

V_{DSS}	30V
$R_{DS(on)}(Max.)$	37m Ω
I_D	$\pm 3.5A$
P_D	1W

●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

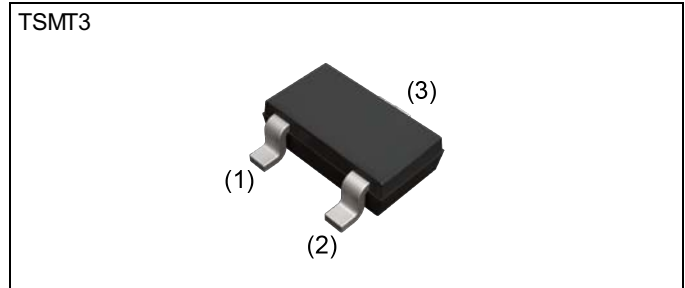
●Application

Switching

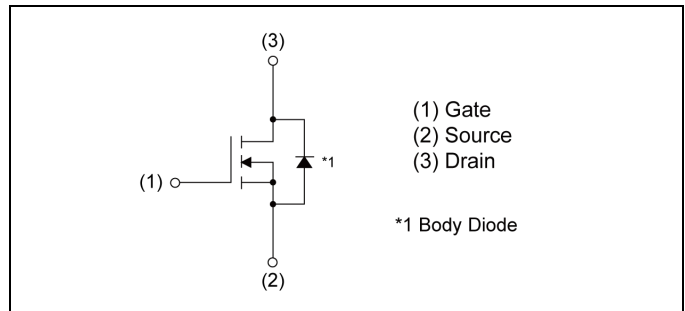
●Absolute maximum ratings ($T_a = 25^\circ C$)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	30	V
Continuous drain current	I_D^{*1}	± 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}	1.9	mJ
Avalanche current	I_{AS}^{*3}	3.5	A
Power dissipation	P_D^{*4}	1	W
Junction temperature	T_j	150	$^\circ C$
Range of storage temperature	T_{stg}	-55 to +150	$^\circ C$

●Outline



●Inner circuit



●Packaging specifications

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

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*4}	-	125	-	°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	-	20.84	-	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	-	-3.25	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 10V, I_D = 3.5A$	-	28	37	m Ω
		$V_{GS} = 4.5V, I_D = 3.5A$	-	43	56	
Gate input resistance	R_G		-	2.8	-	Ω
Transconductance	g_{fs}^{*5}	$V_{DS} = 5V, I_D = 3.5A$	2.4	-	-	S

*1 Limited only by maximum temperature allowed.

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

*3 $L \approx 200\mu\text{H}$, $V_{DD} = 15V$, $R_G = 25\Omega$, 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}	$V_{GS} = 0V$	-	250	-	pF
Output capacitance	C_{oss}	$V_{DS} = 15V$	-	40	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	35	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx 15V, V_{GS} = 10V$	-	5.5	-	ns
Rise time	t_r^{*5}	$I_D = 1.75A$	-	7.5	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 8.6\Omega$	-	10	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	3.5	-	

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

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx 15V$ $I_D = 4.5A$	$V_{GS} = 10V$	-	6.0	-	nC
Gate - Source charge	Q_{gs}^{*5}		$V_{GS} = 4.5V$	-	3.1	-	
Gate - Drain charge	Q_{gd}^{*5}		$V_{GS} = 4.5V$	-	1.2	-	
				-	1.1	-	

● 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}	$T_a = 25^\circ\text{C}$	-	-	0.8	A
Body diode pulse current	I_{SP}^{*2}		-	-	12	
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0V, I_S = 0.8A$	-	-	1.2	V

● Electrical characteristic curves

Fig.1 Typical Output Characteristics(I)

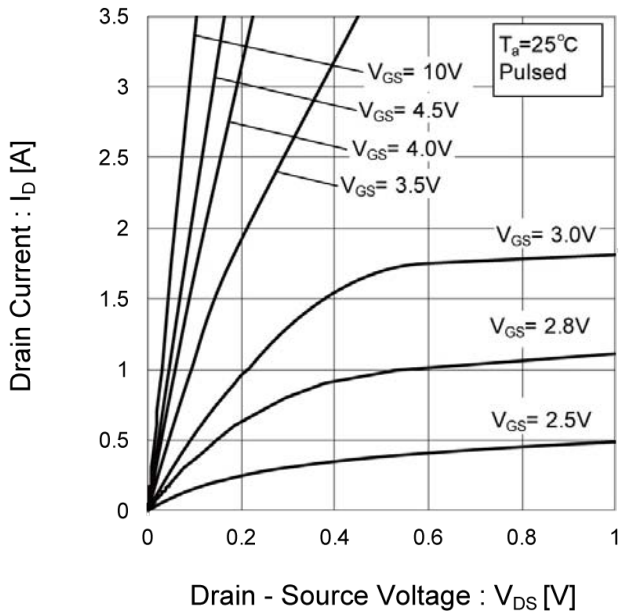


Fig.2 Typical Output Characteristics(II)

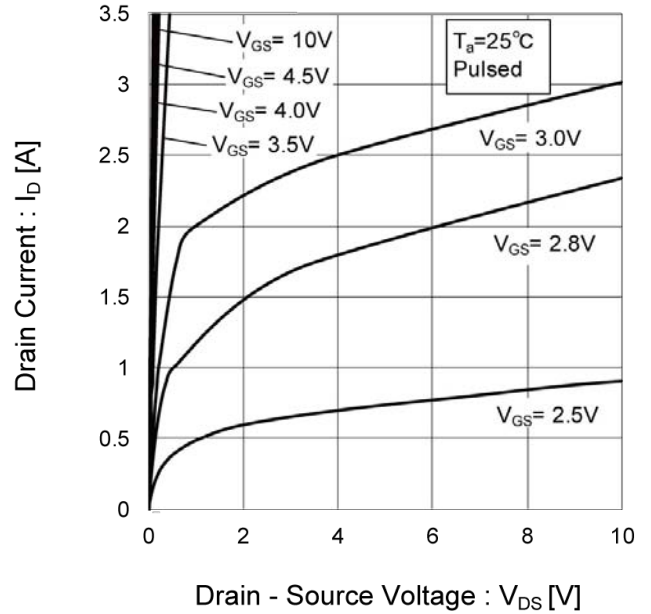
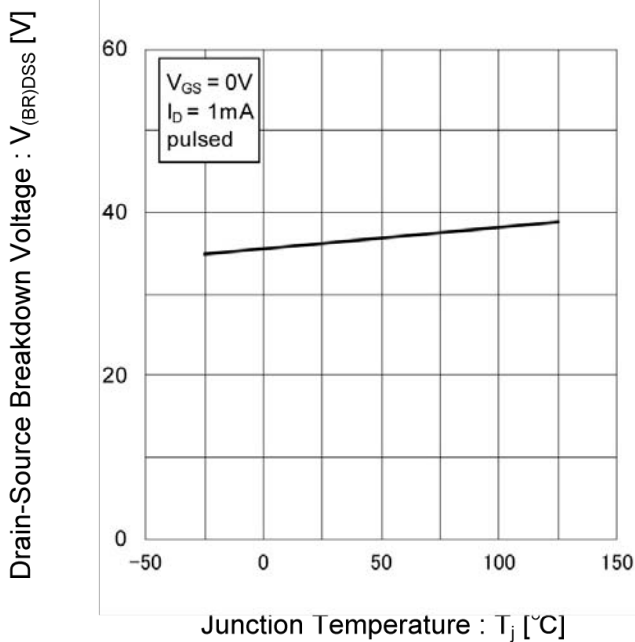


Fig.3 Breakdown Voltage vs. Junction Temperature



● Electrical characteristic curves

Fig.4 Typical Transfer Characteristics

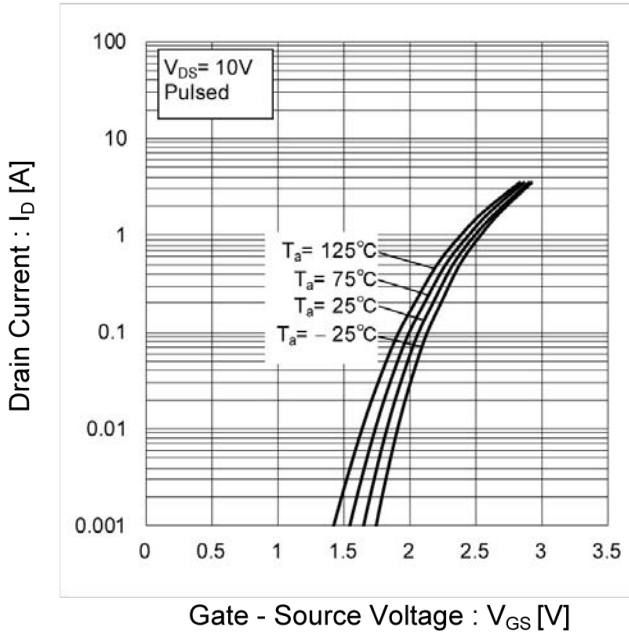


Fig.5 Gate Threshold Voltage vs. Junction Temperature

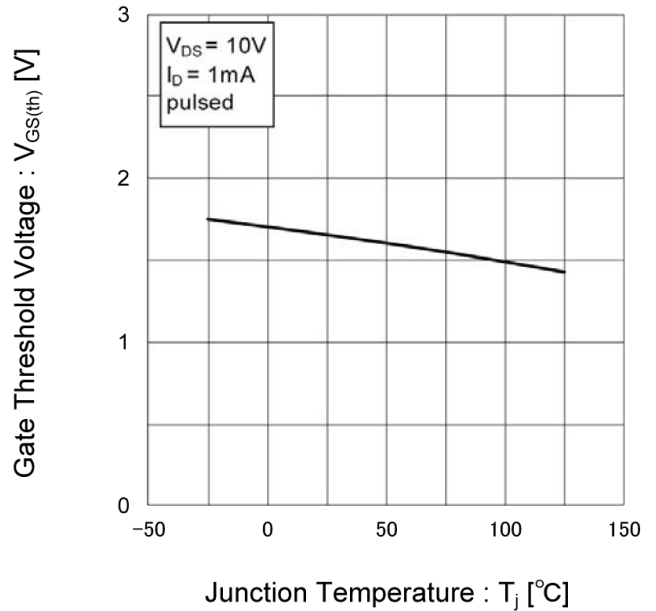
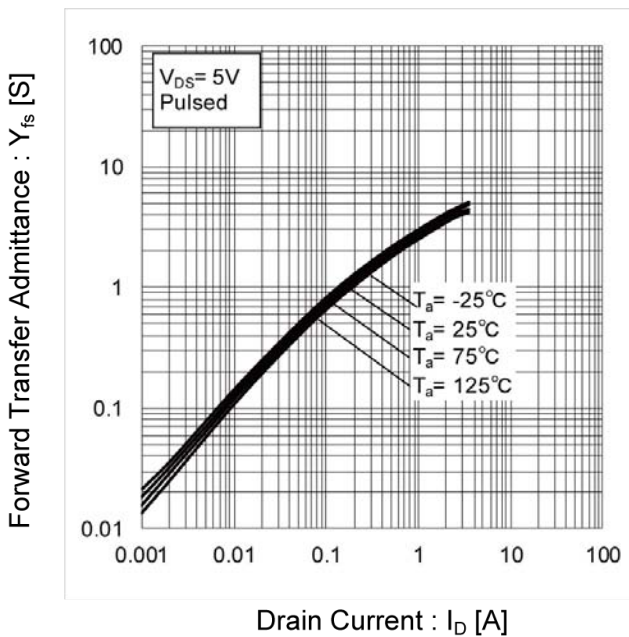


Fig.6 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.7 Drain Current Derating Curve

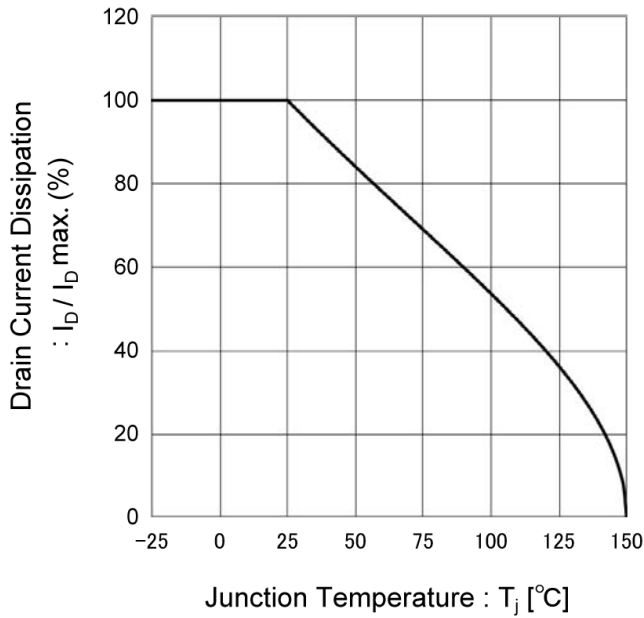


Fig.8 Static Drain - Source On - State Resistance vs. Gate Source Voltage

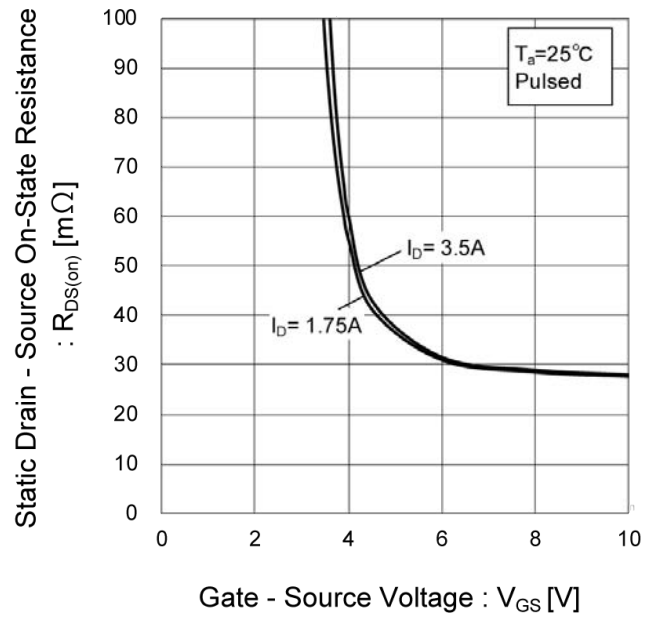
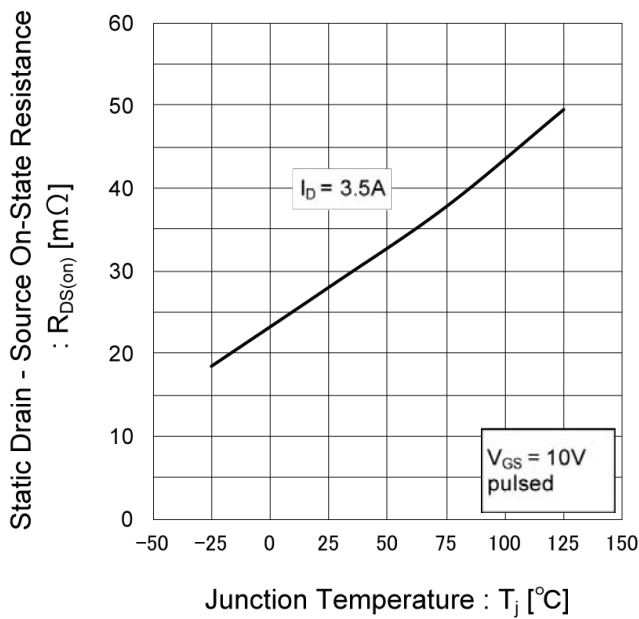


Fig.9 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

Fig.10 Static Drain - Source On - State Resistance vs. Drain Current(I)

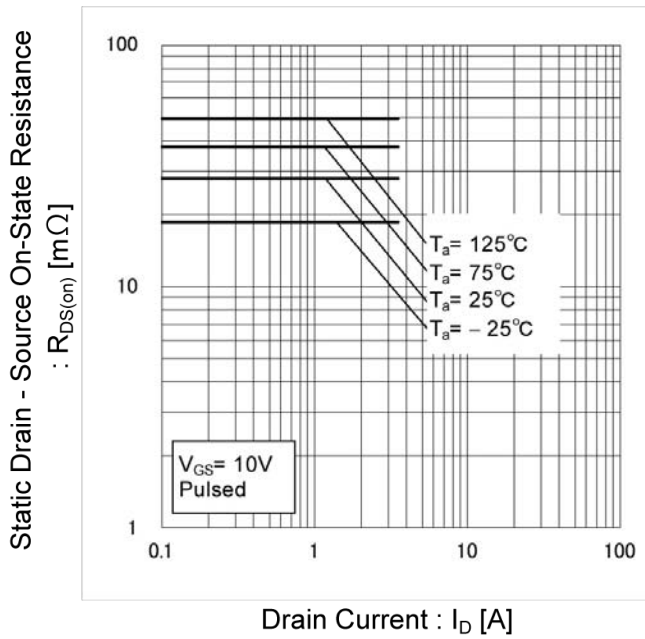
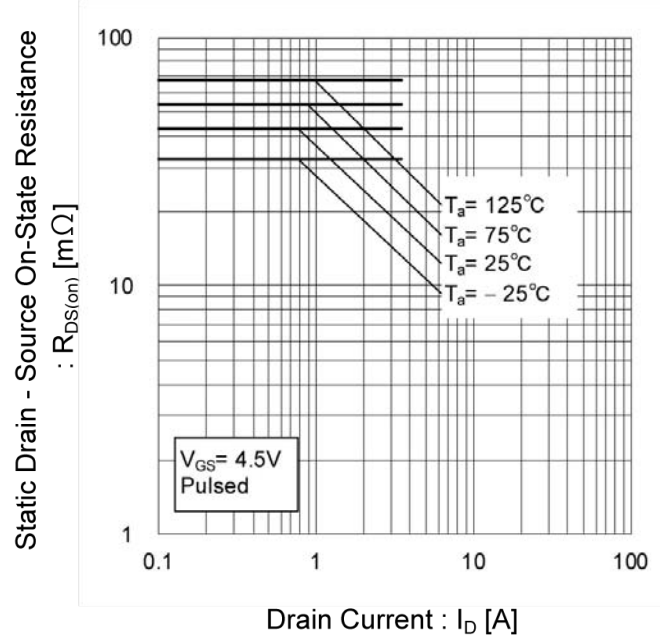


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(II)



● Electrical characteristic curves

Fig.12 Typical Capacitance vs. Drain - Source Voltage

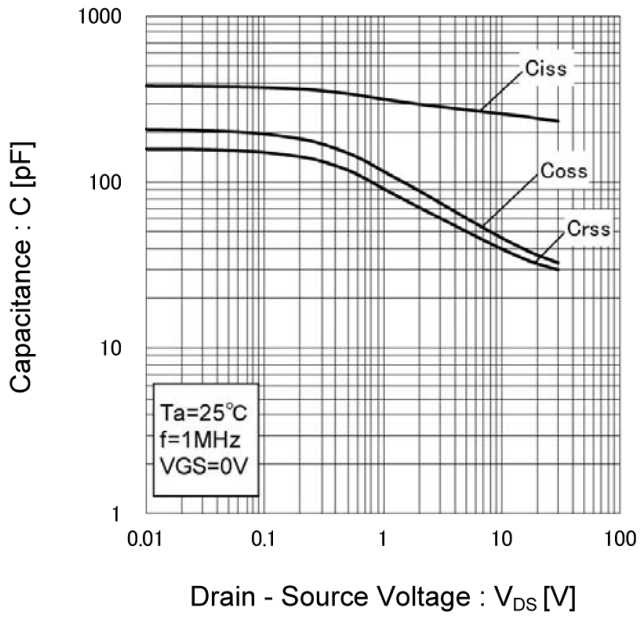
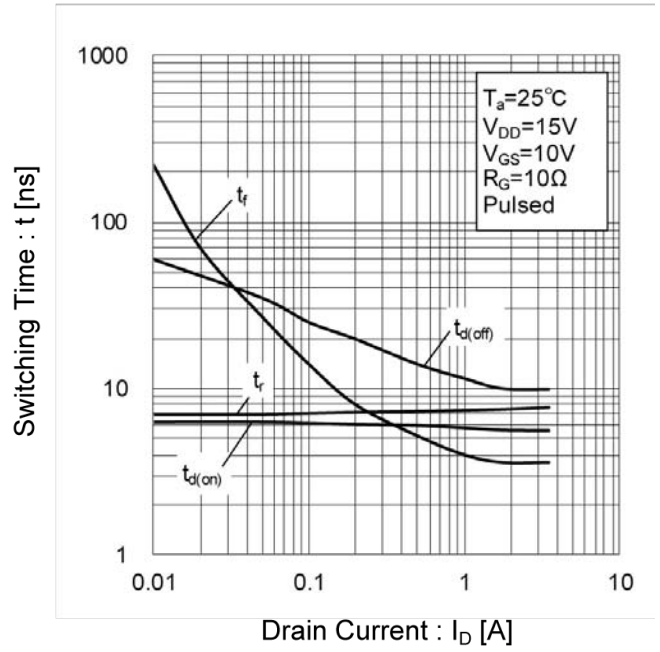


Fig.13 Switching Characteristics



● Electrical characteristic curves

Fig.14 Dynamic Input Characteristics

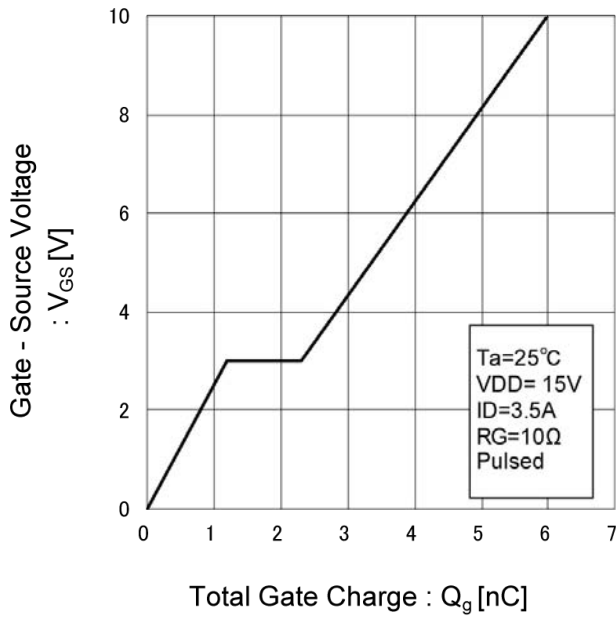
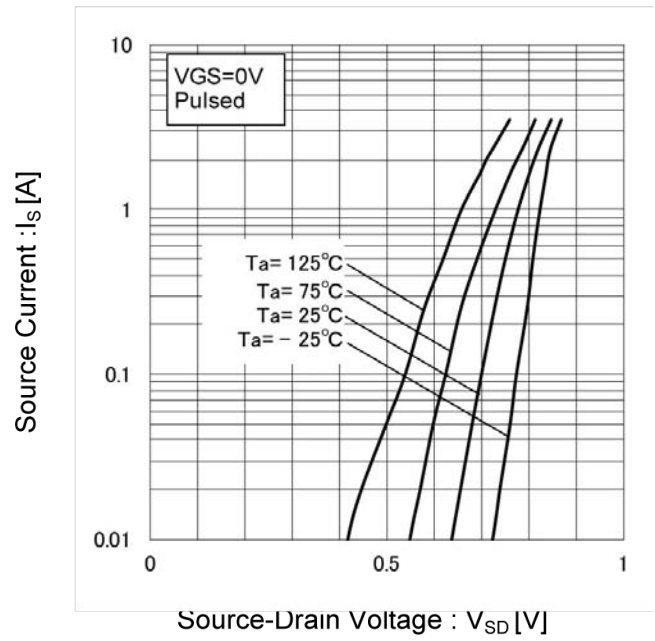


Fig.15 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

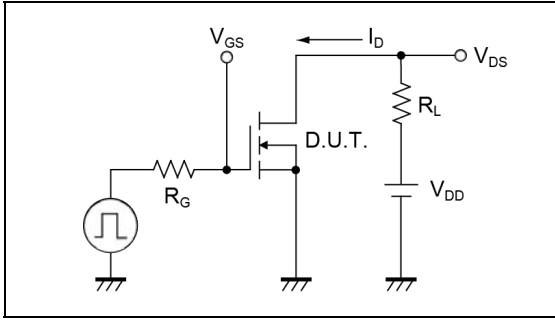


Fig.1-2 Switching Waveforms

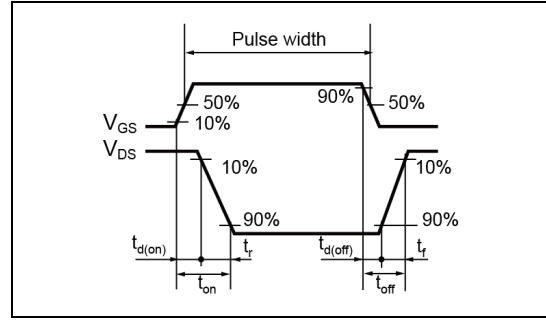


Fig.2-1 Gate Charge Measurement Circuit

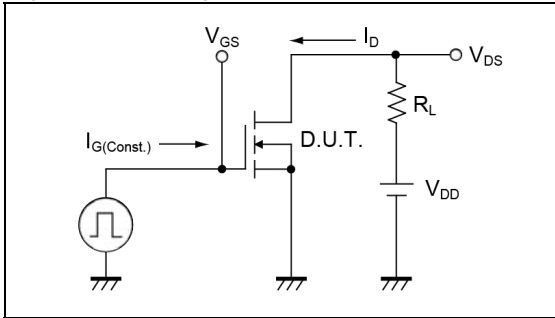


Fig.2-2 Gate Charge Waveform

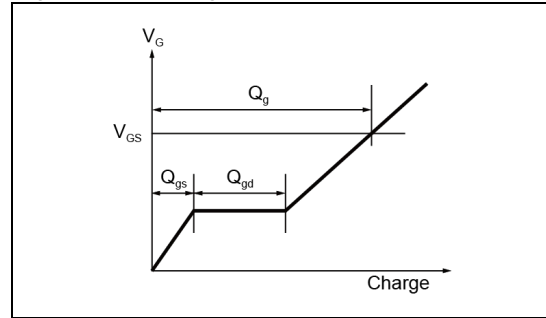


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

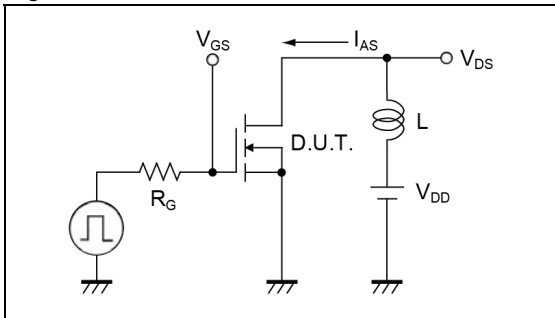
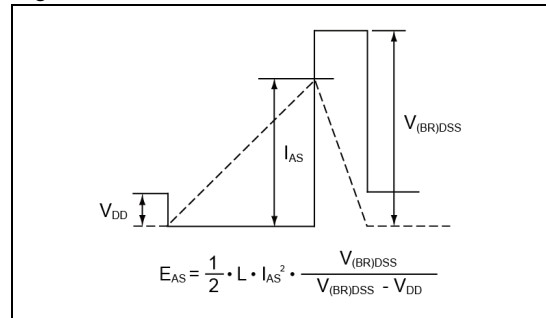
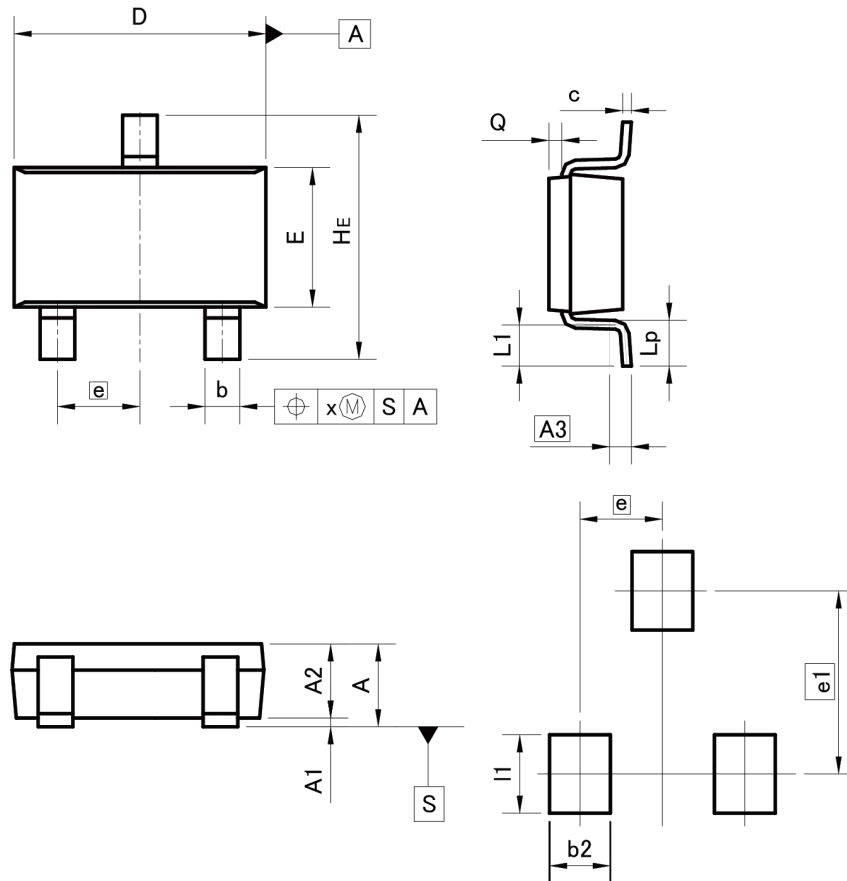


Fig.3-2 AVALANCHE WAVEFORM



●Dimensions

TSMT3



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

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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