

V_{DSS}	-30V
$R_{DS(on)}$ (Max.)	39m Ω
I_D	-5A
P_D	1.5W

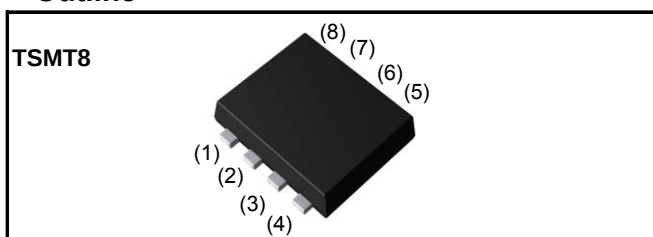
●Features

- 1) Low on - resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TSMT8).
- 4) Pb-free lead plating ; RoHS compliant

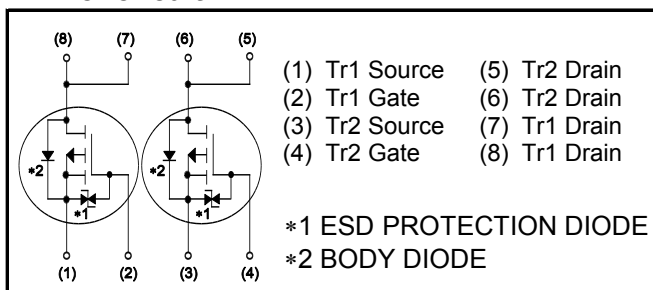
●Application

DC/DC converters

●Outline



●Inner circuit



●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3,000
	Taping code	TR
	Marking	J05

●Absolute maximum ratings($T_a = 25^\circ\text{C}$) <It is the same ratings for the Tr1 and Tr2>

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-30	V
Continuous drain current	I_D^{*1}	± 5	A
Pulsed drain current	$I_{D,pulse}^{*2}$	± 20	A
Gate - Source voltage	V_{GSS}	± 20	V
Power dissipation	P_D^{*3}	1.25	W / total
		0.9	W / element
	P_D^{*4}	0.6	W / total
Junction temperature	T_j	150	$^\circ\text{C}$
Range of storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*3}	-	-	83.3	°C/W
	R_{thJA}^{*4}	-	-	227	°C/W

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

<It is the same characteristics for the Tr1 and Tr2>

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	-	-25	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -30V, V_{GS} = 0V$	-	-	-1	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	±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	-	3.9	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = -10V, I_D = -5A$	-	28	39	mΩ
		$V_{GS} = -4.5V, I_D = -2.5A$	-	40	56	
		$V_{GS} = -4.0V, I_D = -2.5A$	-	45	63	
		$V_{GS} = -10V, I_D = -5A, T_j = 125^\circ\text{C}$	-	45	63	
Gate input resistance	R_G	$f = 1MHz, \text{open drain}$	-	15	-	Ω
Transconductance	g_{fs}^{*5}	$V_{DS} = -10V, I_D = -5A$	3.0	8.5	-	S

*1 Limited only by maximum temperature allowed.

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

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

*4 Mounted on a FR4 (20×20×0.8mm)

*5 Pulsed

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

<It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	1100	-	pF
Output capacitance	C_{oss}	$V_{DS} = -10V$	-	150	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	130	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx -15V, V_{GS} = -10V$	-	9	-	ns
Rise time	t_r^{*5}	$I_D = -2.5A$	-	40	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 6\Omega$	-	90	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	55	-	

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

<It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx -15V, I_D = -5A$ $V_{GS} = -5V$	-	10	-	nC
		$V_{DD} \approx -15V, I_D = -5A$ $V_{GS} = -10V$	-	19	-	
Gate - Source charge	Q_{gs}^{*5}	$V_{DD} \approx -15V, I_D = -5A$	-	3.6	-	
Gate - Drain charge	Q_{gd}^{*5}	$V_{GS} = -5V$	-	3.0	-	

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

<It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S^{*1}	$T_a = 25^\circ\text{C}$	-	-	-1	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0V, I_S = -5A$	-	-	-1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

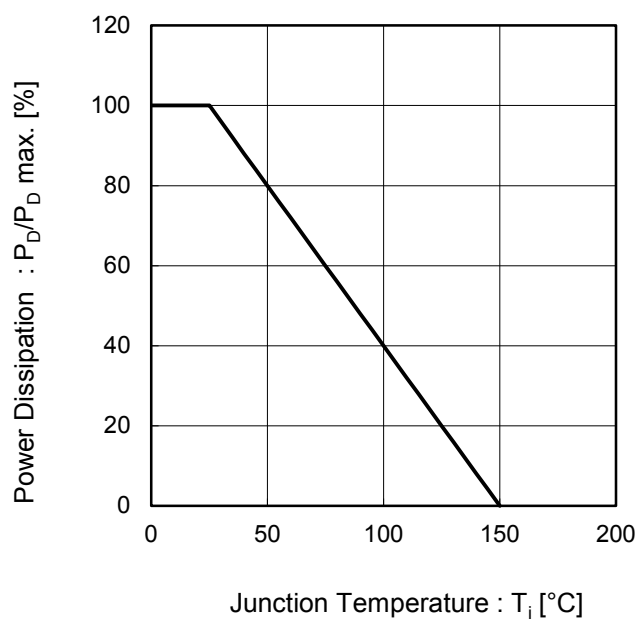


Fig.2 Maximum Safe Operating Area

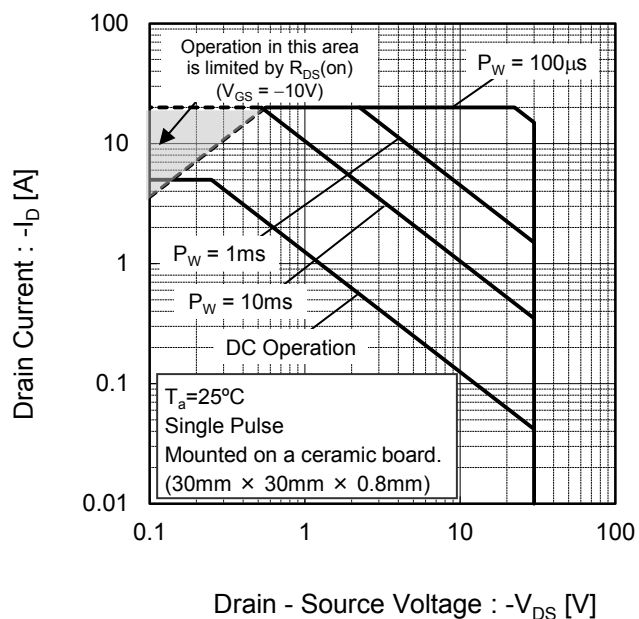


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

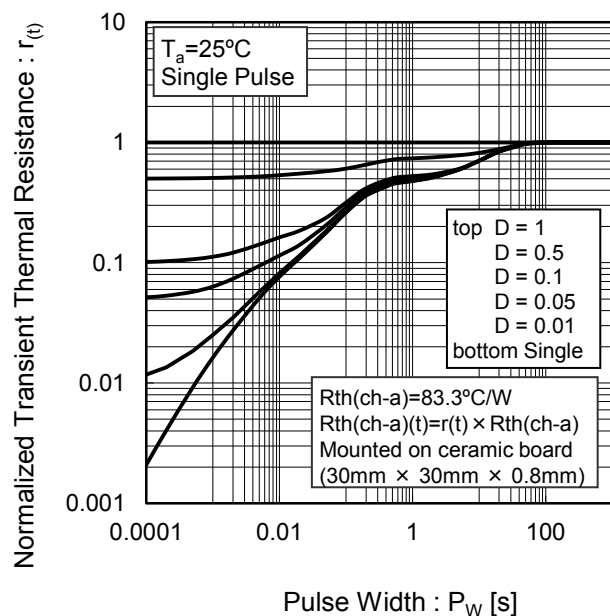
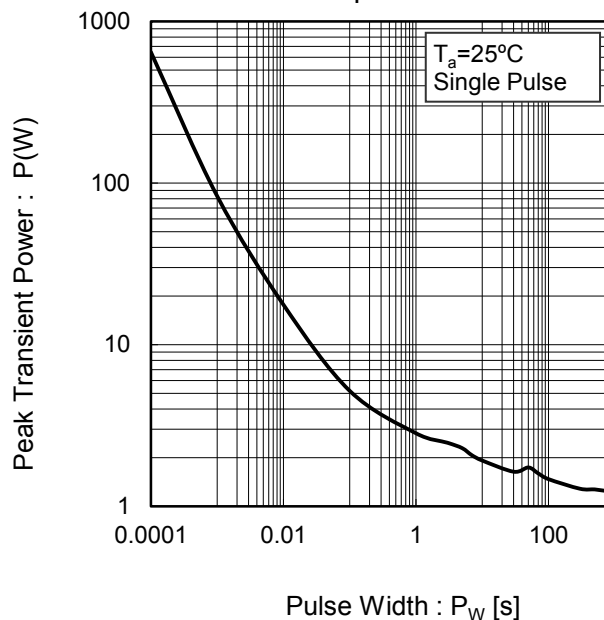


Fig.4 Single Pulse Maximum Power dissipation



Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

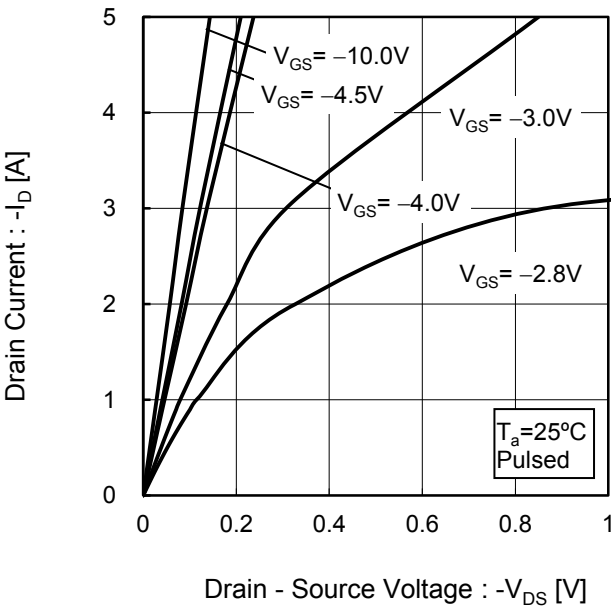


Fig.6 Typical Output Characteristics(II)

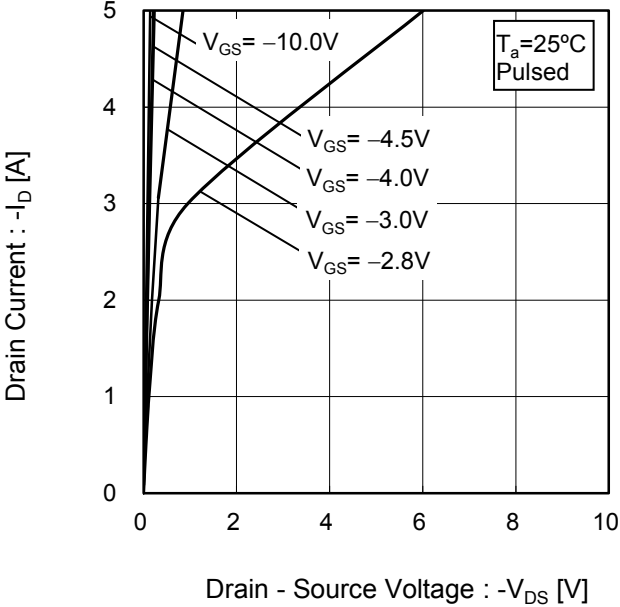


Fig.7 Breakdown Voltage vs. Junction Temperature

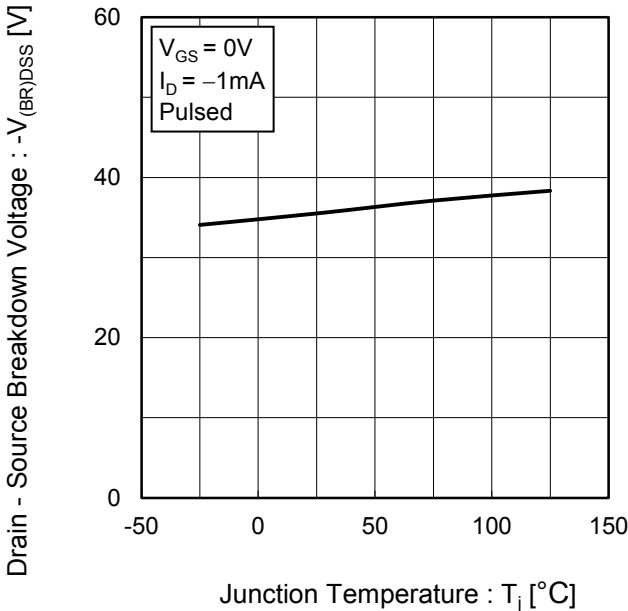
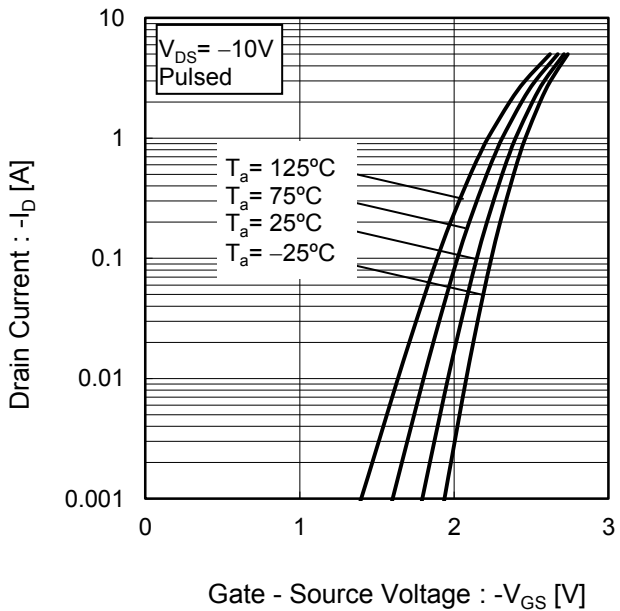


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage
vs. Junction Temperature

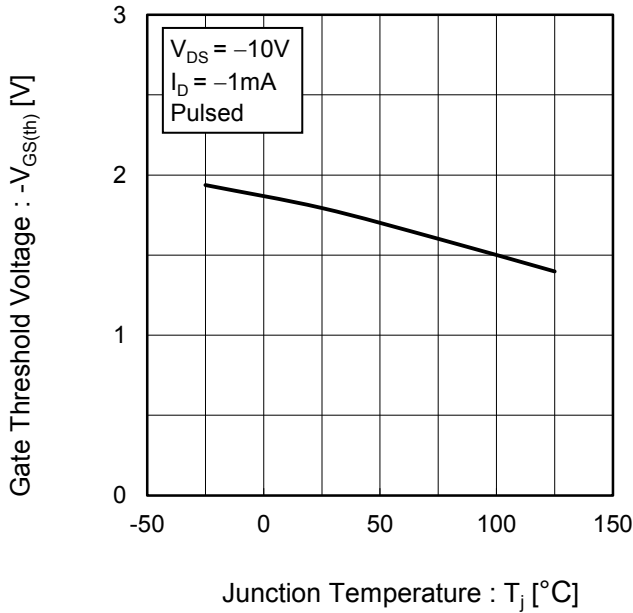


Fig.10 Transconductance vs. Drain Current

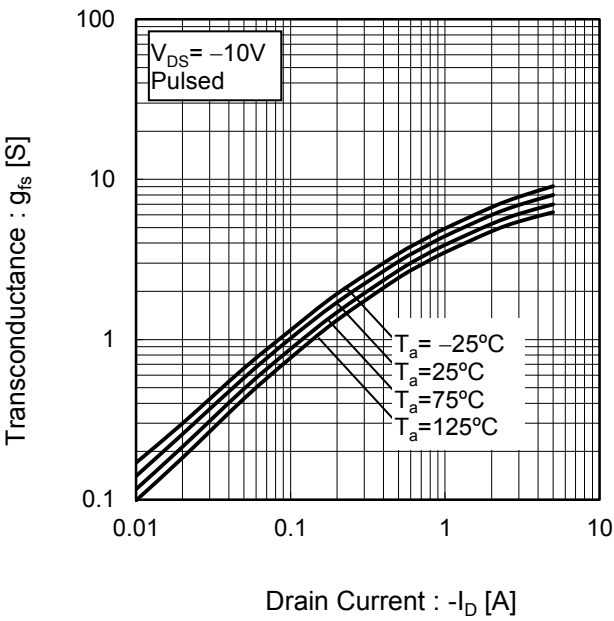


Fig.11 Drain CurrentDerating Curve

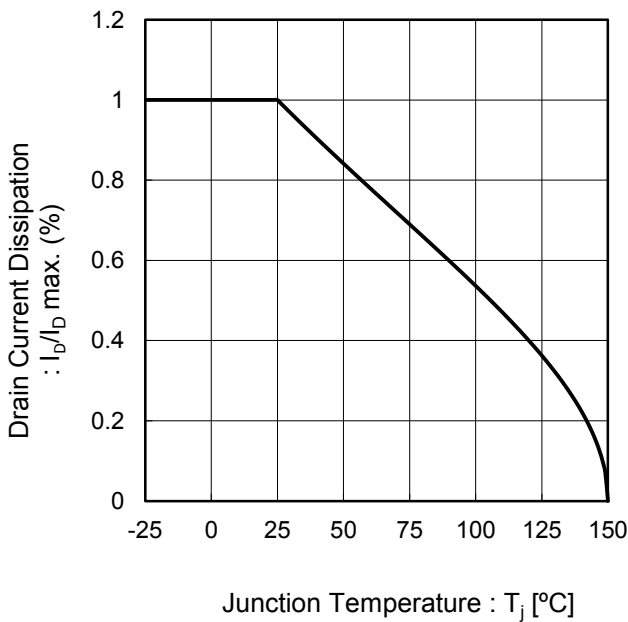
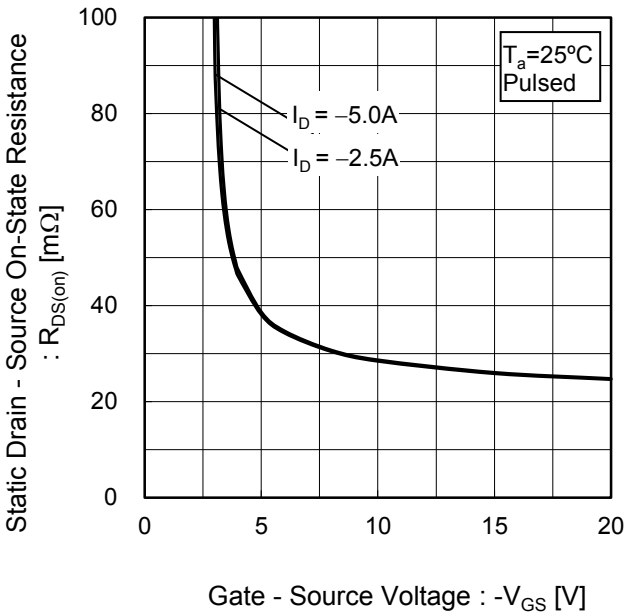


Fig.12 Static Drain - Source On - State
Resistance vs. Gate Source Voltage



●Electrical characteristic curves

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

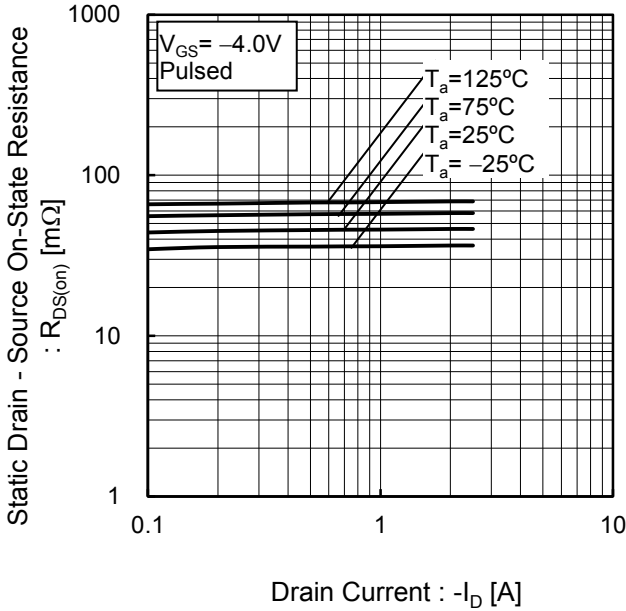


Fig.18 Typical Capacitance vs. Drain - Source Voltage

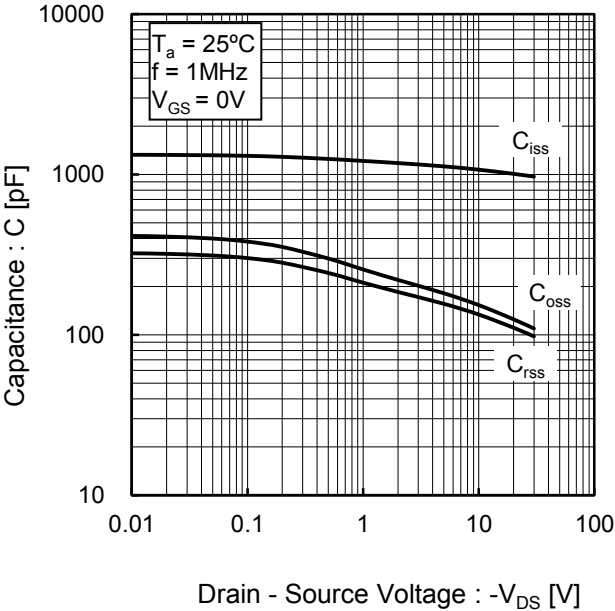


Fig.19 Switching Characteristics

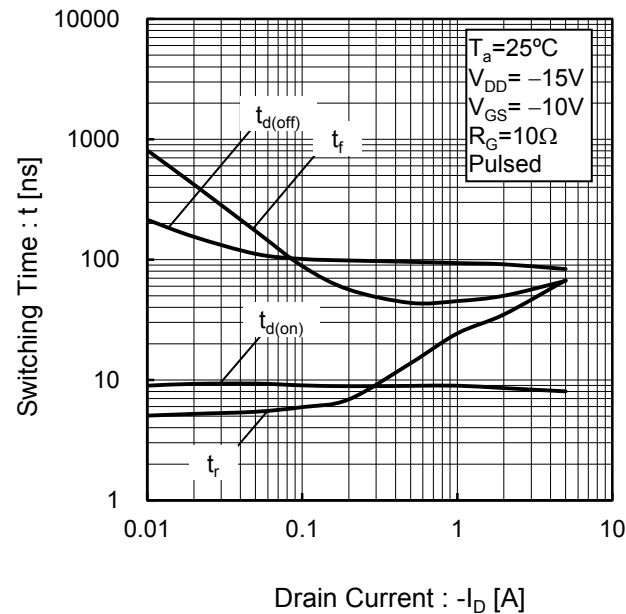
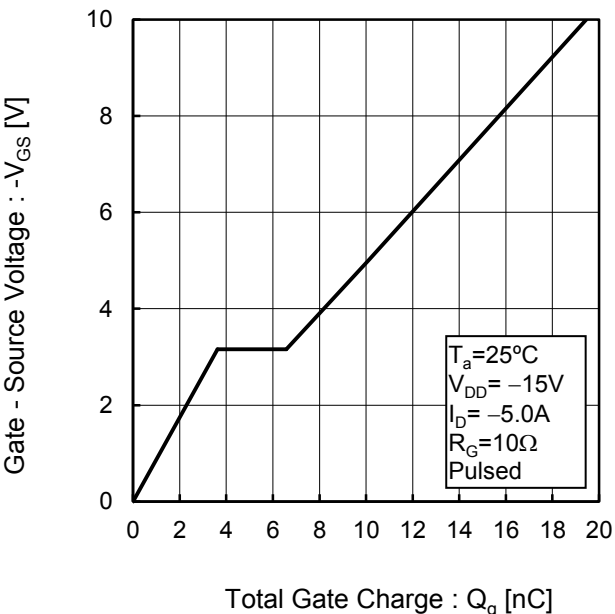
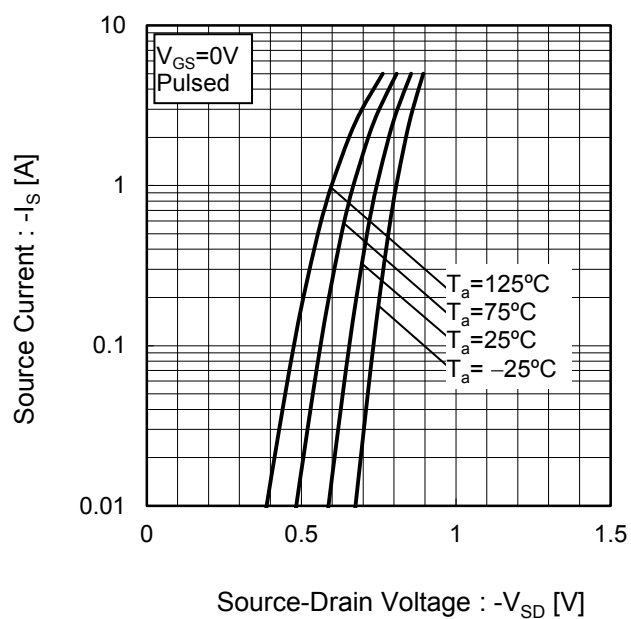


Fig.20 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.21 Source Current
vs. Source Drain Voltage

●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

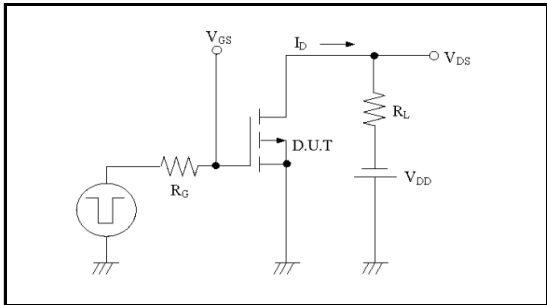


Fig.1-2 Switching Waveforms

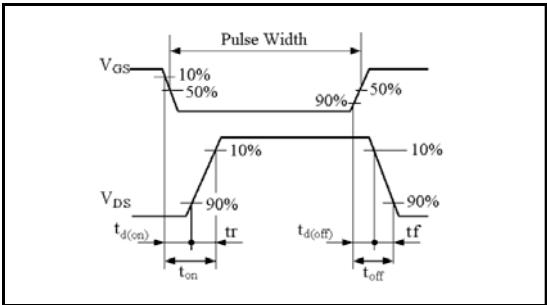


Fig.2-1 Gate Charge Measurement Circuit

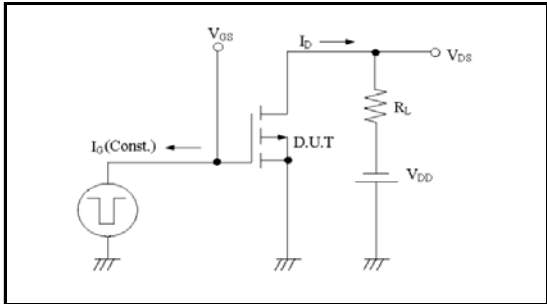
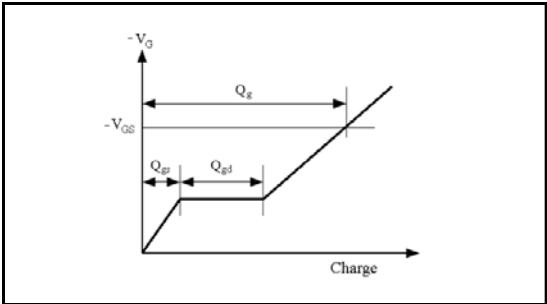
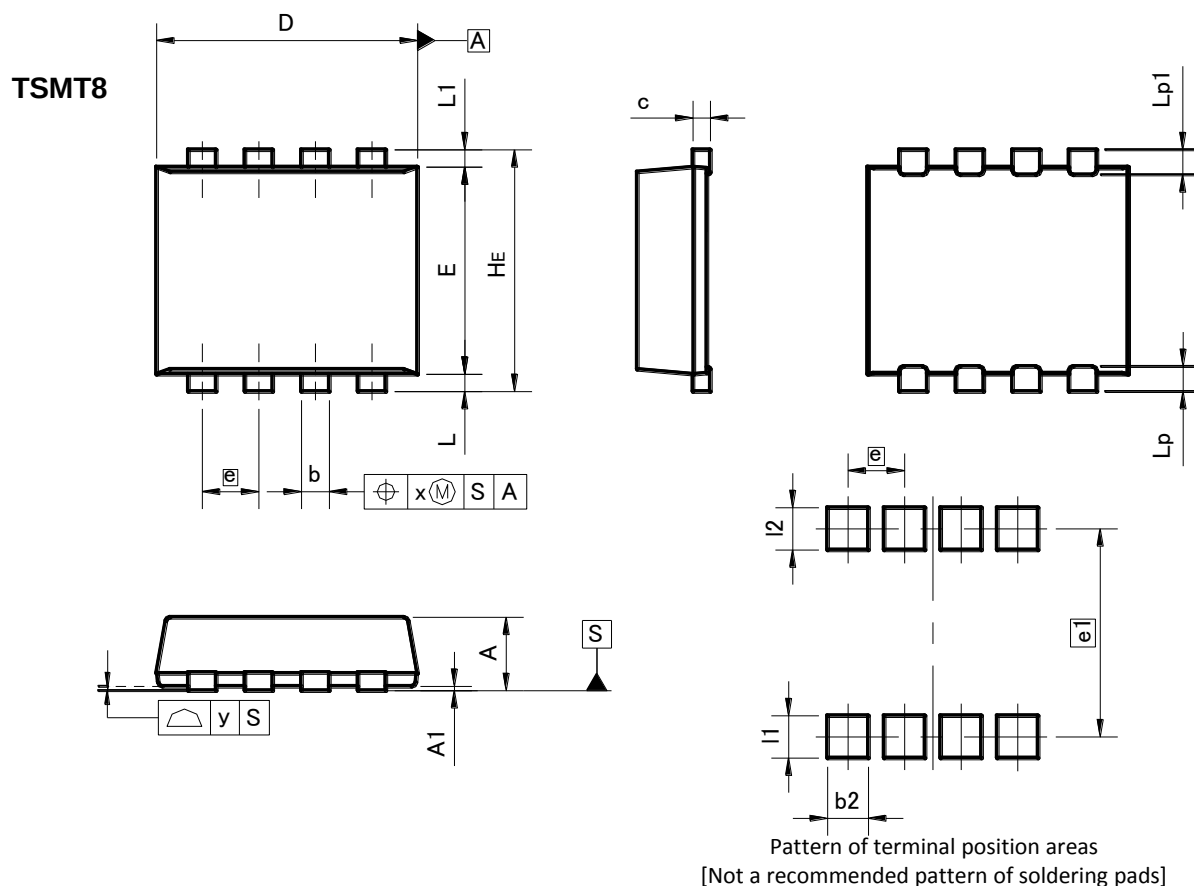


Fig.2-2 Gate Charge Waveform



●Dimensions (Unit : mm)



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

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