

V_{DSS}	-30V
$R_{DS(on)}(Max.)$	50mΩ
I_D	±3.5A
P_D	1.25W

●Features

- 1) Low on - resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TSMT6).
- 4) Pb-free lead plating ; RoHS compliant

●Application

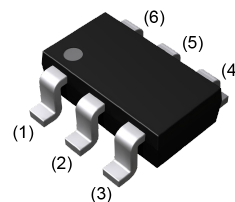
Switching

●Absolute maximum ratings ($T_a = 25^{\circ}C$)

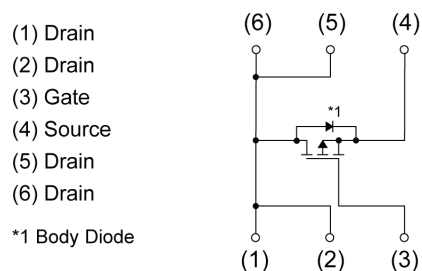
Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-30	V
Continuous drain current	I_D	±3.5	A
Pulsed drain current	$I_{D,pulse}^{*2}$	±12	A
Gate - Source voltage	V_{GSS}	±20	V
Avalanche energy, single pulse	E_{AS}^{*3}	9.0	mJ
Avalanche current	I_{AS}^{*3}	-3.5	A
Power dissipation	P_D^{*4}	1.25	W
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

●Outline

TSMT6



●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	JR

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*4}	-	100	-	°C/W

● Electrical characteristics ($T_a = 25^\circ\text{C}$)

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	-	-22	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -30V, V_{GS} = 0V$	-	-	-1	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	±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	-	2.9	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = -10V, I_D = -3.5A$	-	38	50	mΩ
		$V_{GS} = -4.5V, I_D = -3.5A$	-	54	70	
Transconductance	g_{fs}^{*5}	$V_{DS} = -5V, I_D = -3.5A$	3.2	-	-	S

*1 Limited only by maximum temperature allowed.

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

*3 $L \approx 1mH$, $V_{DD} = -15V$, $R_G = 25\Omega$, 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 ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	475	-	pF
Output capacitance	C_{oss}	$V_{DS} = -15V$	-	85	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	65	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx -15V, V_{GS} = -10V$	-	8	-	ns
Rise time	t_r^{*5}	$I_D = -1.8A$	-	12	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 8.2\Omega$	-	40	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	20	-	

●Gate charge characteristics ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx -15V$ $I_D = -3.5A$	$V_{GS} = -10V$	-	10	-	nC
Gate - Source charge	Q_{gs}^{*5}		$V_{GS} = -4.5V$	-	5.2	-	
Gate - Drain charge	Q_{gd}^{*5}			-	1.6	-	
				-	1.9	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I_S^{*1}	$T_a = 25^\circ\text{C}$	-	-	-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

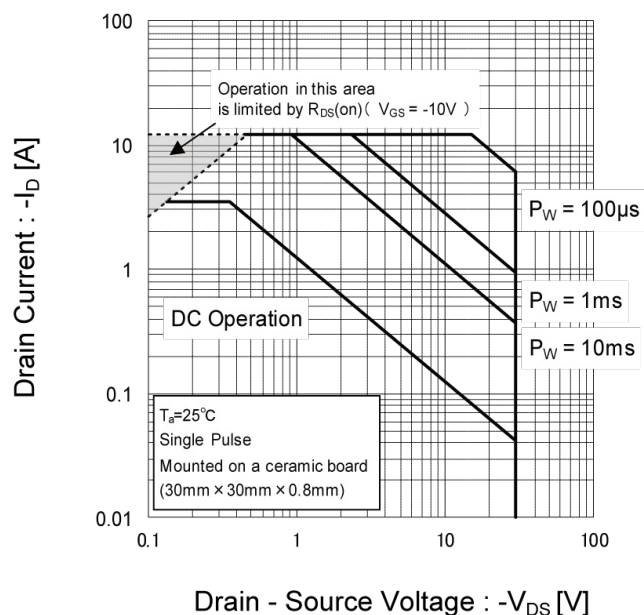


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

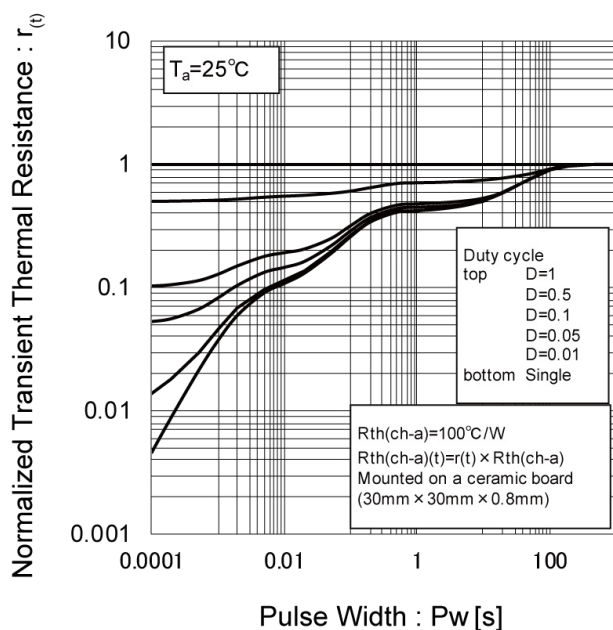
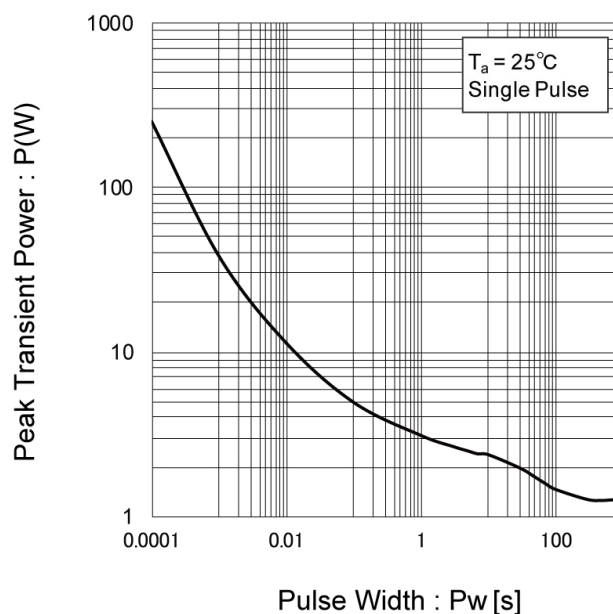


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

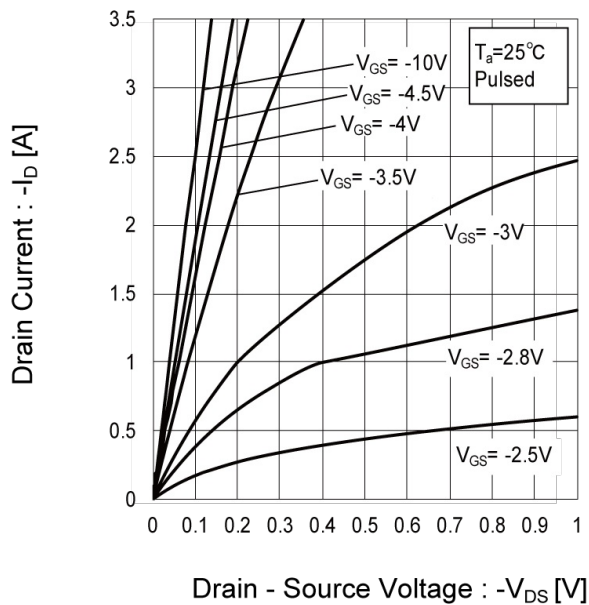


Fig.6 Typical Output Characteristics(II)

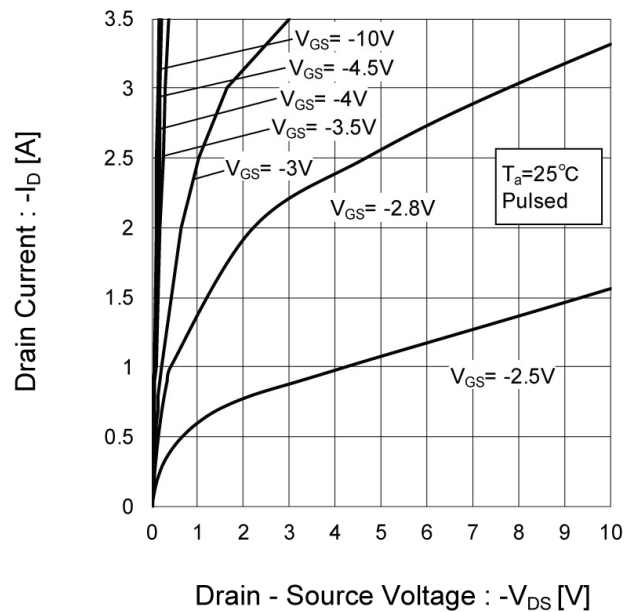
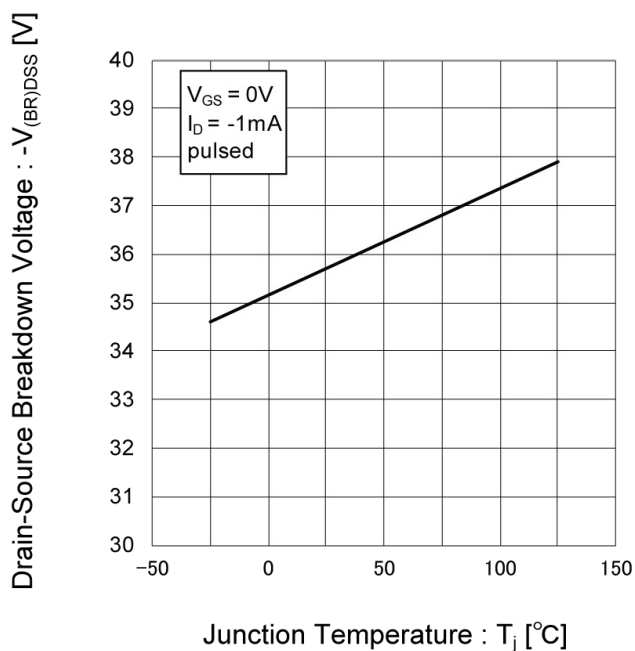


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

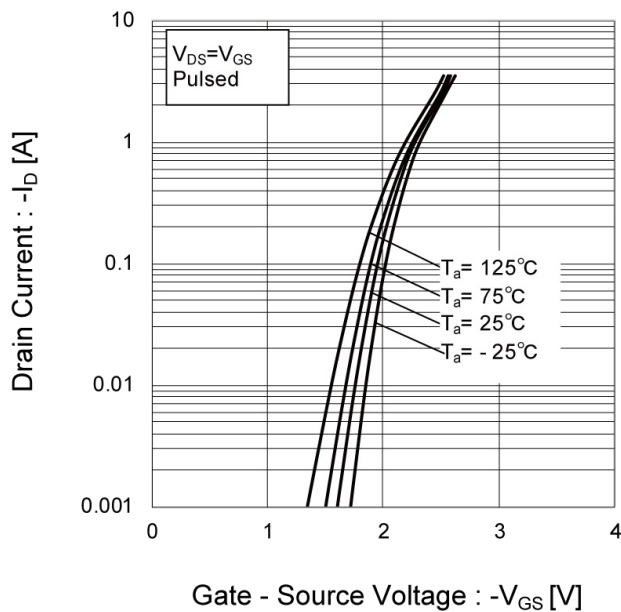


Fig.9 Gate Threshold Voltage vs. Junction Temperature

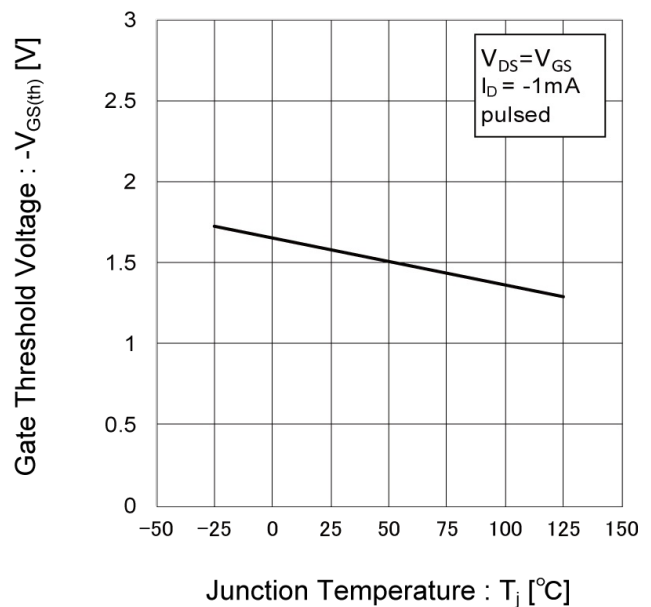
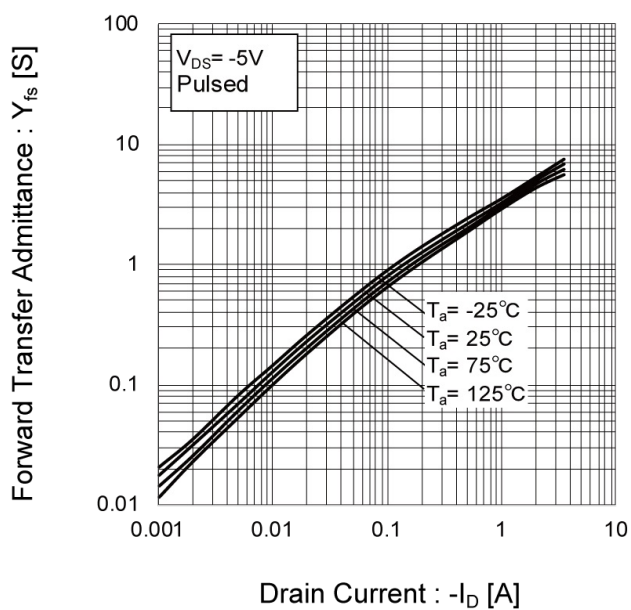


Fig.10 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.11 Drain Current Derating Curve



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

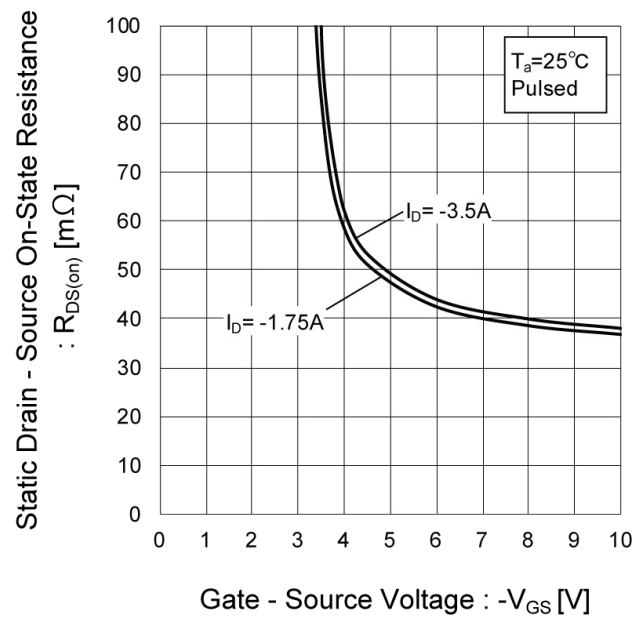
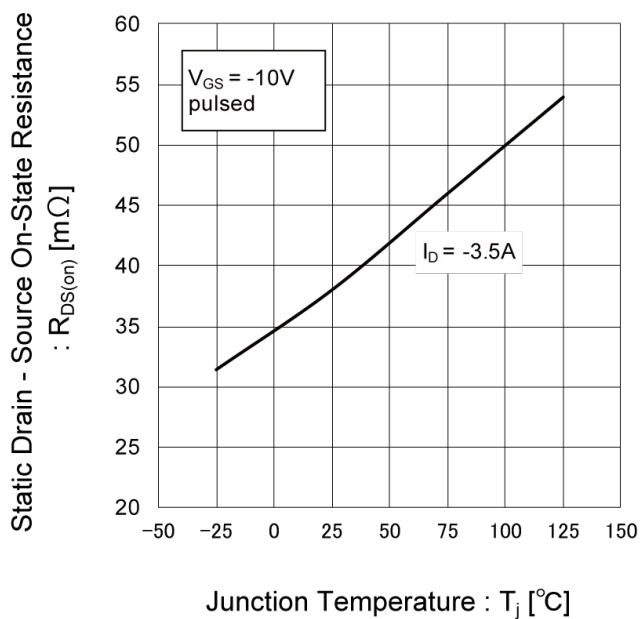


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

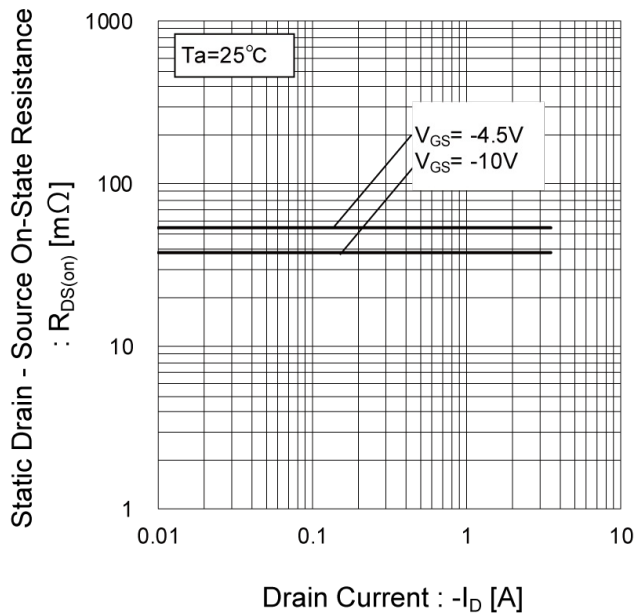


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

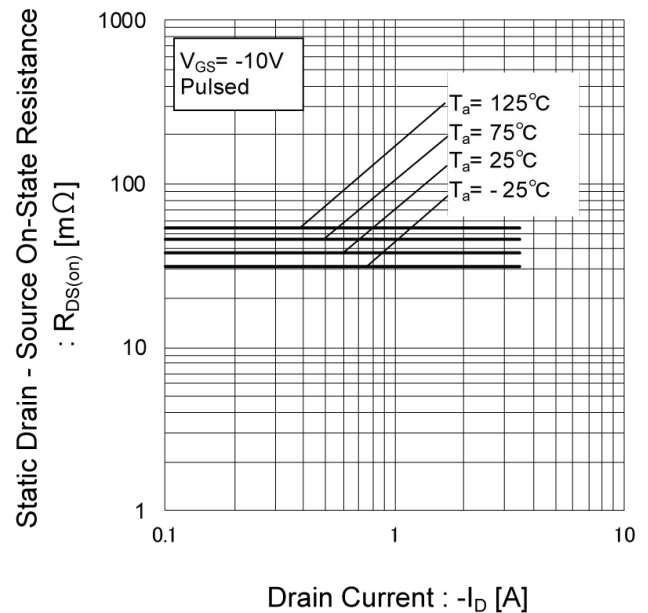
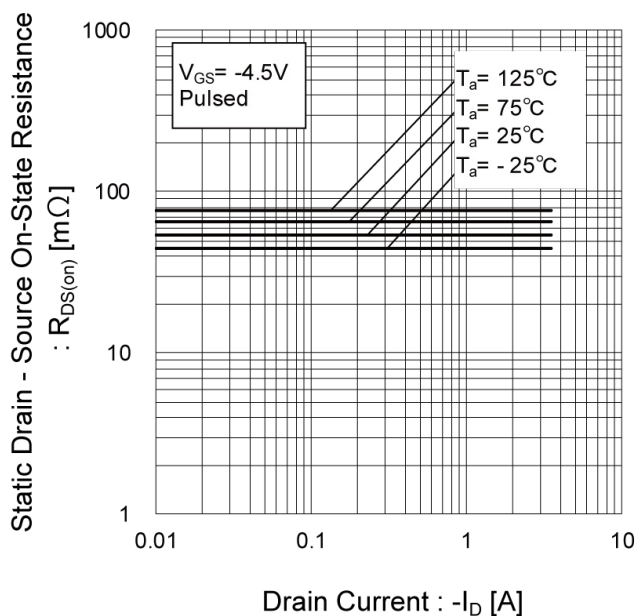


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

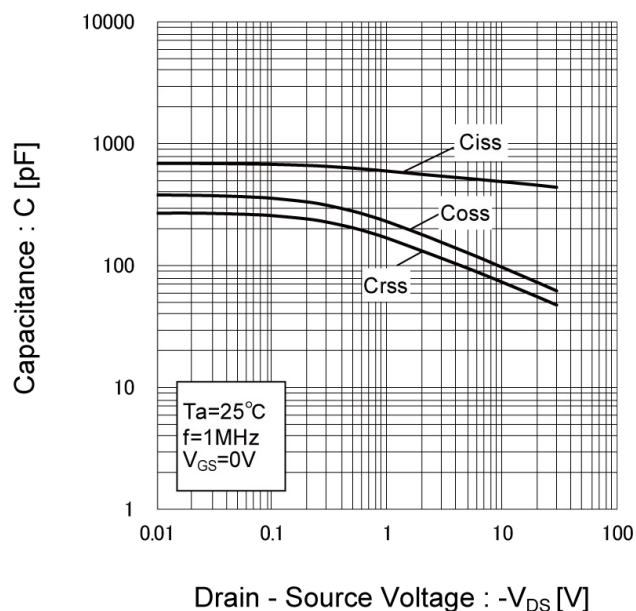


Fig.18 Switching Characteristics

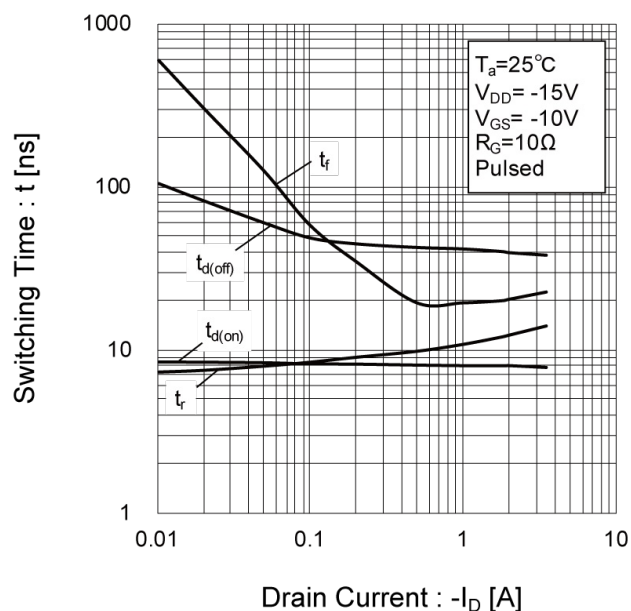


Fig.19 Dynamic Input Characteristics

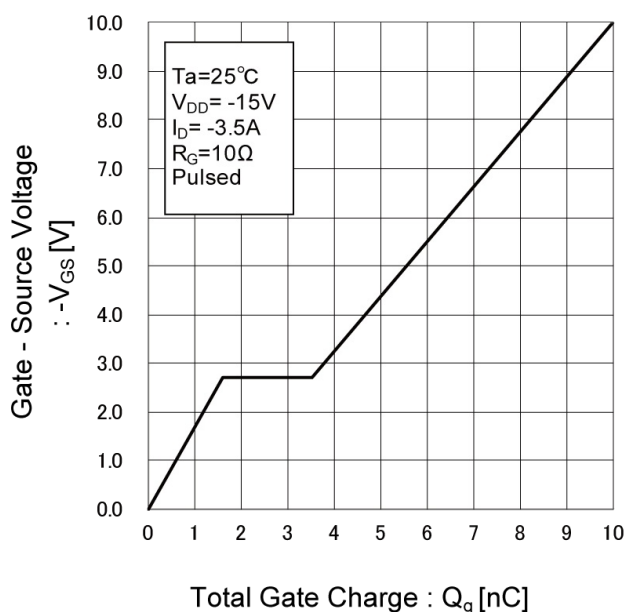
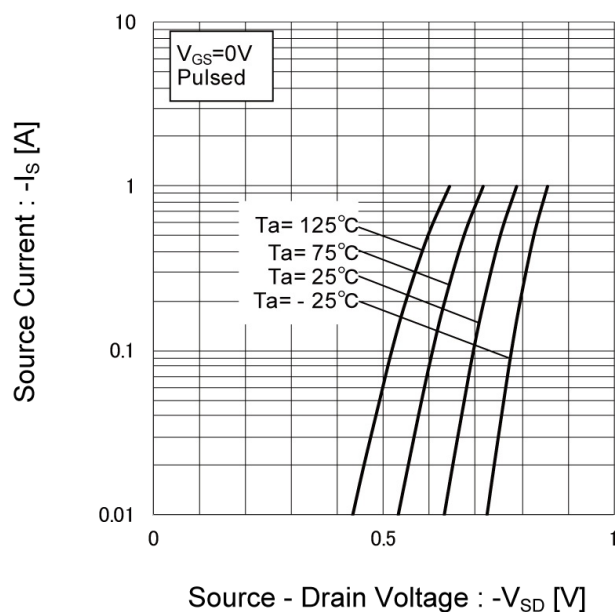


Fig.20 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

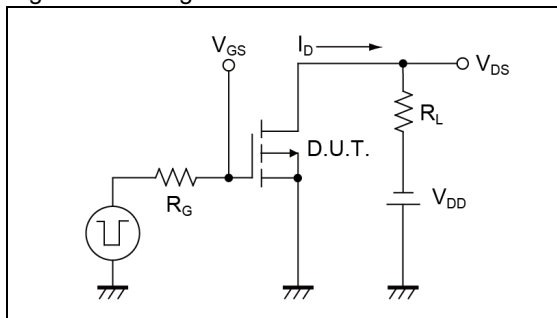


Fig.1-2 Switching Waveforms

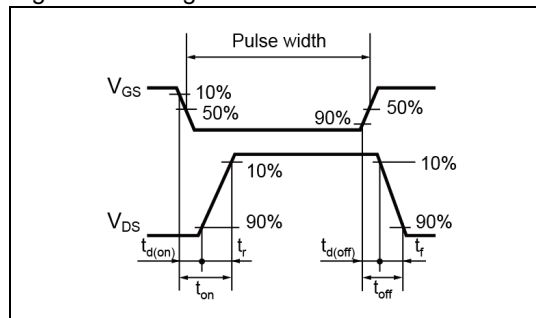


Fig.2-1 Gate Charge Measurement Circuit

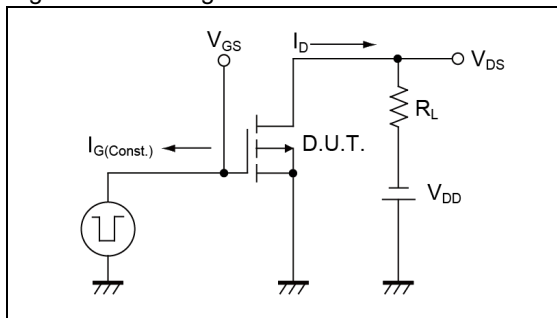


Fig.2-2 Gate Charge Waveform

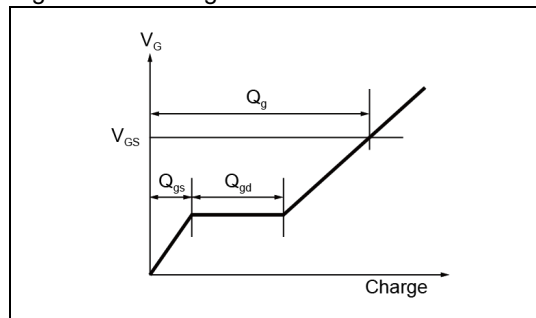


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

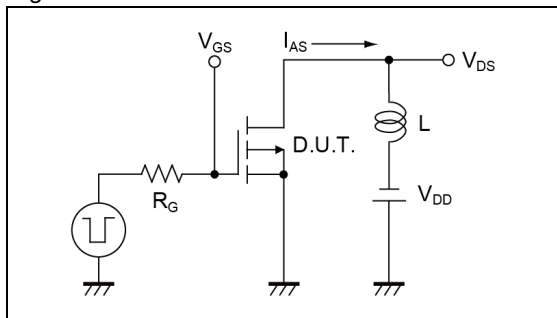
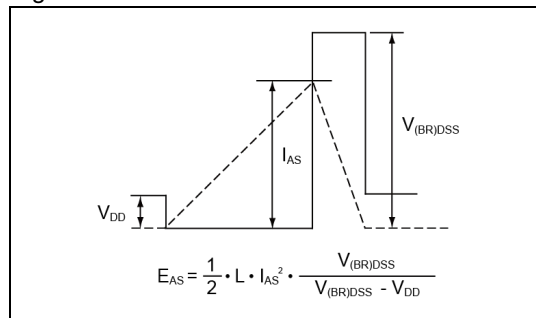
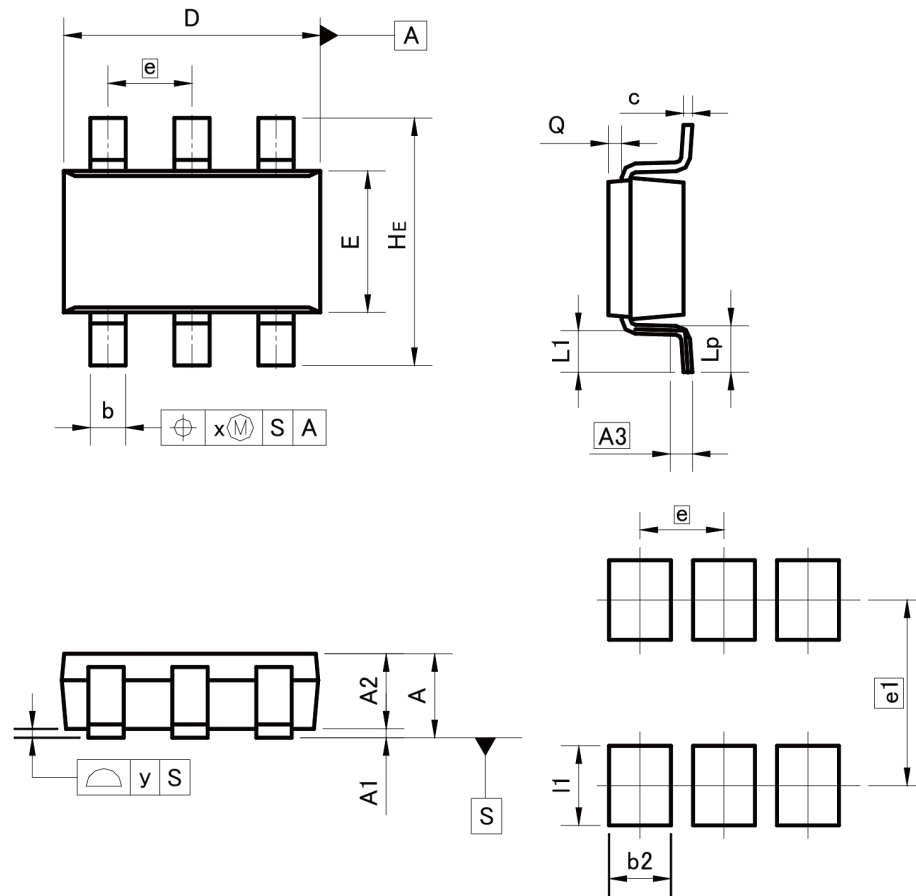


Fig.3-2 AVALANCHE WAVEFORM



●Dimensions

TSMT6



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	1.00	—	0.039
A1	0.00	0.10	0.000	0.004
A2	0.75	0.95	0.030	0.037
A3	0.25		0.010	
b	0.35	0.50	0.014	0.020
c	0.10	0.26	0.004	0.010
D	2.80	3.00	0.110	0.118
E	1.50	1.80	0.059	0.071
e	0.95		0.037	
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	0.010
x	—	0.20	—	0.008
y	—	0.10	—	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	—	0.70	—	0.028
e1	2.10		0.083	
l1	—	0.90	—	0.035

Dimension in mm/inches

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