RQ1A060ZP

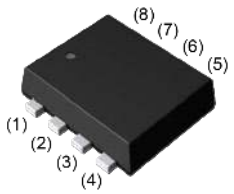
Pch -12V -6A Middle Power MOSFET

Datasheet

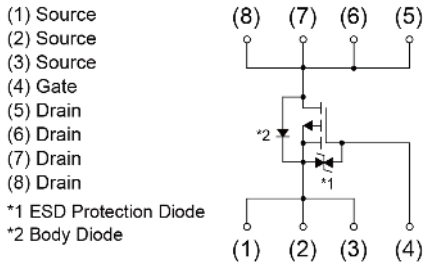
V_{DSS}	-12V
$R_{DS(on)}$(Max.)	23mΩ
I_D	±6A
P_D	1.5W

●Outline

TSMT8



●Inner circuit



●Features

1) Low on - resistance.
2) -1.5V Drive
3) Built-in G-S protection diode.
4) Small surface mount package(TSMT8).
5) Pb-free lead plating ; RoHS compliant

●Application

Switching

●Packaging specifications

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

●Absolute maximum ratings (T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-12	V
Continuous drain current	I_D	±6	A
Pulsed drain current	$I_{D,pulse}$ *1	±24	A
Gate - Source voltage	V_{GSS}	±10	V
Power dissipation	P_D *2	1.5	W
	P_D *3	0.7	W
Junction temperature	T_j	150	℃
Range of storage temperature	T_{stg}	-55 to +150	℃

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA} *2	-	-	83.3	℃/W
	R_{thJA} *3	-	-	178	℃/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	-12	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D = -1mA referenced to 25℃	-	-21.9	-	mV/℃
Zero gate voltage drain current	I_{DSS}	V_{DS} = -12V, V_{GS} = 0V	-	-	-1	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±10V, V_{DS} = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = -6V, I_D = -1mA	-0.3	-	-1.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	I_D = -1mA referenced to 25℃	-	2.4	-	mV/℃
Static drain - source on - state resistance	$R_{DS(on)}$ *4	V_{GS} = -4.5V, I_D = -6A	-	16	23	mΩ
		V_{GS} = -2.5V, I_D = -3A	-	22	31	
		V_{GS} = -1.8V, I_D = -3A	-	28	42	
		V_{GS} = -1.5V, I_D = -1.2A	-	39	78	
Gate input resistance	R_G	f = 1MHz, open drain	-	20	-	Ω
Forward Transfer Admittance	$\|Y_{fs}\|$ *4	V_{DS} = -6V, I_D = -6A	7.5	-	-	S

*1 Pw≦10μs , Duty cycle≦1%

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

*3 Mounted on a FR4 (20×20×0.8mm)

*4 Pulsed

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	2800	-	pF
Output capacitance	C_{oss}	V_{DS} = -6V	-	340	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	310	-	
Turn - on delay time	$t_{d(on)}$ *4	V_{DD} ≃ -6V,V_{GS} = -4.5V	-	12	-	ns
Rise time	t_r *4	I_D = -3A	-	105	-	
Turn - off delay time	$t_{d(off)}$ *4	R_L ≃ 2Ω	-	400	-	
Fall time	t_f *4	R_G = 10Ω	-	230	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *4	V_{DD} ≃ -6V, I_D = -6A, V_{GS} = -4.5V	-	34	-	nC
Gate - Source charge	Q_{gs} *4		-	6.0	-	
Gate - Drain charge	Q_{gd} *4		-	5.0	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I_S	T_a = 25°C	-	-	-1	A
Body diode pulse current	I_{SP} *1		-	-	-24	A
Forward voltage	V_{SD} *4	V_{GS} = 0V, I_S = -6A	-	-	-1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

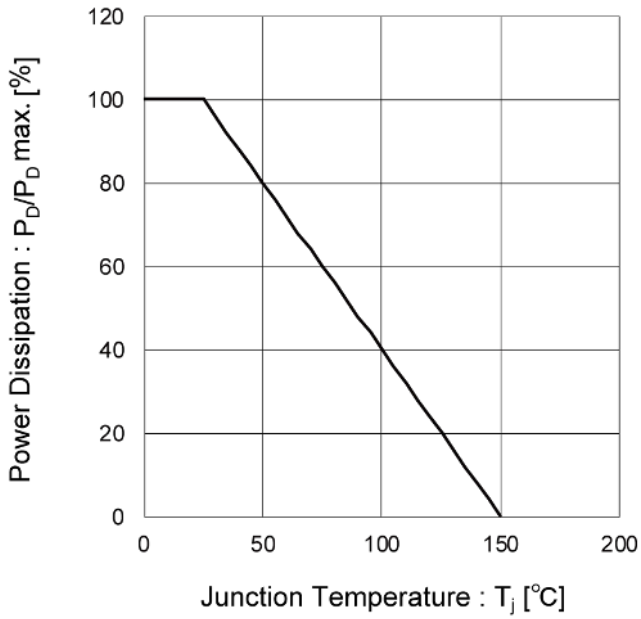


Fig.2 Maximum Safe Operating Area

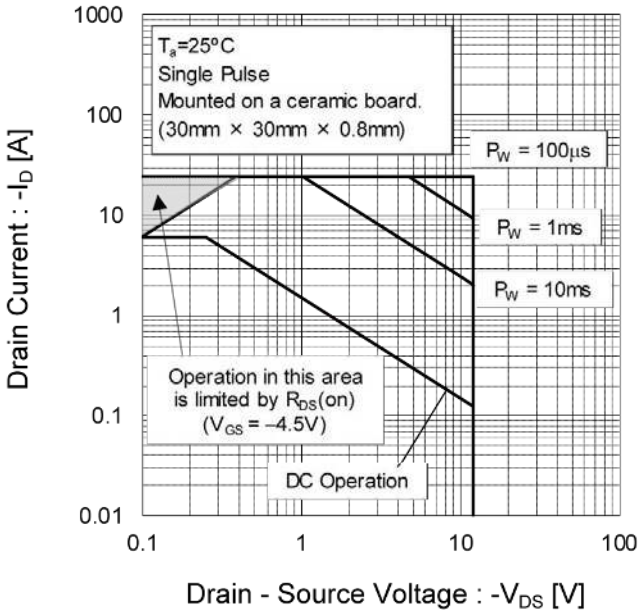


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

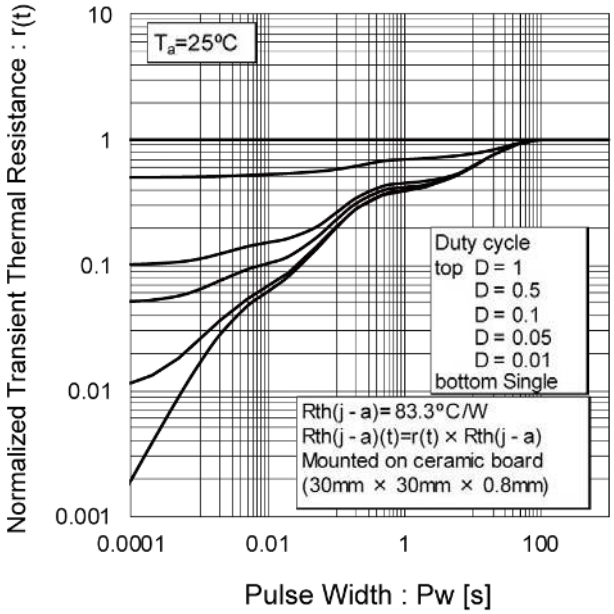
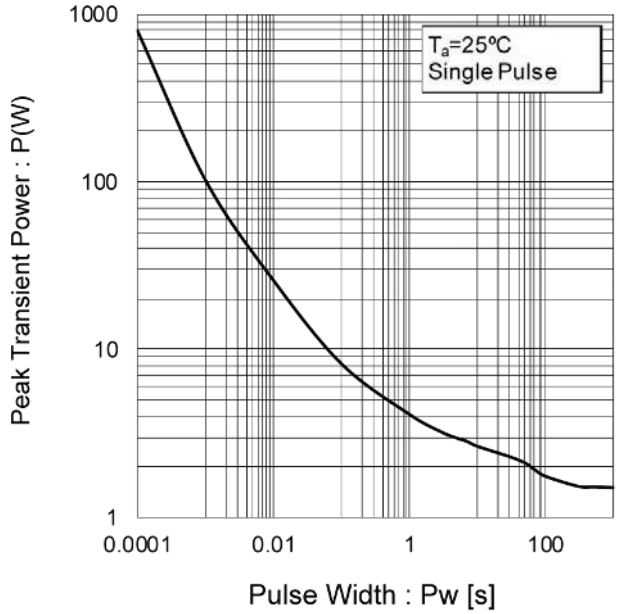


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

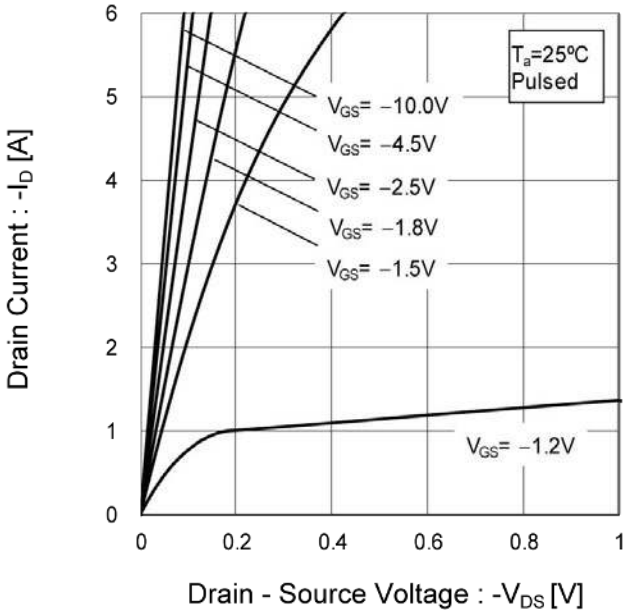


Fig.6 Typical Output Characteristics(II)

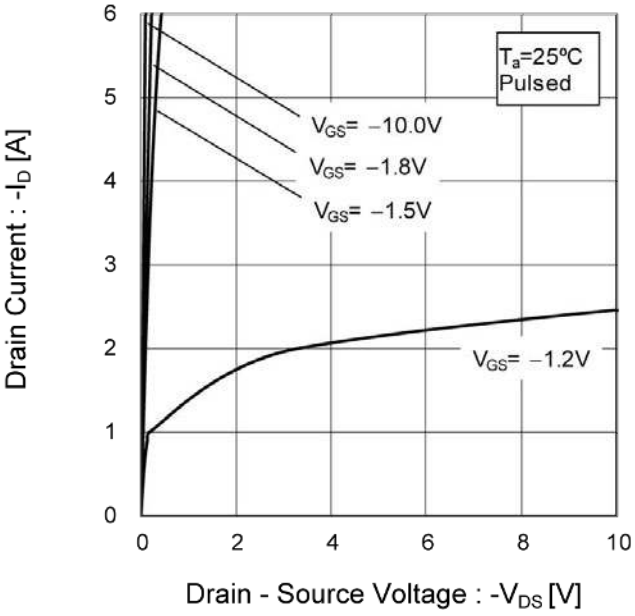


Fig.7 Breakdown Voltage vs. Junction Temperature

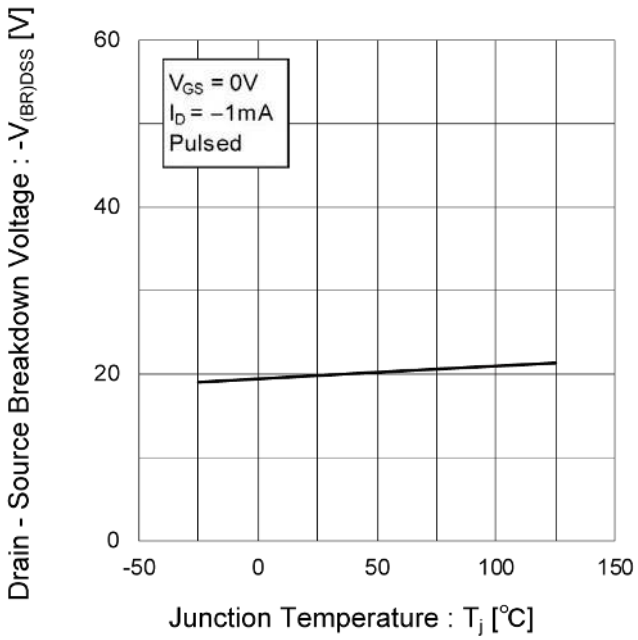
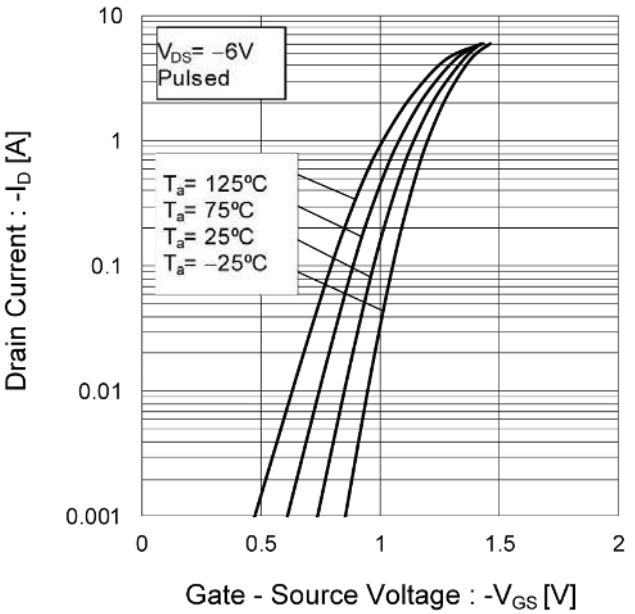


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

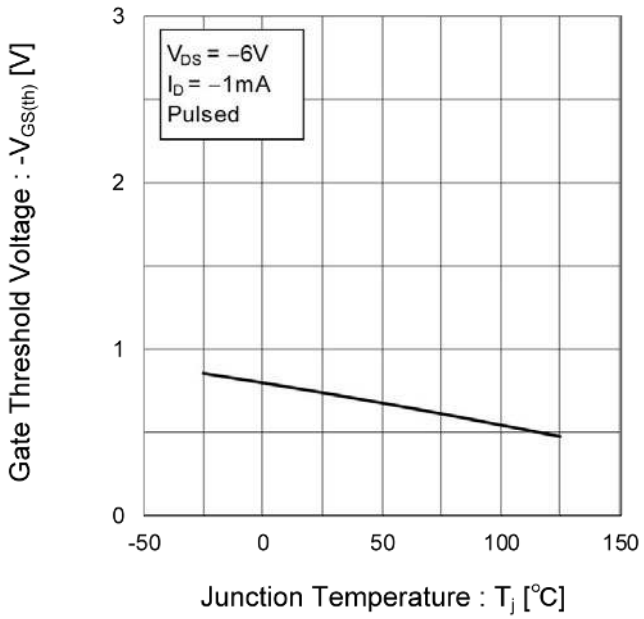


Fig.10 Forward Transfer Admittance vs. Drain Current

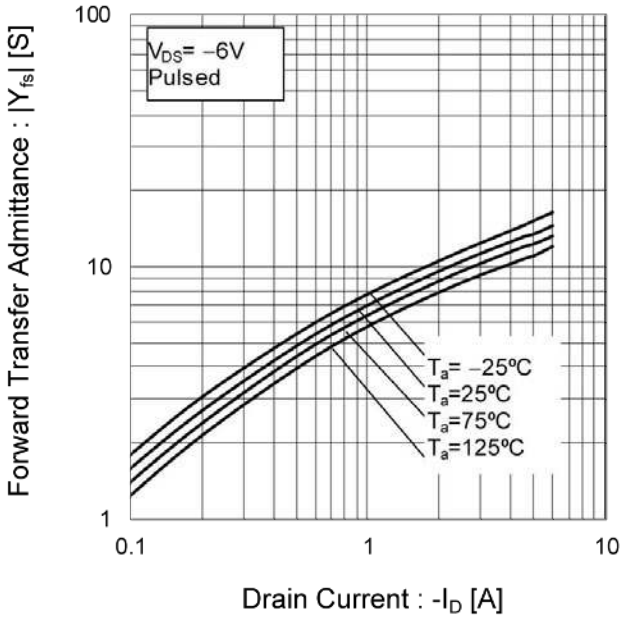


Fig.11 Drain Current Derating Curve

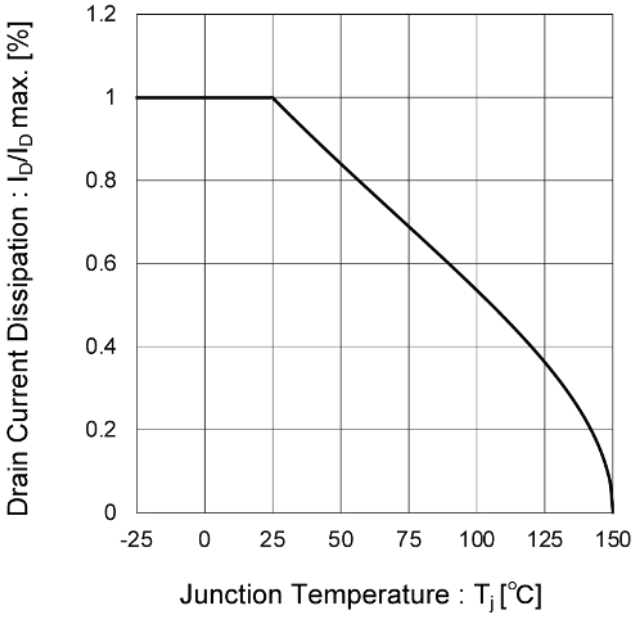
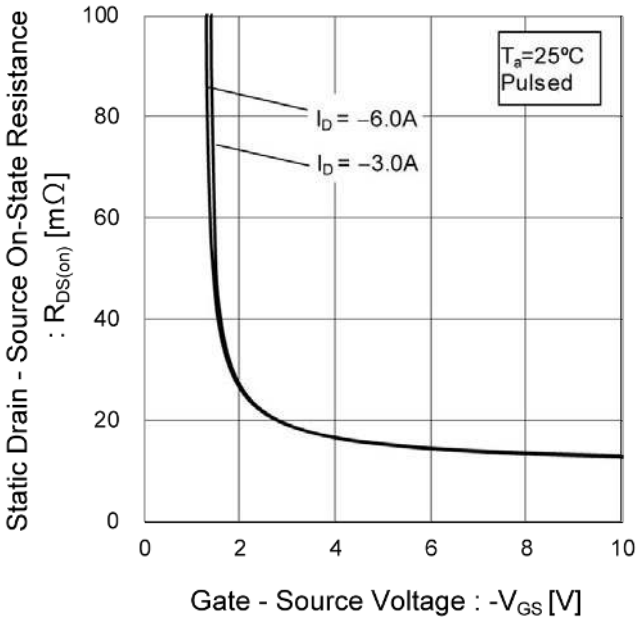


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●Electrical characteristic curves

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

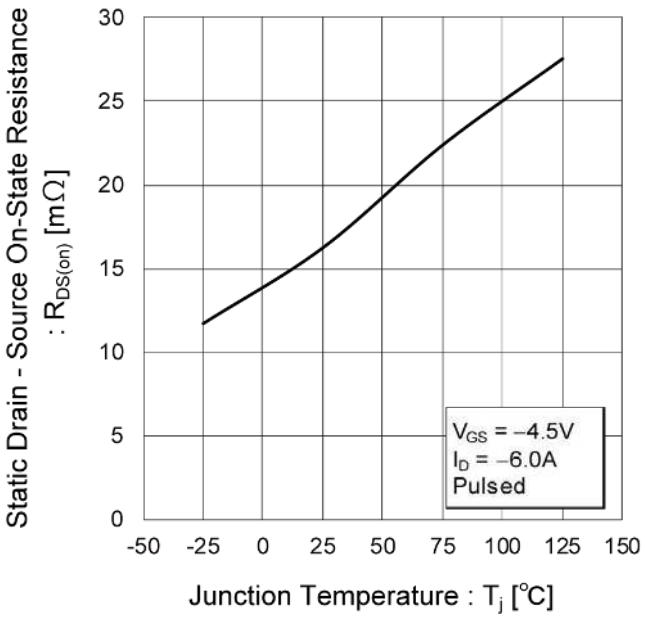
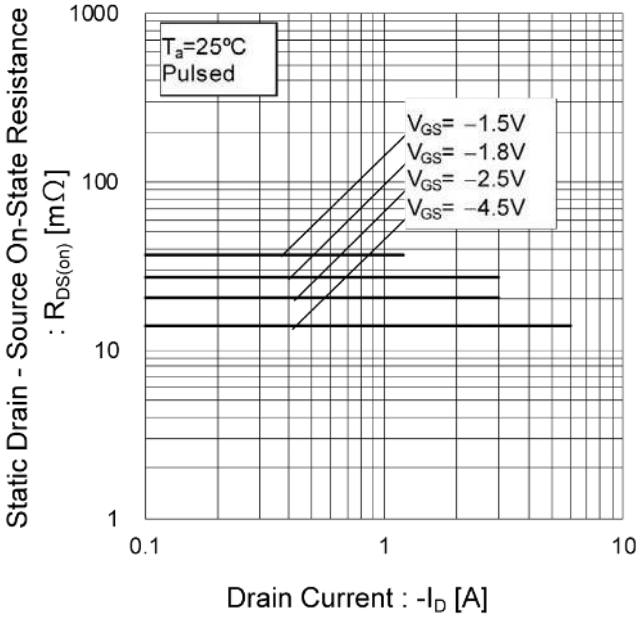


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)



●Electrical characteristic curves

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

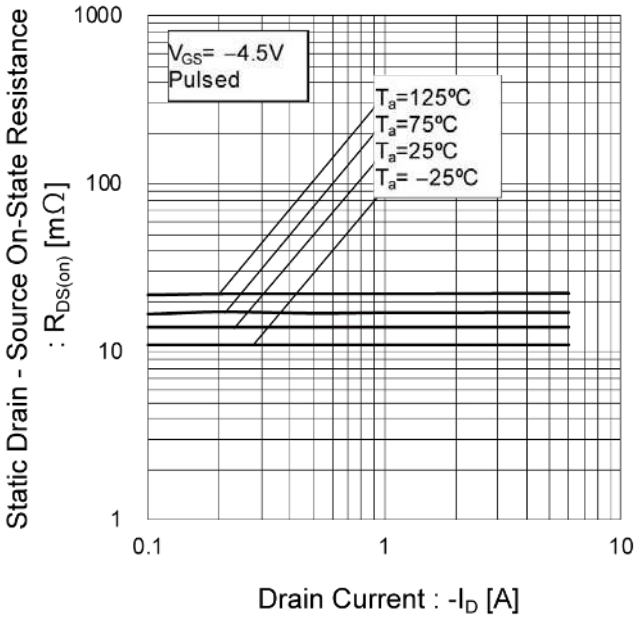


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)

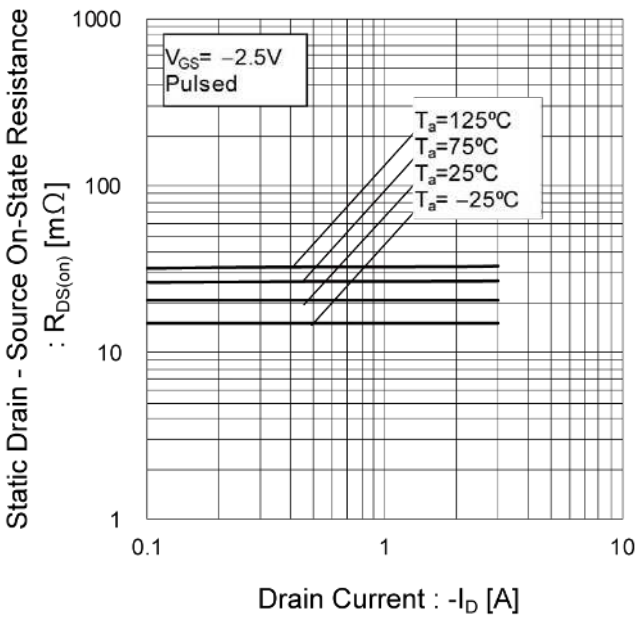


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current (IV)

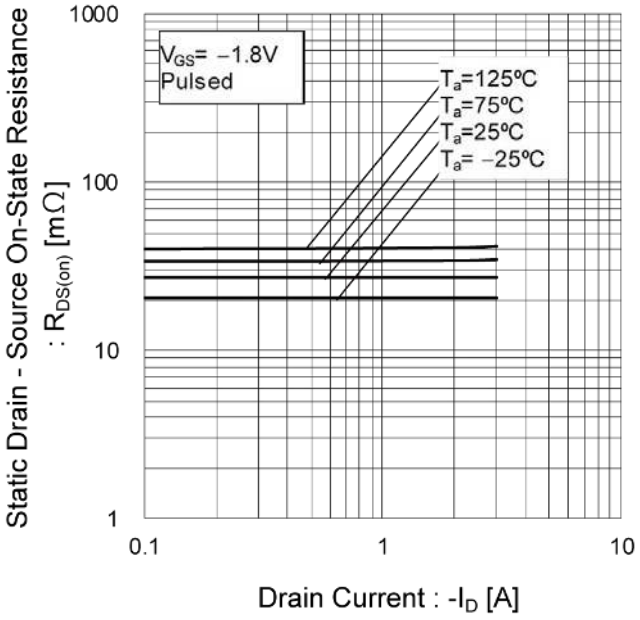
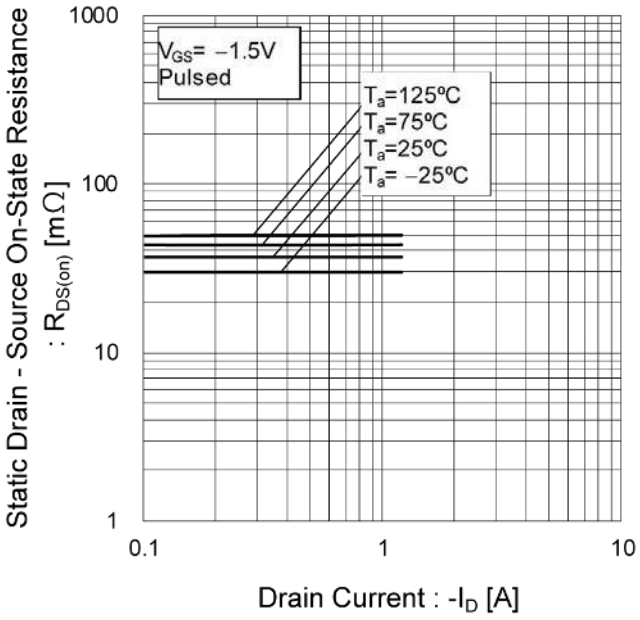


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current (V)



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

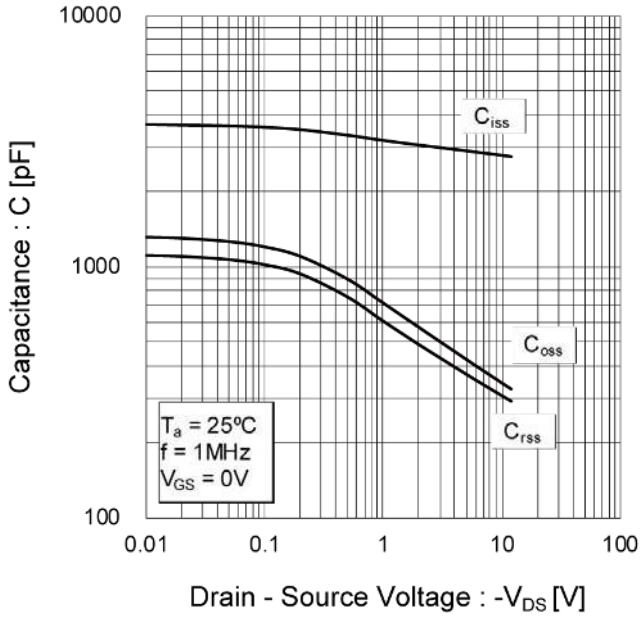


Fig.20 Switching Characteristics

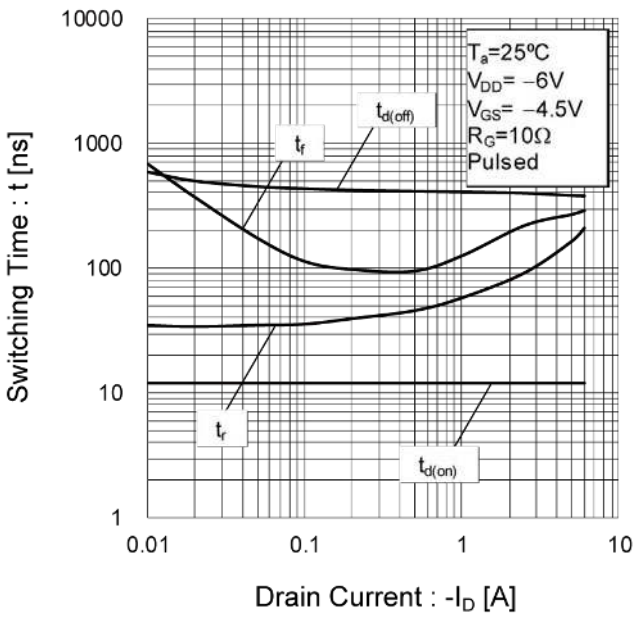


Fig.21 Dynamic Input Characteristics

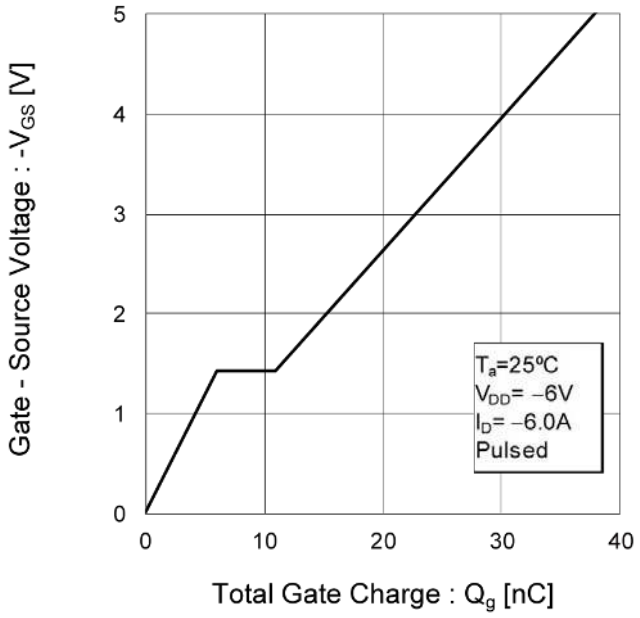
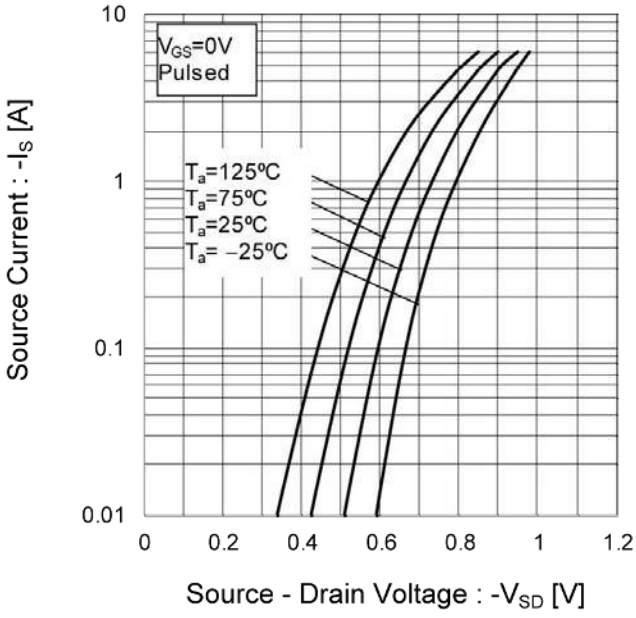


Fig.22 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

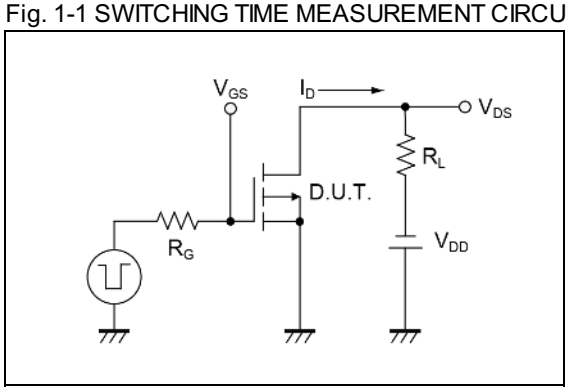


Fig. 1-2 SWITCHING WAVEFORMS

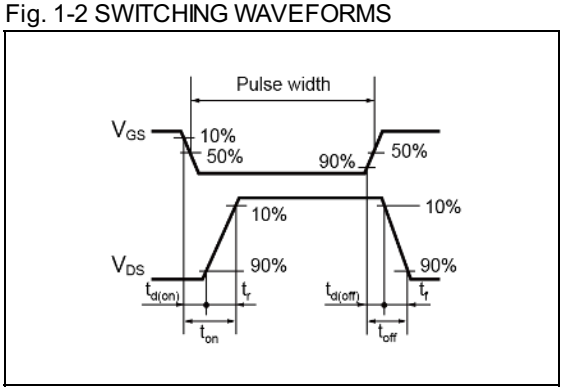


Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

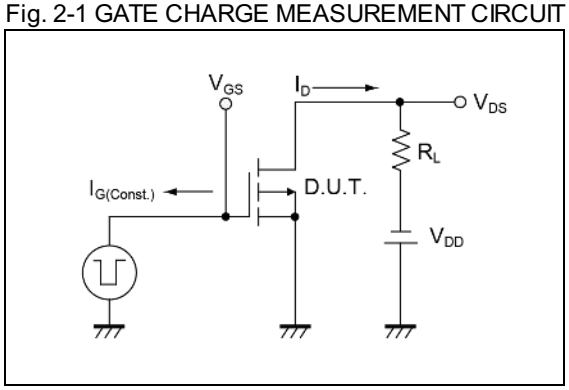
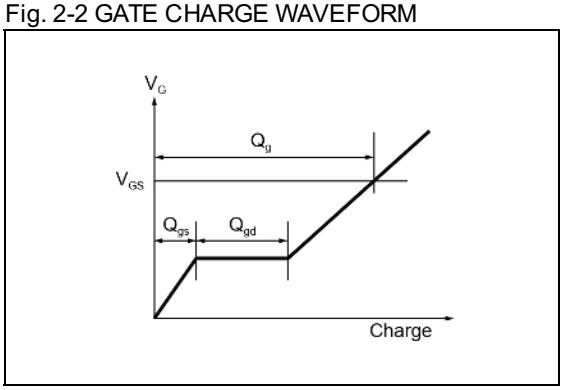


Fig. 2-2 GATE CHARGE WAVEFORM

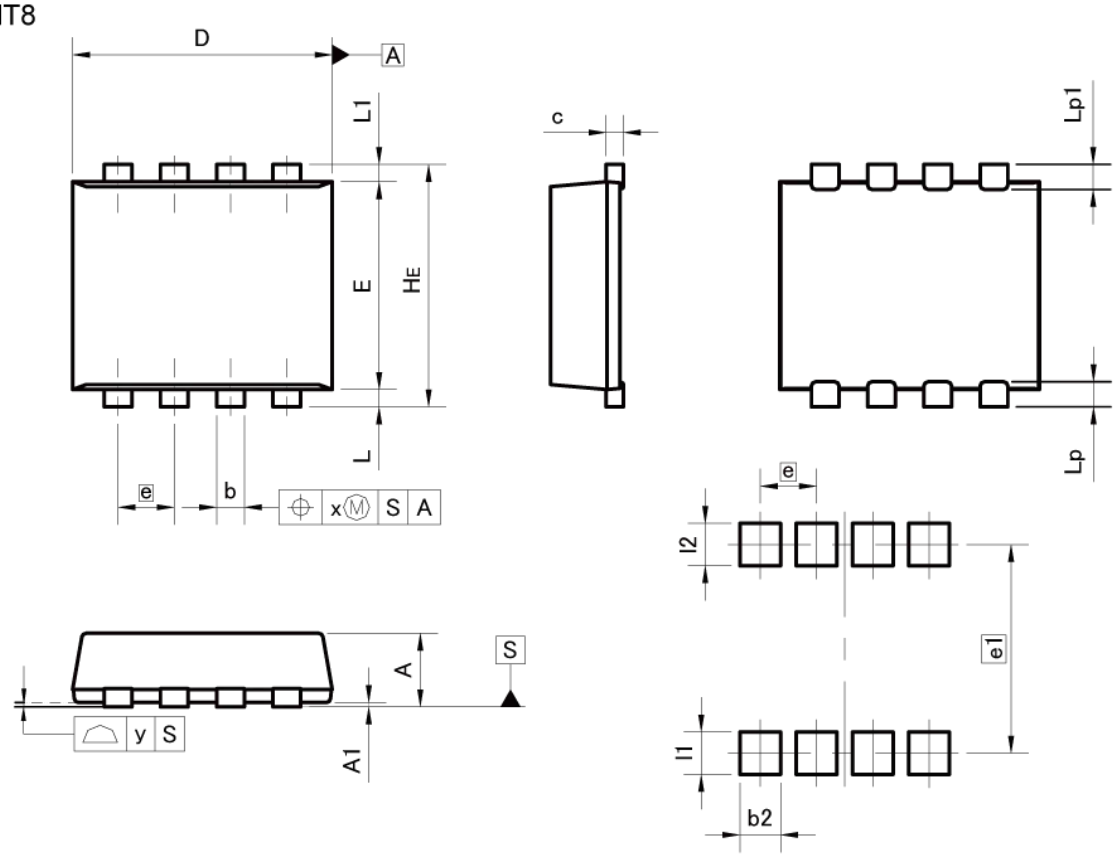


●Notice

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 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

Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

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7) The Products specified in this document are not designed to be radiation tolerant.

8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

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