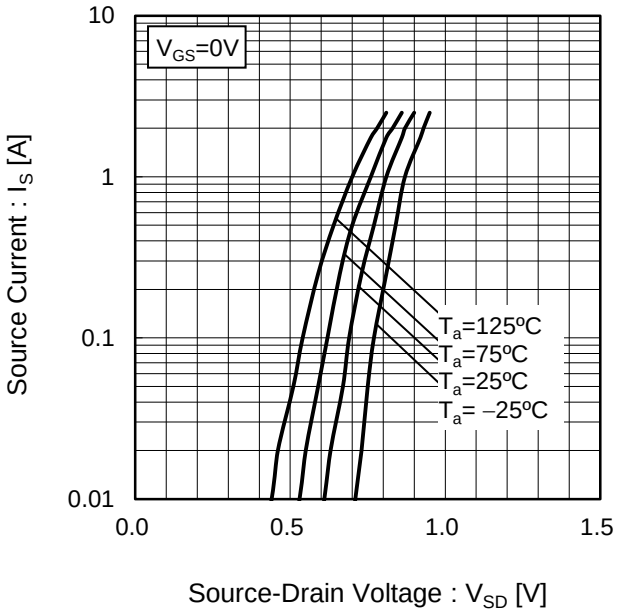
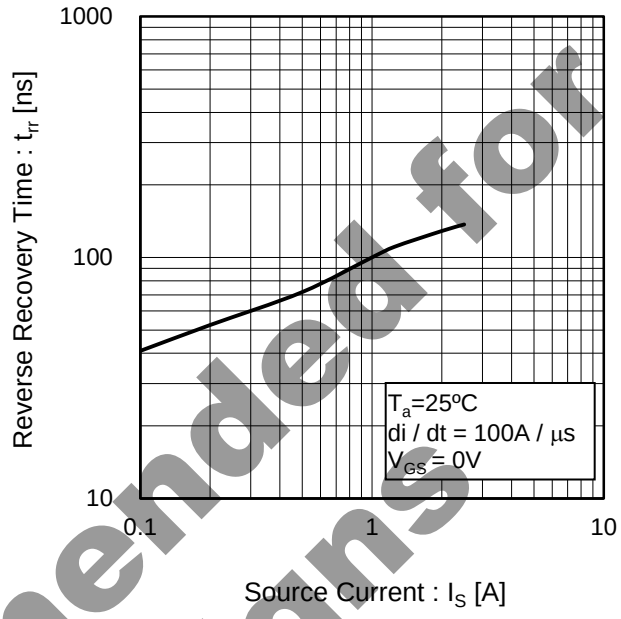


Fig.18 Reverse Recovery Time vs.Source Current



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●Measurement circuits (N-Channel MOSFET)

Fig.1-1 Switching Time Measurement Circuit

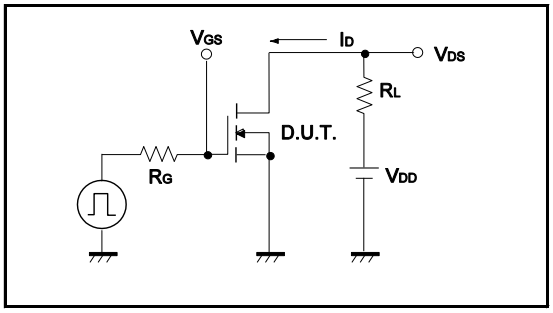


Fig.1-2 Switching Waveforms

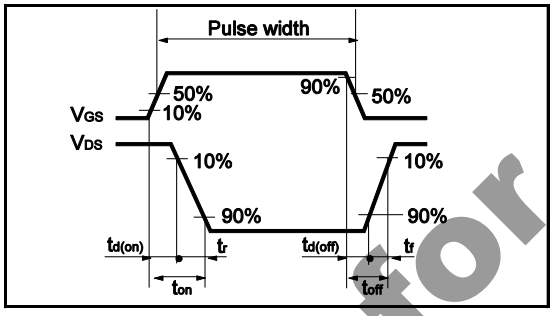


Fig.2-1 Gate Charge Measurement Circuit

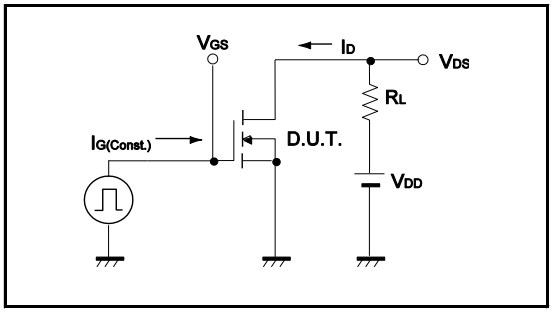
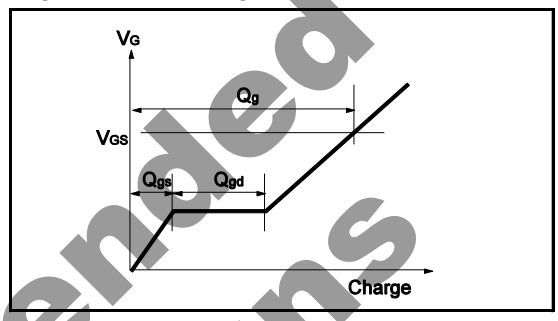


Fig.2-2 Gate Charge Waveform



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●Measurement circuits (P-Channel MOSFET)

Fig.3-1 Switching Time Measurement Circuit

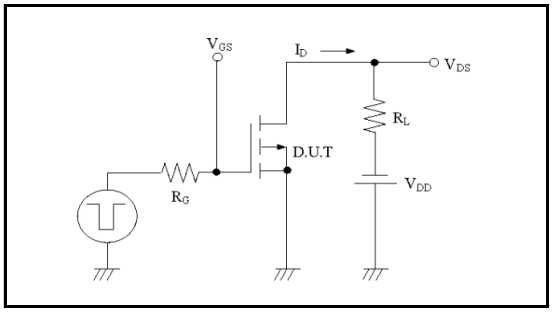


Fig.3-2 Switching Waveforms

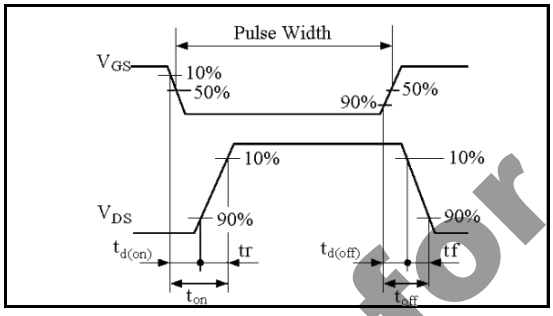


Fig.4-1 Gate Charge Measurement Circuit

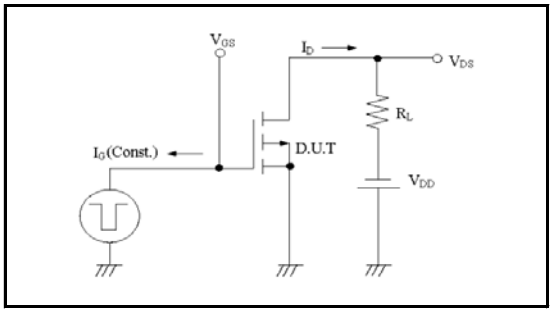
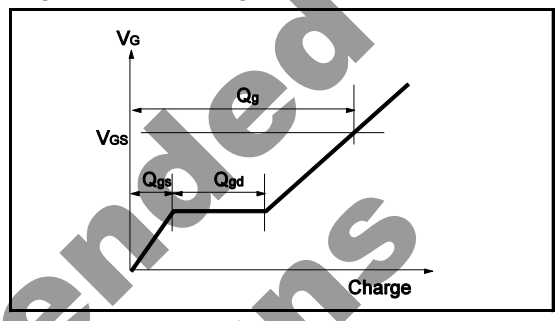


Fig.4-2 Gate Charge Waveform



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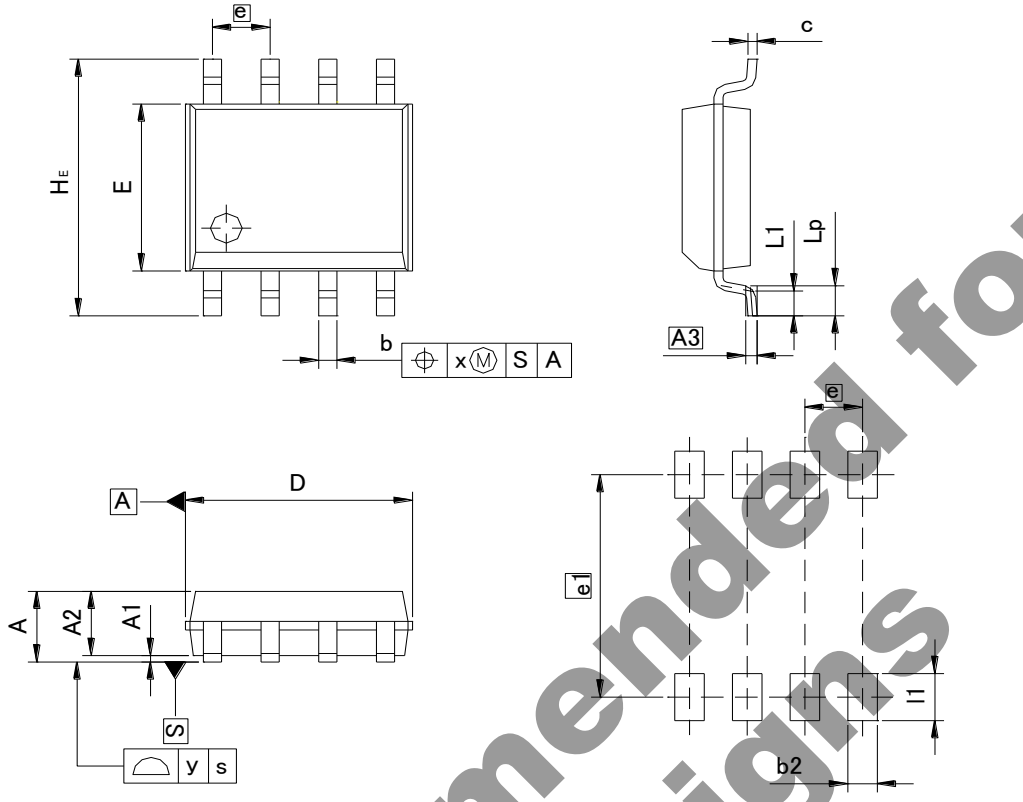
●**Dimensions** (Unit : mm)

SOP8



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	–	1.75	–	0.069
A1	0.15		0.006	
A2	1.40	1.60	0.055	0.063
A3	0.25		0.010	
b	0.30	0.50	0.012	0.020
c	0.10	0.30	0.004	0.012
D	4.80	5.20	0.189	0.205
E	3.75	4.05	0.148	0.159
e	1.27		0.050	
HE	5.70	6.30	0.224	0.248
L1	0.50	0.70	0.020	0.028
Lp	0.65	0.85	0.026	0.033
x	0.15		0.006	
y	0.10		0.004	

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	–	0.65	–	0.026
e1	5.15		0.203	
l1	–	1.15	–	0.045

Dimension in mm / inches

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