

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	

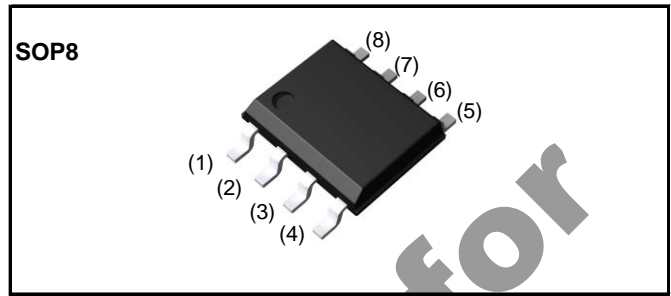
●Features

- 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).

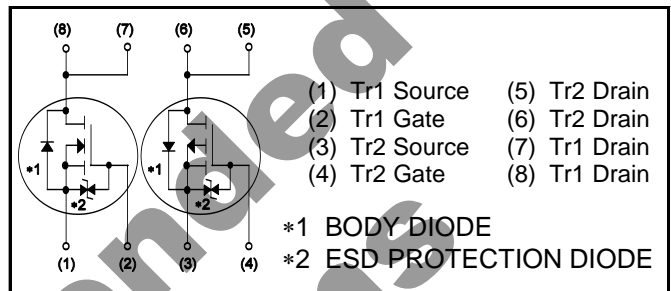
●Application

Switching Power Supply

●Outline



●Inner circuit



●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 ($T_a = 25^\circ\text{C}$), 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

●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 ($T_a = 25^\circ\text{C}$), 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	$V_{DS} = 250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	25	μA
		P	$V_{DS} = -250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	-25	
		N	$V_{DS} = 250V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$	-	-	100	
		P	$V_{DS} = -250V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$	-	-	-100	
Gate - Source leakage current	I_{GSS}	N	$V_{GS} = \pm 25V, V_{DS} = 0V$	-	-	± 10	μA
		P	$V_{GS} = \pm 15V, V_{DS} = 0V$	-	-	± 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
			$V_{GS}=10V, I_D=1.5A$ $T_j=125^\circ\text{C}$	-	2.50	3.30	
		P	$V_{GS}=-10V, I_D=-1.25A$	-	2.20	2.80	Ω
			$V_{GS}=-10V, I_D=-1.25A$ $T_j=125^\circ\text{C}$	-	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	-	

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Type	Conditions	Values			Unit
				Min.	Typ.	Max.	
Input capacitance	C _{iss}	N	V _{GS} = 0V, V _{DS} = 25V f = 1MHz	-	180	-	pF
		P		-	250	-	
Output capacitance	C _{oss}	N	V _{GS} = 0V, V _{DS} = -25V f = 1MHz	-	70	-	
		P		-	40	-	
Reverse transfer capacitance	C _{rss}	N	V _{GS} = 0V, V _{DS} = -25V f = 1MHz	-	20	-	
		P		-	10	-	
Turn - on delay time	t _{d(on)} ^{*5}	N	V _{DD} ≈ 125V V _{GS} = 10V I _D = 1.5A, R _L = 83Ω R _G = 10Ω	-	10	-	ns
		P		-	9	-	
Rise time	t _r ^{*5}	N	V _{DD} ≈ 125V V _{GS} = 10V I _D = 1.5A, R _L = 83Ω R _G = 10Ω	-	20	-	
		P		-	15	-	
Turn - off delay time	t _{d(off)} ^{*5}	N	V _{DD} ≈ -125V V _{GS} = -10V I _D = -1.25A, R _L = 100Ω R _G = 10Ω	-	20	-	
		P		-	30	-	
Fall time	t _f ^{*5}	N	V _{DD} ≈ -125V V _{GS} = -10V I _D = -1.25A, R _L = 100Ω R _G = 10Ω	-	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	V _{DD} ≈ 125V I _D = 3A V _{GS} = 10V	-	5.2	-	nC
		P		-	8.0	-	
Gate - Source charge	Q _{gs} ^{*5}	N	V _{DD} ≈ -125V I _D = -2.5A V _{GS} = -10V	-	2.1	-	
		P		-	2.5	-	
Gate - Drain charge	Q _{gd} ^{*5}	N	V _{DD} ≈ 125V I _D = 3A V _{GS} = -10V	-	1.2	-	
		P		-	2.8	-	
Gate plateau voltage	V(plateau)	N	V _{DD} ≈ 125V I _D = 3A V _{GS} = -10V	-	7.0	-	V
		P		-	6.0	-	

●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

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

*1 Limited only by maximum temperature allowed.

*2 $P_w \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*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

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

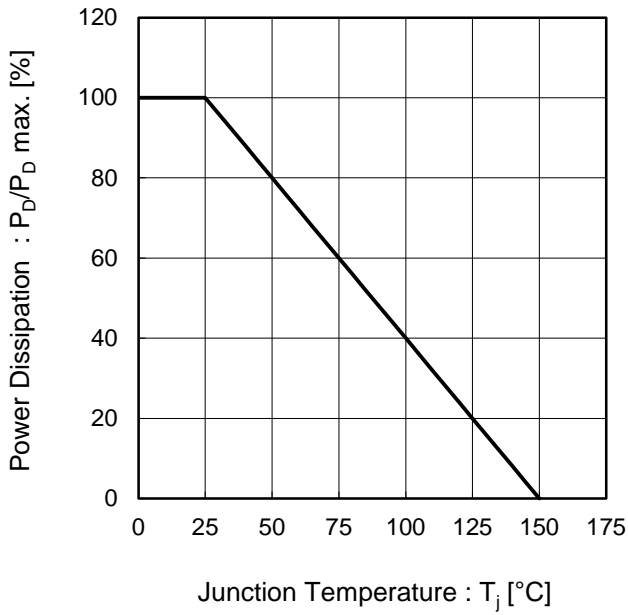


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

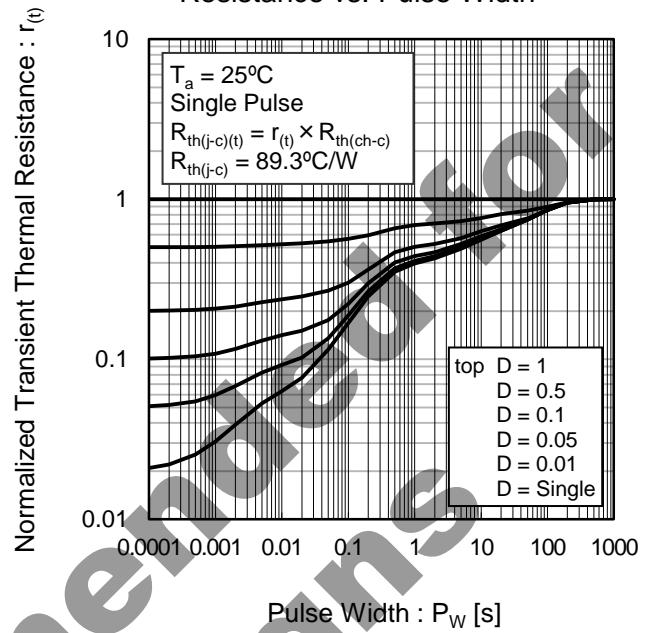
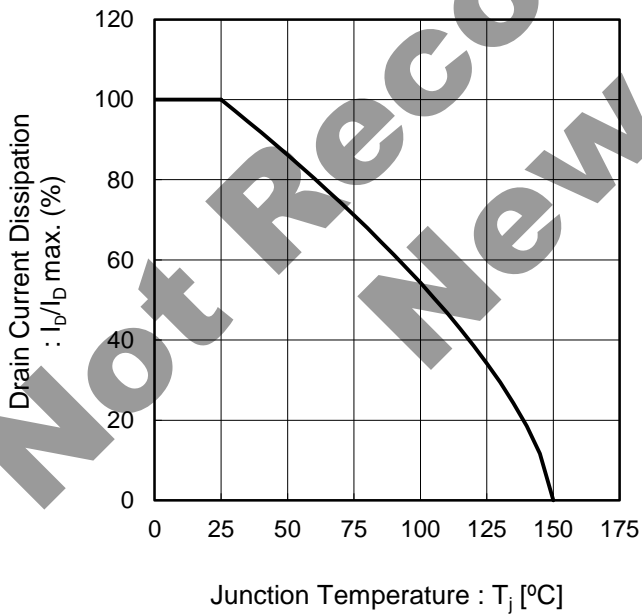


Fig.3 Drain Current Derating Curve



●Electrical characteristic curves (N-channel MOSFET)

Fig.4 Typical Output Characteristics(I)

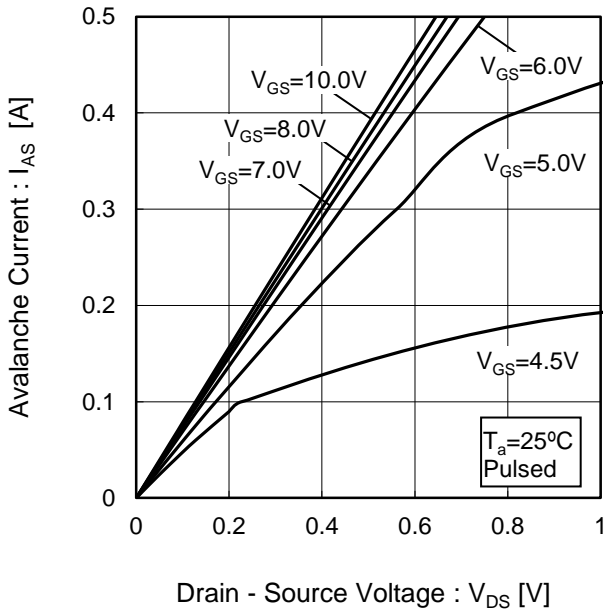
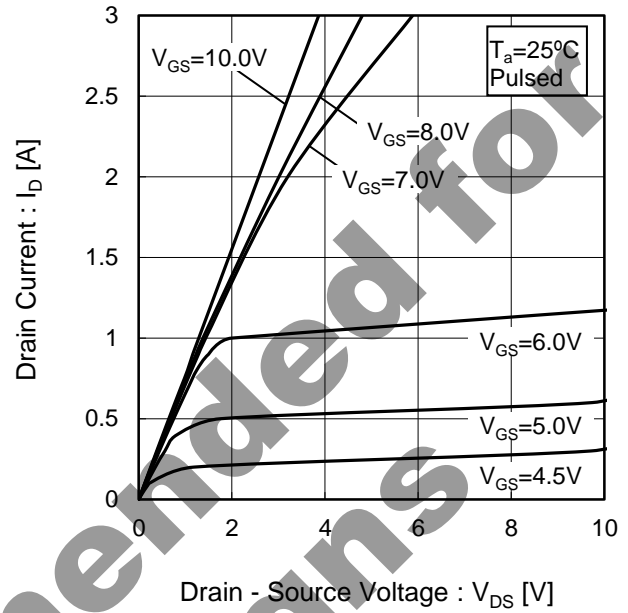


Fig.5 Typical Output Characteristics(II)



Not Recommended for New Designs

●Electrical characteristic curves (N-channel MOSFET)

Fig.6 Breakdown Voltage vs. Junction Temperature

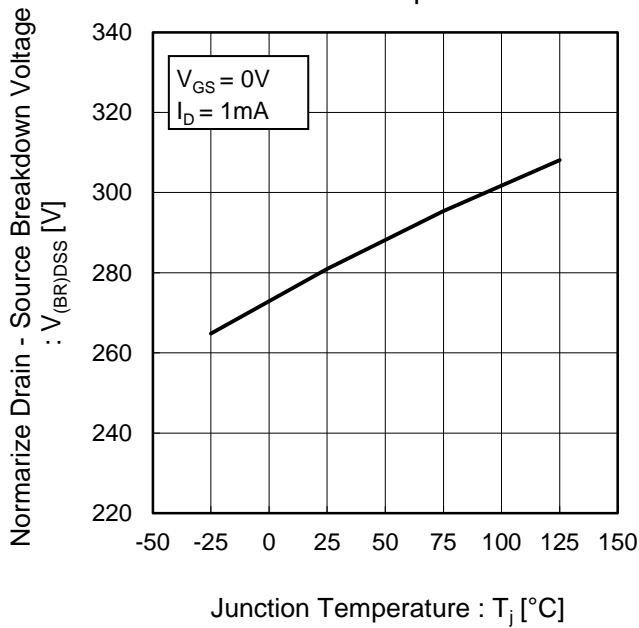


Fig.7 Typical Transfer Characteristics

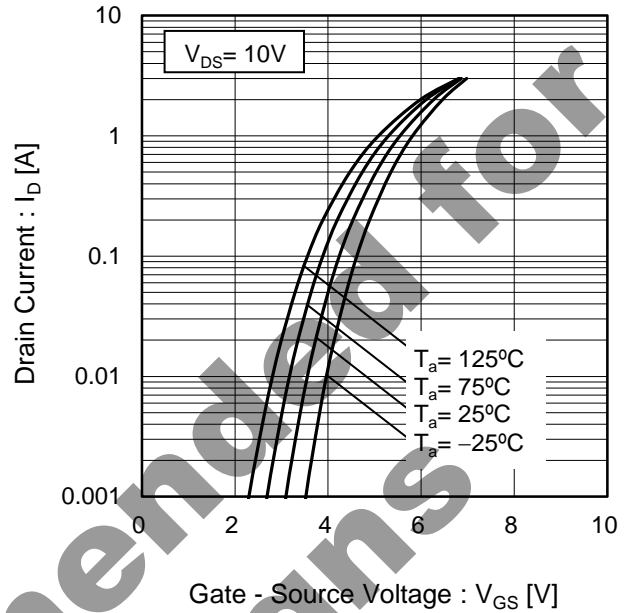


Fig.8 Gate Threshold Voltage vs. Junction Temperature

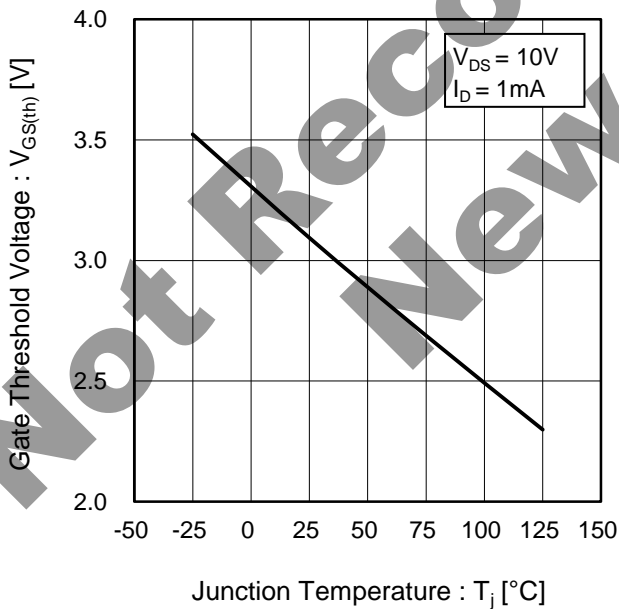
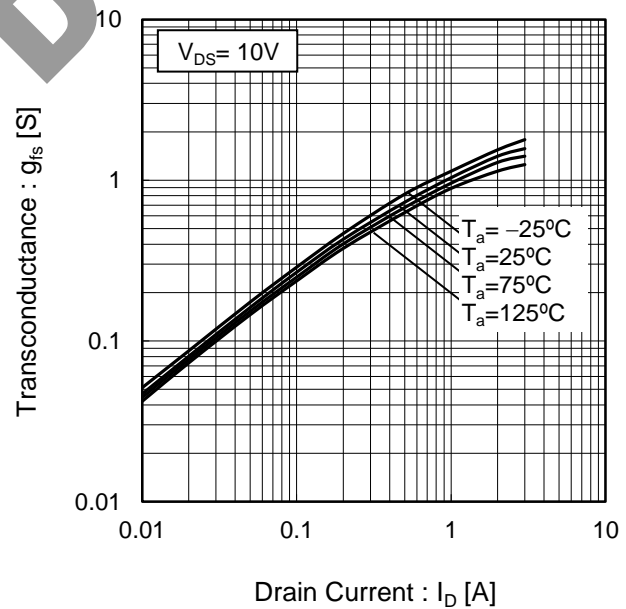


Fig.9 Transconductance vs. Drain Current



●Electrical characteristic curves (N-channel MOSFET)

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

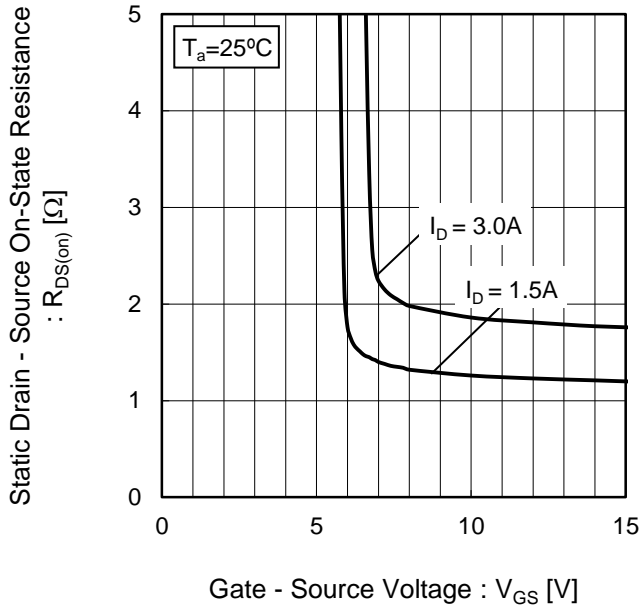


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(I)

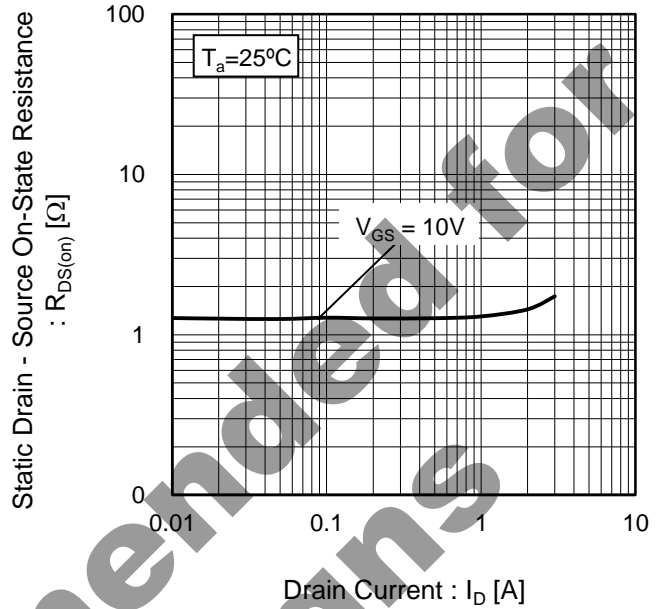


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature

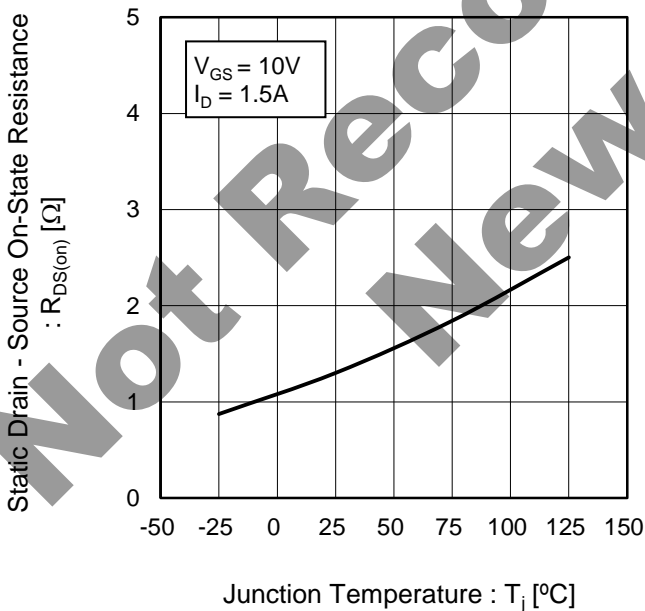
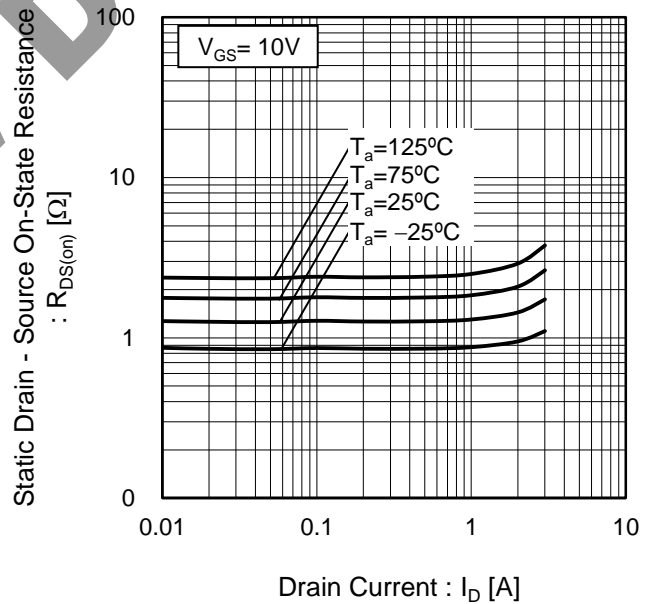


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)



●Electrical characteristic curves (N-channel MOSFET)

Fig.14 Typical Capacitance vs. Drain - Source Voltage

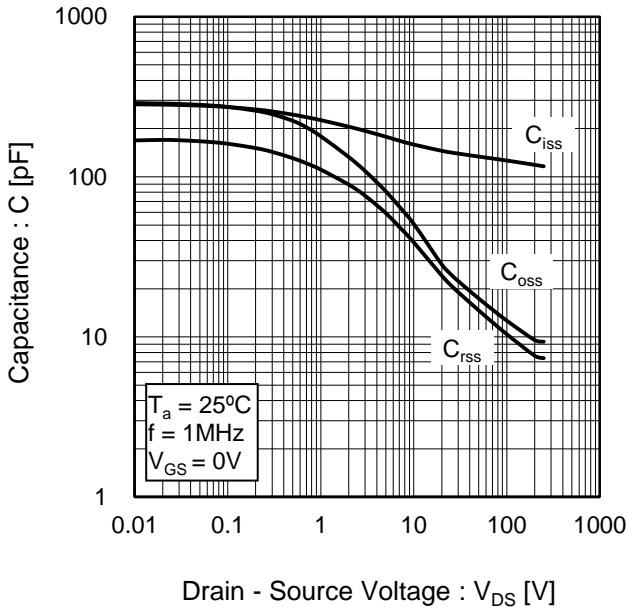


Fig.15 Switching Characteristics

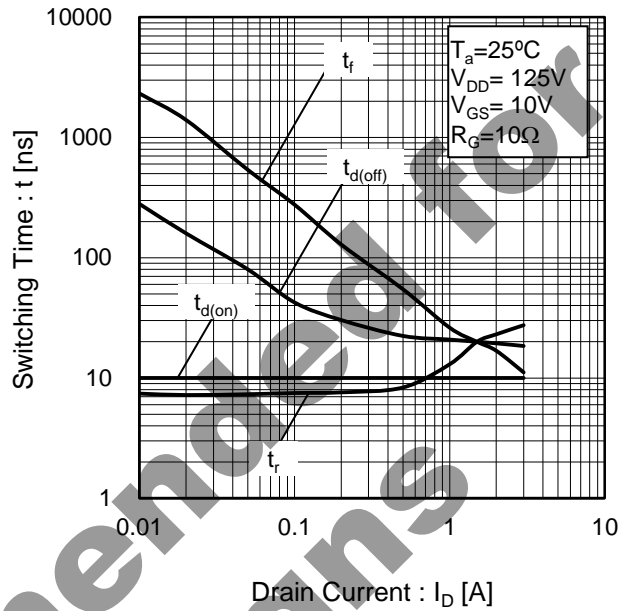
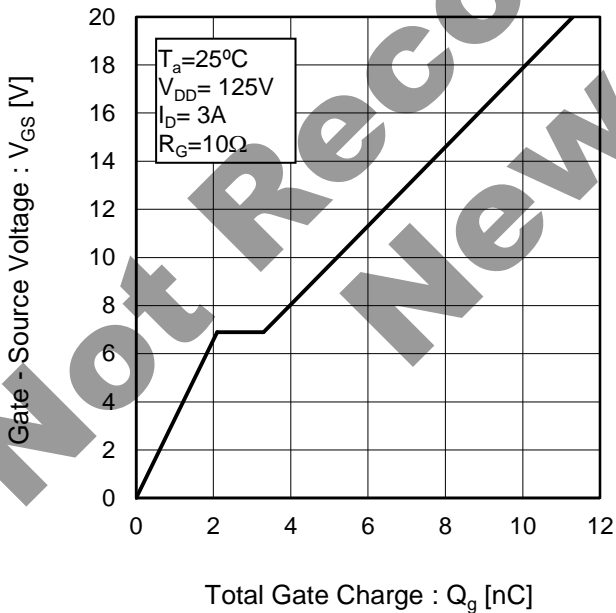


Fig.16 Dynamic Input Characteristics



●Electrical characteristic curves (N-channel MOSFET)

Fig.17 Source Current vs. Source - Drain Voltage

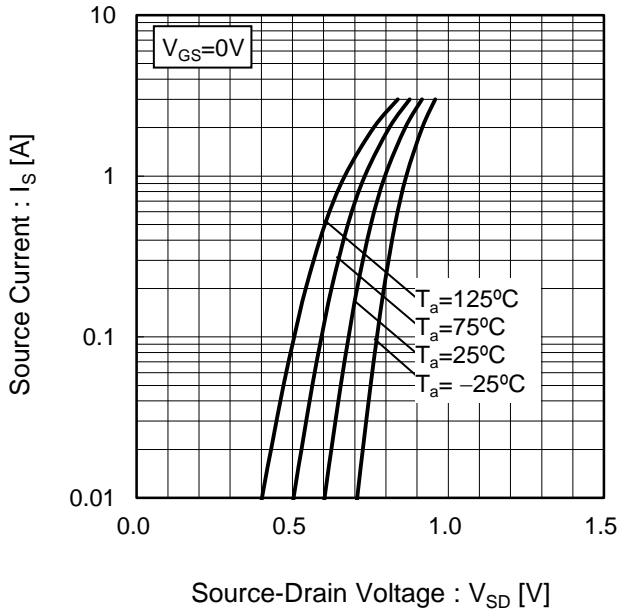
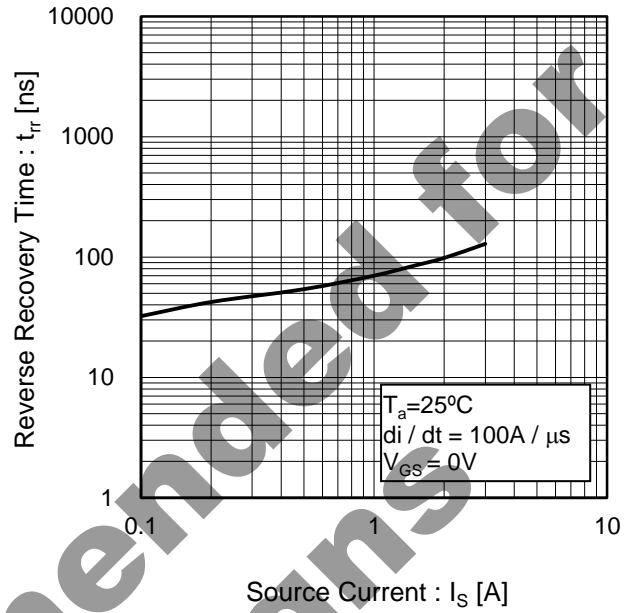


Fig.18 Reverse Recovery Time vs. Source Current



Not Recommended for New Designs

●Electrical characteristic curves (P-channel MOSFET)

Fig.19 Typical Output Characteristics(I)

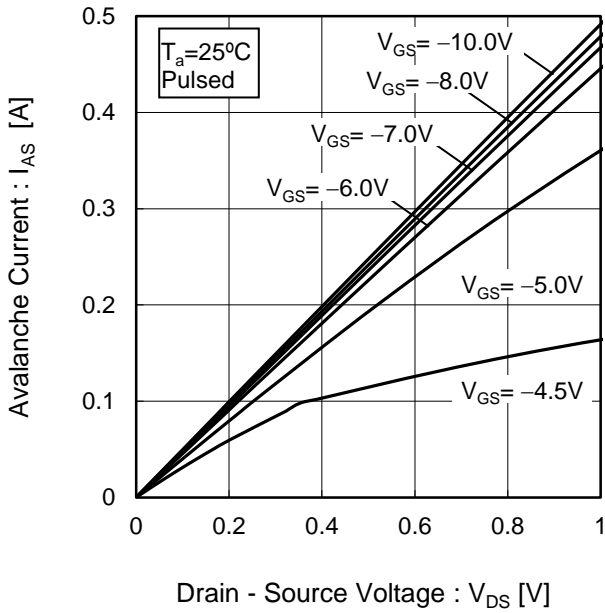
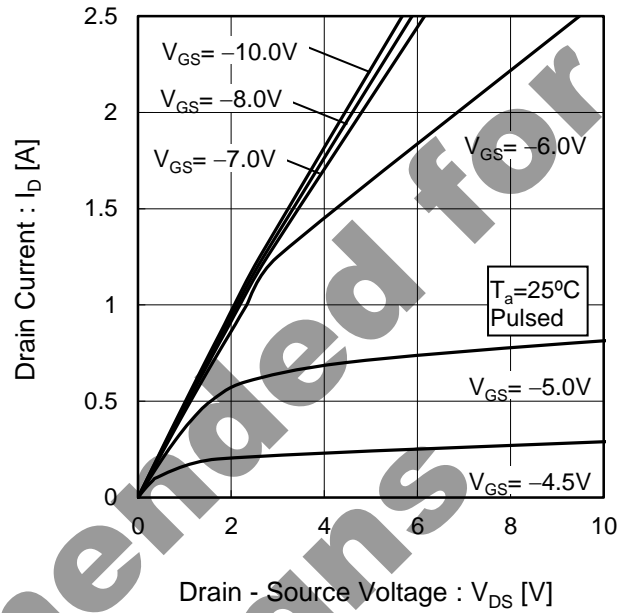


Fig.5 Typical Output Characteristics(II)



Not Recommended for New Designs

●Electrical characteristic curves (P-channel MOSFET)

Fig.6 Breakdown Voltage vs. Junction Temperature

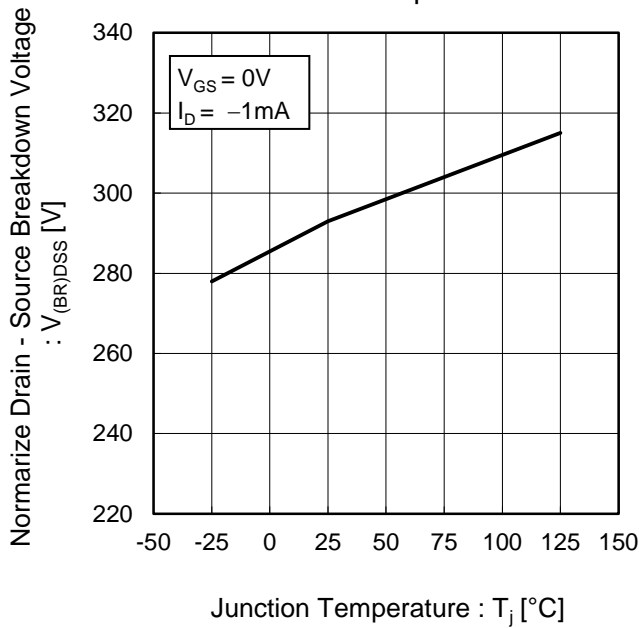


Fig.7 Typical Transfer Characteristics

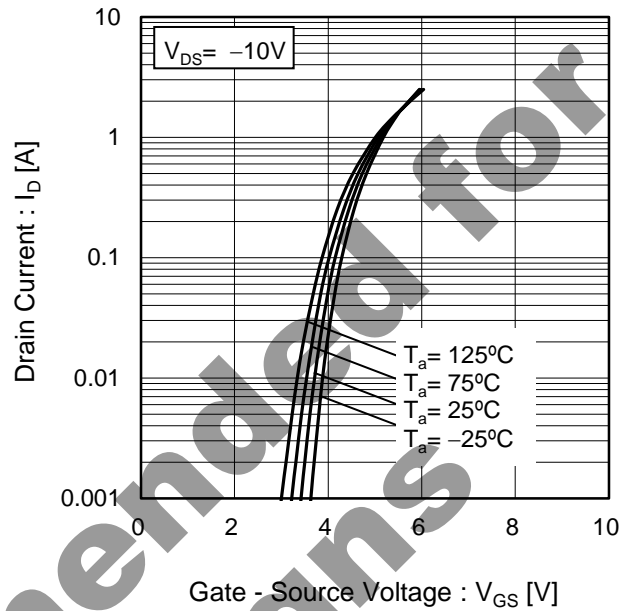


Fig.8 Gate Threshold Voltage vs. Junction Temperature

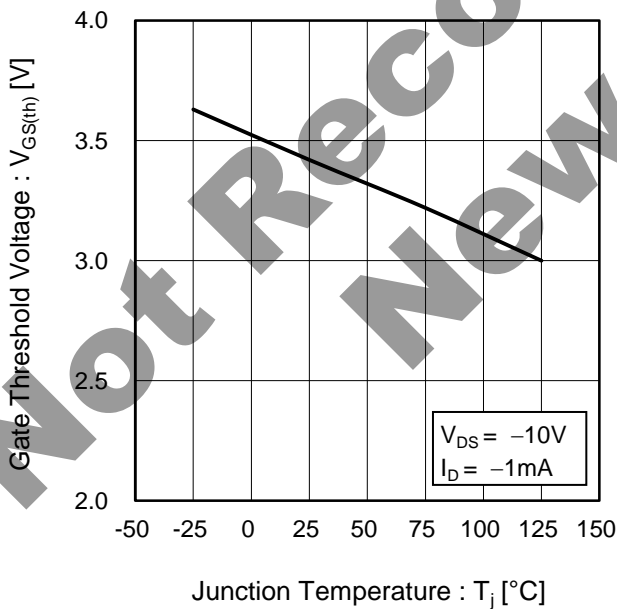
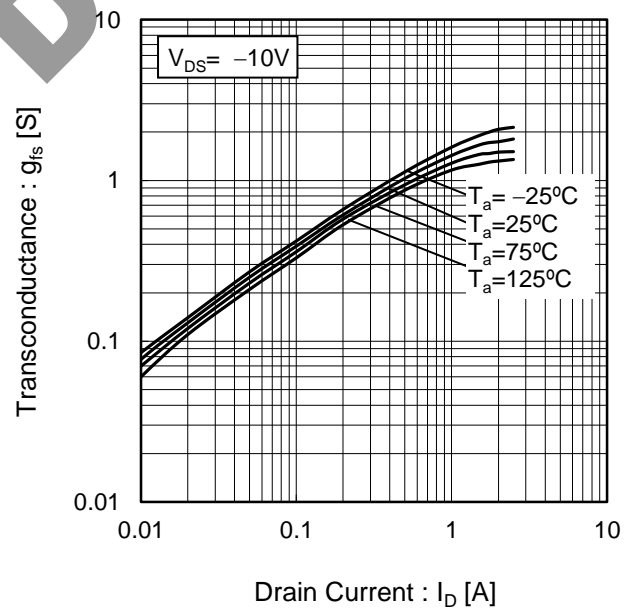


Fig.9 Transconductance vs. Drain Current



●Electrical characteristic curves (P-channel MOSFET)

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

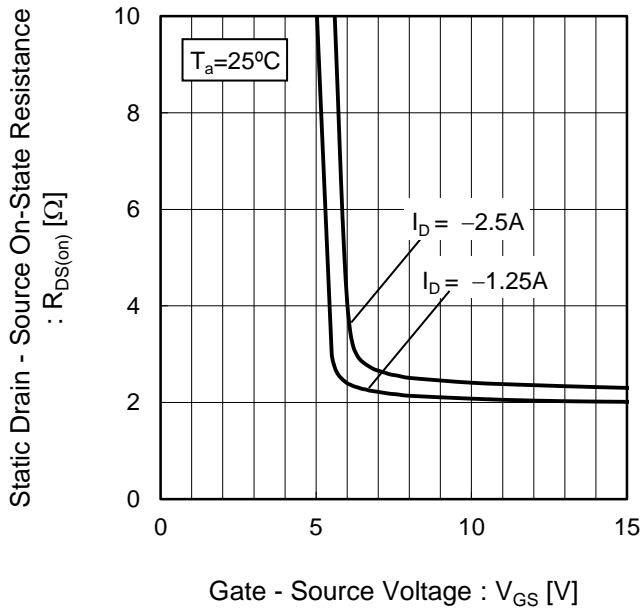


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(I)

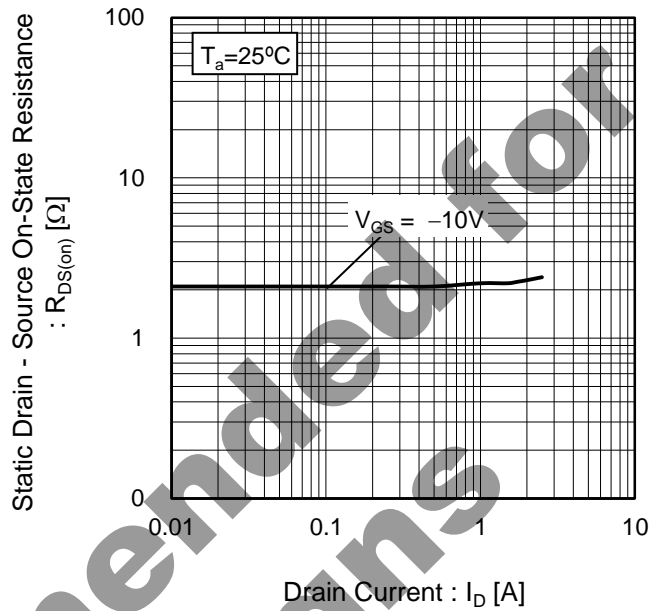


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature

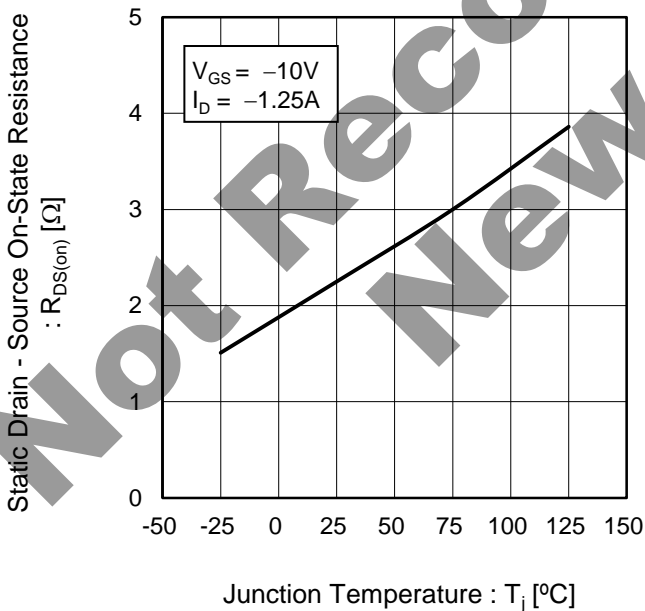
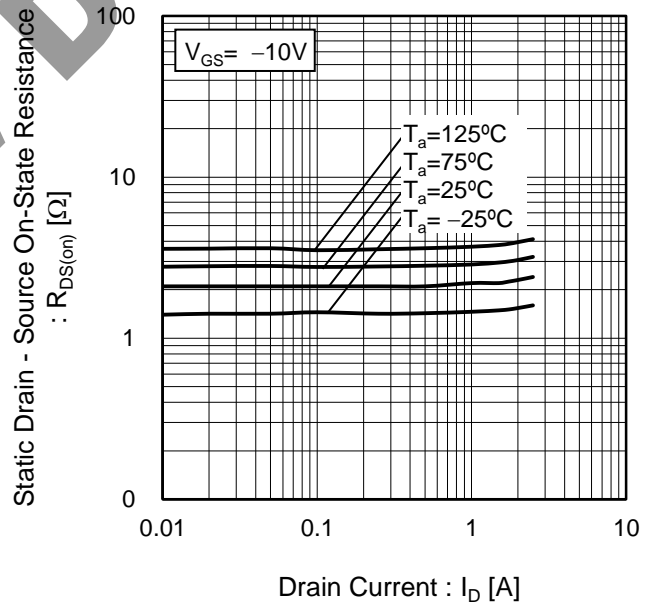


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)



●Electrical characteristic curves (P-channel MOSFET)

Fig.14 Typical Capacitance vs. Drain - Source Voltage

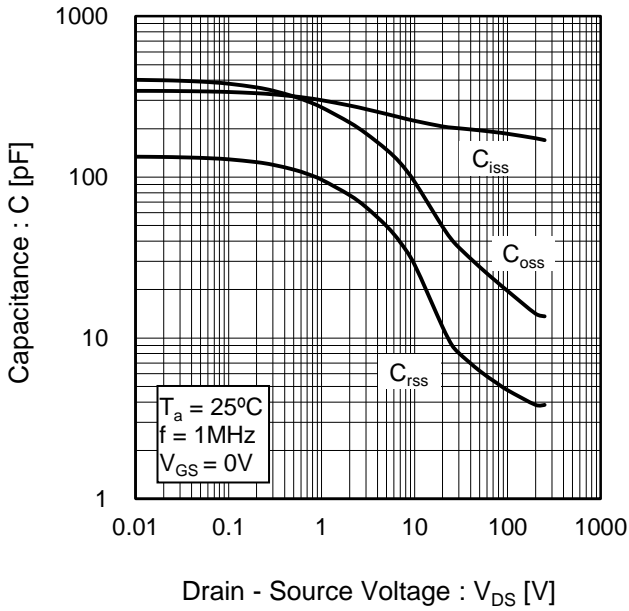


Fig.15 Switching Characteristics

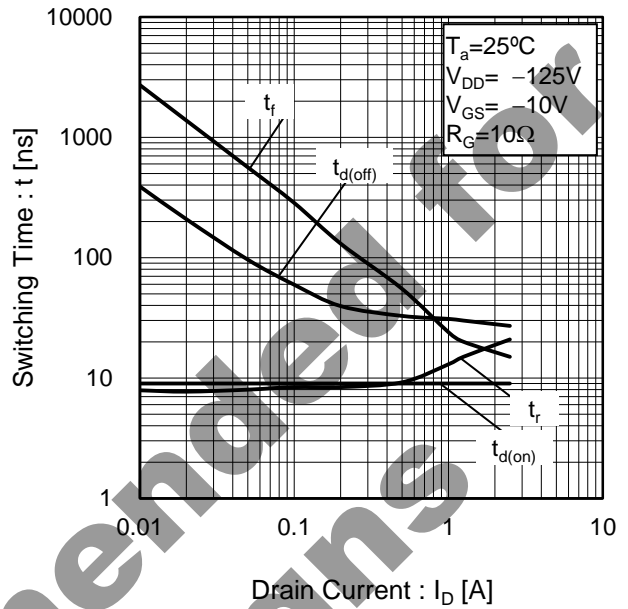
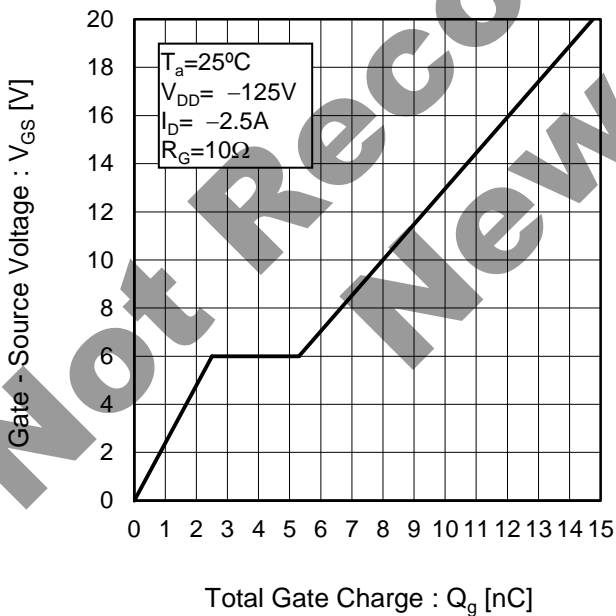


Fig.16 Dynamic Input Characteristics



●Electrical characteristic curves (P-channel MOSFET)

Fig.17 Source Current vs. Source - Drain Voltage

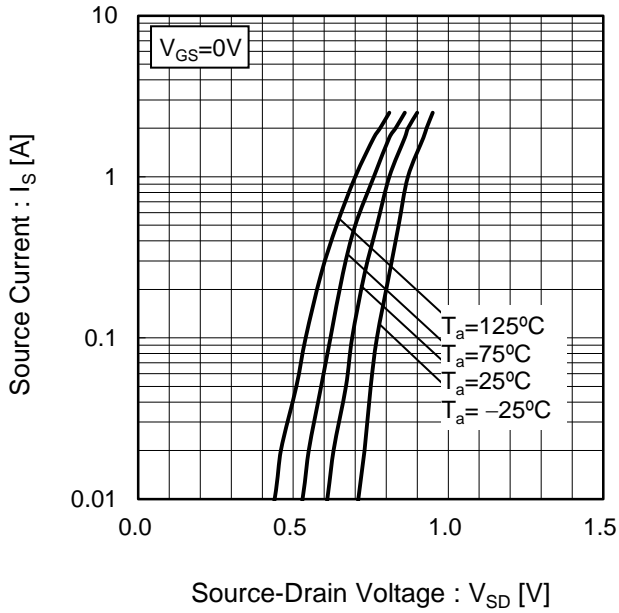
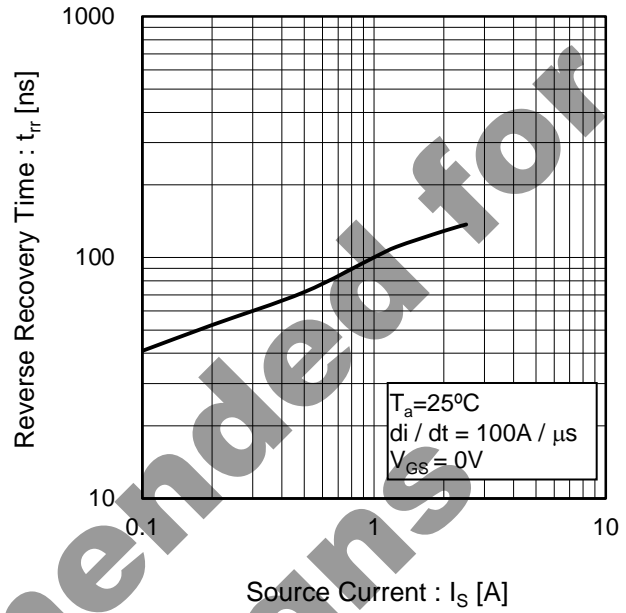


Fig.18 Reverse Recovery Time vs. Source Current



Not Recommended for New Designs

●Measurement circuits (N-Channel MOSFET)

Fig.1-1 Switching Time Measurement Circuit

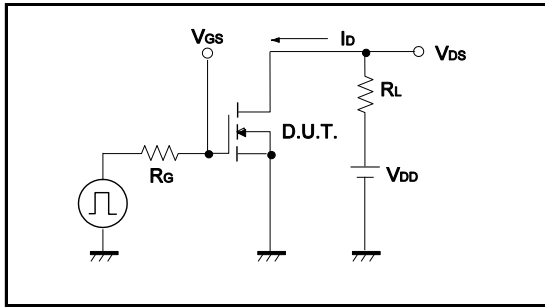


Fig.1-2 Switching Waveforms

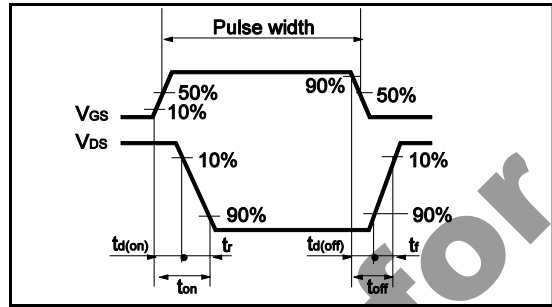


Fig.2-1 Gate Charge Measurement Circuit

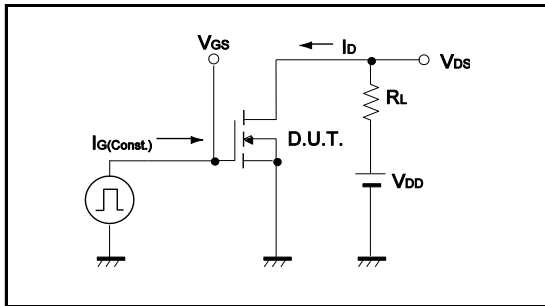
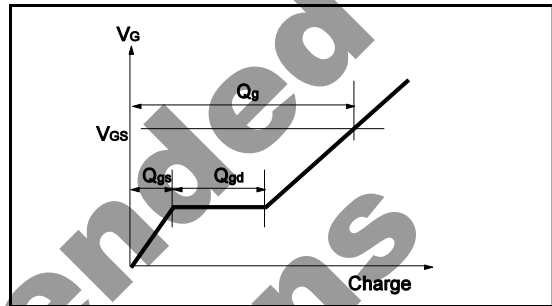


Fig.2-2 Gate Charge Waveform



Not Recommended for New Designs

●Measurement circuits (P-Channel MOSFET)

Fig.3-1 Switching Time Measurement Circuit

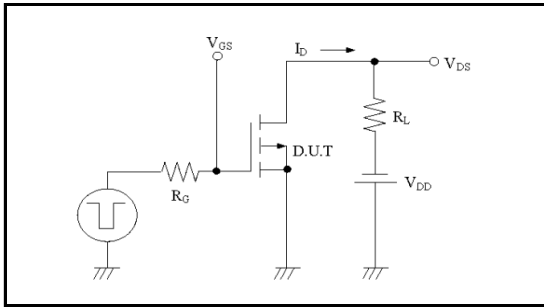


Fig.3-2 Switching Waveforms

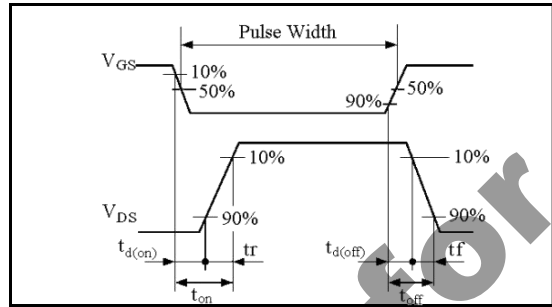


Fig.4-1 Gate Charge Measurement Circuit

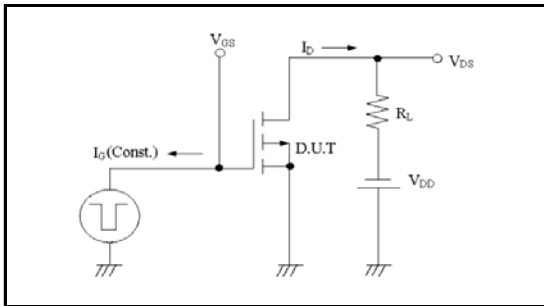
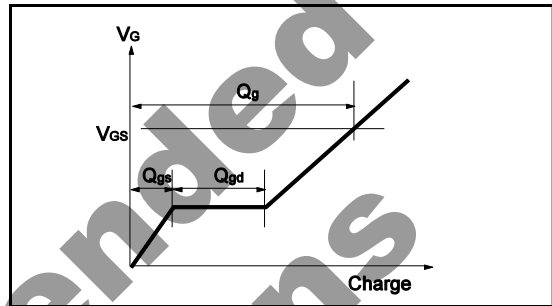


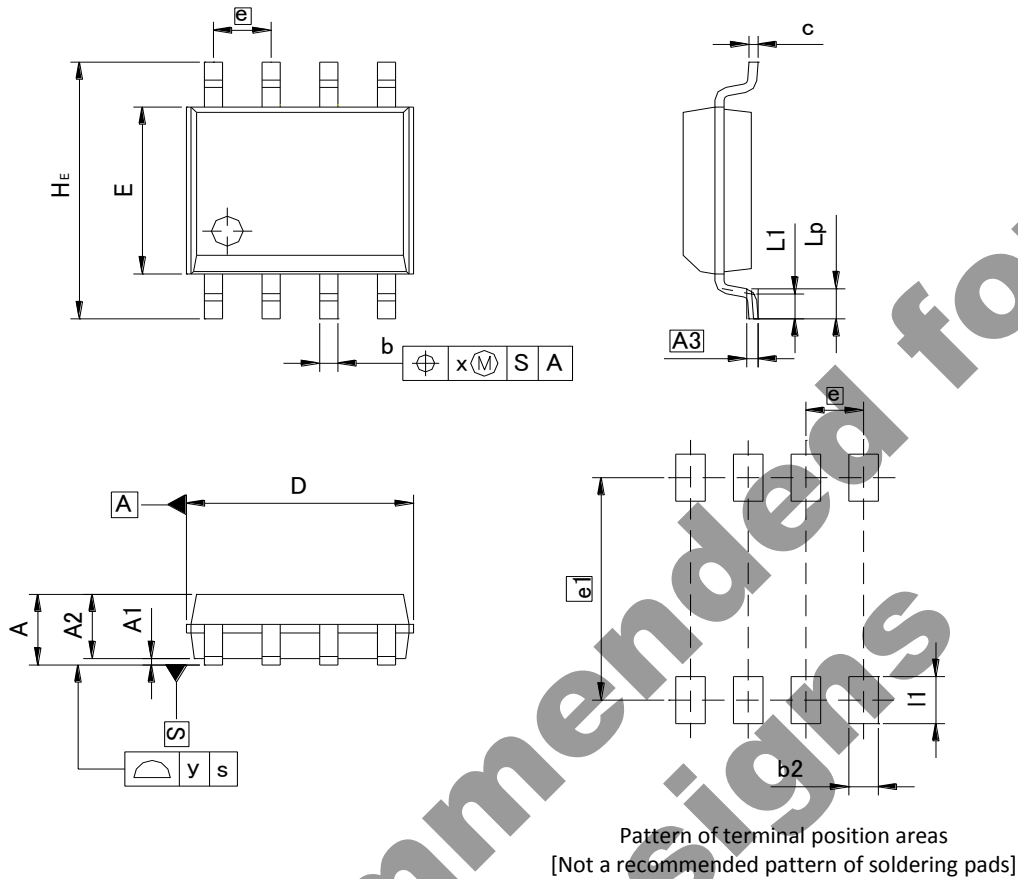
Fig.4-2 Gate Charge Waveform



Not Recommended for New Designs

●Dimensions (Unit : mm)

SOP8



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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