

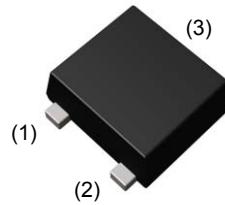
V_{DSS}	20V
$R_{DS(on)}$ (Max.)	54m Ω
I_D	2.5A
P_D	0.8W

●Features

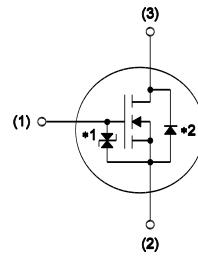
- 1) Low on - resistance.
- 2) 1.5V Drive.
- 3) Built-in G-S Protection Diode.
- 4) Small Surface Mount Package (TUMT3).
- 5) Pb-free lead plating ; RoHS compliant

●Outline

TUMT3



●Inner circuit



(1) Gate
(2) Source
(3) Drain

*1 ESD PROTECTION DIODE
*2 BODY DIODE

●Packaging specifications

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

●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}	± 2.5	A
Pulsed drain current	$I_{D,pulse}$ ^{*2}	± 5	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	$^\circ\text{C}$
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}	-	-	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	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}$, $I_D = 1\text{mA}$	20	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1\text{mA}$ referenced to 25°C	-	20	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 20\text{V}$, $V_{GS} = 0\text{V}$	-	-	1	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 10\text{V}$, $V_{DS} = 0\text{V}$	-	-	± 10	μA
Gate threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = 10\text{V}$, $I_D = 1\text{mA}$	0.3	-	1.3	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{(GS)\text{th}}}{\Delta T_j}$	$I_D = 1\text{mA}$ referenced to 25°C	-	-1.9	-	mV/°C
Static drain - source on - state resistance	$R_{DS(\text{on})}$ ^{*5}	$V_{GS} = 4.5\text{V}$, $I_D = 2.5\text{A}$	-	39	54	mΩ
		$V_{GS} = 2.5\text{V}$, $I_D = 2.5\text{A}$	-	49	68	
		$V_{GS} = 1.8\text{V}$, $I_D = 1.3\text{A}$	-	65	91	
		$V_{GS} = 1.5\text{V}$, $I_D = 0.5\text{A}$	-	80	160	
		$V_{GS} = 4.5\text{V}$, $I_D = 2.5\text{A}$, $T_j = 125^\circ\text{C}$	-	65	95	
Gate input resistannce	R_G	$f = 1\text{MHz}$, open drain	-	7.5	-	Ω
Transconductance	g_{fs} ^{*5}	$V_{DS} = 10\text{V}$, $I_D = 2.5\text{A}$	3.6	6.0	-	S

*1 Limited only by maximum temperature allowed.

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

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

*4 Mounted on a FR4 (15×20×0.8mm)

*5 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$ $V_{DS} = 10V$ $f = 1MHz$	-	370	-	pF
Output capacitance	C_{oss}		-	90	-	
Reverse transfer capacitance	C_{rss}		-	50	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx 10V, V_{GS} = 4.5V$ $I_D = 1.3A$ $R_L = 7.7\Omega$ $R_G = 10\Omega$	-	7	-	ns
Rise time	t_r^{*5}		-	15	-	
Turn - off delay time	$t_{d(off)}^{*5}$		-	35	-	
Fall time	t_f^{*5}		-	15	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx 10V, I_D = 2.5A$ $V_{GS} = 4.5V$	-	5	-	nC
Gate - Source charge	Q_{gs}^{*5}		-	0.9	-	
Gate - Drain charge	Q_{gd}^{*5}		-	0.8	-	

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

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

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

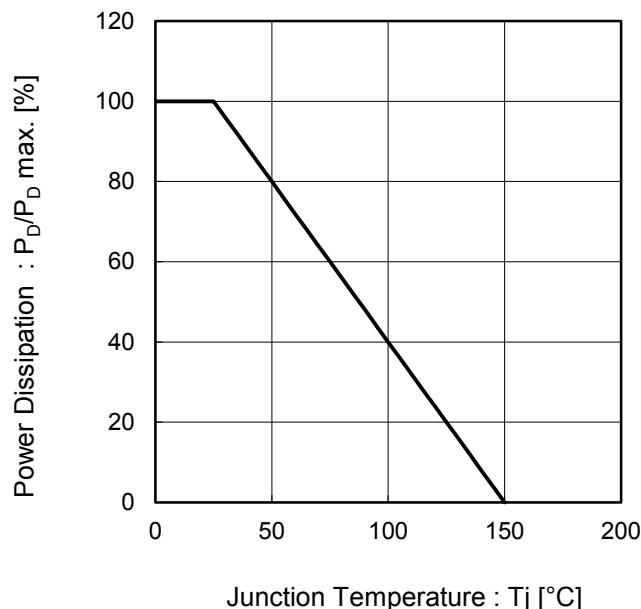


Fig.2 Maximum Safe Operating Area

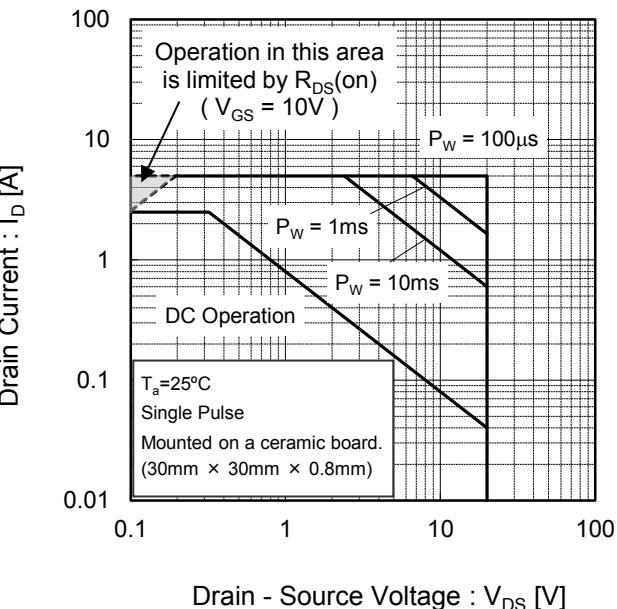


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

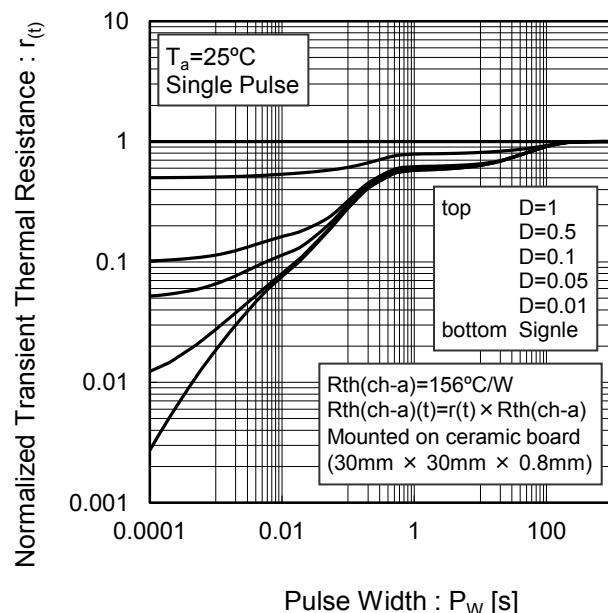
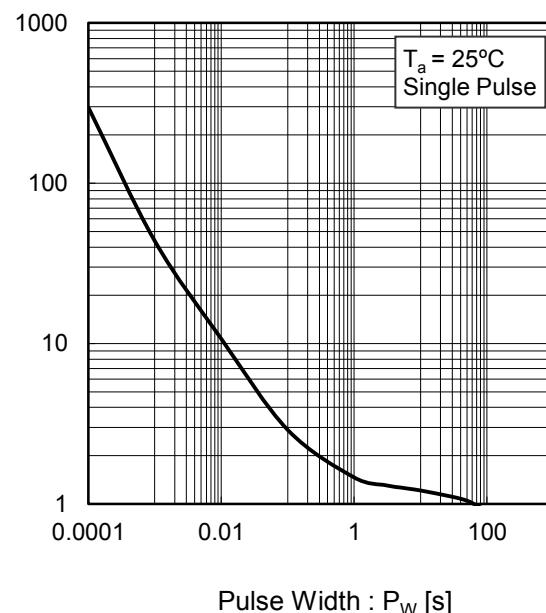


Fig.4 Single Pulse Maximum Power dissipation



● Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

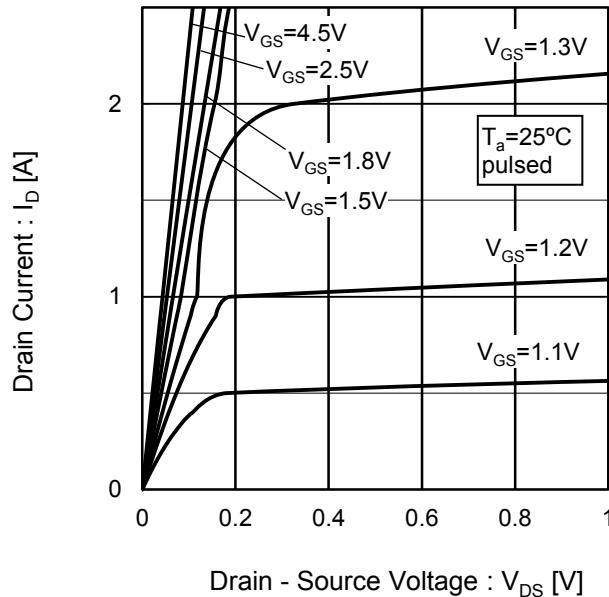


Fig.6 Typical Output Characteristics(II)

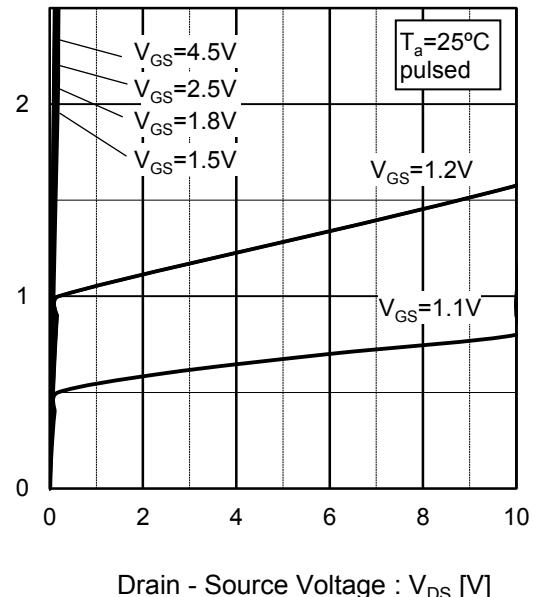


Fig.7 Breakdown Voltage
vs. Junction Temperature

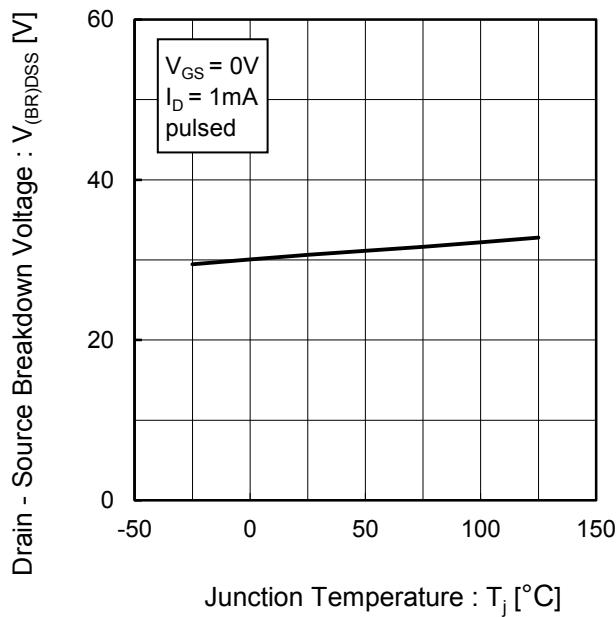
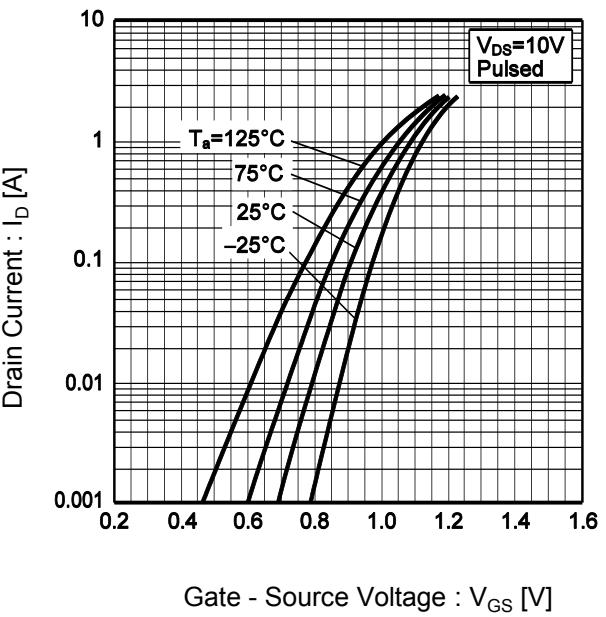


Fig.8 Typical Transfer Characteristics



● Electrical characteristic curves

Fig.9 Gate Threshold Voltage
vs. Junction Temperature

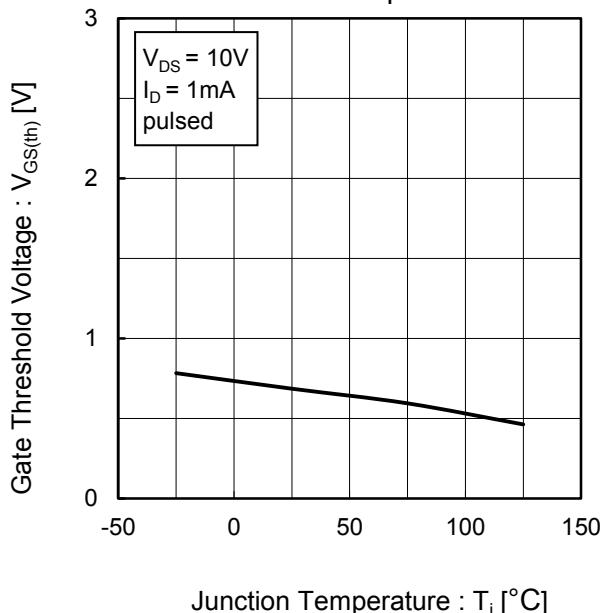


Fig.10 Transconductance vs. Drain Current

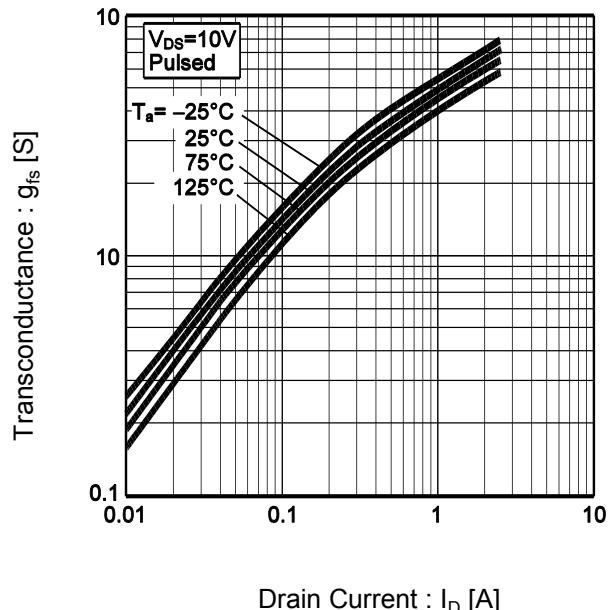


Fig.11 Drain CurrentDerating Curve

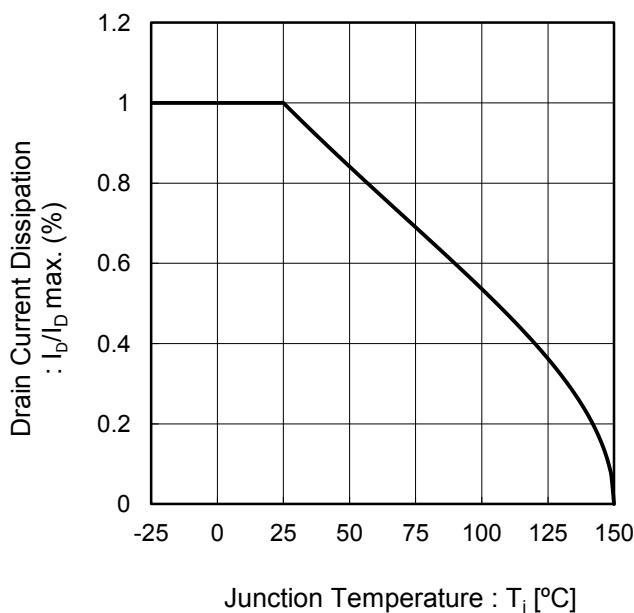
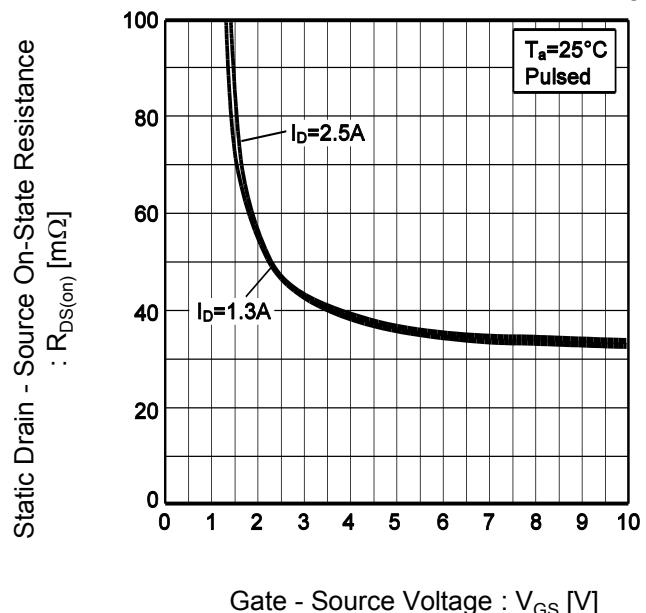


Fig.12 Static Drain - Source On - State
Resistance vs. Gate Source Voltage



● Electrical characteristic curves

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

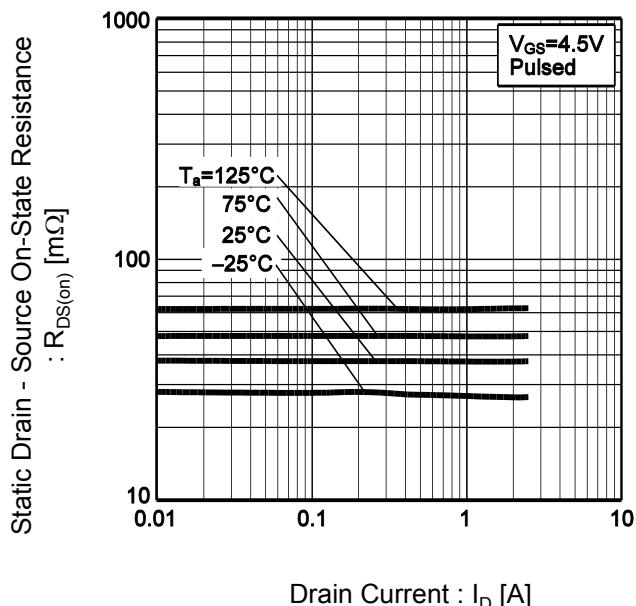
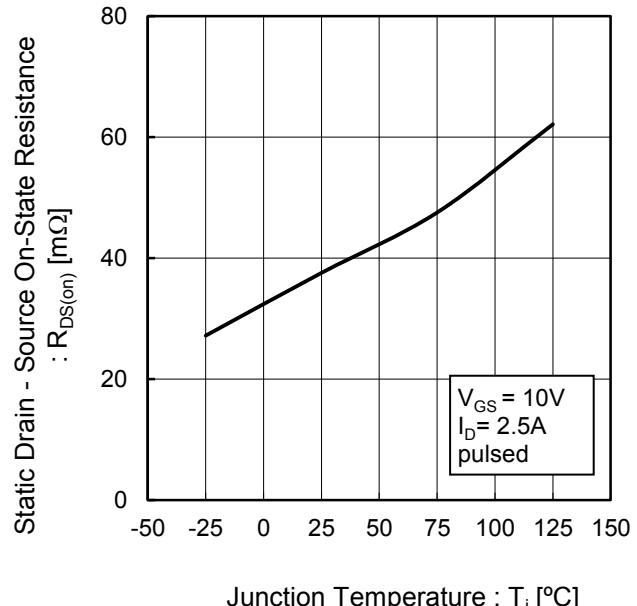


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

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

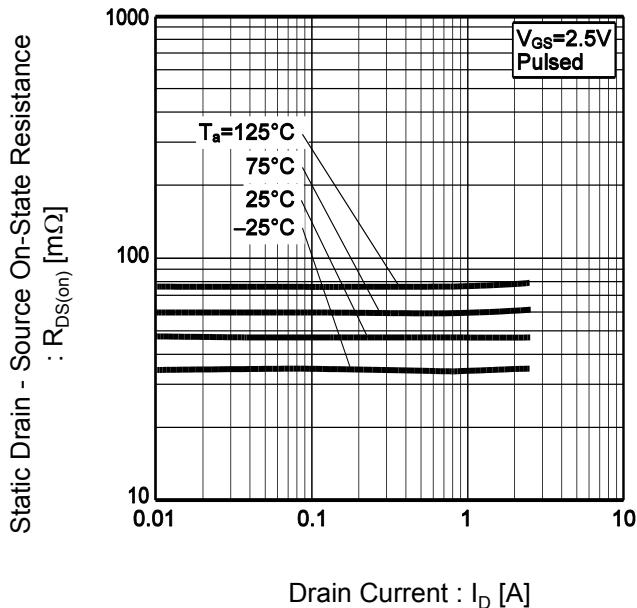


Fig.16 Static Drain-Source On-State Resistance vs. Drain Current(III)

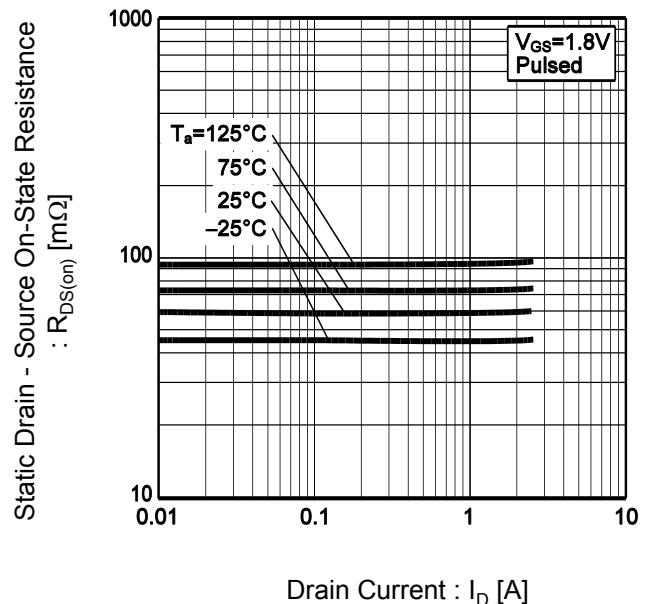


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

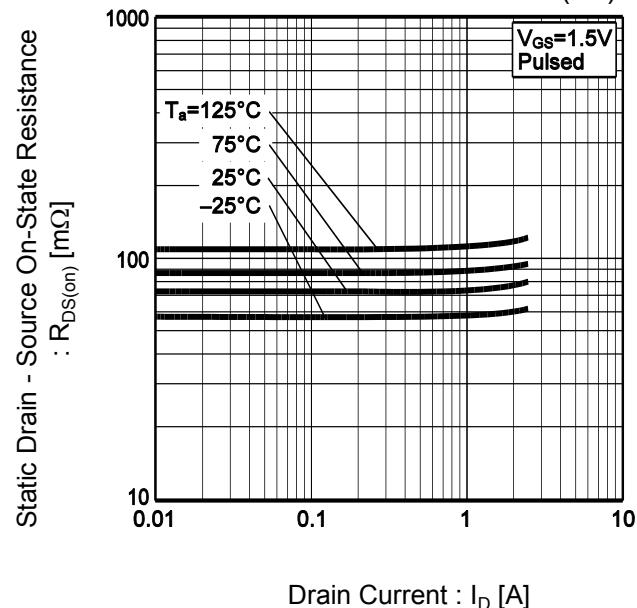
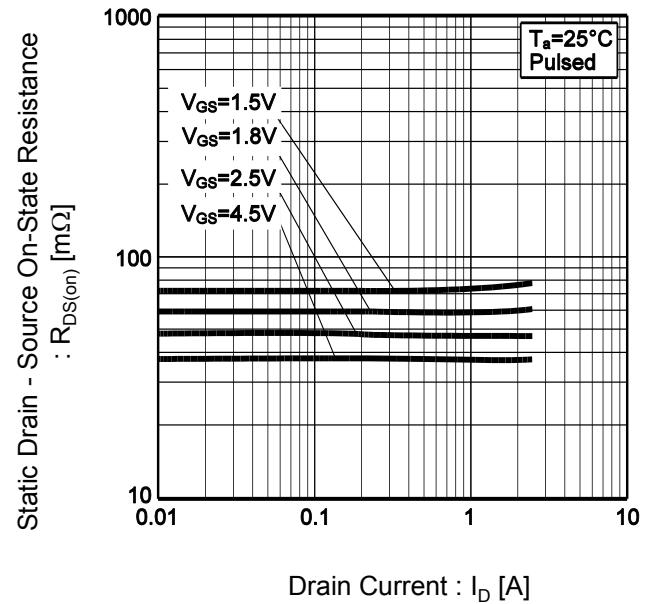


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)



● Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

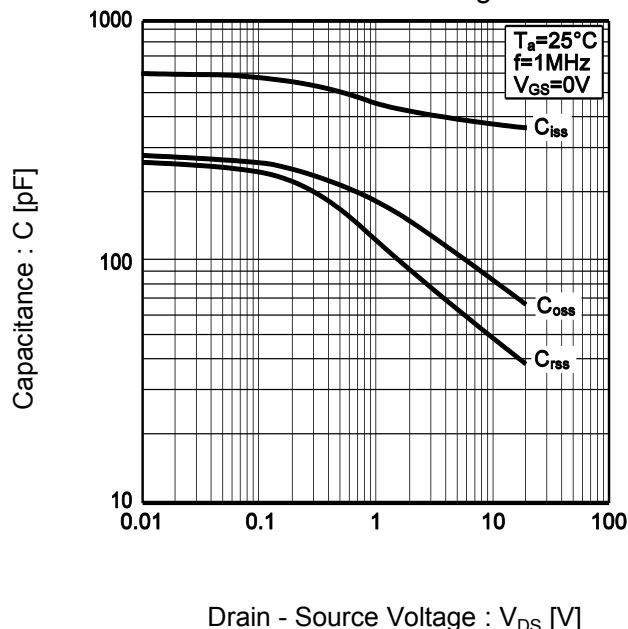


Fig.20 Switching Characteristics

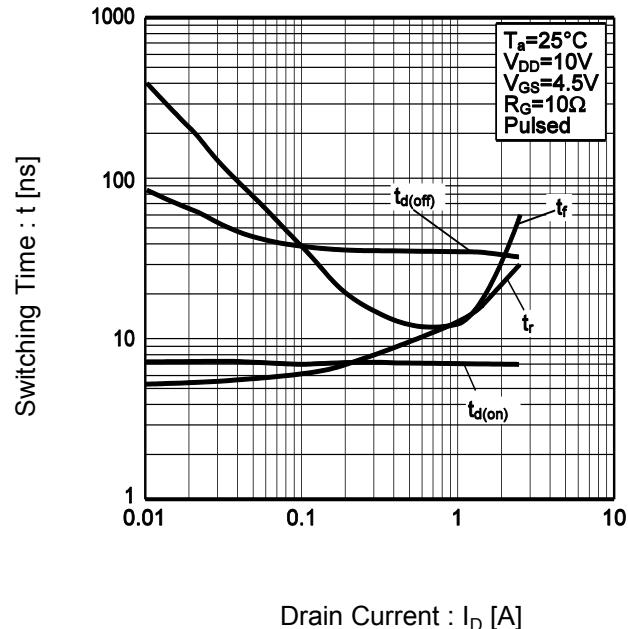


Fig.21 Dynamic Input Characteristics

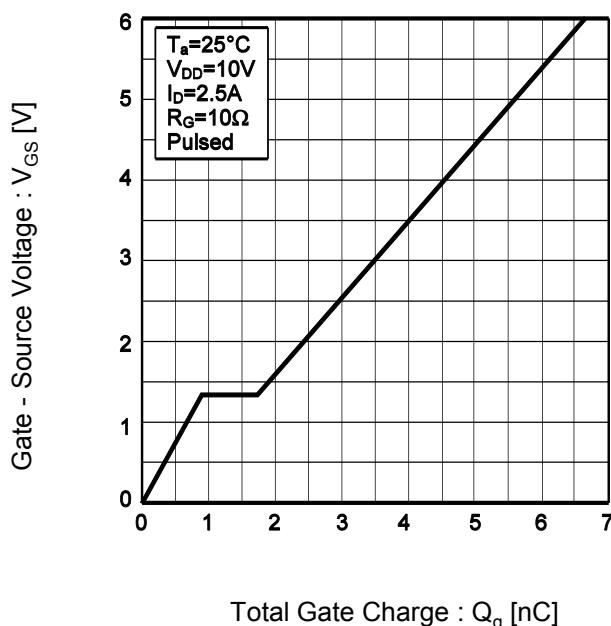
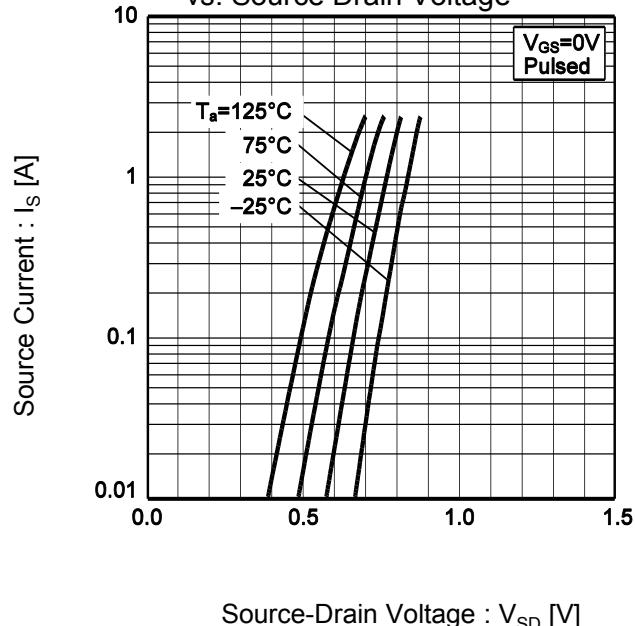


Fig.22 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

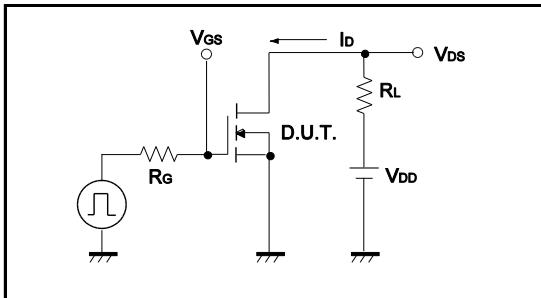


Fig.1-2 Switching Waveforms

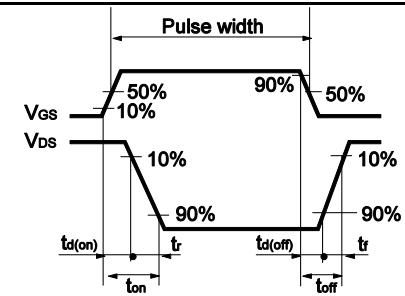


Fig.2-1 Gate Charge Measurement Circuit

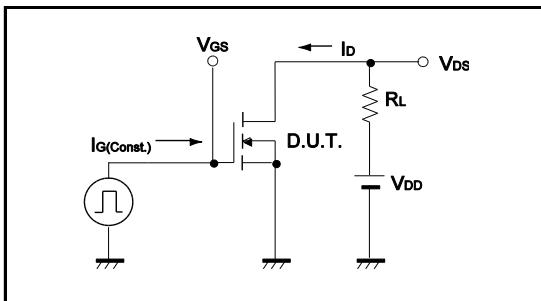
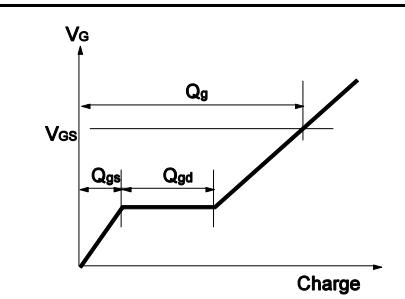
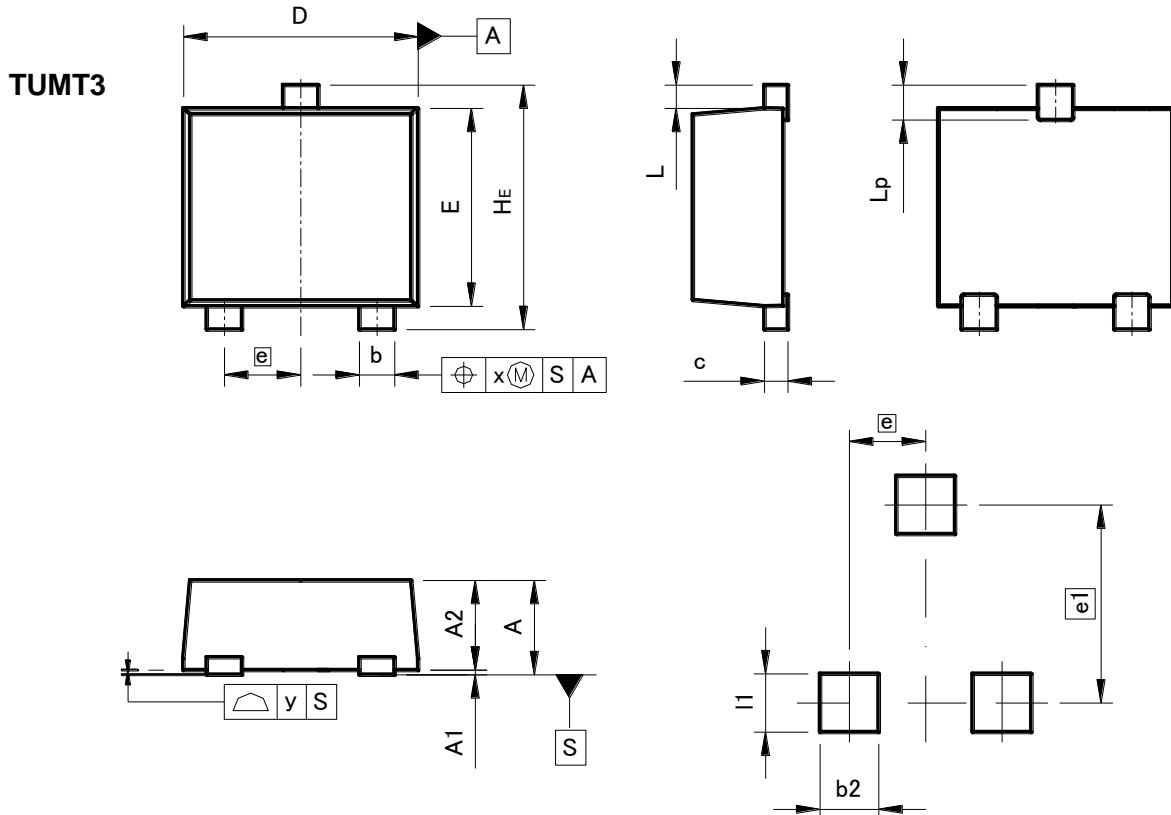


Fig.2-2 Gate Charge Waveform



●Dimensions (Unit : mm)



Pattern of terminal position areas

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	0.85	—	0.033
A ₁	0.00	0.10	0	0.004
A ₂	0.72	0.82	0.028	0.032
b	0.25	0.40	0.01	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		0.03	
H _E	2.00	2.20	0.079	0.087
L	0.20		0.01	
L _p	—	0.40	—	0.016
x	—	0.10	—	0.004
y	—	0.10	—	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
e ₁	1.70		0.067	
b ₂	—	0.50	—	0.02
l ₁	—	0.50	—	0.02

Dimension in mm/inches

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