RT1A045AP

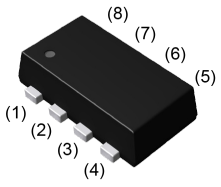
Pch -12V -4.5A Power MOSFET

Datasheet

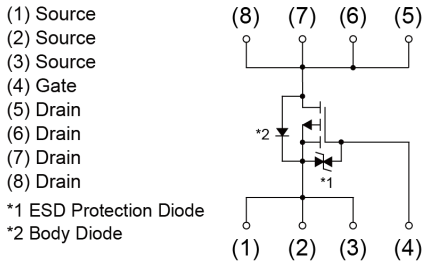
V_{DSS}	-12V
$R_{DS(on)}$(Max.)	30mΩ
I_D	±4.5A
P_D	1.25W

●Outline

TSST8



●Inner circuit



●Features

1) Low on - resistance.
2) Built-in G-S Protection Diode.
3) Small Surface Mount Package (TSST8).
4) Pb-free lead plating ; RoHS compliant

●Application

DC/DC converters

●Packaging specifications

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

●Absolute maximum ratings (T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-12	V
Continuous drain current	I_D	±4.5	A
Pulsed drain current	$I_{D,pulse}$ *2	±18	A
Gate - Source voltage	V_{GSS}	0 to -8	V
Power dissipation	P_D *3	1.25	W
	P_D *4	0.65	W
Junction temperature	T_j	150	℃
Range of storage temperature	T_{stg}	-55 to +150	℃

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●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA} *3	-	-	100	℃/W
		-	-	192	℃/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℃	-	-12	-	mV/℃
Zero gate voltage drain current	I_{DSS}	V_{DS} = -12V, V_{GS} = 0V	-	-	-10	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = -8V, 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℃	-	2.6	-	mV/℃
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = -4.5V, I_D = -4.5A	-	22	30	mΩ
		V_{GS} = -2.5V, I_D = -2.2A	-	28	39	
		V_{GS} = -1.8V, I_D = -2.2A	-	38	57	
		V_{GS} = -1.5V, I_D = 0.9A	-	50	100	
		V_{GS} = -4.5V, I_D = -4.5A, T_j = 125℃	-	34	48	
Gate input resistance	R_G	f = 1MHz, open drain	-	20	-	Ω
Forward Transfer Admittance	$\|Y_{fs}\|$ *5	V_{DS} = -6V, I_D = -4.5A	5.5	11	-	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(20×20×0.8mm)

*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	-	4200	-	pF
Output capacitance	C_{oss}	V_{DS} = -6V	-	350	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	330	-	
Turn - on delay time	$t_{d(on)}$ *5	V_{DD} ≃ -6V,V_{GS} = -4.5V	-	16	-	ns
Rise time	t_r *5	I_D = -2.2A	-	60	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L ≃ 2.7Ω	-	400	-	
Fall time	t_f *5	R_G = 10Ω	-	150	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	V_{DD} ≃ -6V, I_D = -4.5A V_{GS} = -4.5V	-	40	-	nC
Gate - Source charge	Q_{gs} *5		-	6.5	-	
Gate - Drain charge	Q_{gd} *5		-	6.0	-	

●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℃	-	-	-1	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = -4.5A	-	-	-1.2	V

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

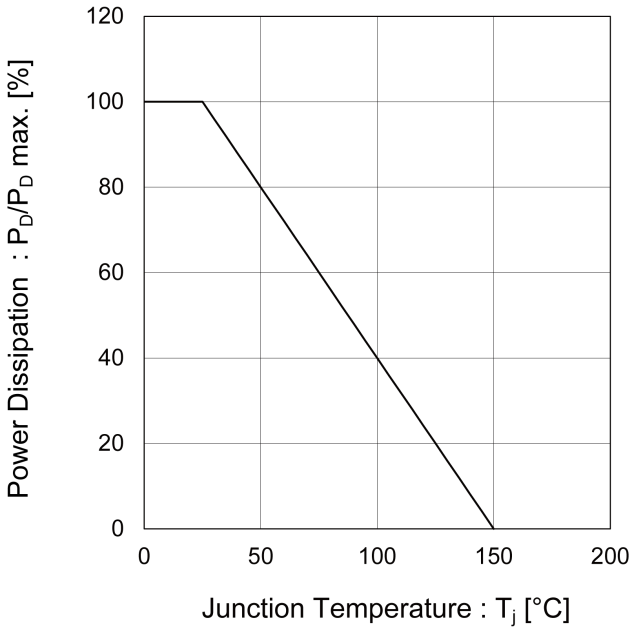


Fig.2 Maximum Safe Operating Area

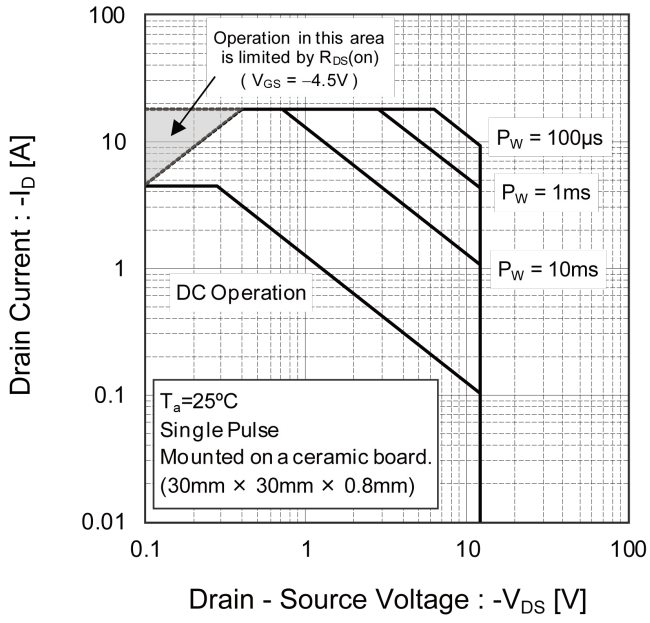


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

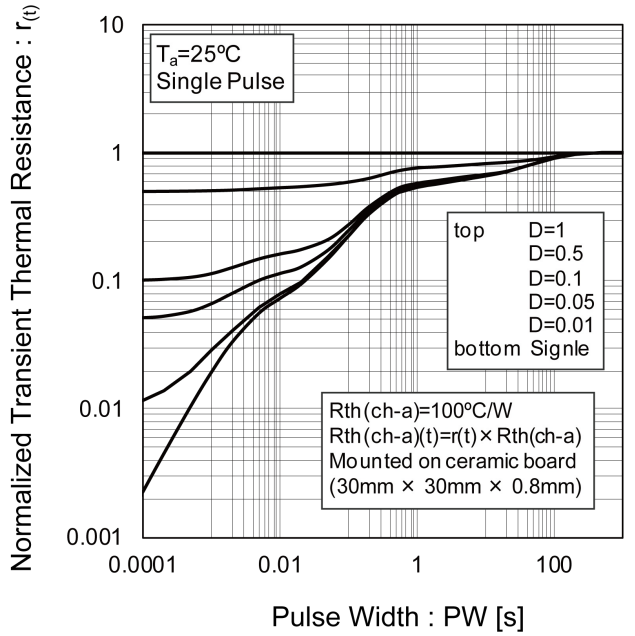
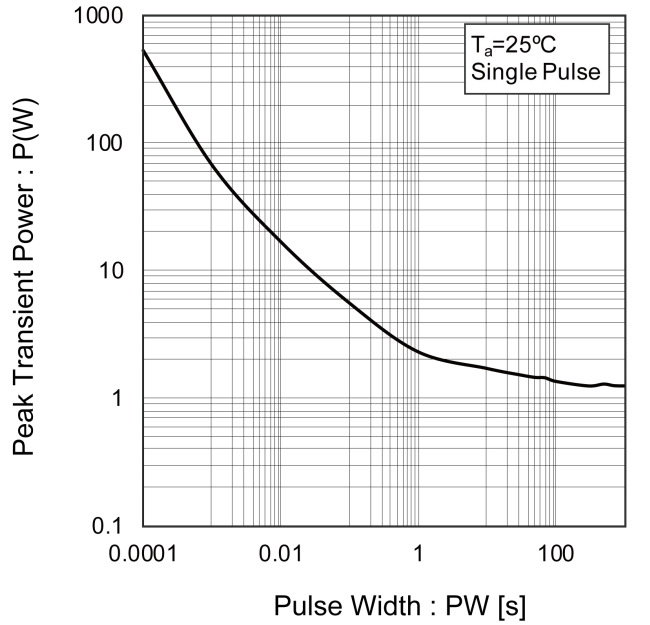


Fig.4 Single Pulse Maximum Power dissipation



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●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

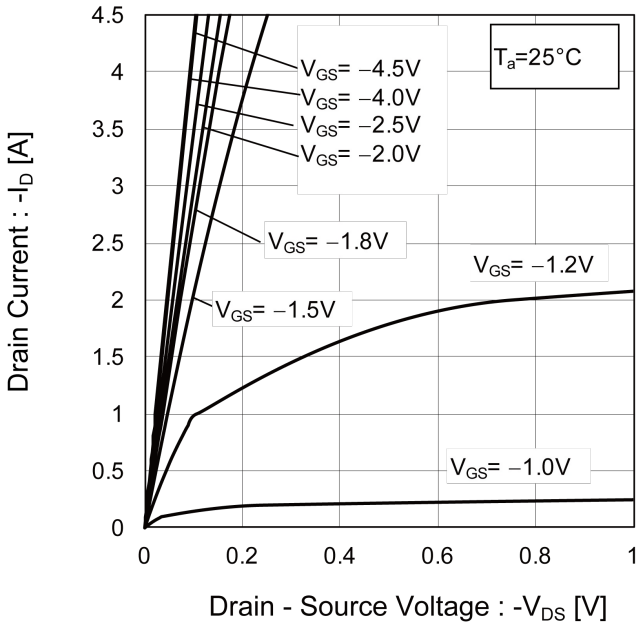
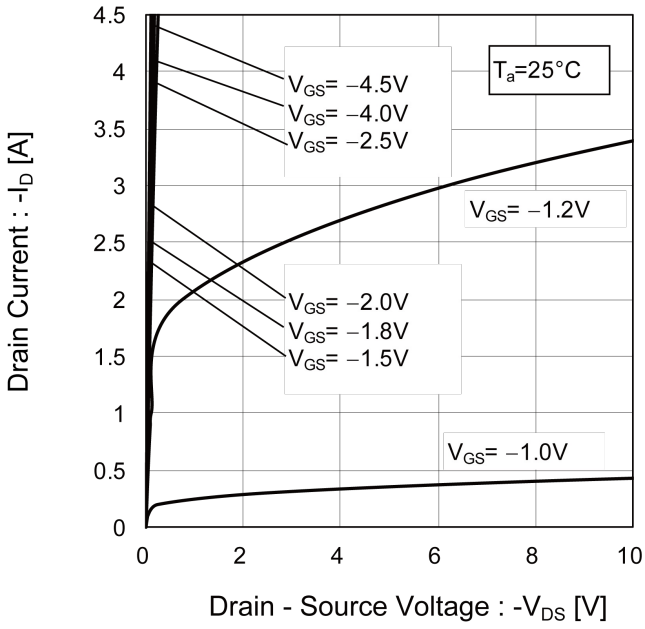


Fig.6 Typical Output Characteristics(II)



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●Electrical characteristic curves

Fig.7 Breakdown Voltage vs. Junction Temperature

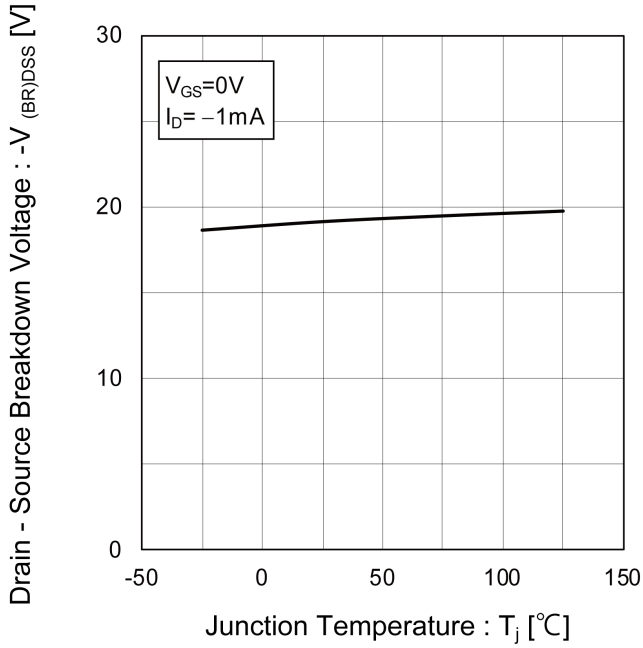


Fig.8 Typical Transfer Characteristics

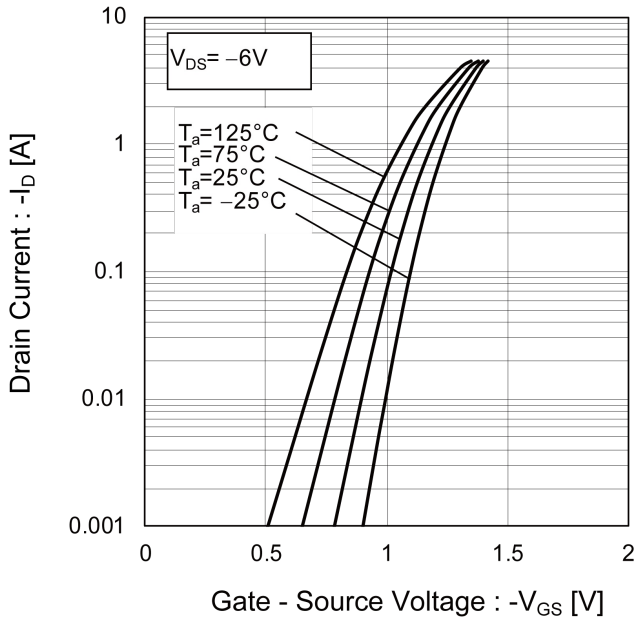


Fig.9 Gate Threshold Voltage vs. Junction Temperature

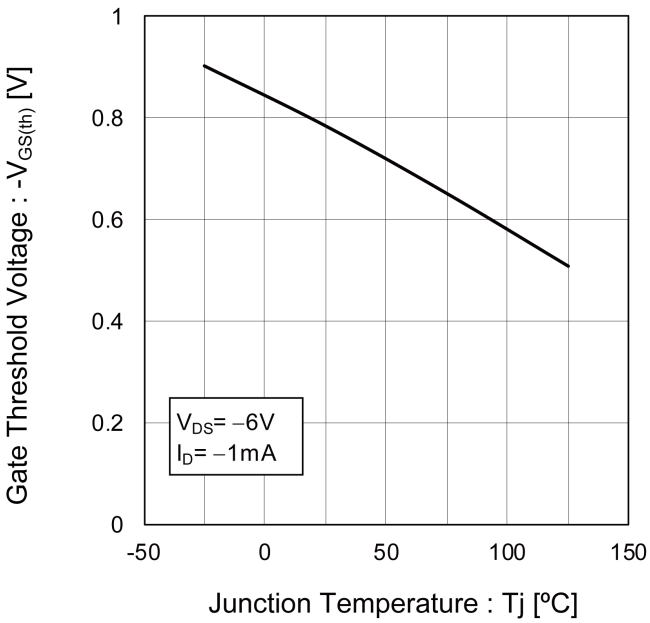
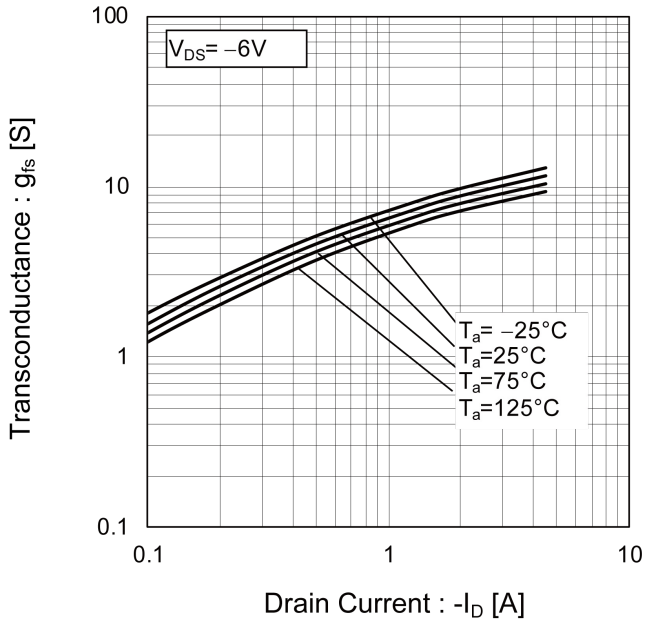


Fig.10 Transconductance vs. Drain Current



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●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

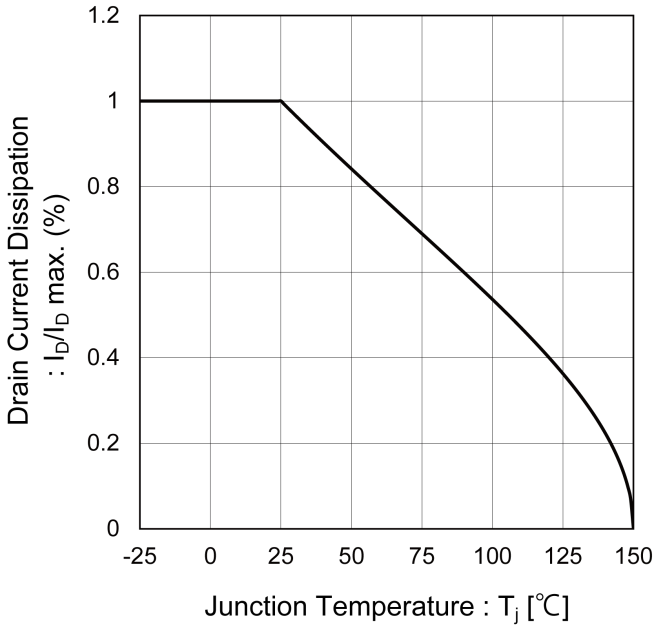


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

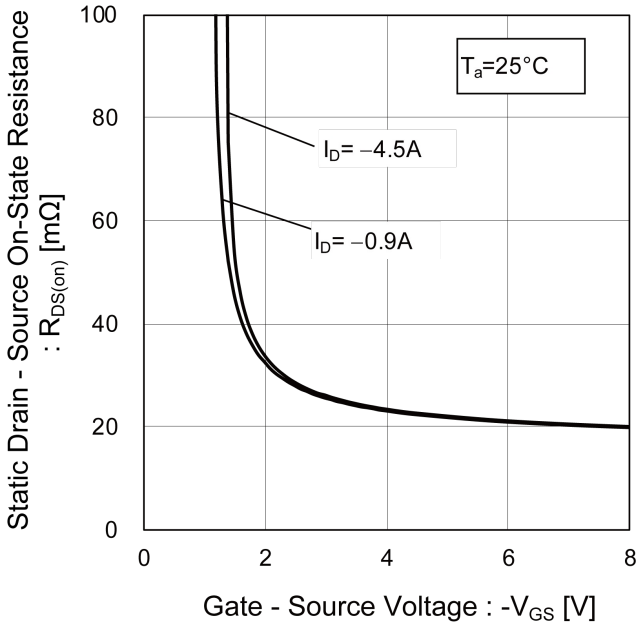


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

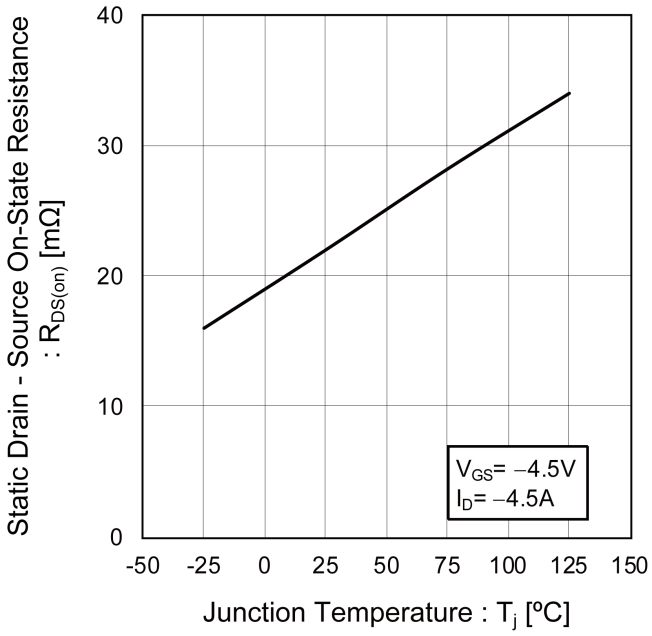
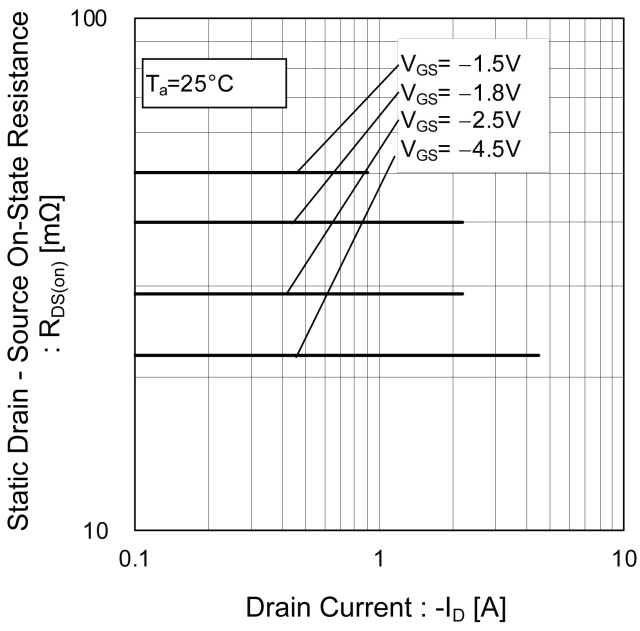


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(I)



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●Electrical characteristic curves

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

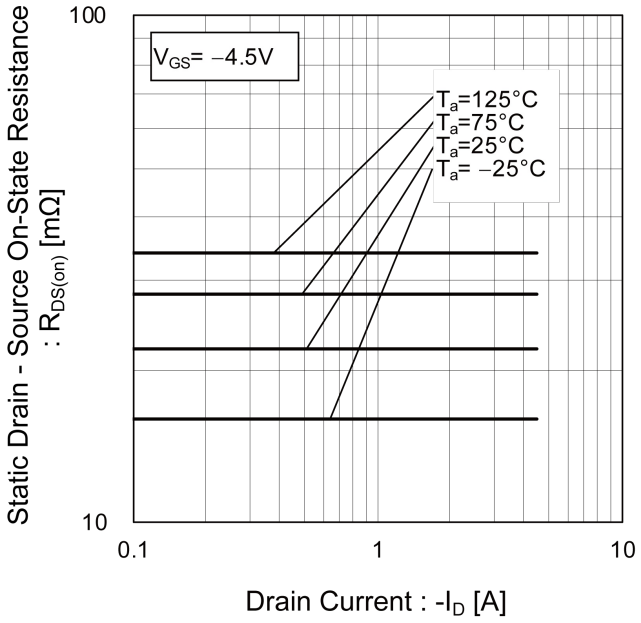


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

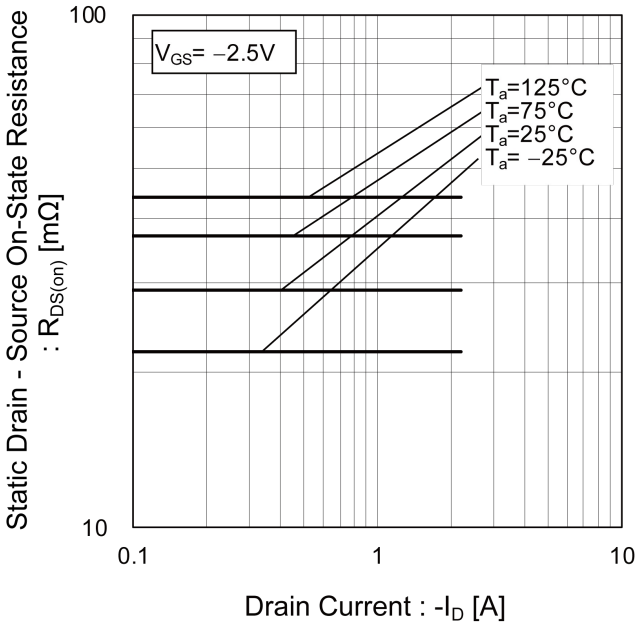
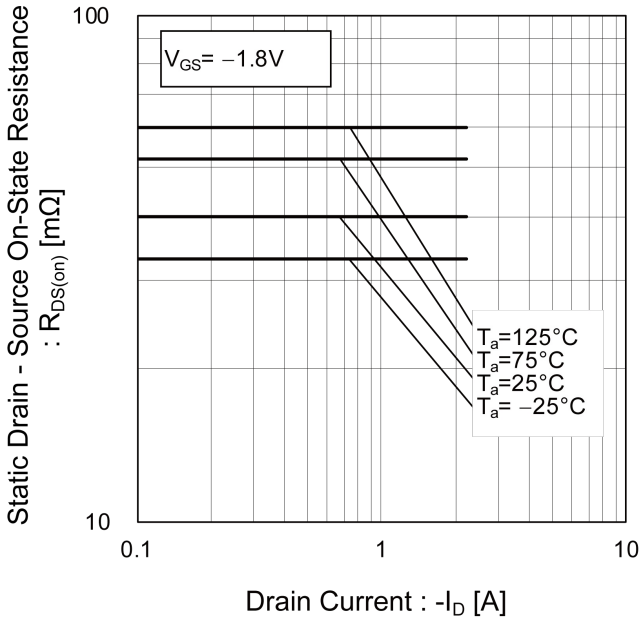


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)



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●Electrical characteristic curves

Fig.18 Typical Capacitance vs. Drain - Source Voltage

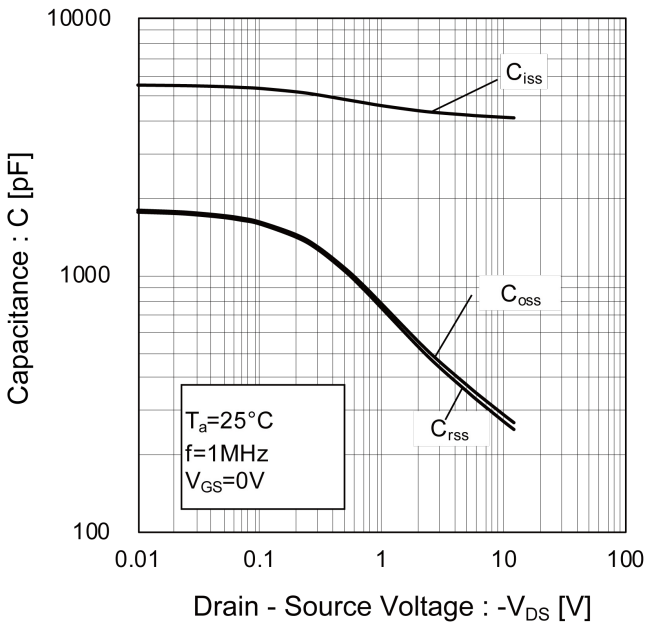


Fig.19 Switching Characteristics

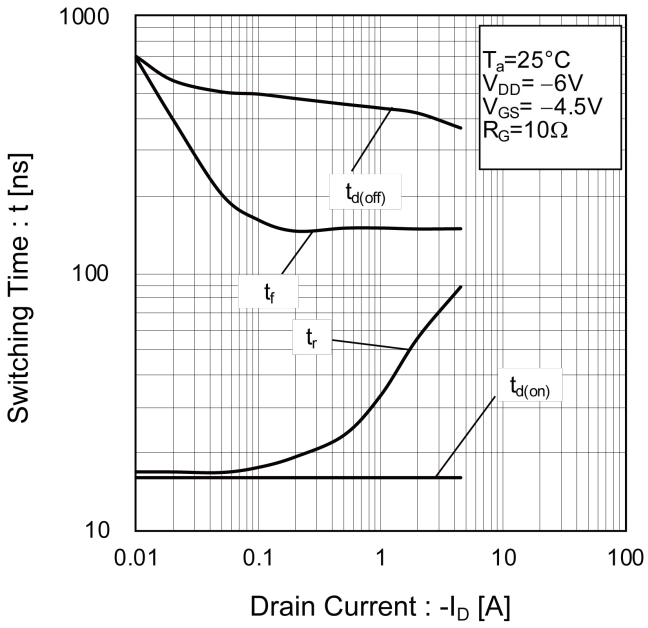


Fig.20 Dynamic Input Characteristics

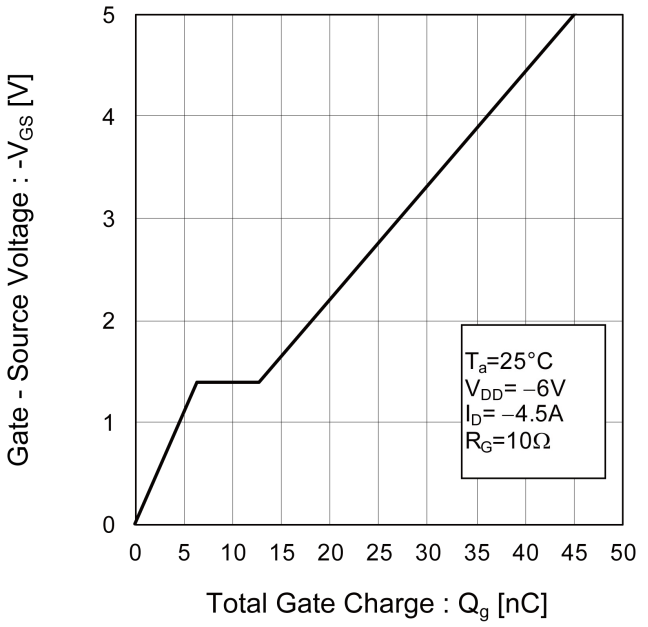
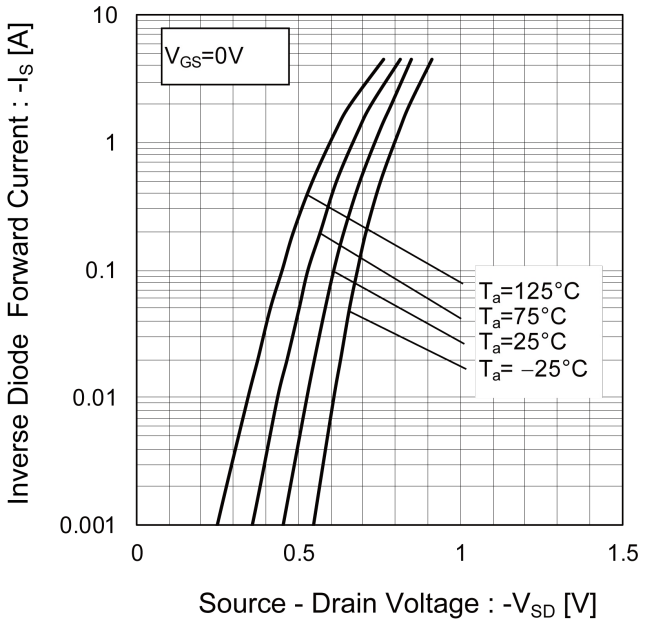


Fig.21 Source Current vs. Source Drain Voltage



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●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

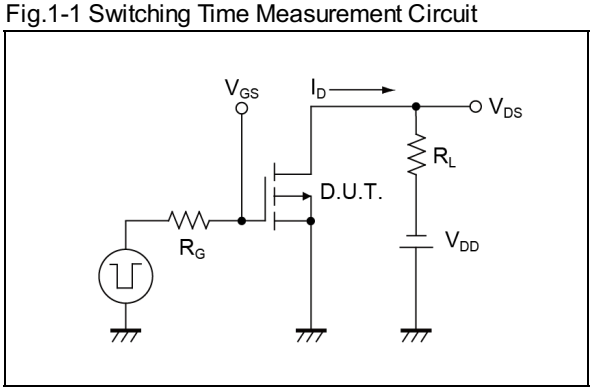


Fig.1-2 Switching Waveforms

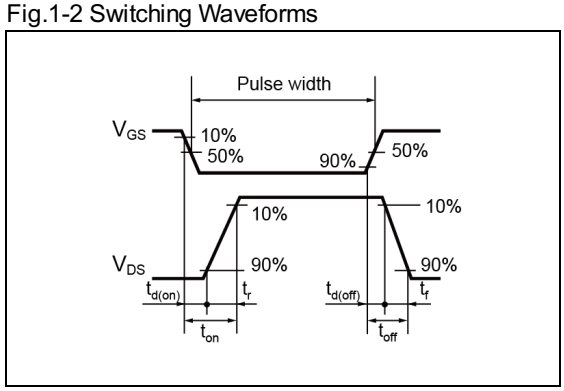


Fig.2-1 Gate Charge Measurement Circuit

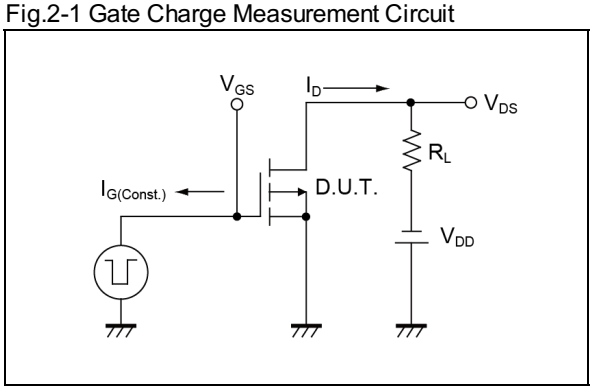
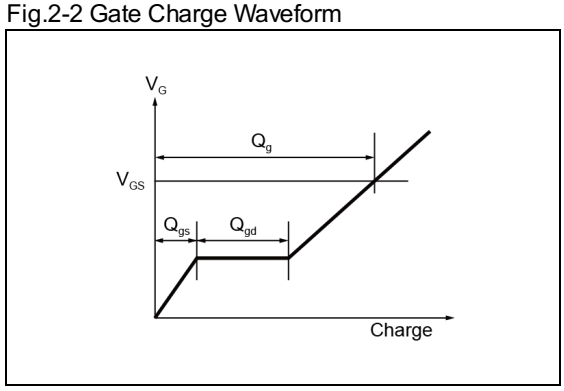


Fig.2-2 Gate Charge Waveform



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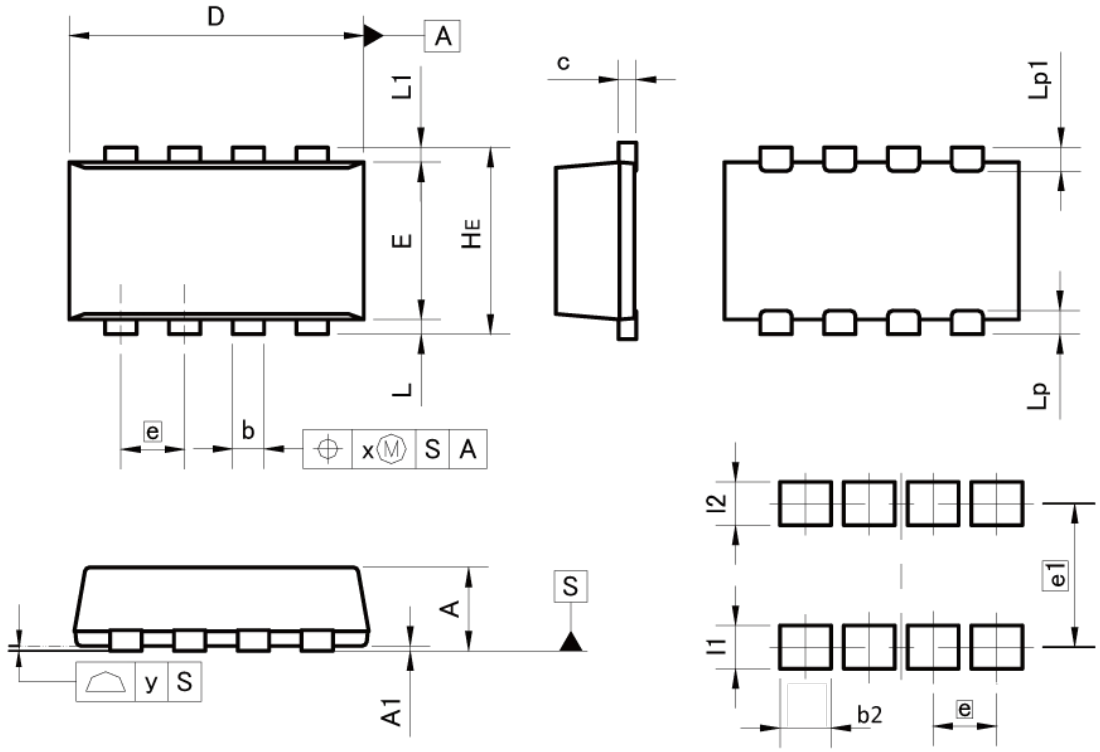
●Dimensions

TSST8



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	0.22	0.42	0.009	0.017
c	0.12	0.22	0.005	0.009
D	2.90	3.10	0.114	0.122
E	1.50	1.70	0.059	0.067
e	0.65		0.026	
HE	1.80	2.00	0.071	0.079
L	0.05	0.25	0.002	0.010
L1	0.05	0.25	0.002	0.010
Lp	0.15	0.34	0.006	0.013
Lp1	0.15	0.34	0.006	0.013
x	–	0.10	–	0.004
y	–	0.10	–	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	–	0.52	–	0.020
e1	1.46		0.057	
l1	–	0.44	–	0.017
l2	–	0.44	–	0.017

Dimension in mm/inches

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