RTF015N03

Nch 30V 1.5A Power MOSFET

Datasheet

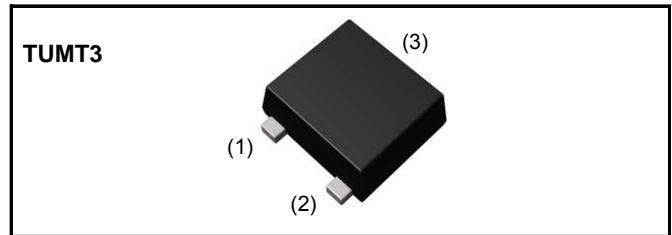|	
V_{DSS}	30V
$R_{DS(on)}$ (Max.)	240mΩ
I_D	1.5A
P_D	0.8W

●**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

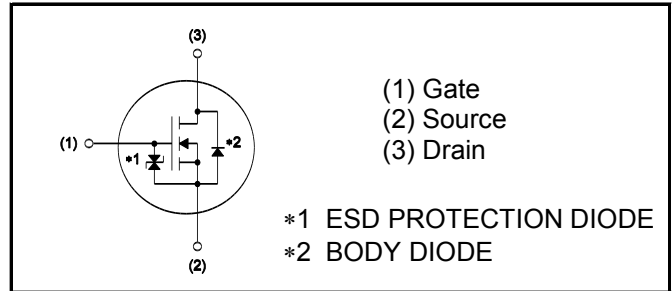●**Application**

DC/DC converters

●**Outline**

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	PP

●**Absolute maximum ratings**(T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	30	V
Continuous drain current	I_D [*1]	±1.5	A
Pulsed drain current	$I_{D,pulse}$ [*2]	±6.0	A
Gate - Source voltage	V_{GSS}	12	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°C)

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	$\dfrac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D=1mA referenced to 25°C	-	30	-	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} = 12V, V_{DS} = 0V	-	-	10	μA
Gate threshold voltage	$V_{GS\,(th)}$	V_{DS} = 10V, I_D = 1mA	0.5	-	1.5	V
Gate threshold voltage temperature coefficient	$\dfrac{\Delta V_{(GS)th}}{\Delta T_j}$	I_D=1mA referenced to 25°C	-	−2.3	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}$ [5]	V_{GS}=4.5V, I_D=1.5A	-	170	240	mΩ
		V_{GS}=4V, I_D=1.5A	-	180	250	
		V_{GS}=2.5V, I_D=1.5A	-	240	340	
		V_{GS}=4.5V, I_D=1.5A, T_j=125°C	-	270	380	
Gate input resistannce	R_G	f = 1MHz, open drain	-	17	-	Ω
Transconductance	g_{fs} [5]	V_{DS}=10V, I_D=1.5A	1.5	2.6	-	S

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

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

*4 Mounted on a FR4 (15×20×0.8mm)

*5 Pulsed

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SEMICONDUCTOR

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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	-	80	-	pF
Output capacitance	C_{oss}	V_{DS} = 10V	-	14	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	12	-	
Turn - on delay time	$t_{d(on)}$ [5]	$V_{DD} \simeq$ 15V, V_{GS} = 4.5V	-	7	-	ns
Rise time	t_r [5]	I_D = 0.75A	-	9	-	
Turn - off delay time	$t_{d(off)}$ [5]	R_L = 20Ω	-	15	-	
Fall time	t_f [5]	R_G = 10Ω	-	6	-	

●**Gate Charge characteristics**(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g [5]	$V_{DD} \simeq$ 15V, I_D=1.5A V_{GS} = 4.5V	-	1.6	-	nC
Gate - Source charge	Q_{gs} [5]		-	0.5	-	
Gate - Drain charge	Q_{gd} [5]		-	0.3	-	

●**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	-	-	0.6	A
Forward voltage	V_{SD} [5]	V_{GS} = 0V, I_s = 0.6A	-	-	1.2	V

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●**Electrical characteristic curves**

Fig.1 Power Dissipation Derating Curve

Junction Temperature : Tj [°C]
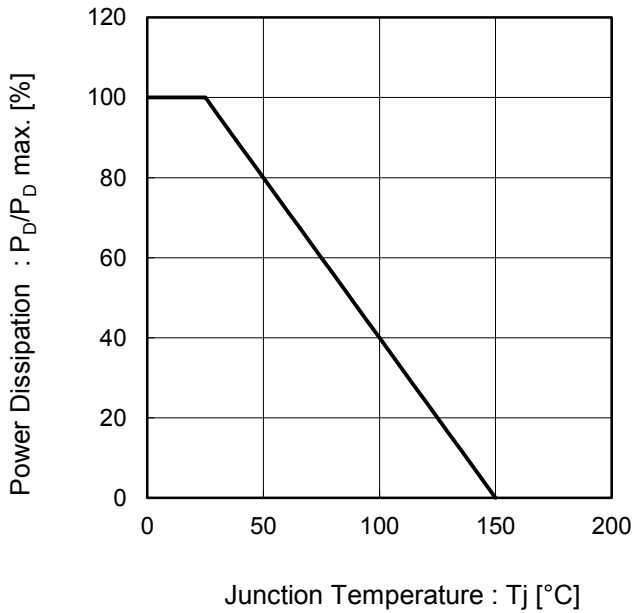
Fig.2 Maximum Safe Operating Area

Drain - Source Voltage : V_{DS} [V]
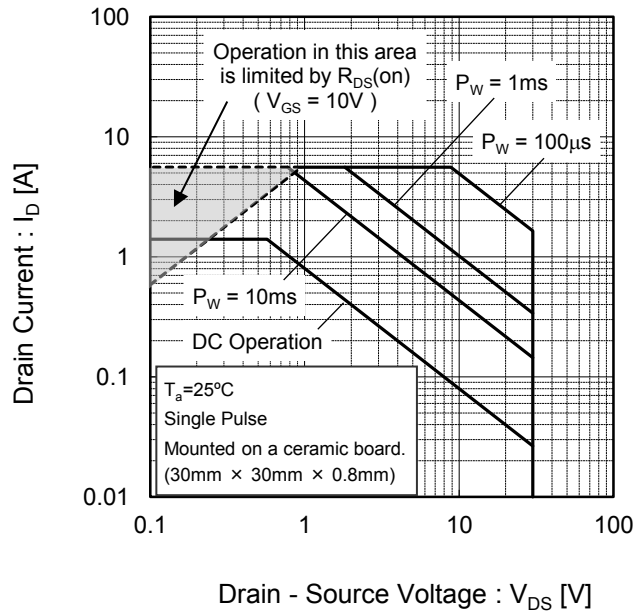
Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

Pulse Width : P_W [s]
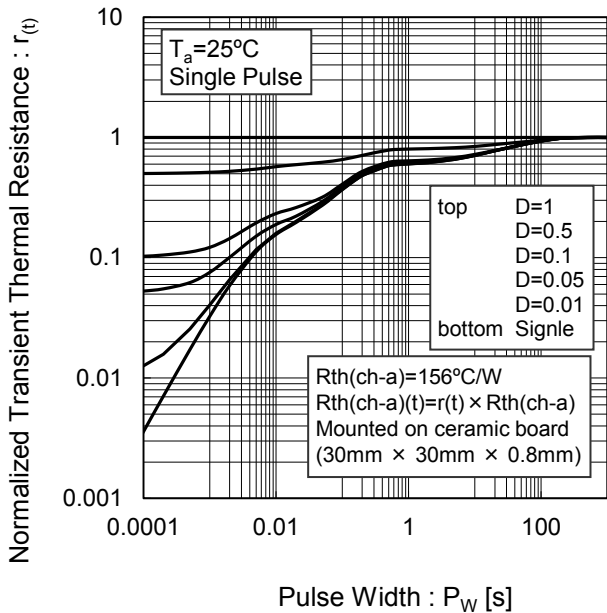
Fig.4 Single Pulse Maxmum Power dissipation

Pulse Width : P_W [s]
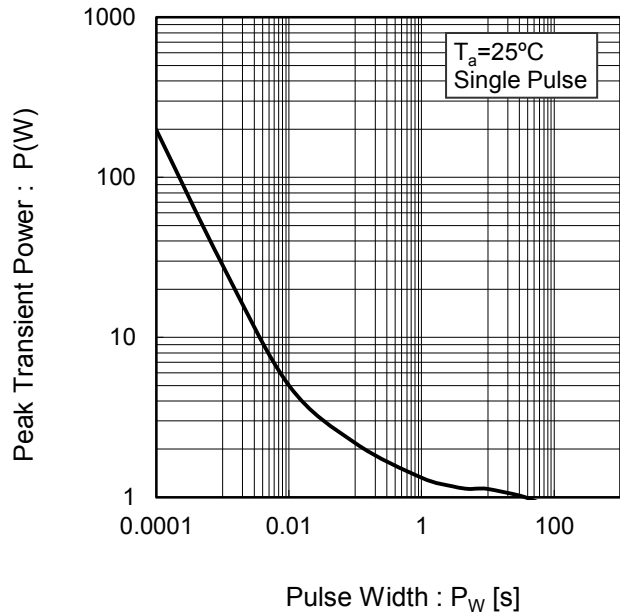
●**Electrical characteristic curves**

Fig.5 Typical Output Characteristics(I)
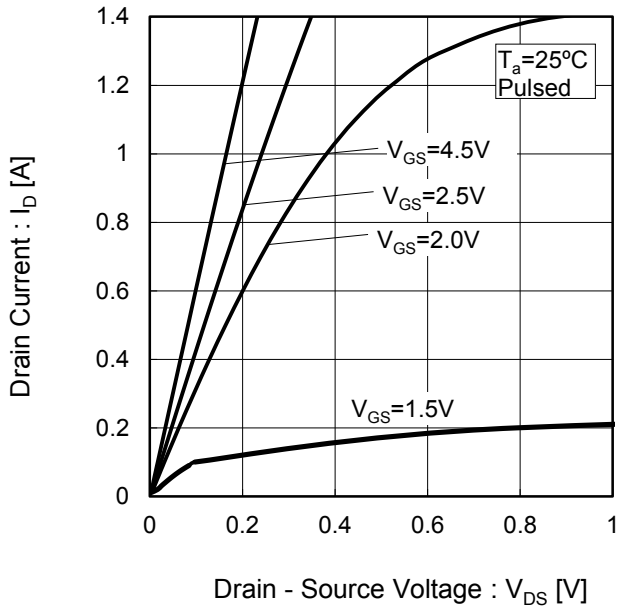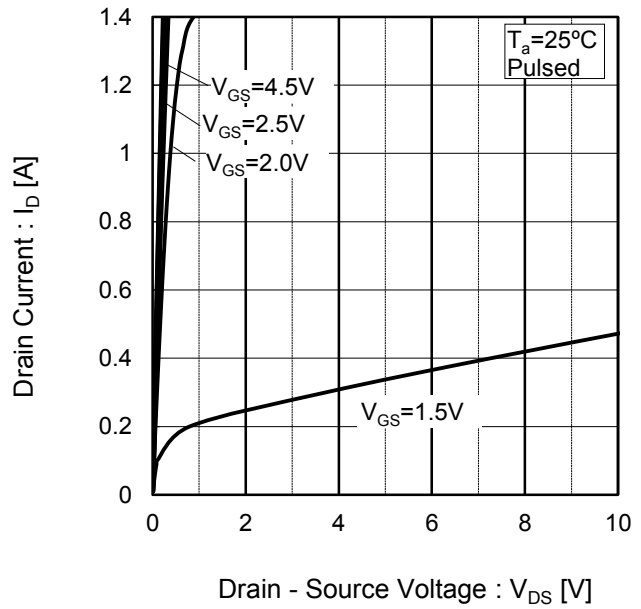

Fig.6 Typical Output Characteristics(II)

Fig.7 Breakdown Voltage
       vs. Junction Temperature
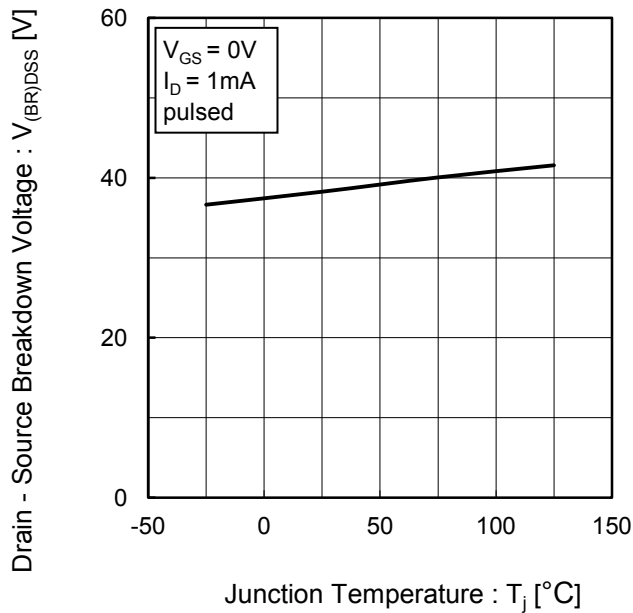
Fig.8 Typical Transfer Characteristics
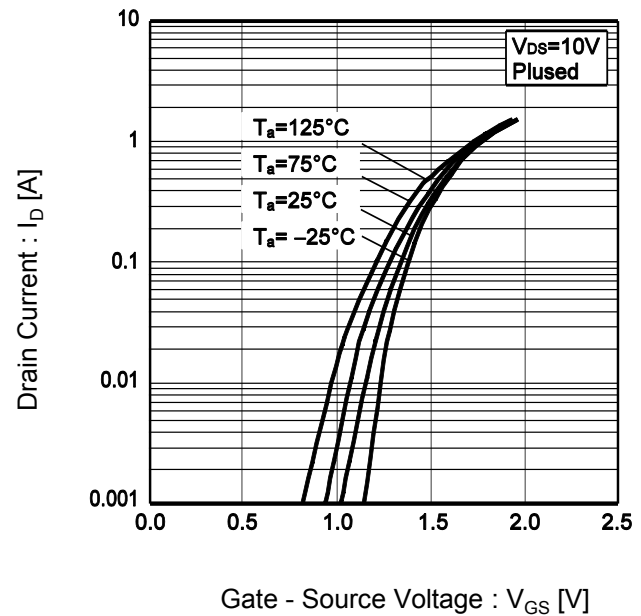
● **Electrical characteristic curves**

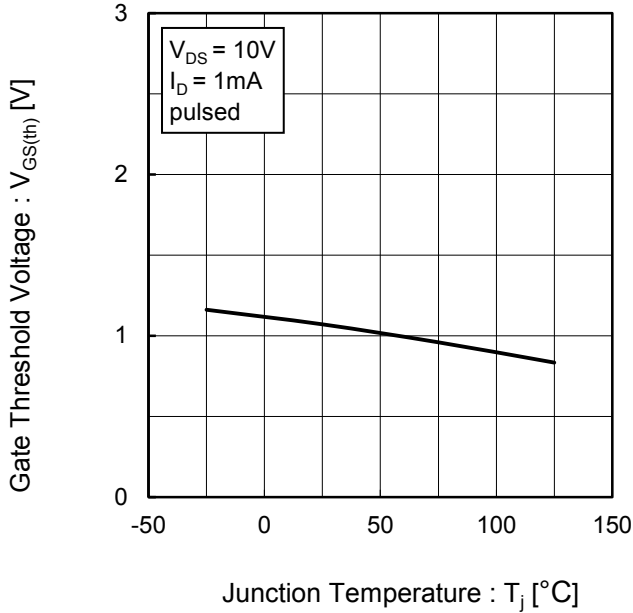Fig.9 Gate Threshold Voltage
vs. Junction Temperature

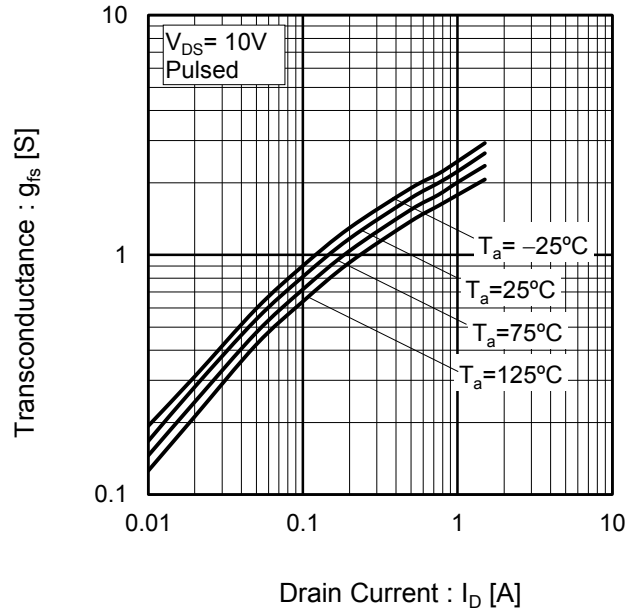
Fig.10 Transconductance vs. Drain Current

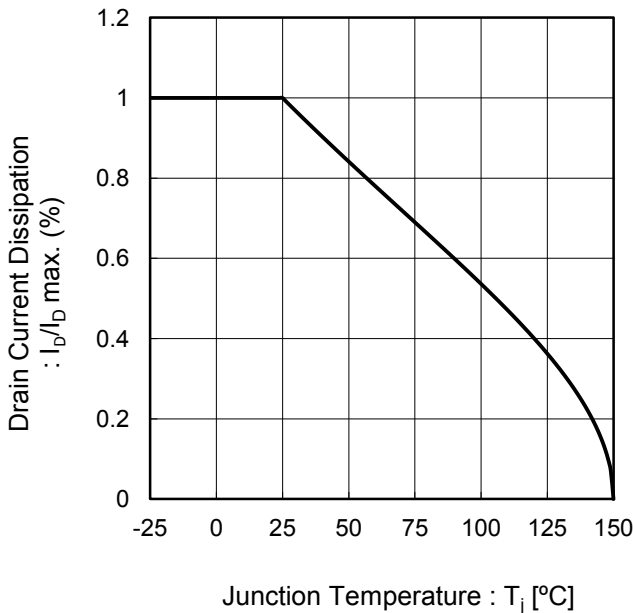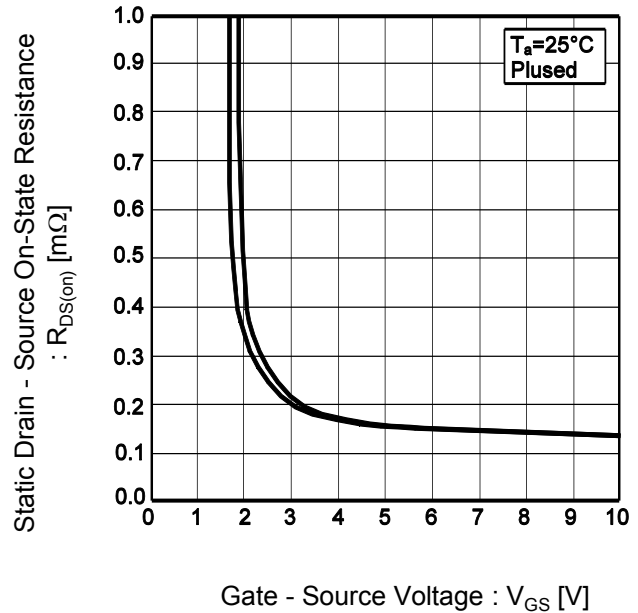
Fig.11 Drain CurrentDerating Curve

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

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●**Electrical characteristic curves**

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

Static Drain - Source On-State Resistance : $R_{DS(on)}$ [mΩ]

V_{GS}=4.5V
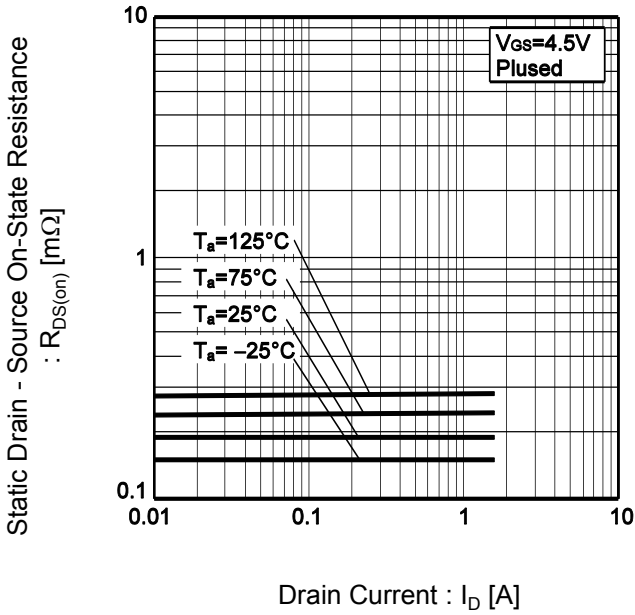Plused

T_a=125°C
T_a=75°C
T_a=25°C
T_a=−25°C

Drain Current : I_D [A]

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

Static Drain - Source On-State Resistance : $R_{DS(on)}$ [mΩ]

I_D = 1.5A

V_{GS} = 10V
pulsed

Junction Temperature : T_j [ºC]

Fig.15 Static Drain - Source On - State
Resistance vs. Drain Current(II)
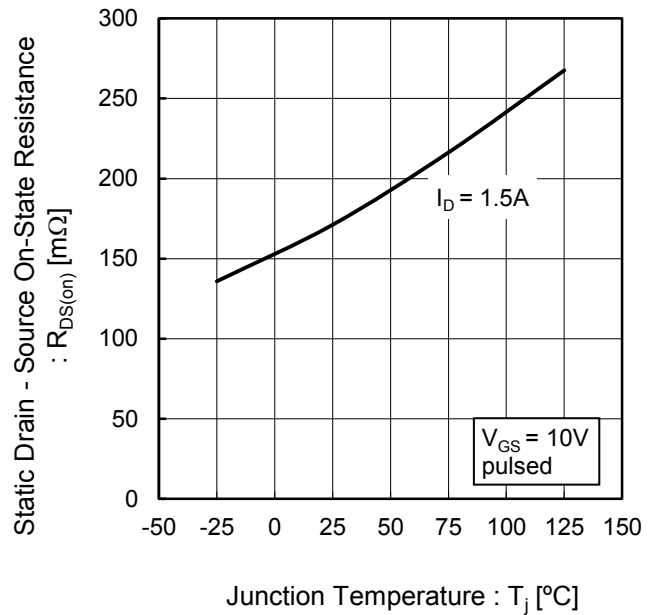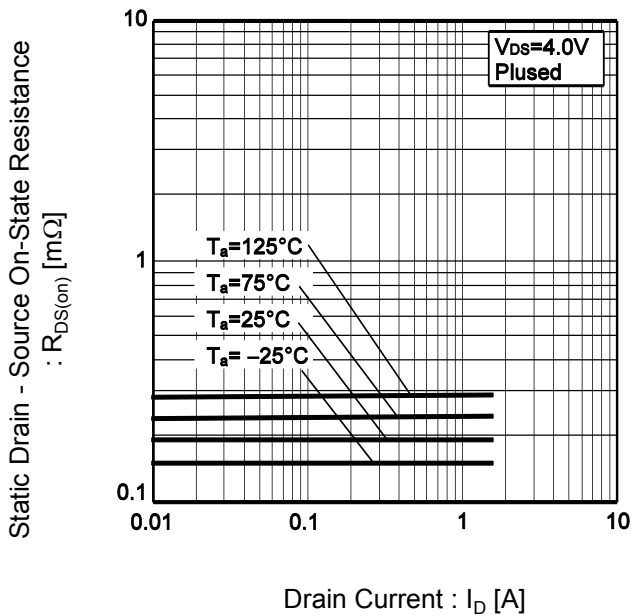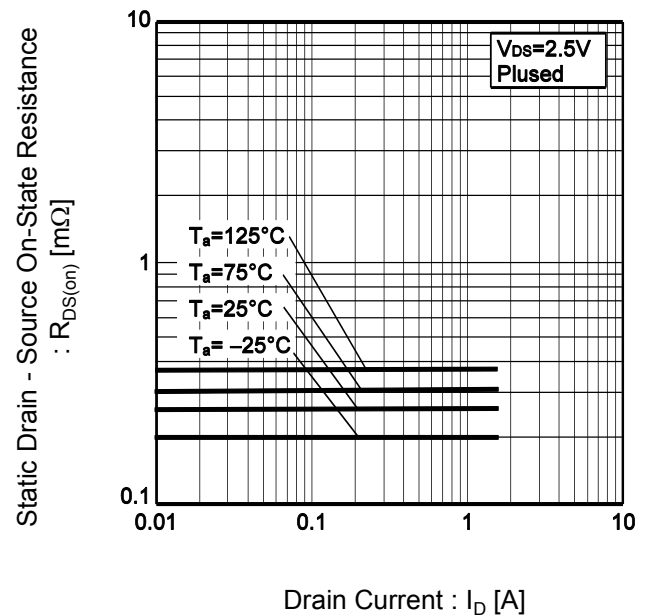
Static Drain - Source On-State Resistance : $R_{DS(on)}$ [mΩ]

V_{DS}=4.0V
Plused

T_a=125°C
T_a=75°C
T_a=25°C
T_a=−25°C

Drain Current : I_D [A]

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

Static Drain - Source On-State Resistance : $R_{DS(on)}$ [mΩ]

V_{DS}=2.5V
Plused

T_a=125°C
T_a=75°C
T_a=25°C
T_a=−25°C

Drain Current : I_D [A]

●**Electrical characteristic curves**

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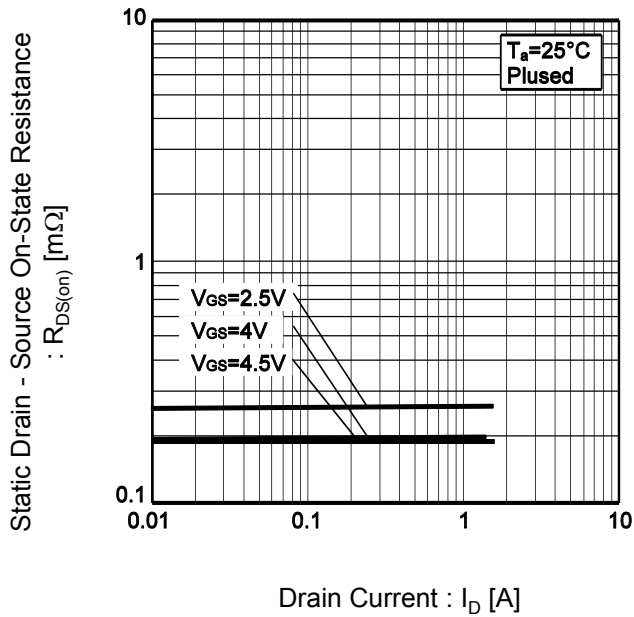Resistance vs. Drain Current(IV)
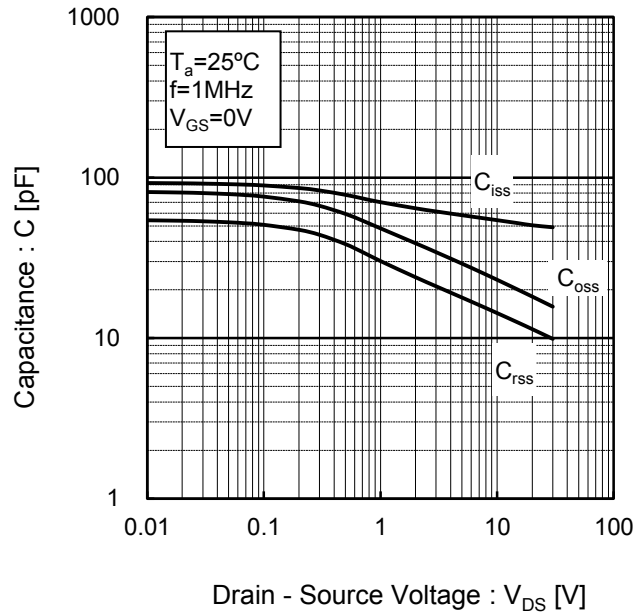

Fig.18 Typical Capacitance
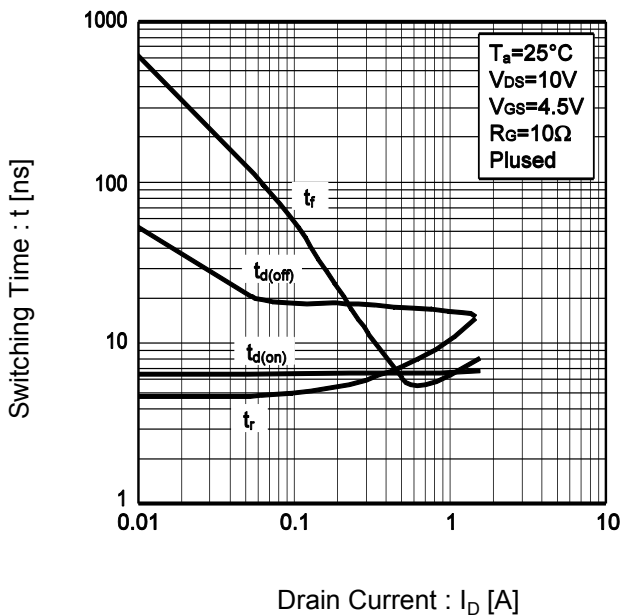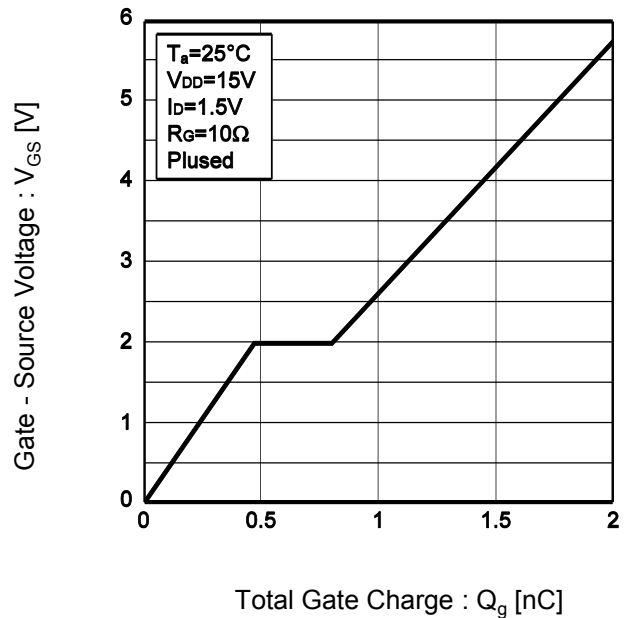vs. Drain - Source Voltage
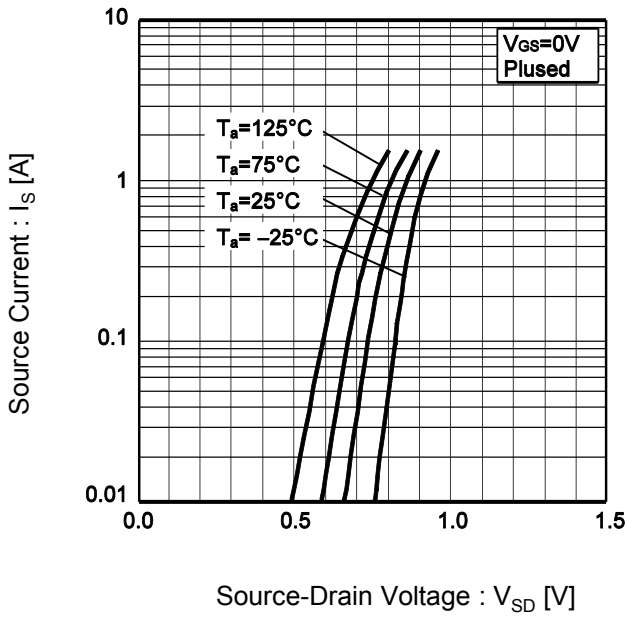

Fig.19 Switching Characteristics

Fig.20 Dynamic Input Characteristics

● **Electrical characteristic curves**

Fig.21 Source Current
         vs. Source Drain Voltage

Source-Drain Voltage : V_{SD} [V]

● **Measurement circuits**

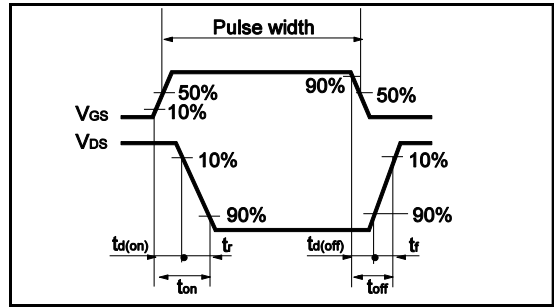Fig.1-1 Switching Time Measurement Circuit

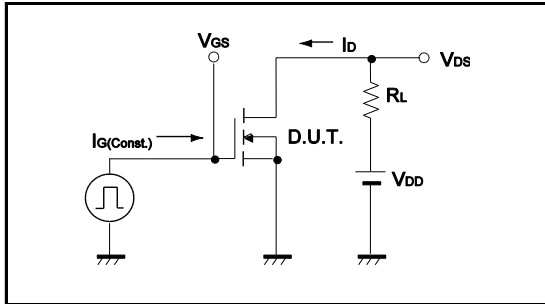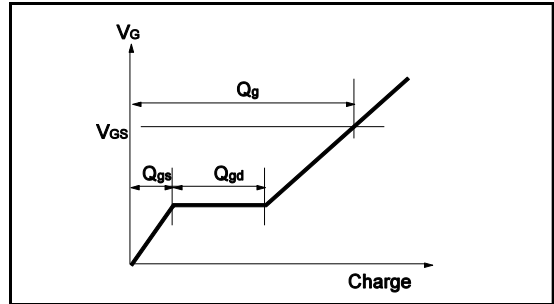Fig.1-2 Switching Waveforms

Fig.2-1 Gate Charge Measurement Circuit

Fig.2-2 Gate Charge Waveform

● **Dimensions** (Unit : mm)

TUMT3
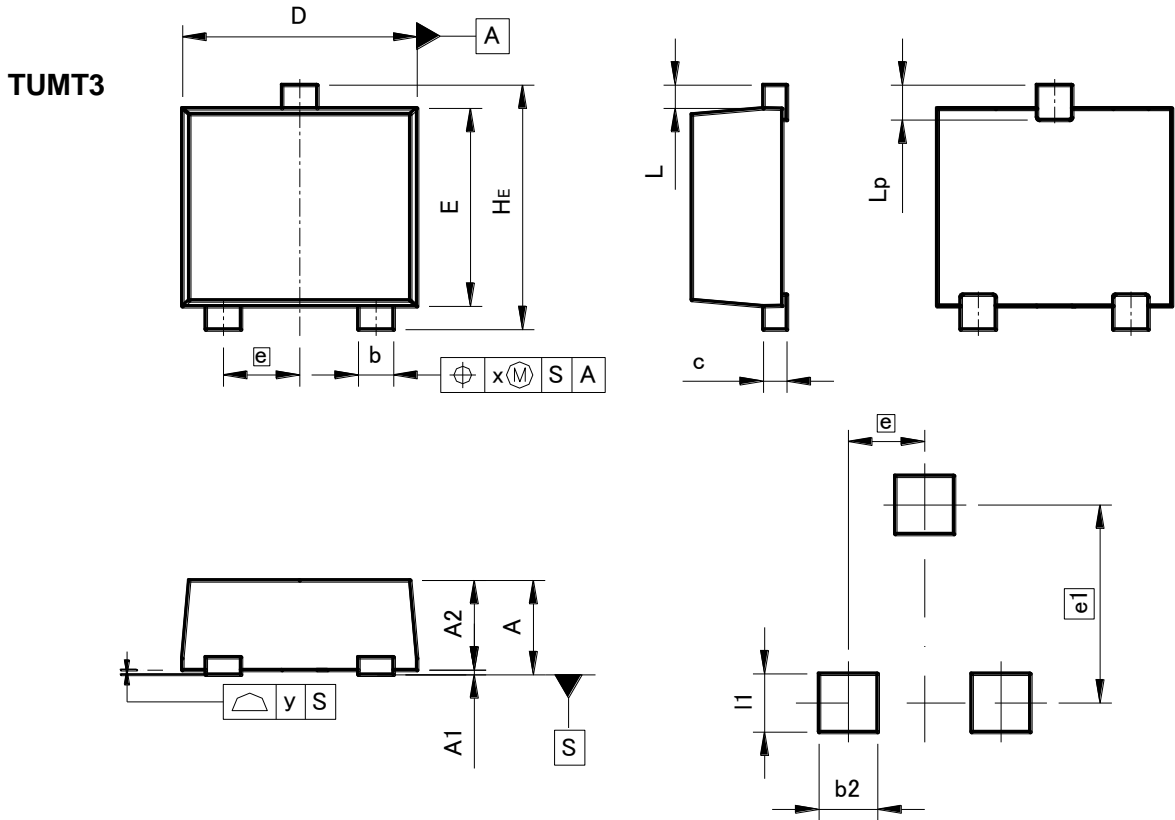
Patterm of terminal position areas

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	−	0.85	−	0.033
A1	0.00	0.10	0	0.004
A2	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	
Lp	−	0.40	−	0.016
x	−	0.10	−	0.004
y	−	0.10	−	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
e1	1.70		0.067	
b2	−	0.50	−	0.02
l1	−	0.50	−	0.02

Dimension in mm/inches

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