

V_{DSS}	20V
$R_{DS(on)}$ (Max.)	105mΩ
I_D	2A
P_D	0.8W

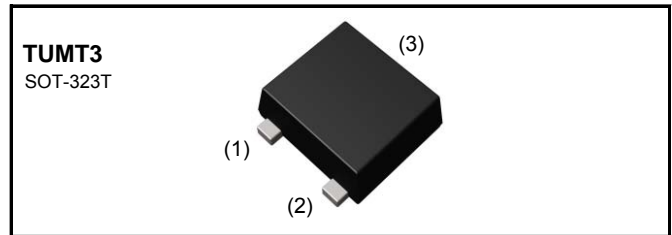
●Features

- 1) Low on - resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TUMT3).
- 4) Pb-free lead plating ; RoHS compliant

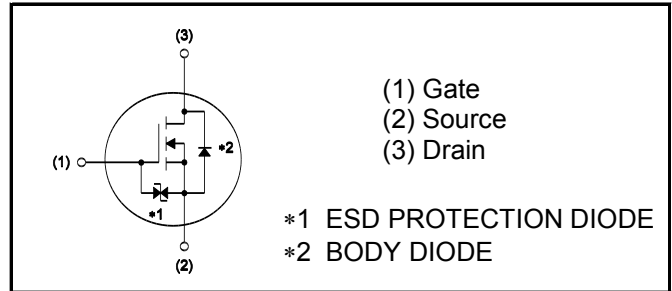
●Application

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	TL
	Marking	XK

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

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	20	V
Continuous drain current	I_D^{*1}	±2	A
Pulsed drain current	$I_{D,pulse}^{*2}$	±6	A
Gate - Source voltage	V_{GSS}	±10	V
Power dissipation	P_D^{*3}	0.8	W
	P_D^{*4}	0.32	W
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*3}	-	-	156	°C/W
	R_{thJA}^{*4}	-	-	391	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	20	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1mA$ referenced to 25°C	-	20	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 20V, V_{GS} = 0V$	-	-	1	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 10V, V_{DS} = 0V$	-	-	± 10	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	0.3	-	1.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{(GS)th}}{\Delta T_j}$	$I_D = 1mA$ referenced to 25°C	-	-1.9	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 4.5V, I_D = 2A$	-	75	105	m Ω
		$V_{GS} = 2.5V, I_D = 2A$	-	95	135	
		$V_{GS} = 1.8V, I_D = 1A$	-	130	185	
		$V_{GS} = 1.5V, I_D = 0.4A$	-	170	240	
		$V_{GS} = 4.5V, I_D = 2A, T_j = 125^\circ\text{C}$	-	120	170	
Gate input resistance	R_G	$f = 1MHz, \text{open drain}$	-	24	-	Ω
Transconductance	g_{fs}^{*5}	$V_{DS} = 10V, I_D = 2A$	1.8	4.2	-	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 (15×20×0.8mm)

*5 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	180	-	pF
Output capacitance	C_{oss}	$V_{DS} = 10\text{V}$	-	45	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	25	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx 10\text{V}, V_{GS} = 4.5\text{V}$	-	6	-	ns
Rise time	t_r^{*5}	$I_D = 1\text{A}$	-	17	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 10\Omega$	-	30	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	30	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx 10\text{V}, I_D = 2\text{A}$ $V_{GS} = 4.5\text{V}$	-	2.0	-	nC
Gate - Source charge	Q_{gs}^{*5}		-	0.6	-	
Gate - Drain charge	Q_{gd}^{*5}		-	0.4	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S^{*1}	$T_a = 25^\circ\text{C}$	-	-	0.6	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0\text{V}, I_S = 2\text{A}$	-	-	1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

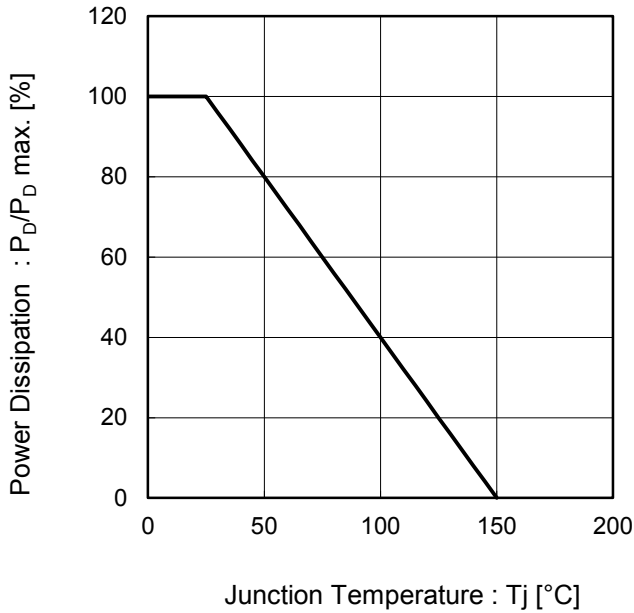


Fig.2 Maximum Safe Operating Area

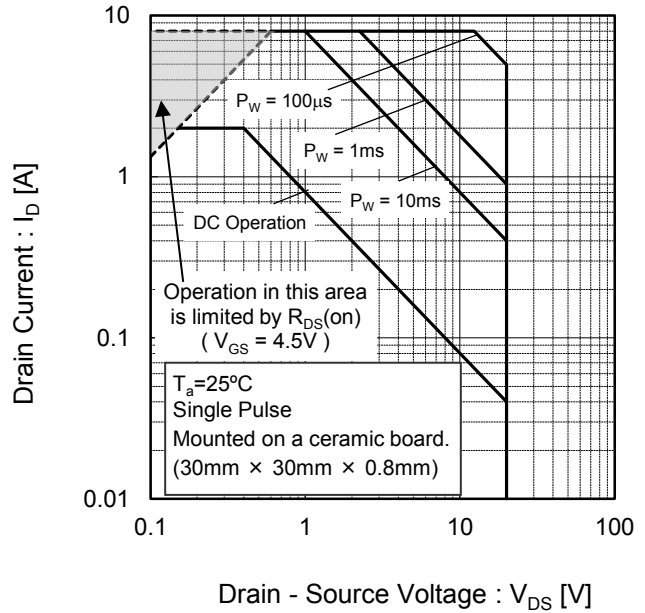


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

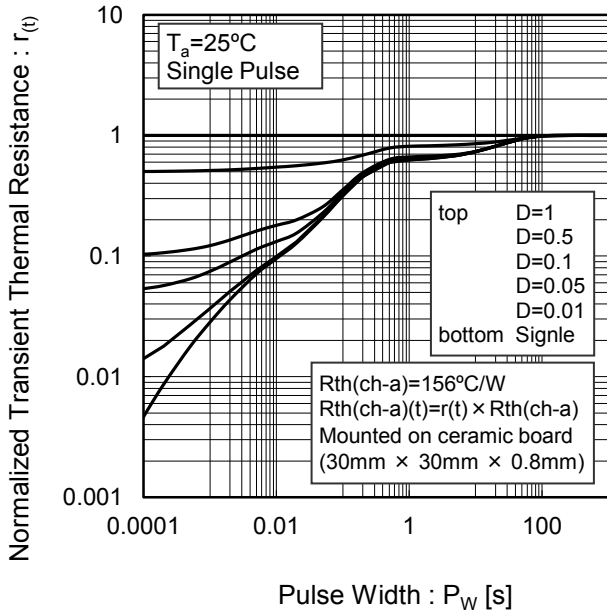
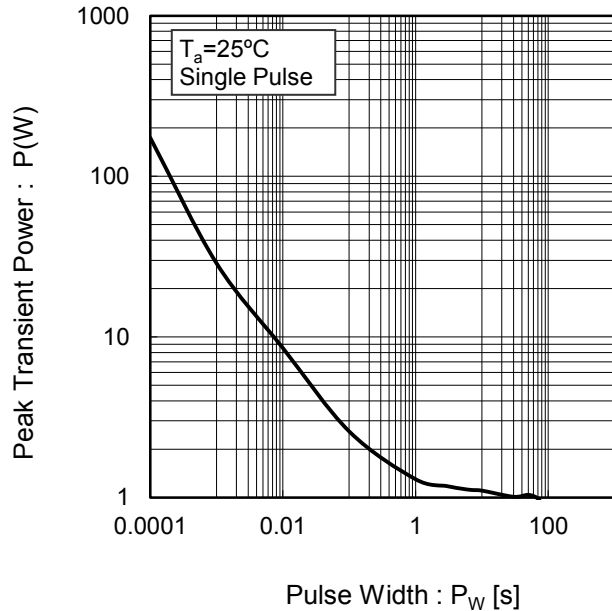


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

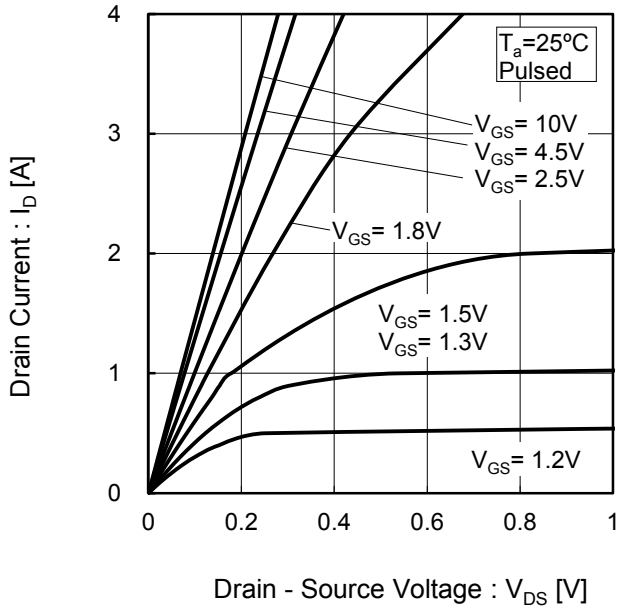


Fig.6 Typical Output Characteristics(II)

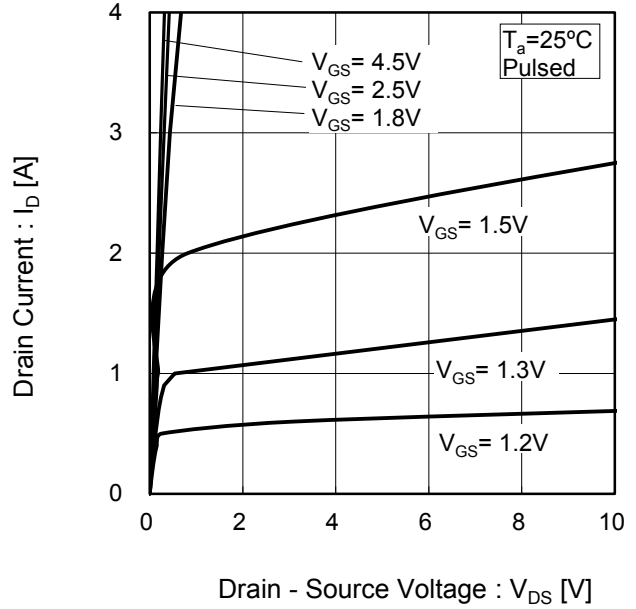


Fig.7 Breakdown Voltage vs. Junction Temperature

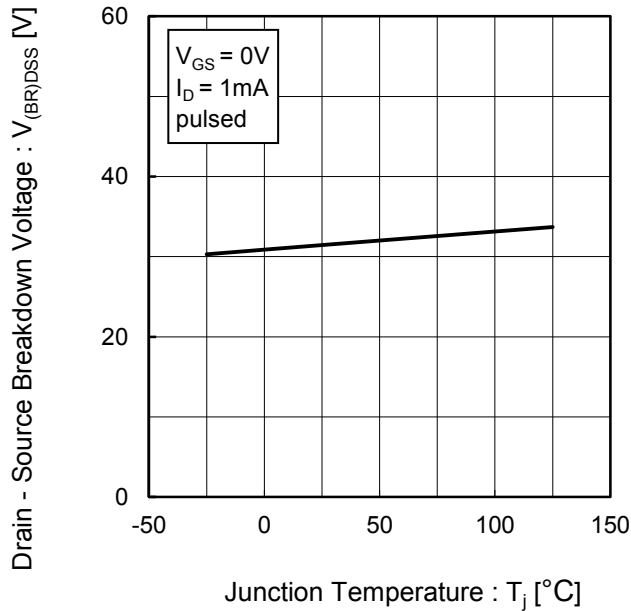
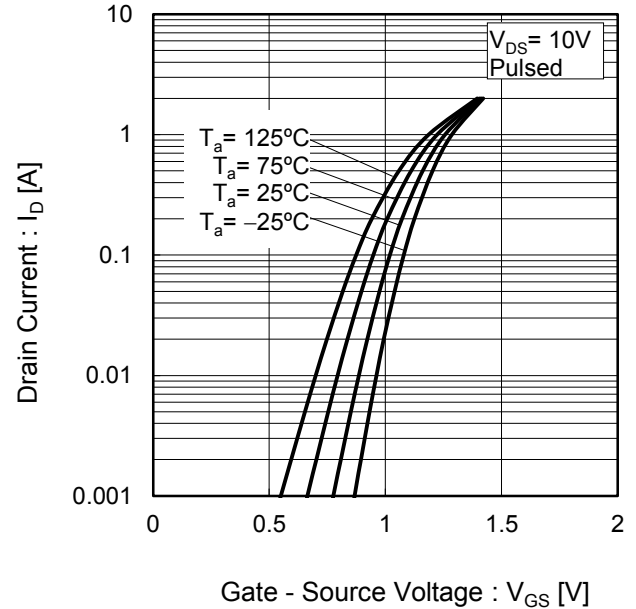


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

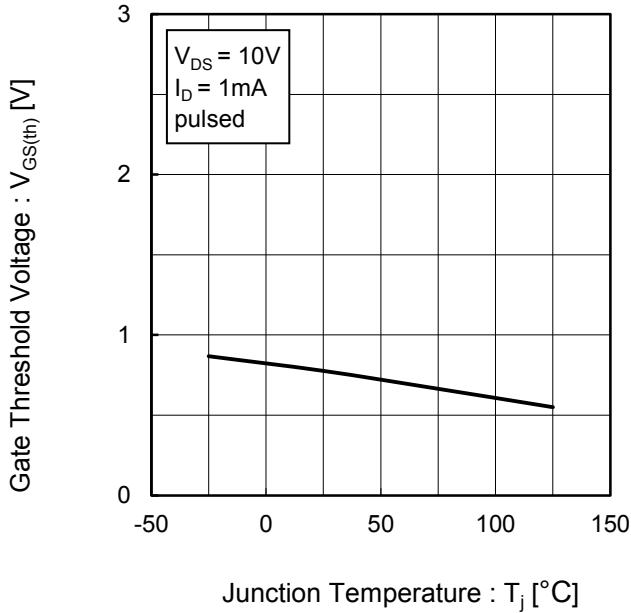


Fig.10 Transconductance vs. Drain Current

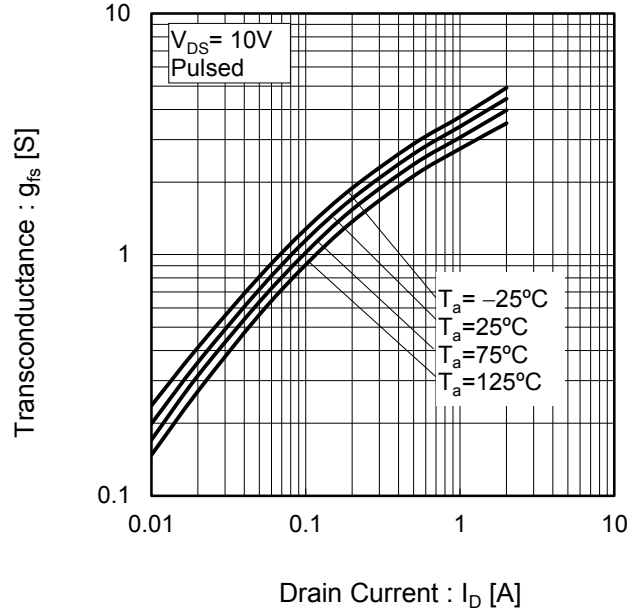


Fig.11 Drain Current Derating Curve

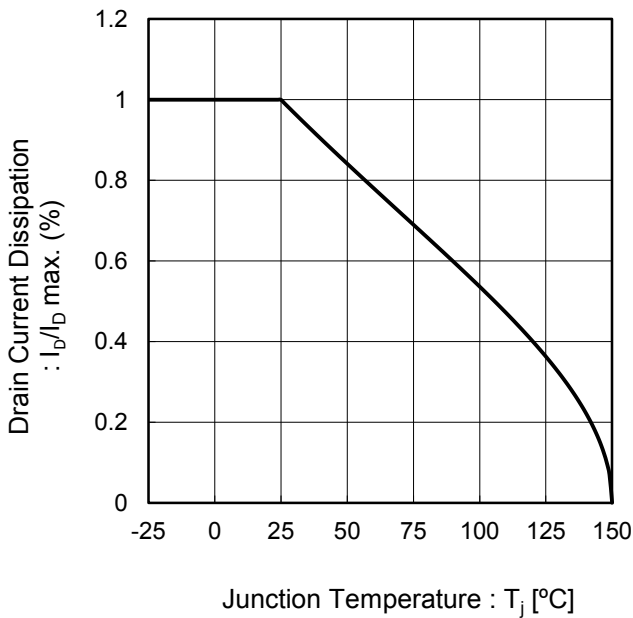
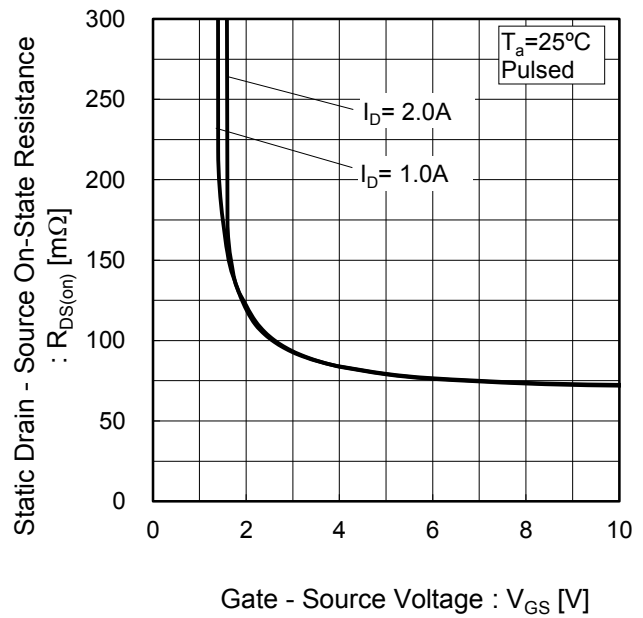


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●Electrical characteristic curves

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

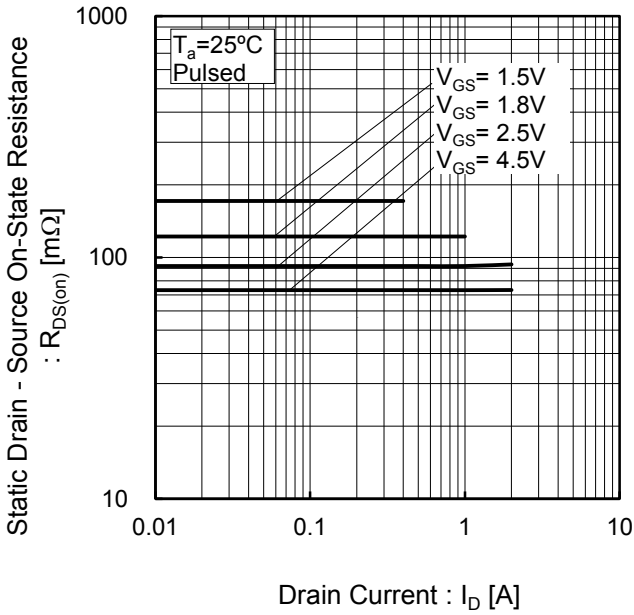
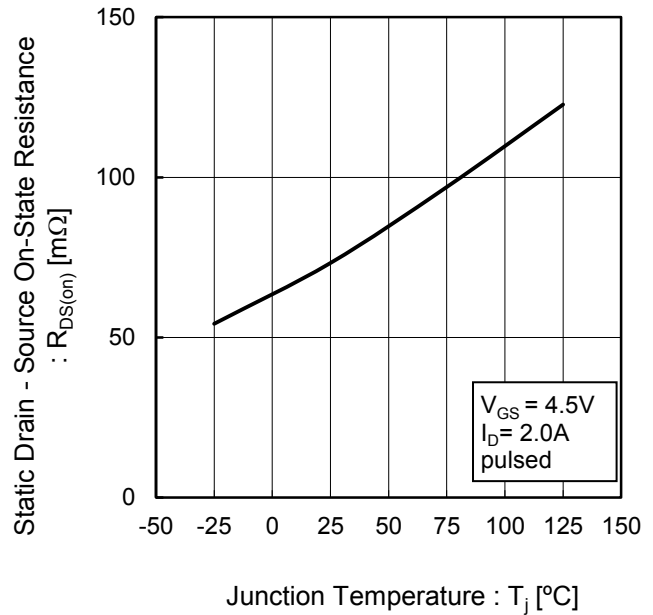


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

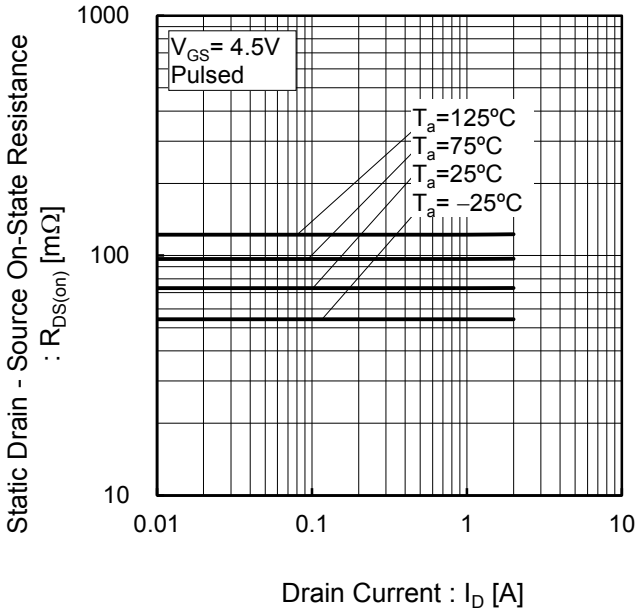


Fig.16 Static Drain-Source On-State Resistance vs. Drain Current(III)

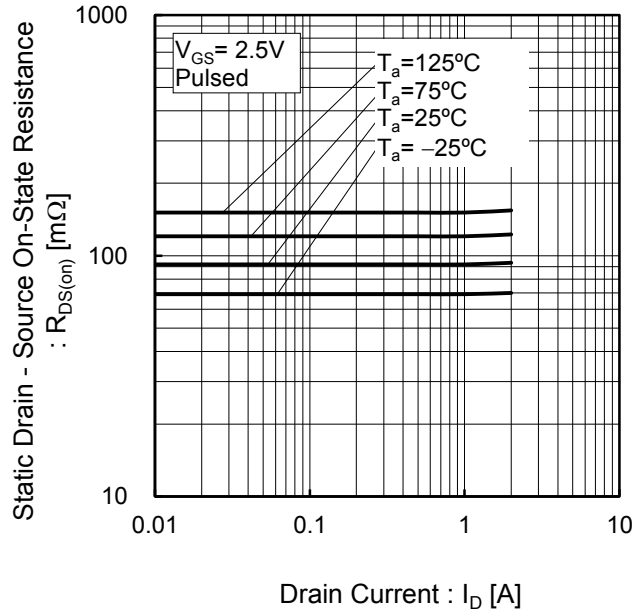


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

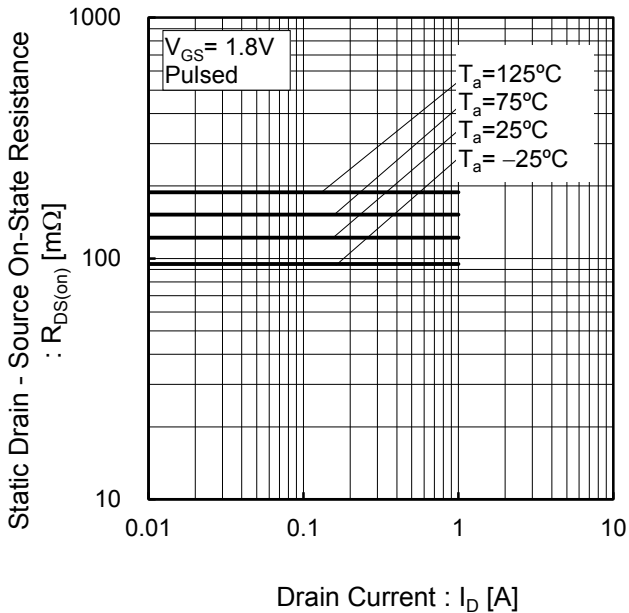
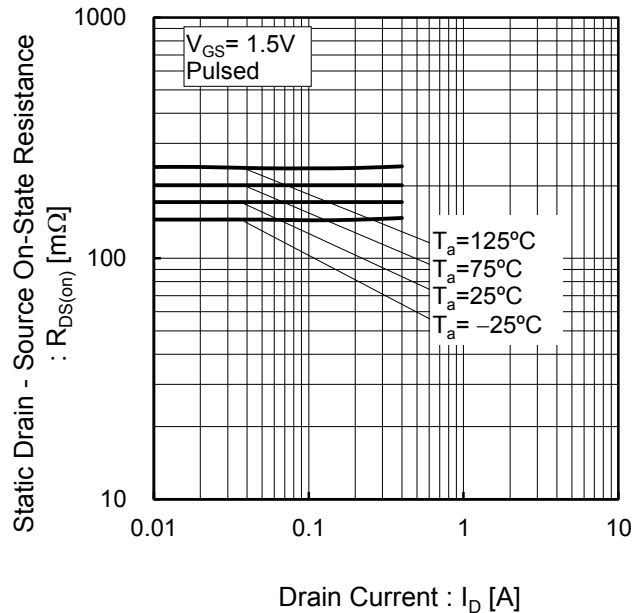


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

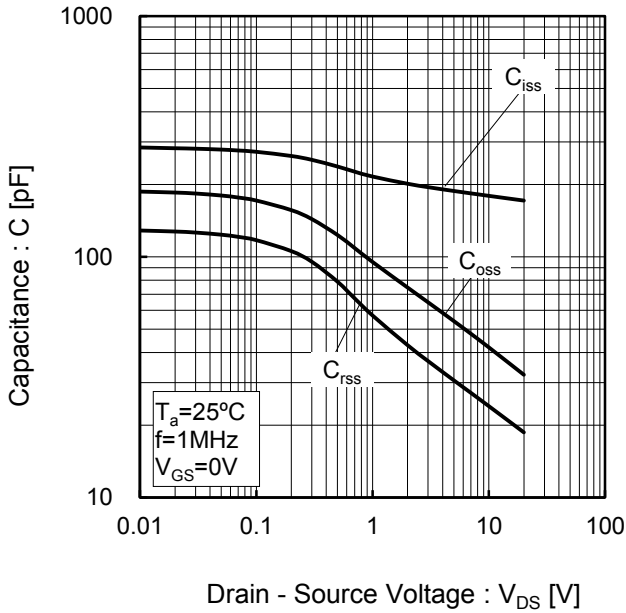


Fig.20 Switching Characteristics

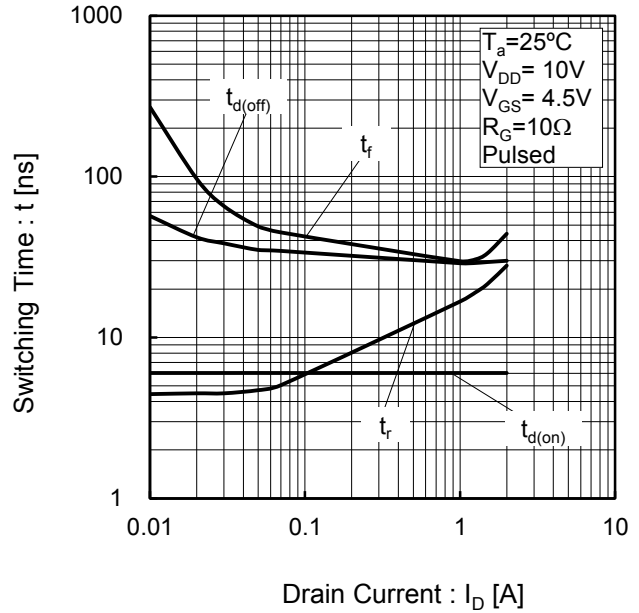


Fig.21 Dynamic Input Characteristics

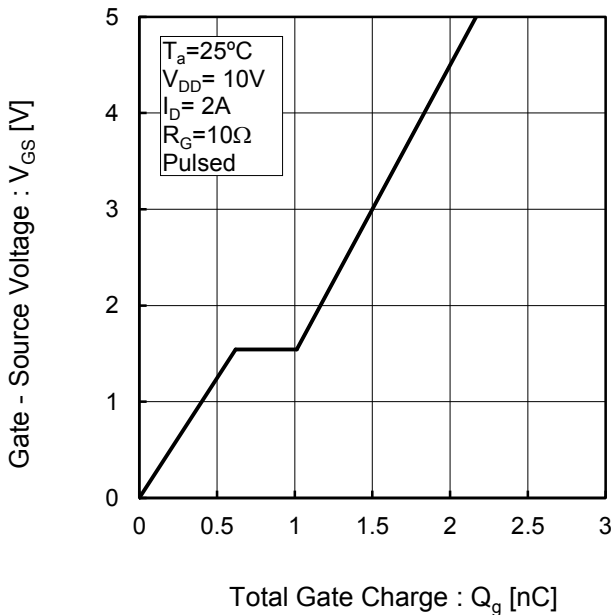
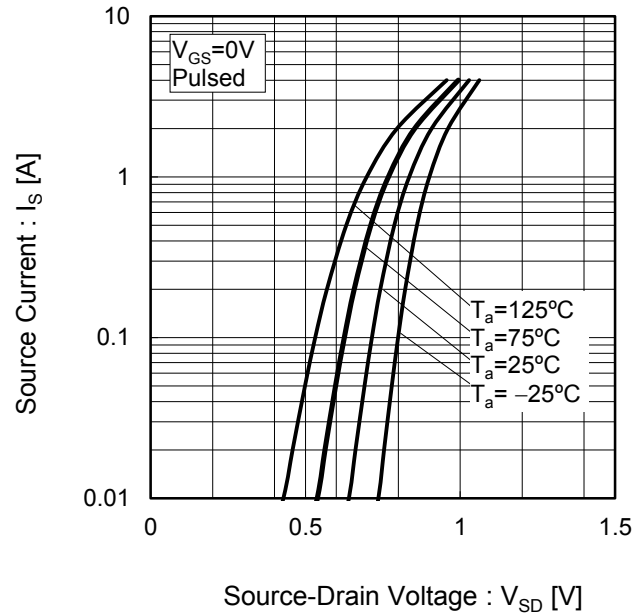


Fig.22 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit



Fig.1-2 Switching Waveforms



Fig.2-1 Gate Charge Measurement Circuit

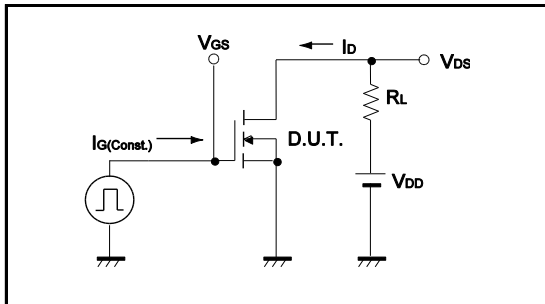
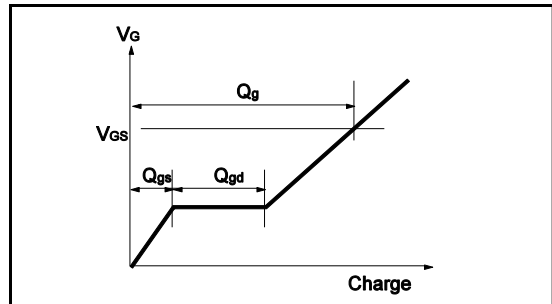
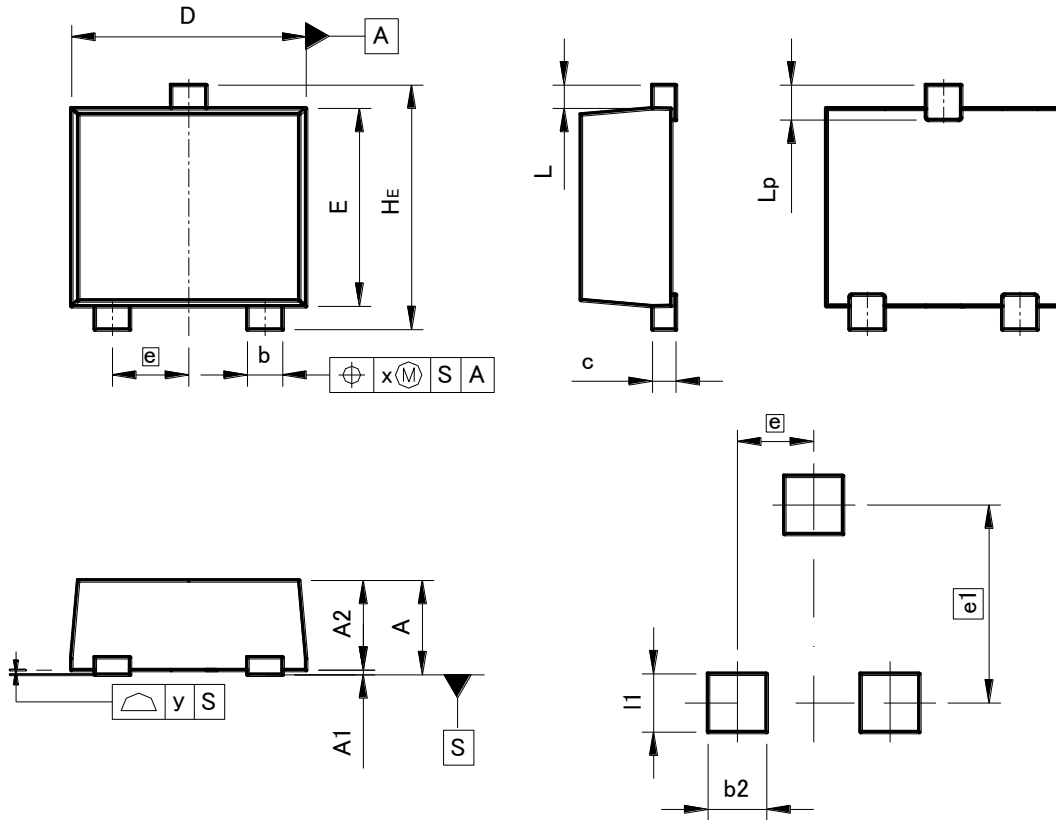


Fig.2-2 Gate Charge Waveform



●Dimensions (Unit : mm)

TUMT3



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	0.85	-	0.033
A1	0.00	0.10	0.000	0.004
A2	0.72	0.82	0.028	0.032
b	0.25	0.40	0.010	0.016
c	0.12	0.22	0.005	0.009
D	1.90	2.10	0.075	0.083
E	1.60	1.80	0.063	0.071
e	0.65		0.026	
HE	2.00	2.20	0.079	0.087
L	0.20		0.008	
Lp	-	0.40	-	0.016
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.50	-	0.020
e1	1.70		0.067	
I1	-	0.50	-	0.020

Dimension in mm / inches

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