

V_{DSS}	30V
$R_{DS(on)}(Max.)$	73mΩ
I_D	±4.5A
P_D	2.4W

●Features

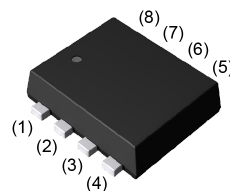
- 1) Low on - resistance.
- 2) Small Surface Mount Package (TSMT8).
- 3) Pb-free lead plating ; RoHS compliant.
- 4) Halogen Free.

●Application

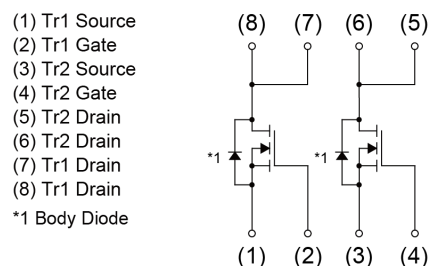
Switching
Motor Drive

●Outline

TSMT8



●Inner circuit



●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3000
	Taping code	TCR
	Marking	KA1

●Absolute maximum ratings ($T_a = 25^\circ\text{C}$) <It is the same ratings for the Tr1 and Tr2>

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	30	V
Continuous drain current		I_D^{*1}	±4.5	A
Pulsed drain current		$I_{D,pulse}^{*2}$	±12	A
Gate - Source voltage		V_{GSS}	±20	V
Avalanche energy, single pulse		E_{AS}^{*3}	0.65	mJ
Avalanche current		I_{AS}^{*3}	3	A
Power dissipation	total	P_D^{*1}	2.4	W
		P_D^{*4}	1.5	
	element	P_D^{*4}	1.25	
Junction temperature		T_j	150	$^\circ\text{C}$
Range of storage temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*4}	-	83.3	-	°C/W

● Electrical characteristics ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	30	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1mA$ referenced to 25°C	-	21	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 30V, V_{GS} = 0V$	-	-	1	μA
Gate - Source leakage current	I_{GSS}	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1mA$	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	-	-3	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 10V, I_D = 4.5A$	-	56	73	mΩ
		$V_{GS} = 4.5V, I_D = 3.0A$	-	86	112	
Transconductance	g_{fs}^{*5}	$V_{DS} = 5V, I_D = 3A$	1.7	-	-	S

*1 $P_w \leq 1s$, Limited only by maximum temperature allowed.

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

*3 $L \approx 0.1mH$, $V_{DD} = 15V$, $R_G = 25\Omega$, STARTING $T_{ch} = 25^\circ\text{C}$ Fig.3-1,3-2

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

*5 Pulsed

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	125	-	pF
Output capacitance	C_{oss}	$V_{DS} = 15V$	-	20	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	15	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx 15V, V_{GS} = 10V$	-	5.0	-	ns
Rise time	t_r^{*5}	$I_D = 2.25A$	-	7.5	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 6.67\Omega$	-	10	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	3.5	-	

● **Gate charge characteristics** ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx 15V$ $I_D = 4.5A$	$V_{GS} = 10V$	-	3.0	-	nC
Gate - Source charge	Q_{gs}^{*5}		$V_{GS} = 4.5V$	-	1.5	-	
Gate - Drain charge	Q_{gd}^{*5}			-	0.6	-	
				-	0.5	-	

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

<It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I_S	$T_a = 25^\circ\text{C}$	-	-	1.0	A
Body diode pulse current	I_{SP}^{*2}		-	-	12	
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0V, I_S = 1.0A$	-	-	1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

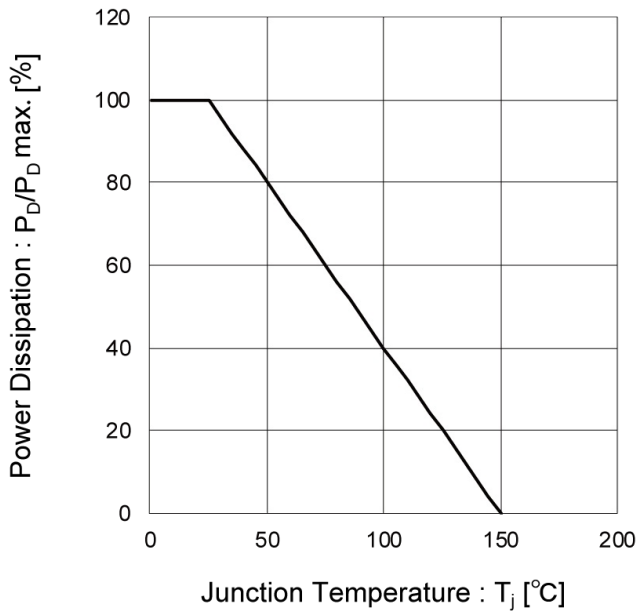


Fig.2 Maximum Safe Operating Area

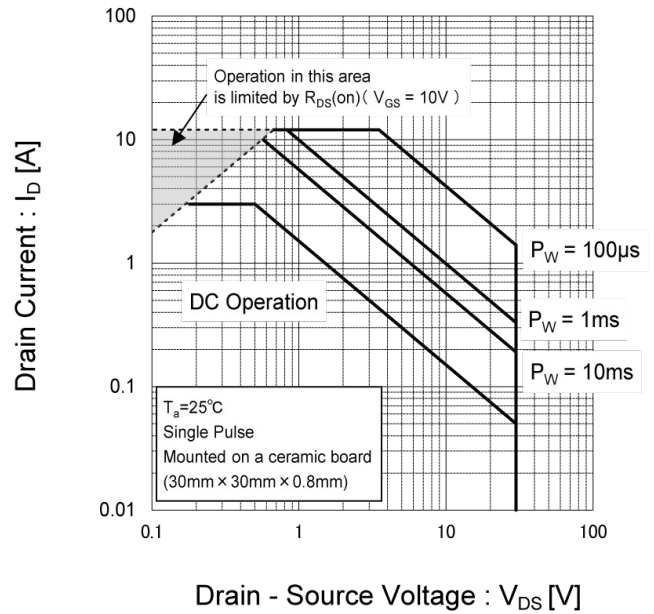


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

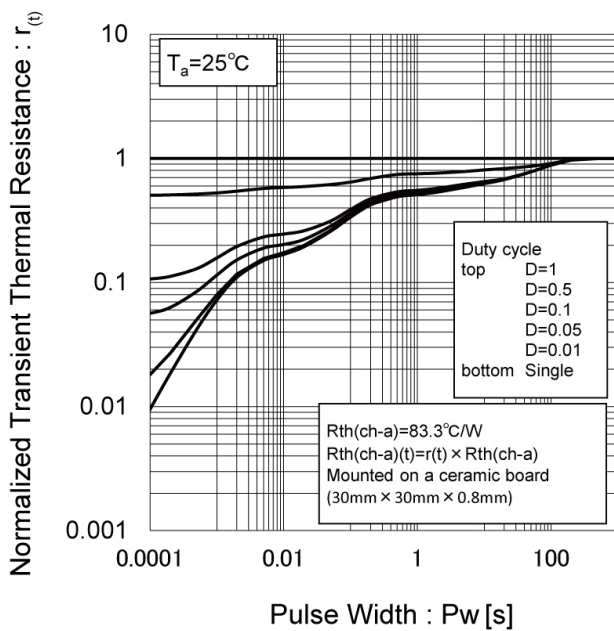
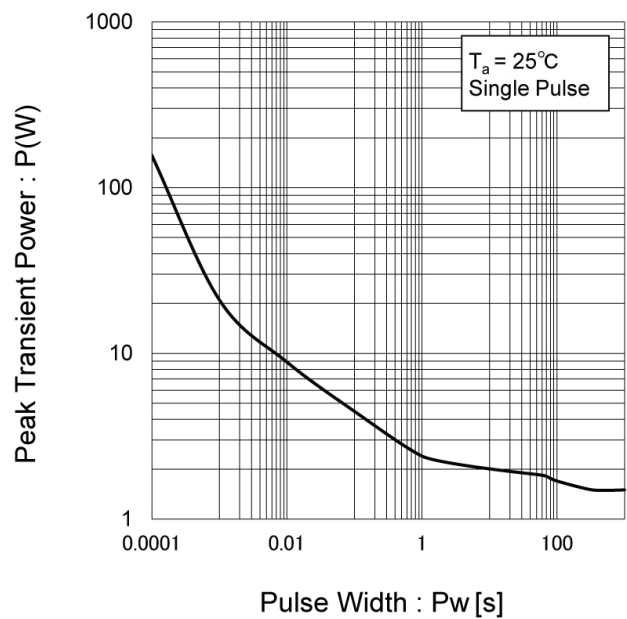


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

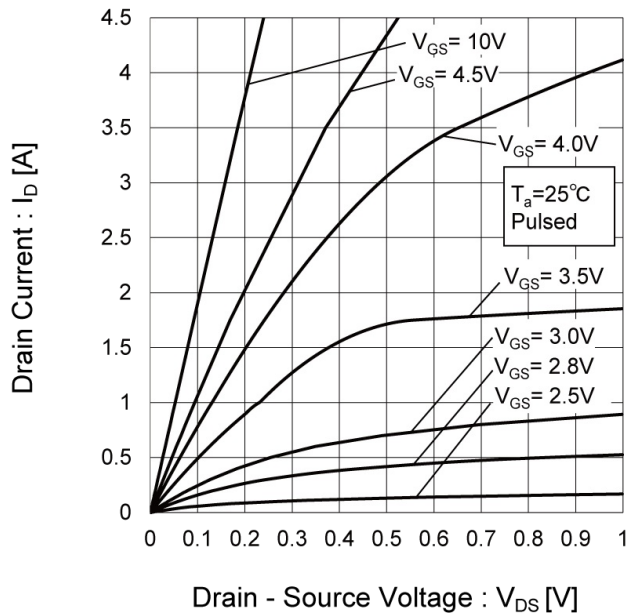


Fig.6 Typical Output Characteristics(II)

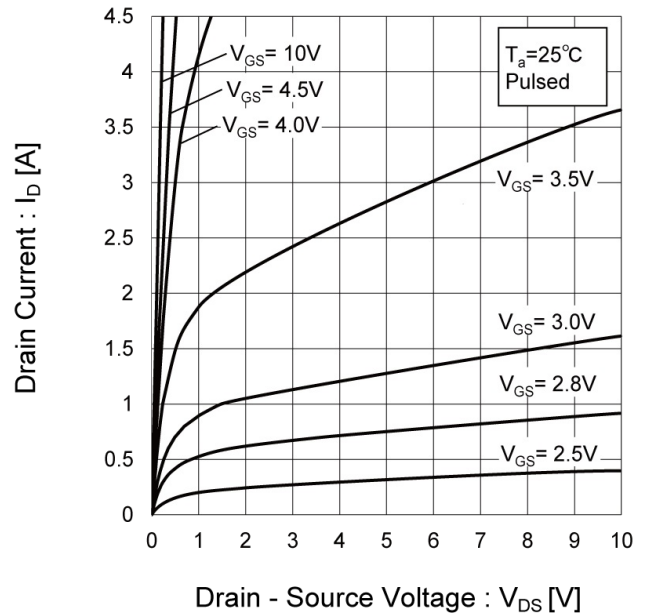
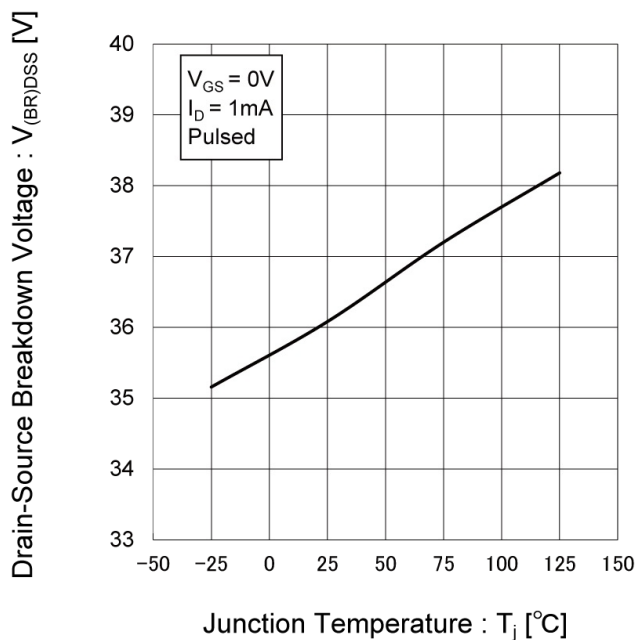


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

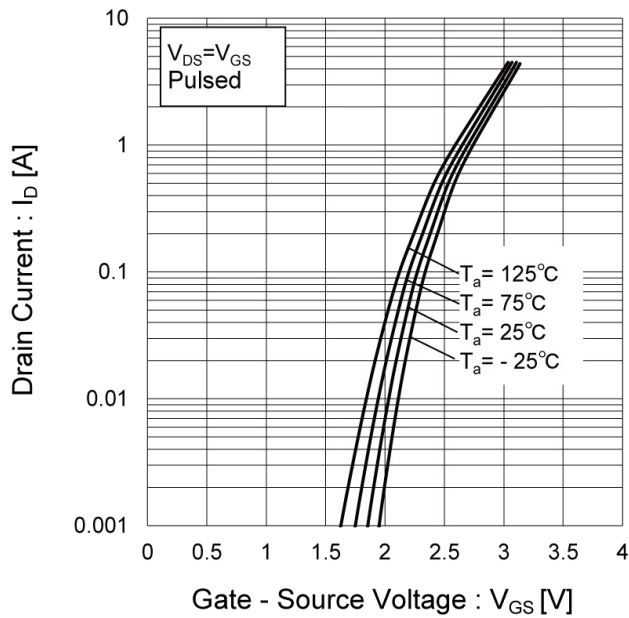


Fig.9 Gate Threshold Voltage vs. Junction Temperature

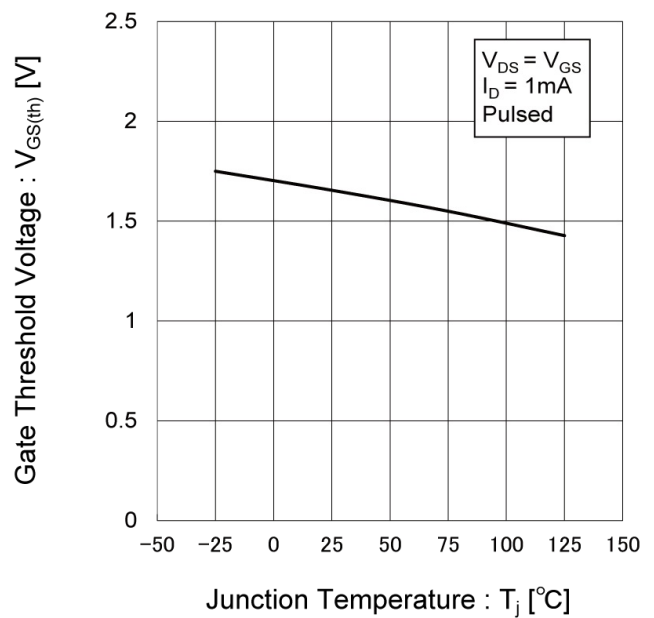
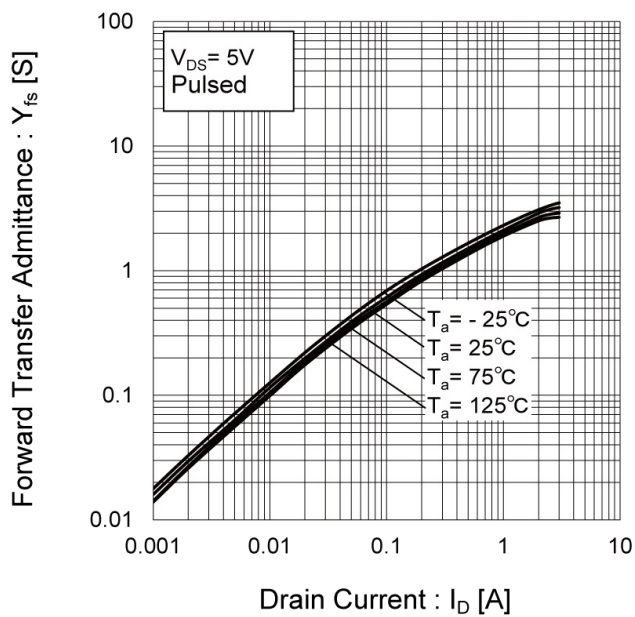


Fig.10 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

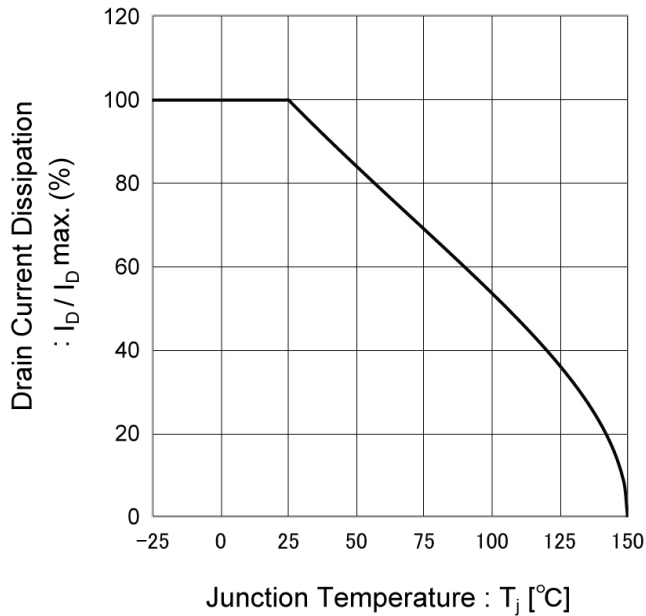


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

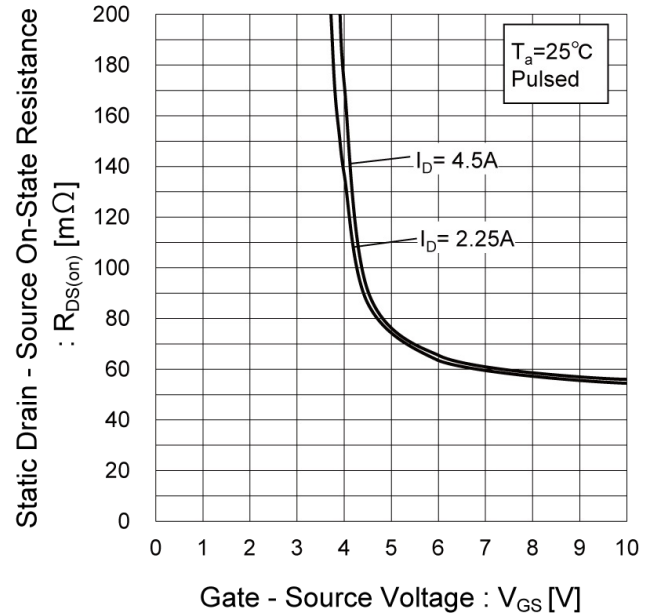
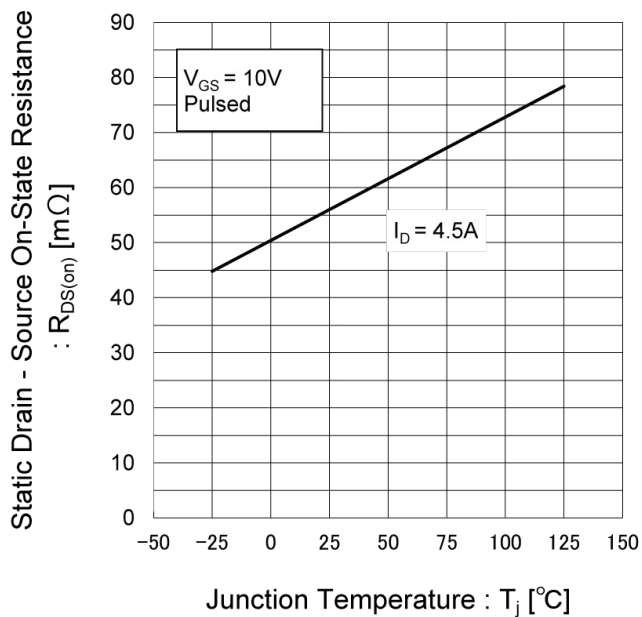


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(I)

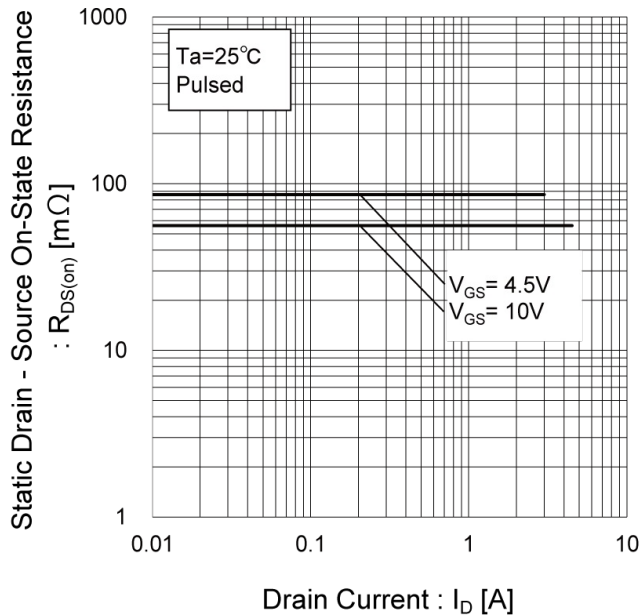


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

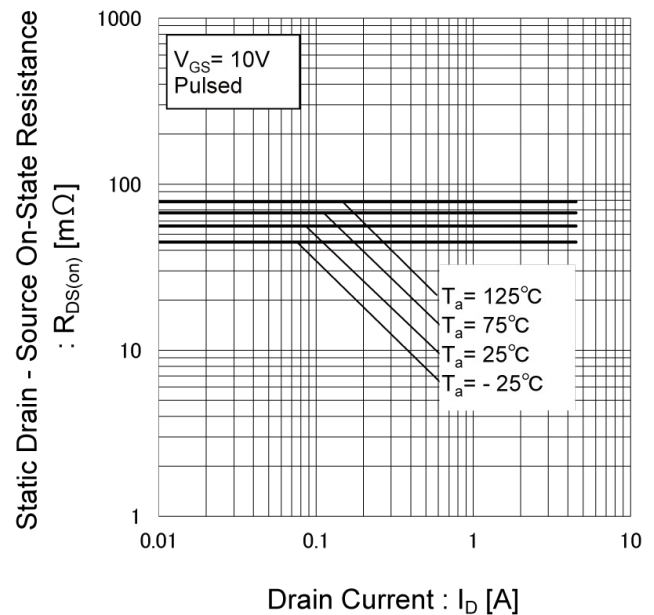
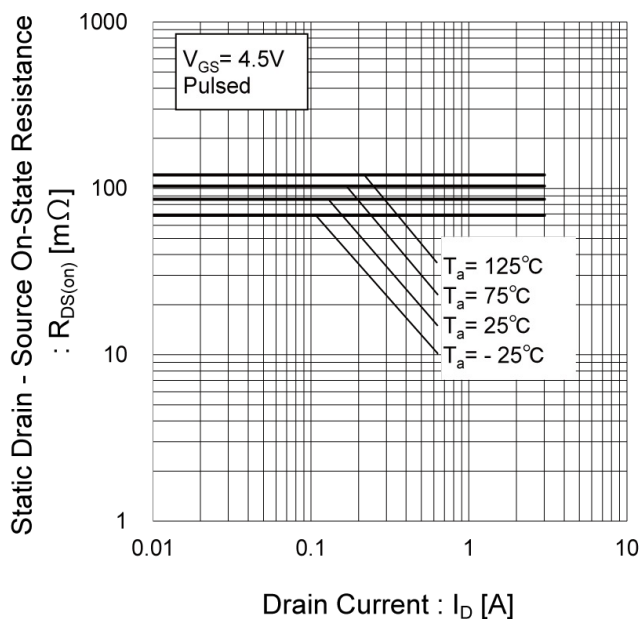


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

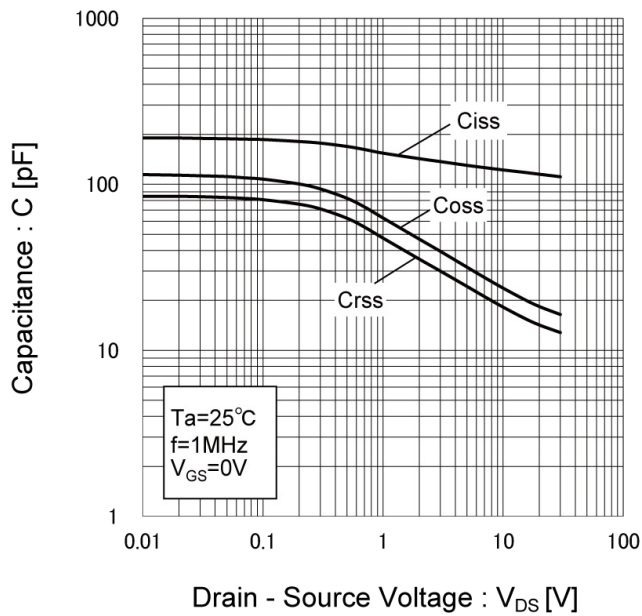


Fig.18 Switching Characteristics

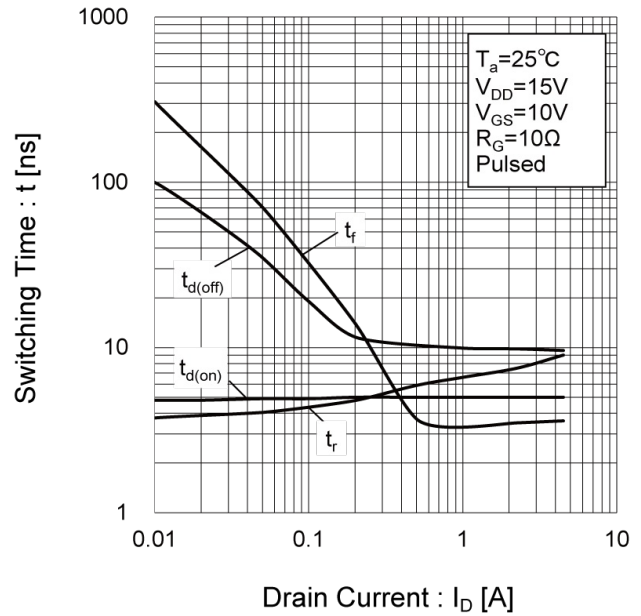


Fig.19 Dynamic Input Characteristics

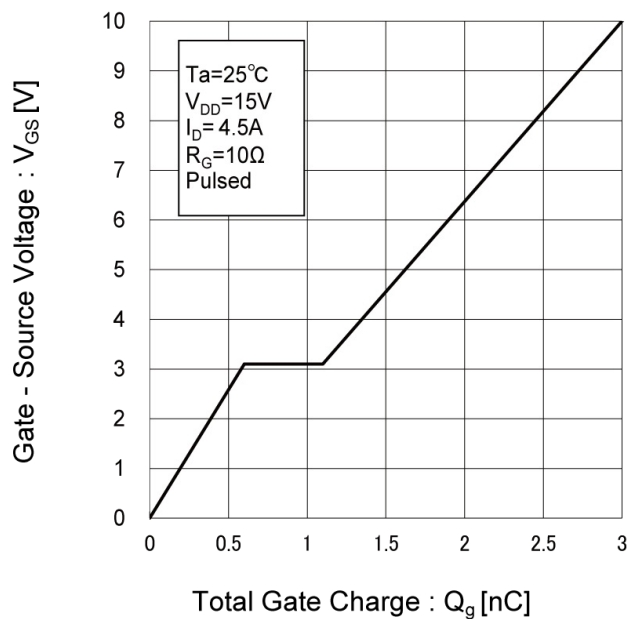
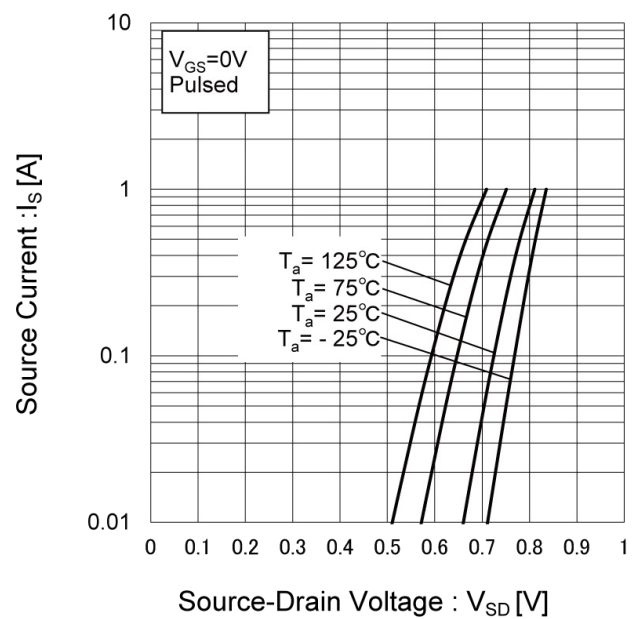


Fig.20 Source Current vs. Source Drain Voltage



● **Measurement circuits** <It is the same for the Tr1 and Tr2>

Fig.1-1 Switching Time Measurement Circuit

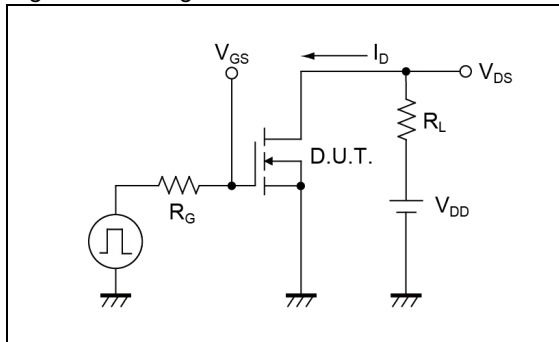


Fig.1-2 Switching Waveforms

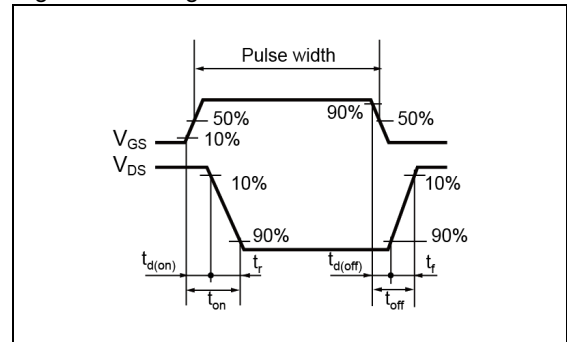


Fig.2-1 Gate Charge Measurement Circuit

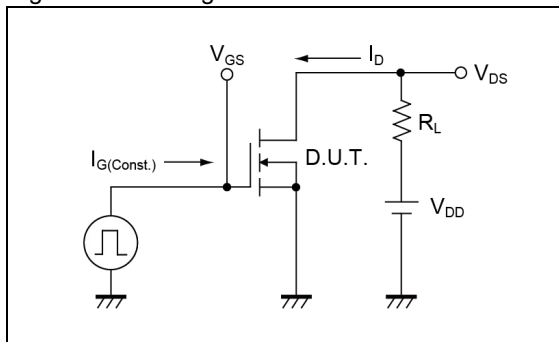


Fig.2-2 Gate Charge Waveform

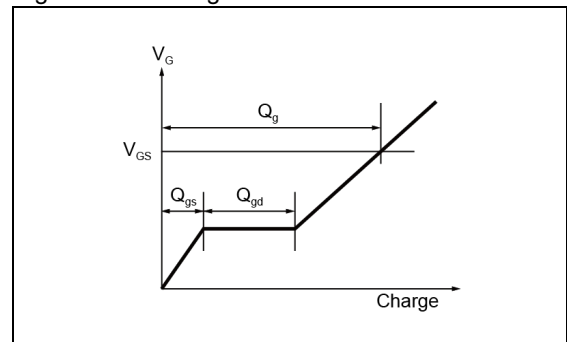


Fig.3-1 Avalanche Measurement Circuit

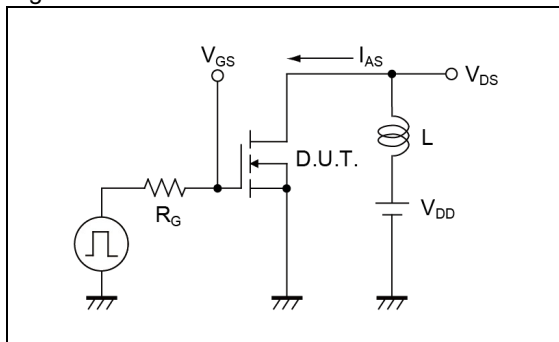
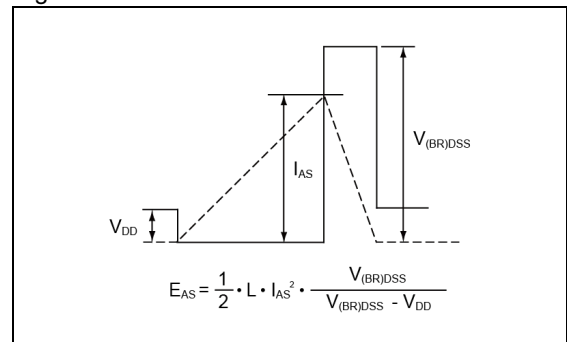


Fig.3-2 Avalanche Waveform

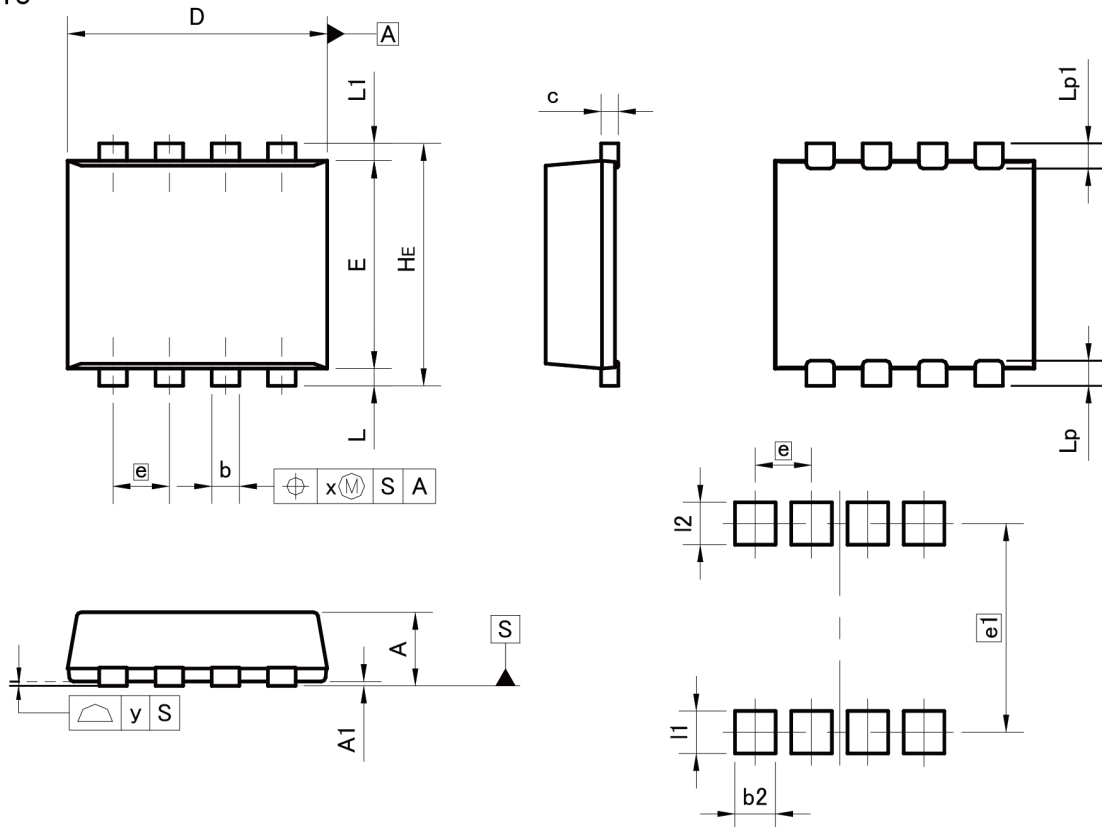


● **Notice**

This product might cause chip aging and breakdown under the large electrified environment.
Please consider to design ESD protection circuit.

●Dimensions

TSMT8



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.75	0.85	0.030	0.033
A1	0.00	0.05	0.000	0.002
b	0.27	0.37	0.011	0.015
c	0.12	0.22	0.005	0.009
D	2.90	3.10	0.114	0.122
E	2.30	2.50	0.091	0.098
e	0.65		0.026	
HE	2.70	2.90	0.106	0.114
L	0.10	0.30	0.004	0.012
L1	0.10	0.30	0.004	0.012
Lp	0.19	0.39	0.007	0.015
Lp1	0.19	0.39	0.007	0.015
x	—	0.10	—	0.004
y	—	0.10	—	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	—	0.47	—	0.019
e1	2.41		0.095	
l1	—	0.49	—	0.019
l2	—	0.49	—	0.019

Dimension in mm/inches

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