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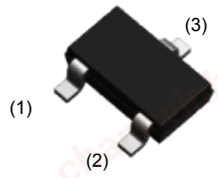
Nch 60V 2A Power MOSFET

Datasheet

V_{DSS}	60V
$R_{DS(on)}$ (Max.)	170mΩ
I_D	2A
P_D	1.0W

●Outline

TSMT3



●Features

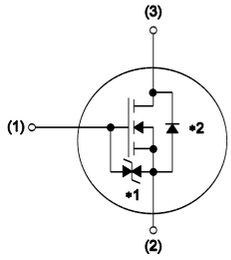
1) Low on - resistance.

2) Built-in G-S Protection Diode.

3) Small Surface Mount Package (TSMT3).

4) Pb-free lead plating ; RoHS compliant

●Inner circuit



(1) Gate
(2) Source
(3) Drain

*1 ESD PROTECTION DIODE
*2 BODY DIODE

●Application

DC/DC converters

●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3,000
	Taping code	TL
	Marking	PZ

●Absolute maximum ratings(T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	60	V
Continuous drain current	I_D *1	±2	A
Pulsed drain current	$I_{D,pulse}$ *2	±8	A
Gate - Source voltage	V_{GSS}	±20	V
Power dissipation	P_D *3	1.0	W
	P_D *4	0.54	W
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	-	-	125	°C/W
Thermal resistance, junction - ambient	R_{thJA} *4	-	-	231	°C/W

●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	60	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D = 1mA referenced to 25°C	-	67	-	mV/°C
Zero gate voltage drain current	I_{DSS}	V_{DS} = 60V, V_{GS} = 0V	-	-	1	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 1mA	1.0	-	2.5	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{(GS)th}}{\Delta T_j}$	I_D = 1mA referenced to 25°C	-	–4.4	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS}=10V, I_D=2A	-	120	170	mΩ
		V_{GS}=4.5V, I_D=2A	-	140	195	
		V_{GS}=4.0V, I_D=2A	-	150	210	
		V_{GS}=10V, I_D=2A, T_j=125°C	-	220	310	
Gate input resistannce	R_G	f = 1MHz, open drain	-	3.0	-	Ω
Transconductance	g_{fs} *5	V_{DS} = 10V, I_D = 2A	1.3	3.0	-	S

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 Mounted on a ceramic board (30×30×0.8mm)

*4 Mounted on a FR4 (12×20×0.8mm)

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●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	180	-	pF
Output capacitance	C_{oss}	V_{DS} = 10V	-	50	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	22	-	
Turn - on delay time	$t_{d(on)}$ *5	$V_{DD} \simeq$ 30V, V_{GS} = 10V	-	6	-	ns
Rise time	t_r *5	I_D = 1.0A	-	10	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L = 30Ω	-	20	-	
Fall time	t_f *5	R_G = 10Ω	-	6	-	

●Gate Charge characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	$V_{DD} \simeq$ 30V, I_D = 2A V_{GS} = 5V	-	2.7	-	nC
		$V_{DD} \simeq$ 30V, I_D = 2A V_{GS} = 10V	-	4.9	-	
Gate - Source charge	Q_{gs} *5	$V_{DD} \simeq$ 30V, I_D = 2A V_{GS} = 5V	-	1.0	-	
Gate - Drain charge	Q_{gd} *5		-	0.6	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_a = 25°C	-	-	0.8	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_s = 2A	-	-	1.2	V

*5 Pulsed

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

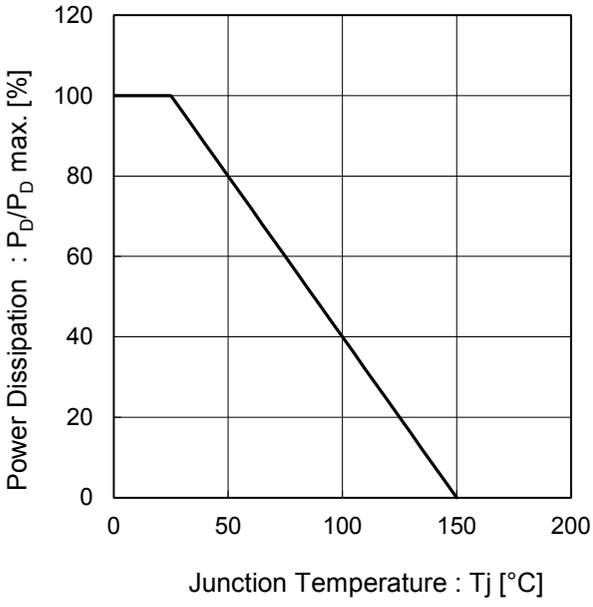


Fig.2 Maximum Safe Operating Area

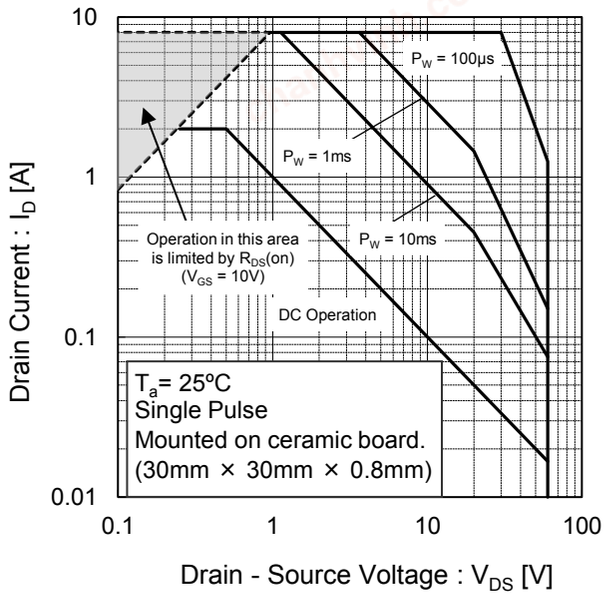


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

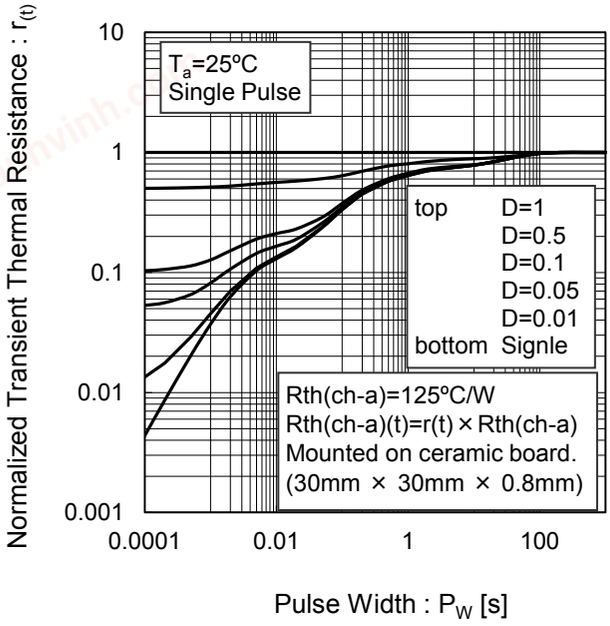
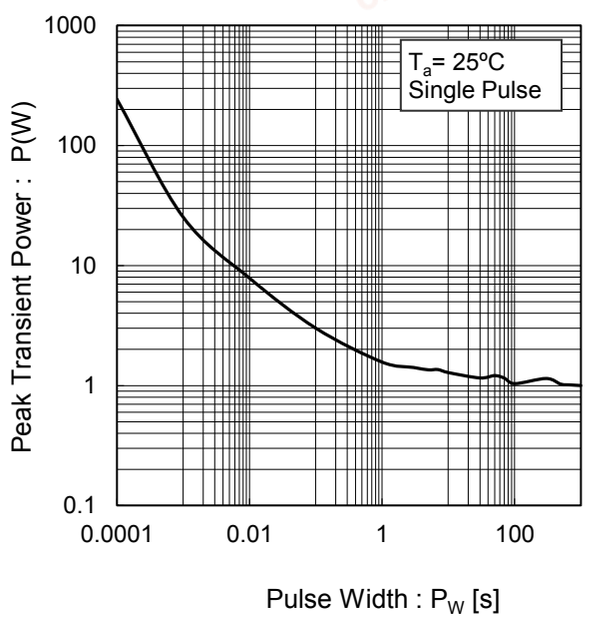


Fig.4 Single Pulse Maxmum Power dissipation



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●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

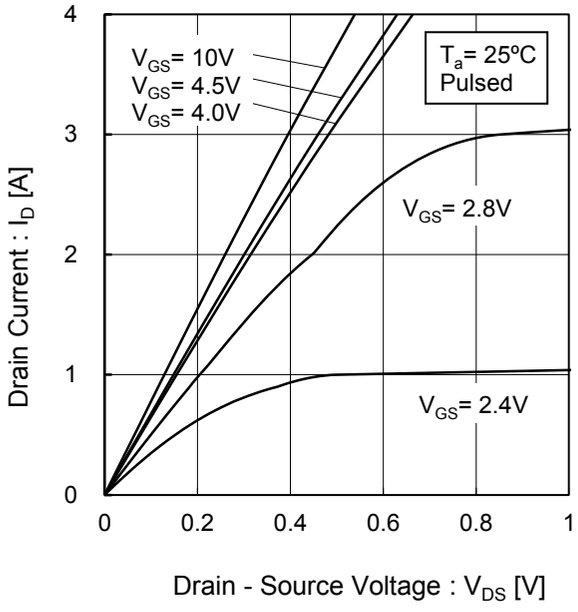
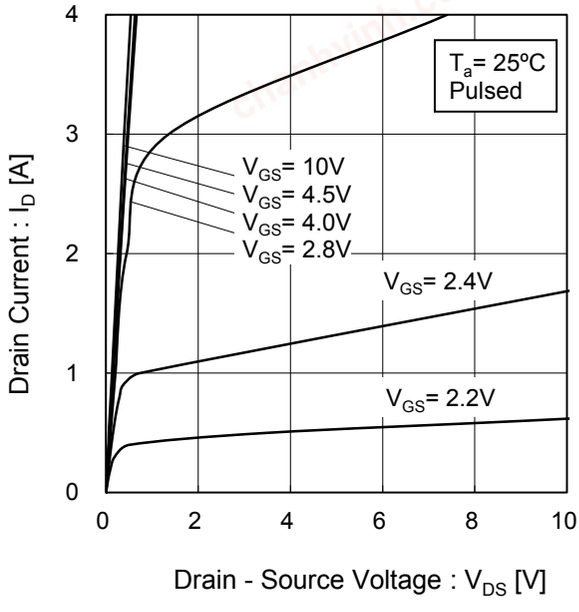


Fig.6 Typical Output Characteristics(II)



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●Electrical characteristic curves

Fig.7 Breakdown Voltage vs. Junction Temperature

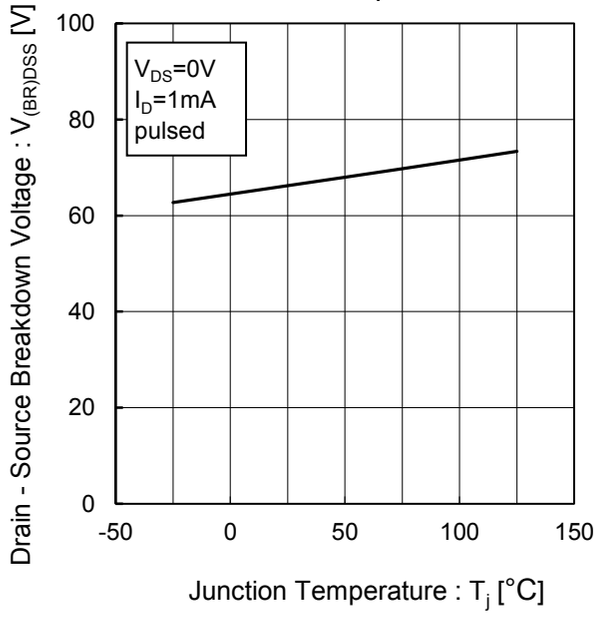


Fig.8 Typical Transfer Characteristics

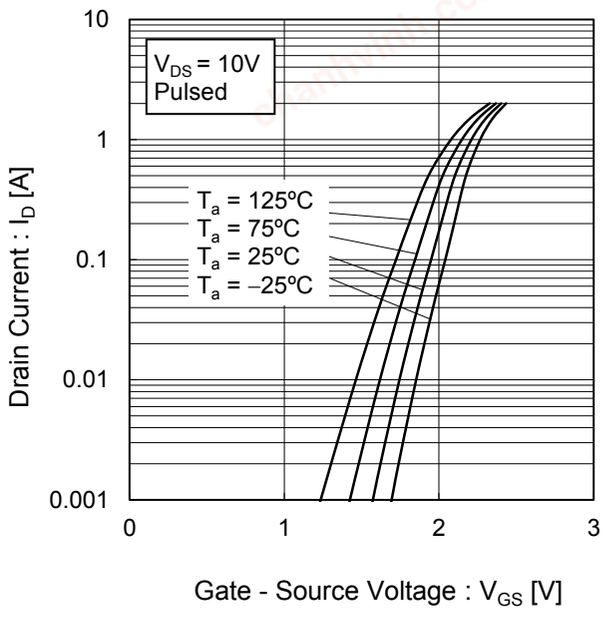


Fig.9 Gate Threshold Voltage vs. Junction Temperature

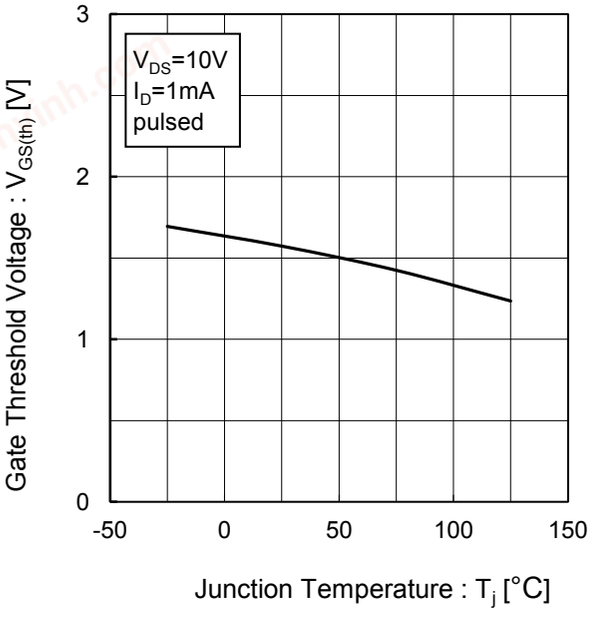
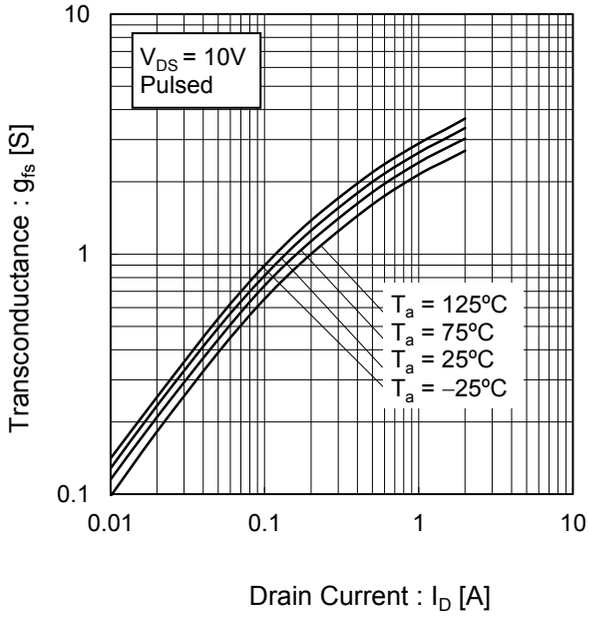


Fig.10 Transconductance vs. Drain Current



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●Electrical characteristic curves

Fig.11 Drain CurrentDerating Curve

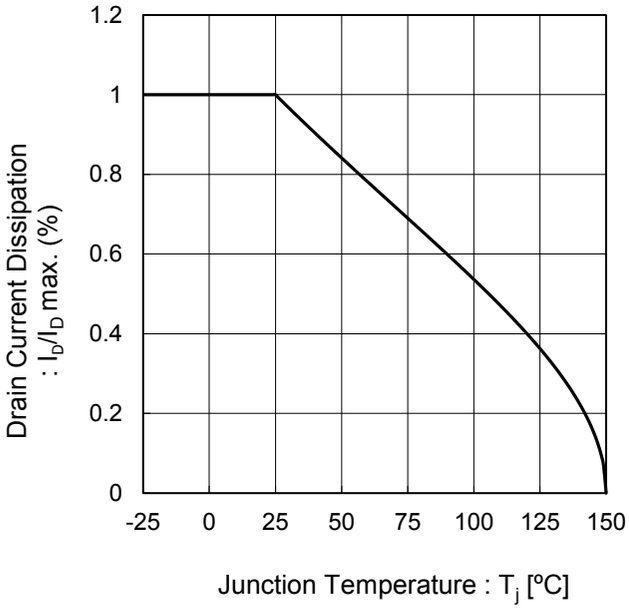


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

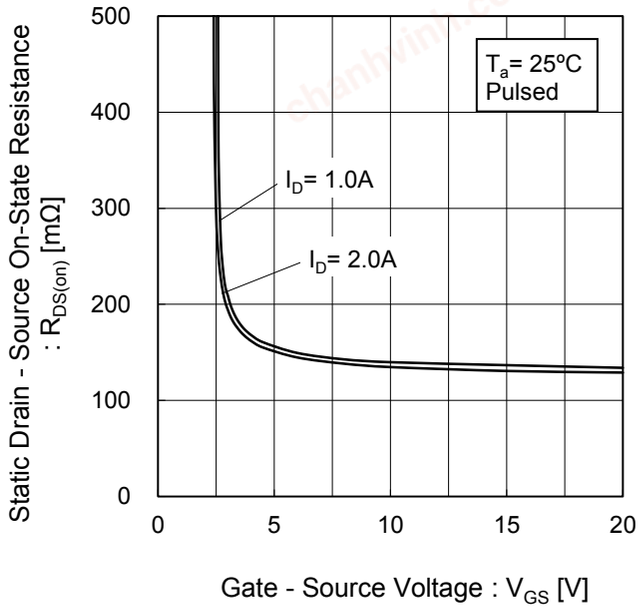


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

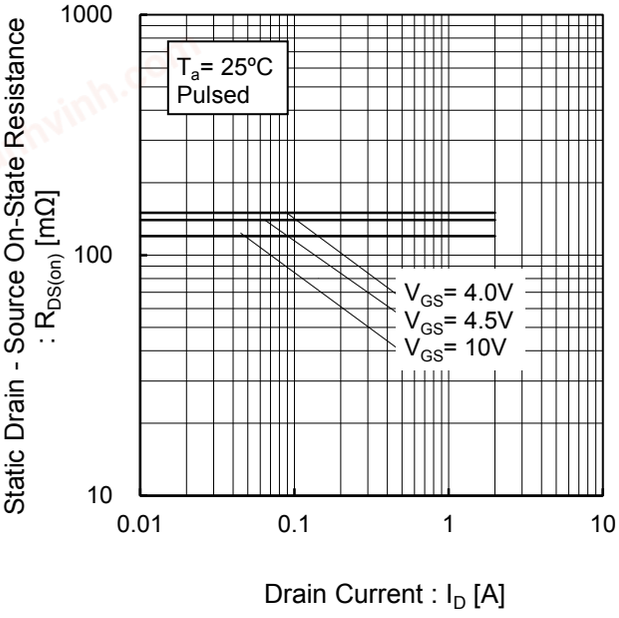
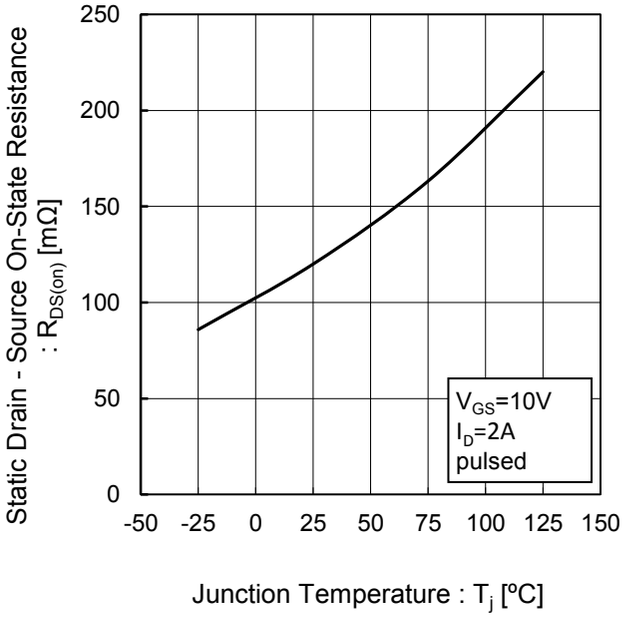


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



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●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

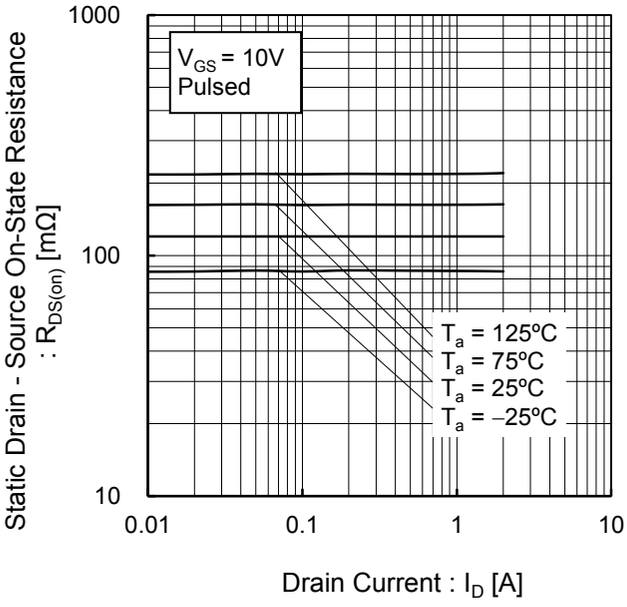


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

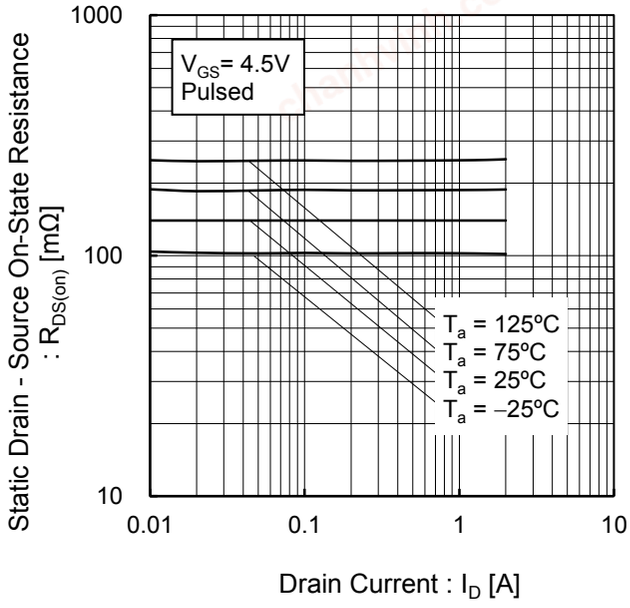
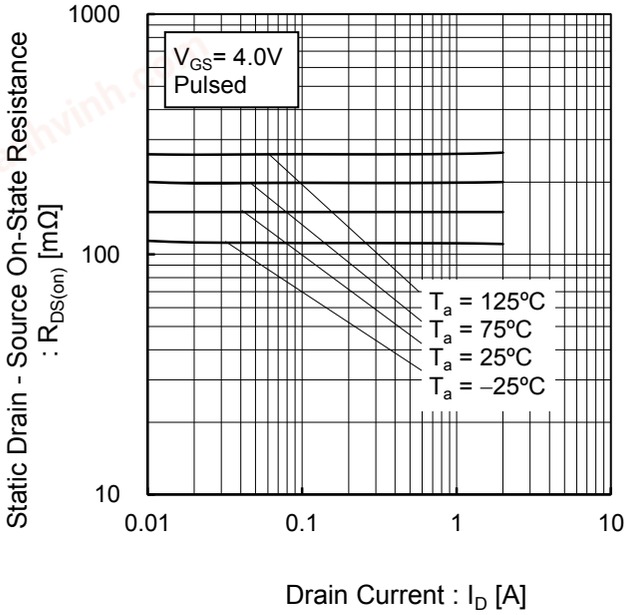


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)



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●Electrical characteristic curves

Fig.18 Typical Capacitance vs. Drain - Source Voltage

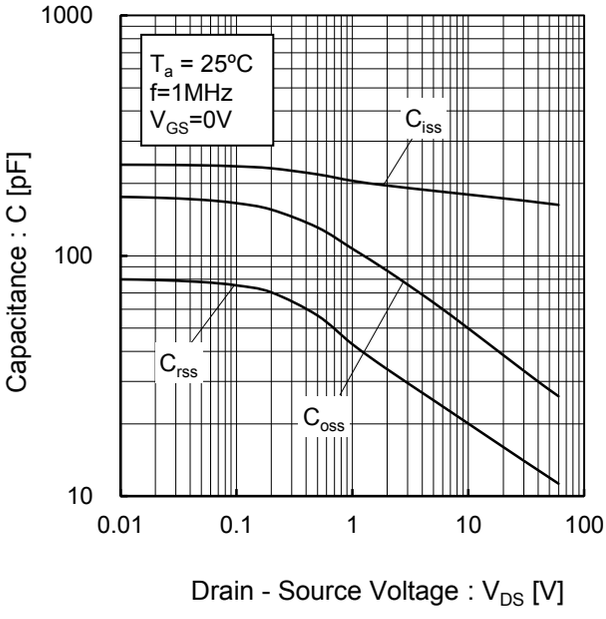


Fig.19 Switching Characteristics

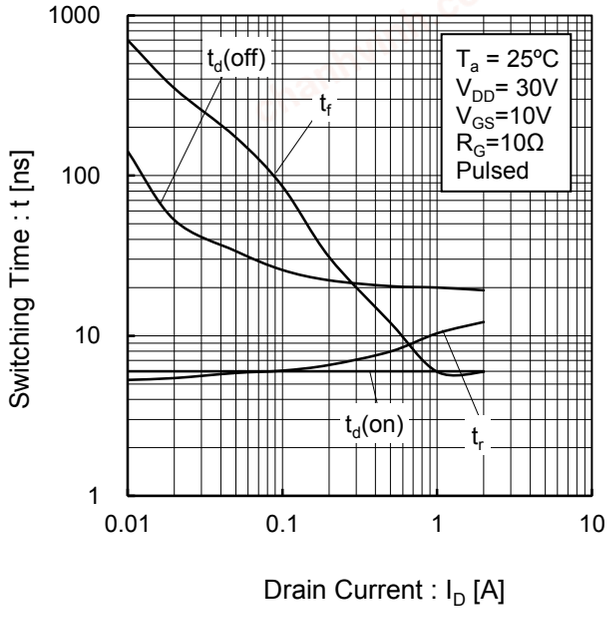


Fig.20 Dynamic Input Characteristics

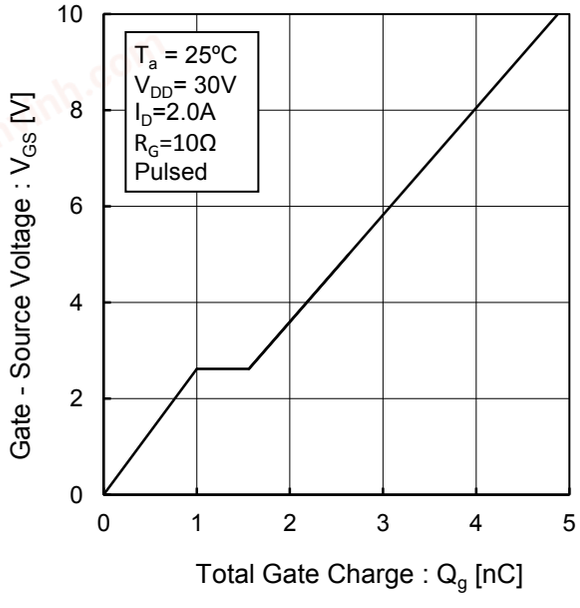
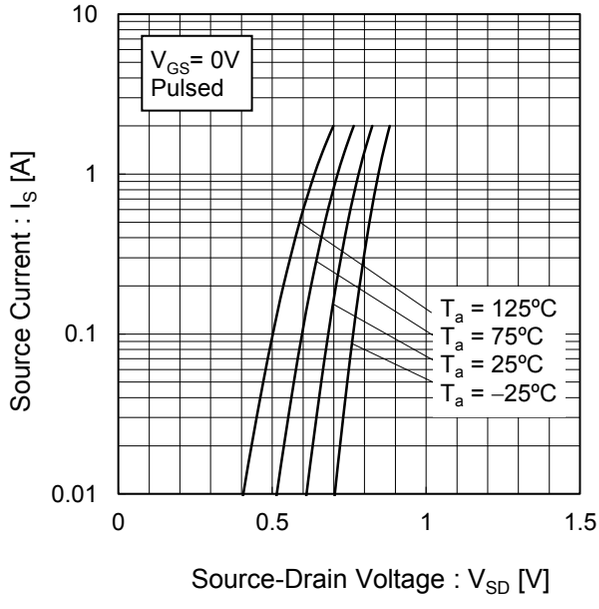


Fig.21 Source Current vs. Source Drain Voltage



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●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

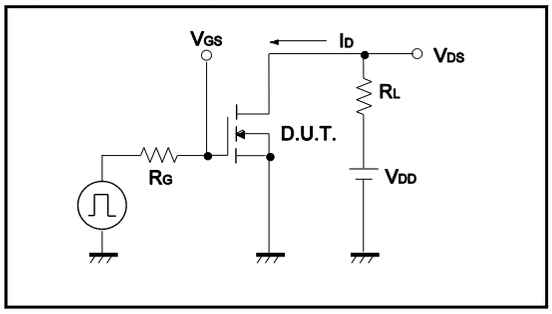


Fig.1-2 Switching Waveforms

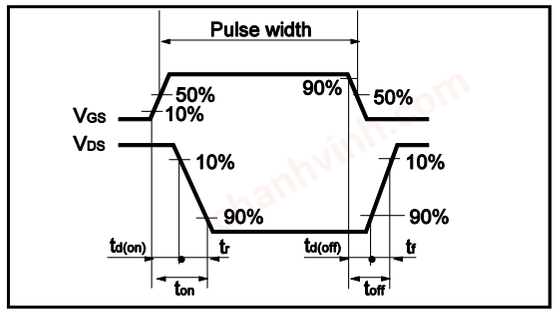


Fig.2-1 Gate Charge Measurement Circuit

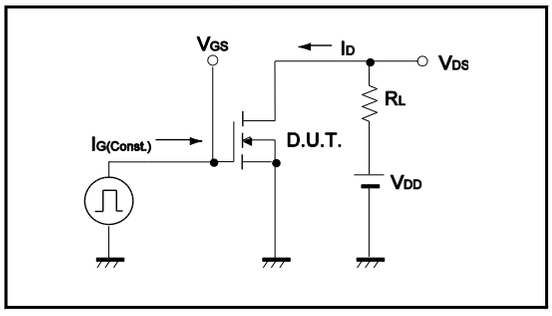
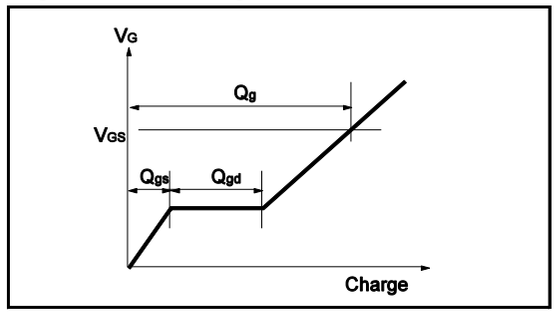


Fig.2-2 Gate Charge Waveform

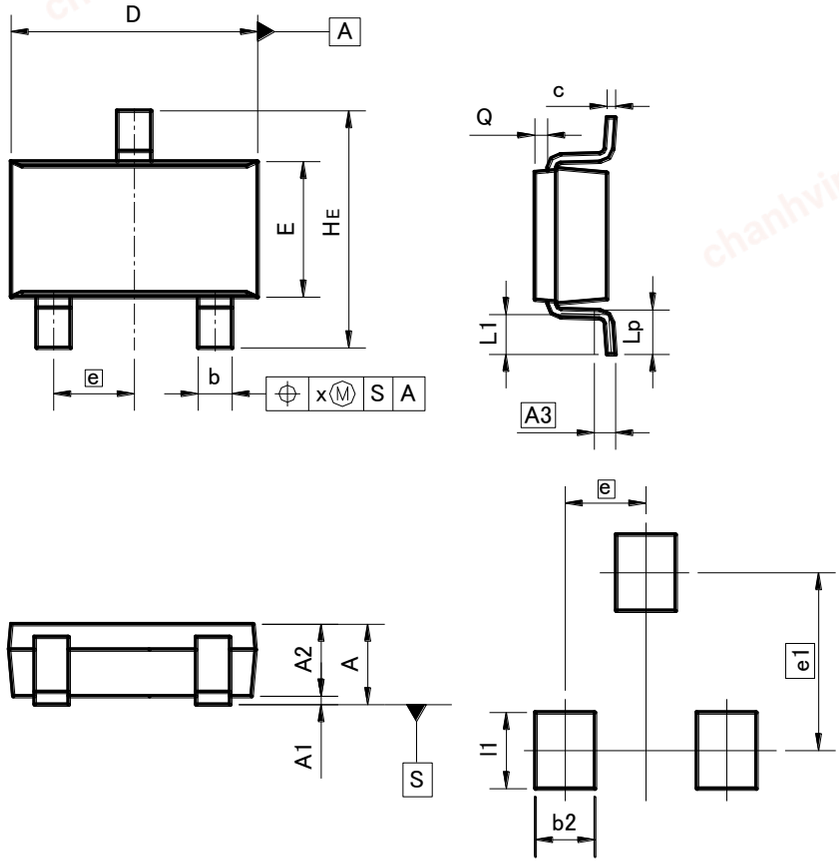


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●Dimensions (Unit : mm)

TSMT3



Patterm of terminal position areas

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	–	1.00	–	0.039
A1	0.00	0.10	0	0.004
A2	0.75	0.95	0.03	0.037
A3	0.25		0.01	
b	0.35	0.50	0.014	0.02
c	0.10	0.26	0.004	0.01
D	2.80	3.00	0.11	0.118
E	1.50	1.80	0.059	0.071
e	0.95		0.04	
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.05	0.25	0.002	0.01
x	–	0.20	–	0.008

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
e1	2.10		0.08	
b2		0.70	–	0.028
l1	–	0.90	–	0.035

Dimension in mm/inches

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