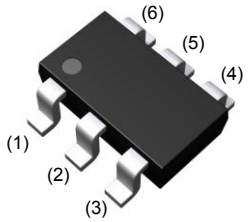
RSQ045N03

Nch 30V 4.5A Power MOSFET Datasheet

V_{DSS}	30V
$R_{DS(on)}$ (Max.)	38mΩ
I_D	4.5A
P_D	1.25W

●Outline

TSMT6
SOT-457T



●Features

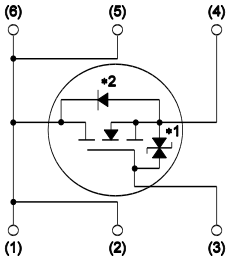
1) Low on - resistance.

2) Built-in G-S Protection Diode.

3) Small Surface Mount Package (TSMT6).

4) Pb-free lead plating ; RoHS compliant

●Inner circuit



(1) Drain
(2) Drain
(3) Gate
(4) Source
(5) Drain
(6) 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	TR
	Marking	QL

●Absolute maximum ratings(T_a = 25°C)

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	±18	A
Gate - Source voltage	V_{GSS}	±20	V
Power dissipation	P_D *3	1.25	W
	P_D *4	0.6	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	-	-	100	°C/W
	R_{thJA} *4	-	-	208	°C/W

●Electrical characteristics(T_a = 25°C) ,unless otherwise specified

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	-	26	-	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} = 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	-	−2.8	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS}=10V, I_D=4.5A	-	27	38	mΩ
		V_{GS}=4.5V, I_D=4.5A	-	36	51	
		V_{GS}=4.0V, I_D=4.5A	-	40	56	
		V_{GS}=10V, I_D=4.5A, T_j=125°C	-	50	70	
Gate input resistannce	R_G	f = 1MHz, open drain	-	6	-	Ω
Transconductance	g_{fs} *5	V_{DS}=10V, I_D=4.5A	3.5	7.0	-	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 (15×20×0.8mm)

*5 Pulsed

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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	-	520	-	pF
Output capacitance	C_{oss}	V_{DS} = 10V	-	150	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	95	-	
Turn - on delay time	$t_{d(on)}$ *5	V_{DD} ≃ 15V, V_{GS} = 10V	-	12	-	ns
Rise time	t_r *5	I_D = 2.25A	-	19	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L = 6.67Ω	-	41	-	
Fall time	t_f *5	R_G = 10Ω	-	14	-	

●Gate Charge characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	V_{DD} ≃ 15V, I_D=4.5A V_{GS} = 5V	-	6.8	9.5	nC
		V_{DD} ≃ 15V, I_D=4.5A V_{GS} = 10V	-	13	-	
Gate - Source charge	Q_{gs} *5	V_{DD} ≃ 15V, I_D=4.5A V_{GS} = 5V	-	1.6	-	
Gate - Drain charge	Q_{gd} *5		-	2.3	-	

●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	-	-	1	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_s = 1.0A	-	-	1.2	V

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

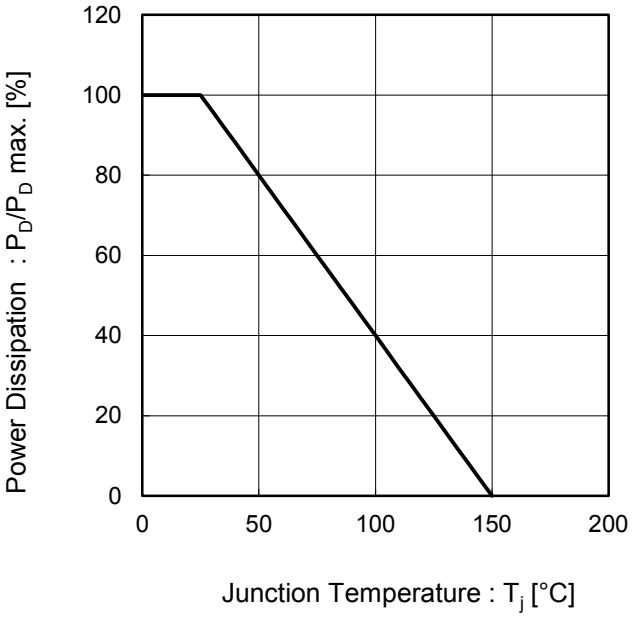


Fig.2 Maximum Safe Operating Area

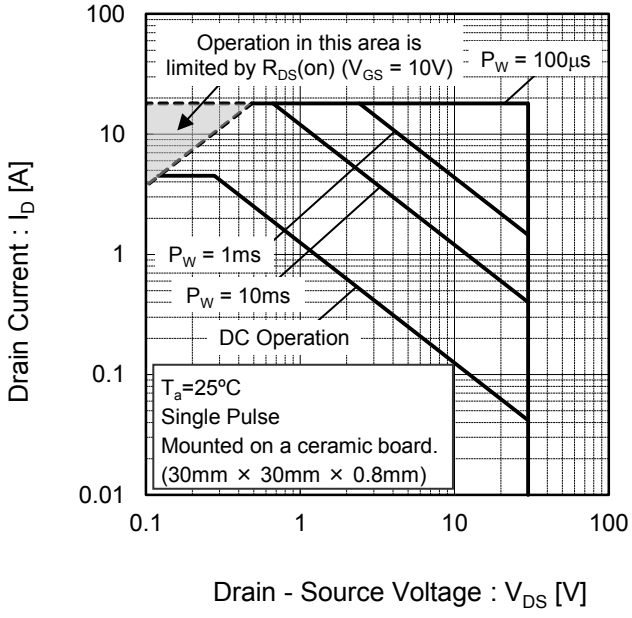


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

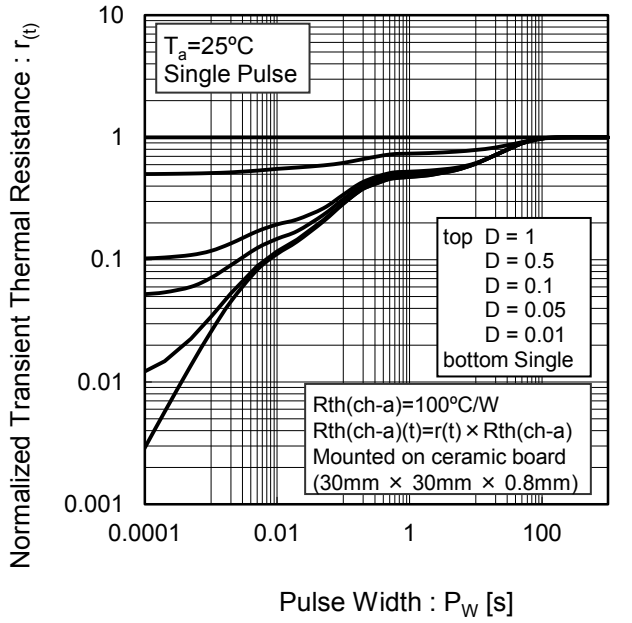
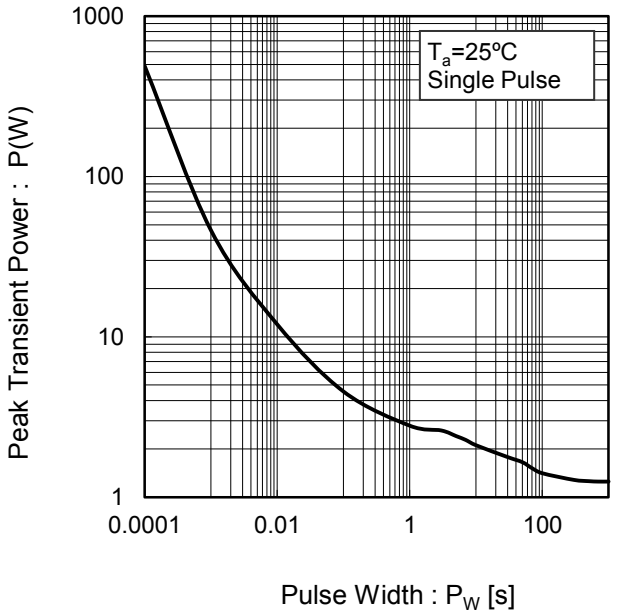


Fig.4 Single Pulse Maximum Power dissipation



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●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

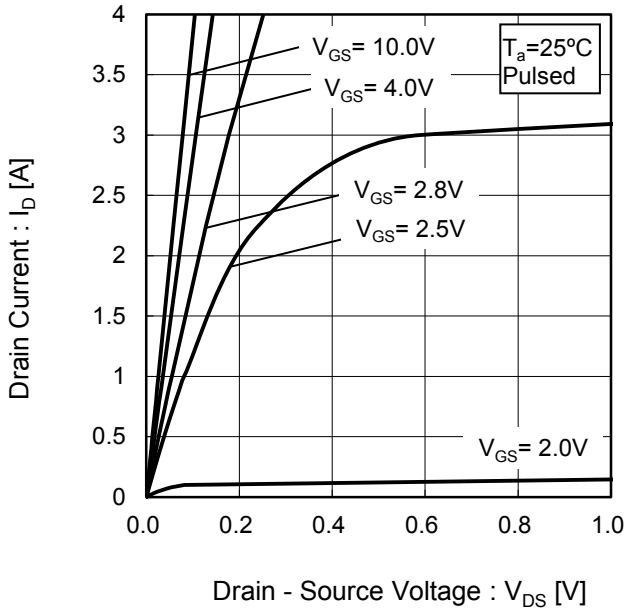


Fig.6 Typical Output Characteristics(II)

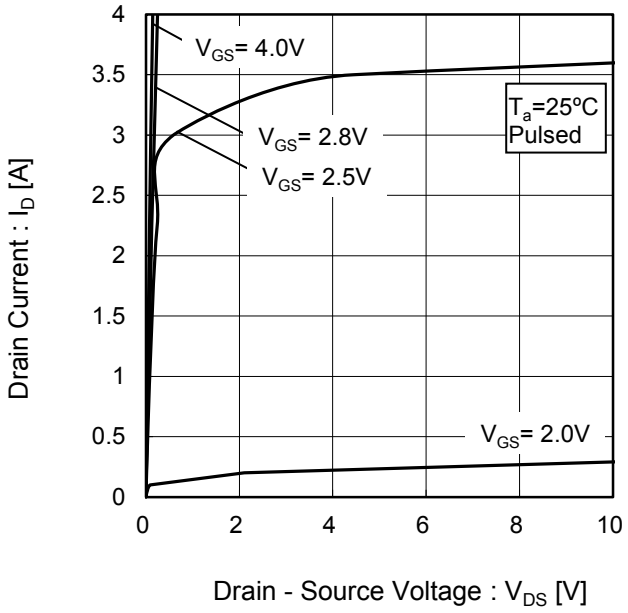


Fig.7 Breakdown Voltage vs. Junction Temperature

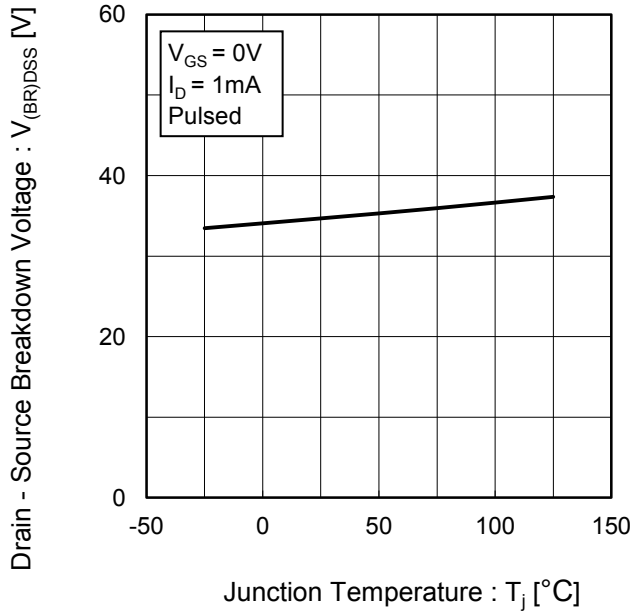
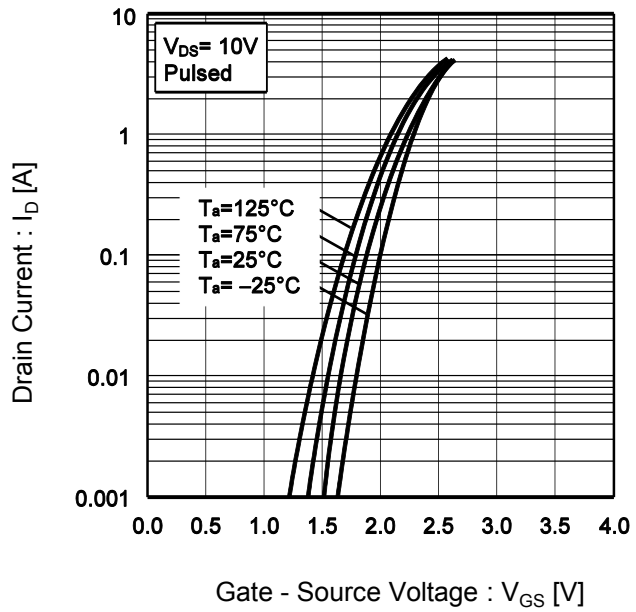


Fig.8 Typical Transfer Characteristics



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●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

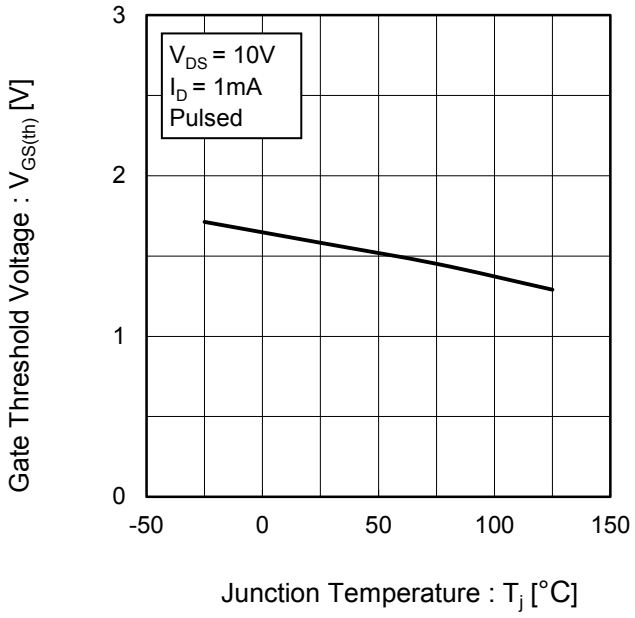


Fig.10 Transconductance vs. Drain Current

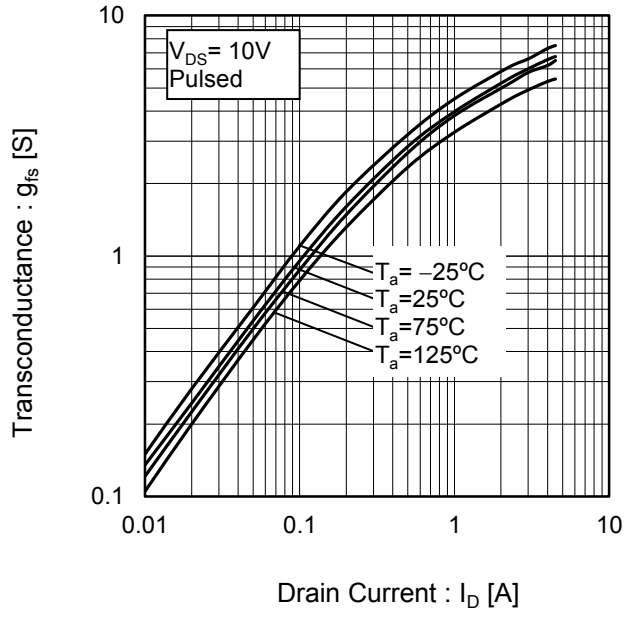


Fig.11 Drain CurrentDerating Curve

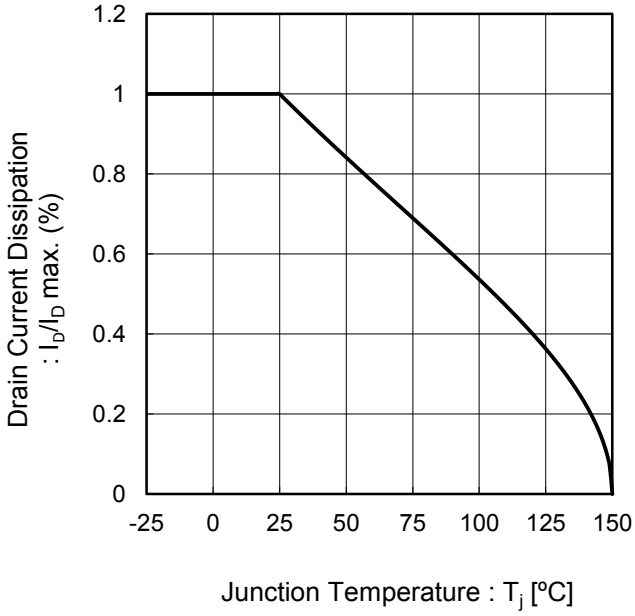
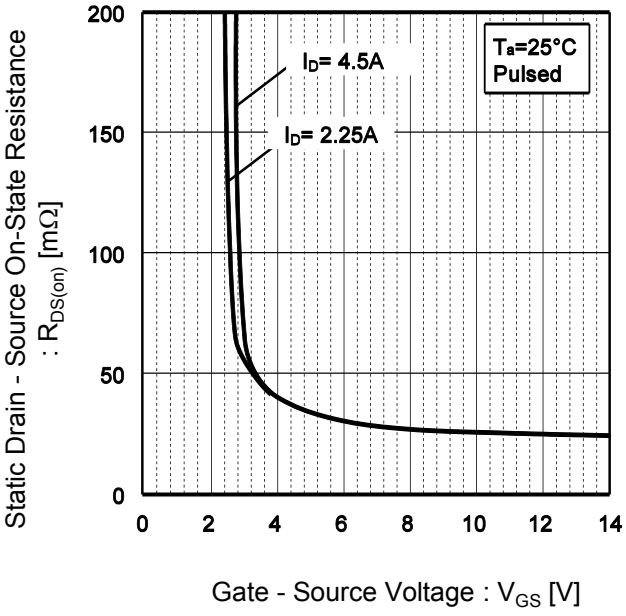


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



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●Electrical characteristic curves

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

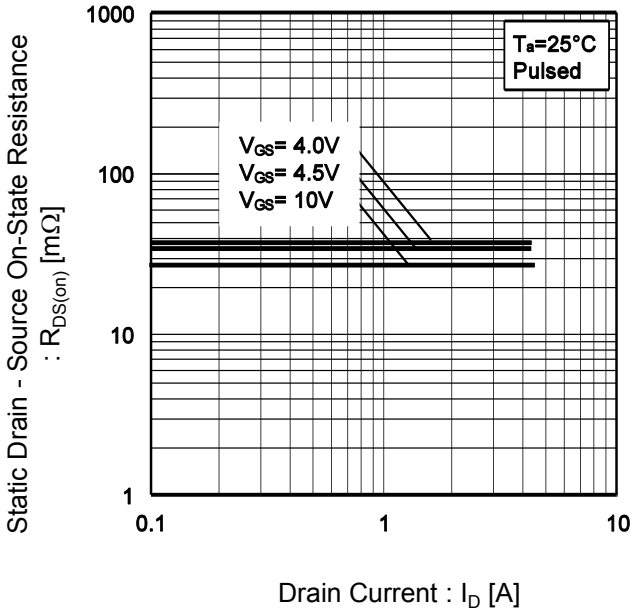


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature

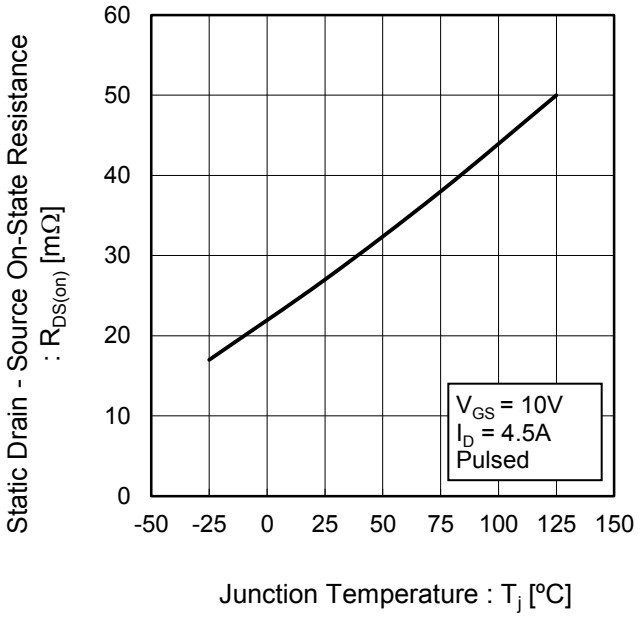


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

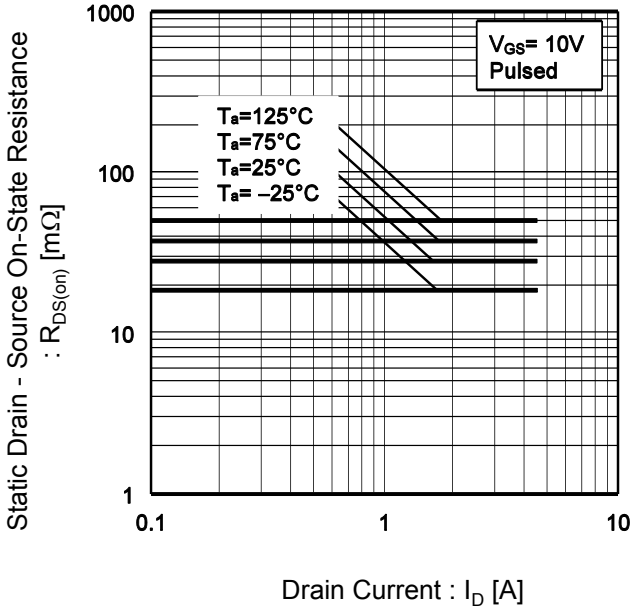
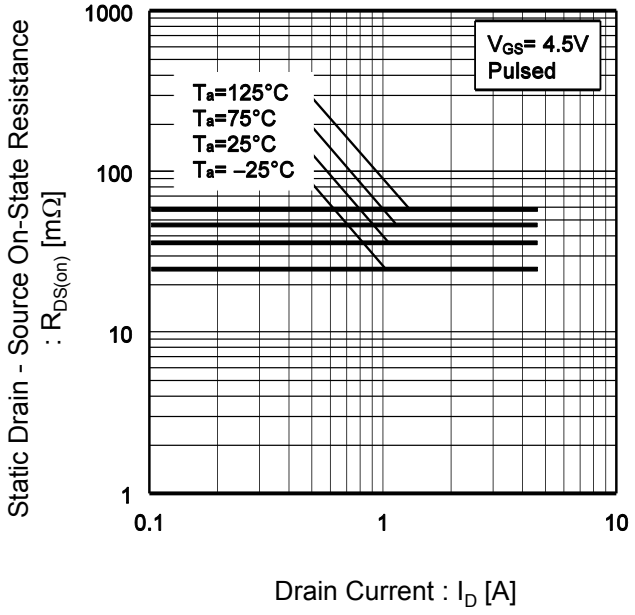


Fig.16 Static Drain-Source On-State Resistance vs. Drain Current(III)



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●Electrical characteristic curves

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

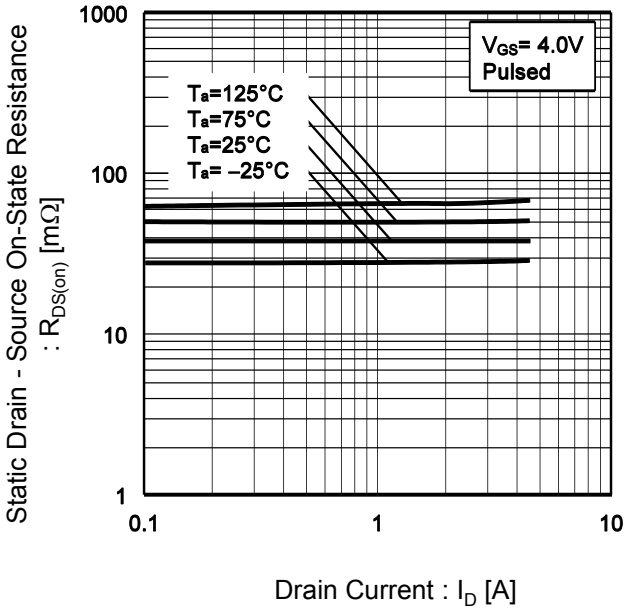


Fig.18 Typical Capacitance vs. Drain - Source Voltage

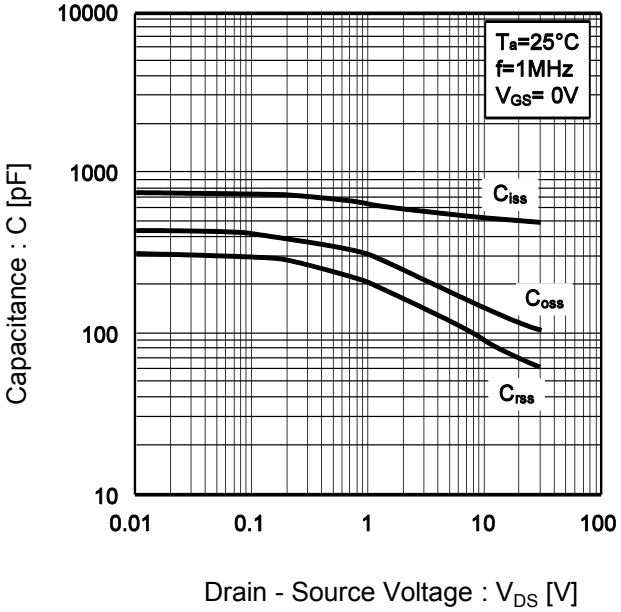


Fig.19 Switching Characteristics

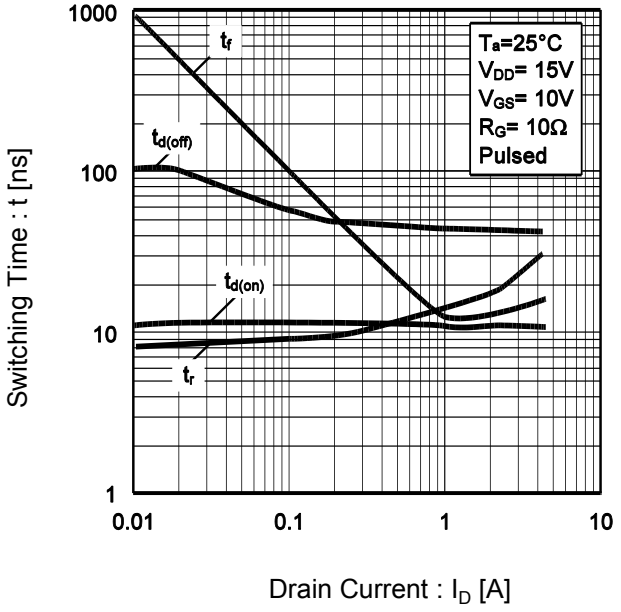
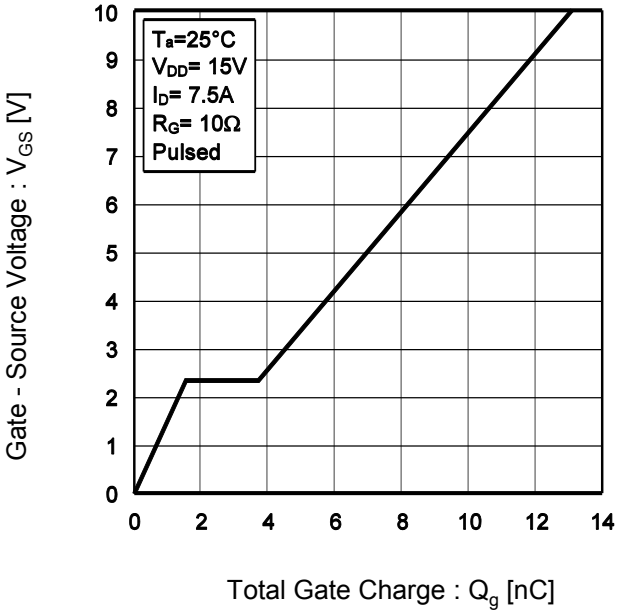


Fig.20 Dynamic Input Characteristics

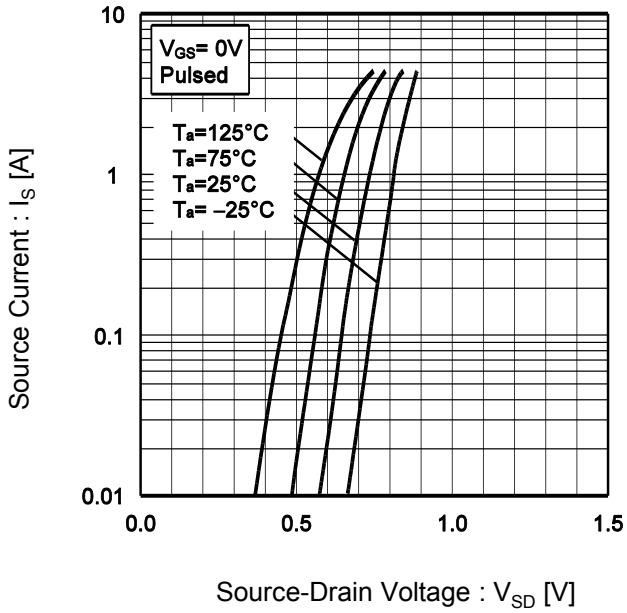


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●Electrical characteristic curves

Fig.21 Source Current
vs. Source Drain Voltage



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●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

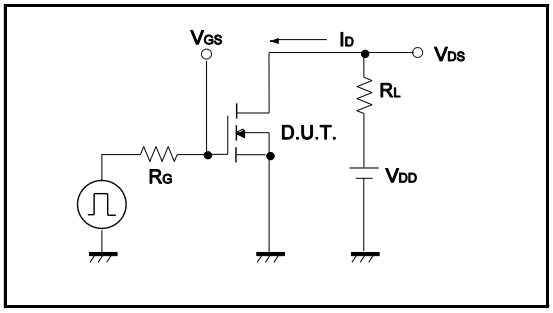


Fig.1-2 Switching Waveforms

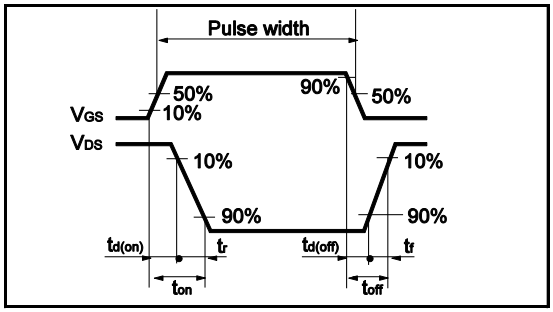


Fig.2-1 Gate Charge Measurement Circuit

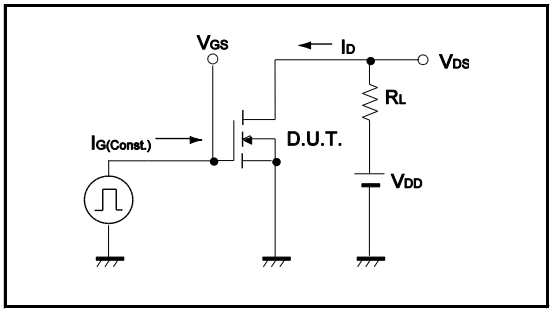
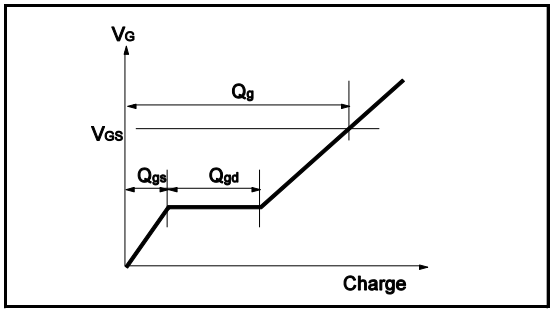


Fig.2-2 Gate Charge Waveform

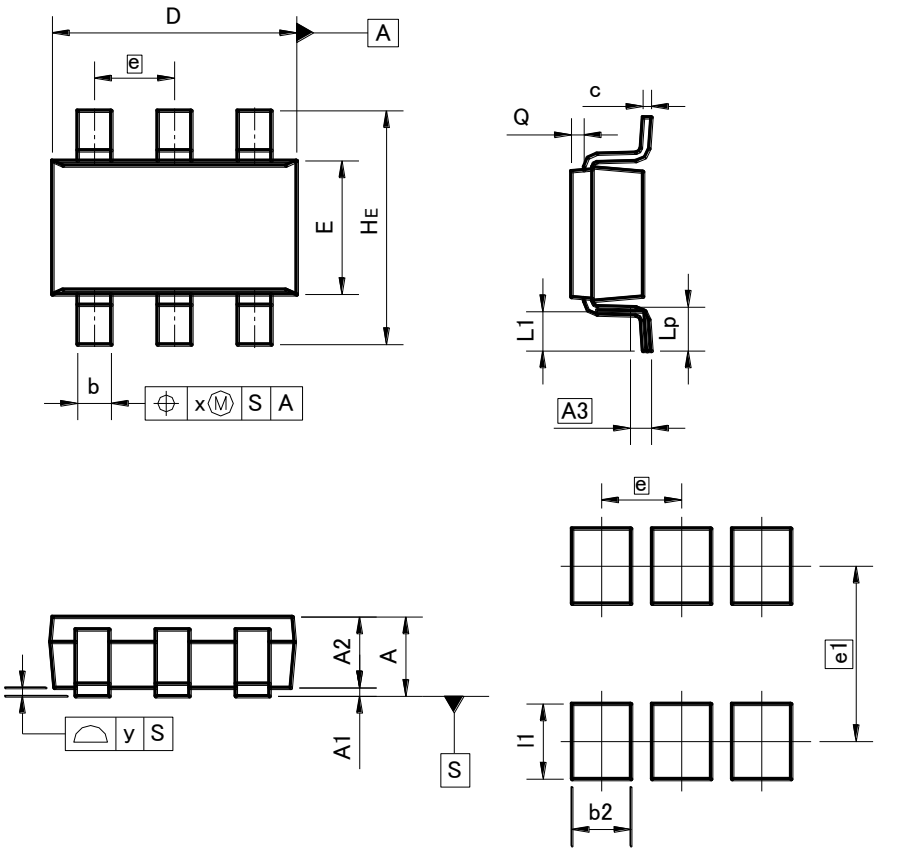


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●**Dimensions** (Unit : mm)

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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