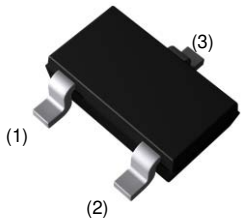
RDR005N25

Nch 250V 0.5A Power MOSFET Datasheet

V_{DSS}	250V
$R_{DS(on)}$ (Max.)	8.8Ω
I_D	0.5A
P_D	1.0W

●Outline

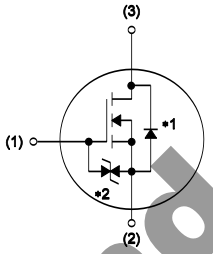
TSMT3
SOT-346T



●Features

1) Low on-resistance.
2) Fast switching speed.
3) Drive circuits can be simple.
4) Parallel use is easy.
5) Pb-free lead plating ; RoHS compliant

●Inner circuit



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

*1 BODY DIODE
*2 ESD PROTECTION DIODE

●Application

Switching Power Supply
Automotive Motor Drive
Automotive Solenoid Drive

●Packaging specifications

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

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	250	V
Continuous drain current	T_c = 25°C	I_D *1	±0.5	A
	T_c = 100°C	I_D *1	±0.27	A
Pulsed drain current		$I_{D,pulse}$ *2	±2.0	A
Gate - Source voltage		V_{GSS}	±20	V
Power dissipation		P_D *3	1.0	W
		P_D *4	0.54	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	-	-	125	°C/W
	R_{thJA} *4	-	-	232	°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	250	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 250V, V_{GS} = 0V T_j = 25°C	-	-	25	μA
		V_{DS} = 250V, V_{GS} = 0V T_j = 125°C	-	-	100	
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 1mA	1.0	-	3.0	V
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = 10V, I_D = 0.25A	-	6.8	8.8	Ω
		V_{GS} = 4.5V, I_D = 0.25A		7.2	9.4	
		V_{GS} = 4V, I_D = 0.25A		7.4	9.6	
		V_{GS} = 10V, I_D = 0.25A T_j = 125°C	-	12.8	18.0	
Forward transfer admittance	g_{fs}	V_{DS} = 10V, I_D = 0.25A	0.21	0.42	-	S

●**Electrical characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	70	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	10	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	3	-	
Turn - on delay time	$t_{d(on)}$ *5	$V_{DD} \simeq$ 125V, V_{GS} = 10V	-	6	-	ns
Rise time	t_r *5	I_D = 0.25A	-	10	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L = 500Ω	-	21	-	
Fall time	t_f *5	R_G = 10Ω	-	90	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	$V_{DD} \simeq$ 125V	-	3.5	-	nC
Gate - Source charge	Q_{gs} *5	I_D = 0.5A	-	0.55	-	
Gate - Drain charge	Q_{gd} *5	V_{GS} = 10V	-	1.0	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \simeq$ 125V, I_D = 0.5A	-	3.0	-	V

●**Body diode electrical characteristics** (Source-Drain)(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous source current	I_S *1	T_c = 25°C	-	-	0.5	A
Pulsed source current	I_{SM} *2		-	-	2.0	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = 0.5A	-	-	1.2	V
Reverse recovery time	t_{rr} *5	I_S = 0.25A di/dt = 100A/μs	-	60	-	ns
Reverse recovery charge	Q_{rr} *5		-	60	-	nC

*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 (12×20×0.8mm)

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

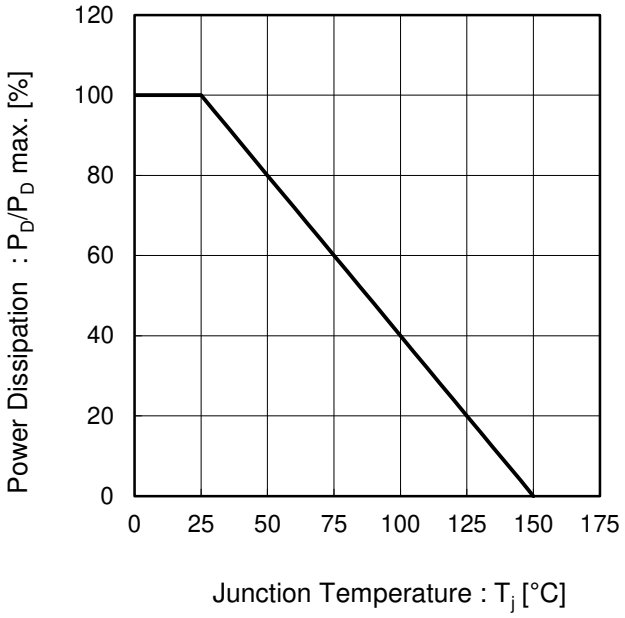
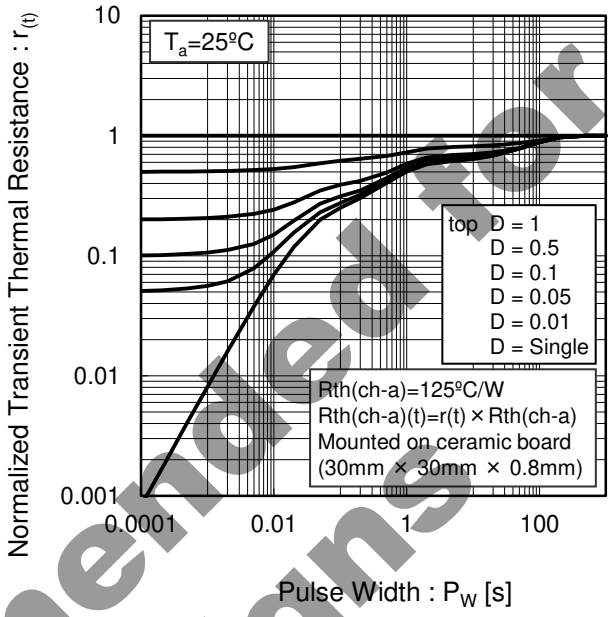


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.3 Typical Output Characteristics(I)

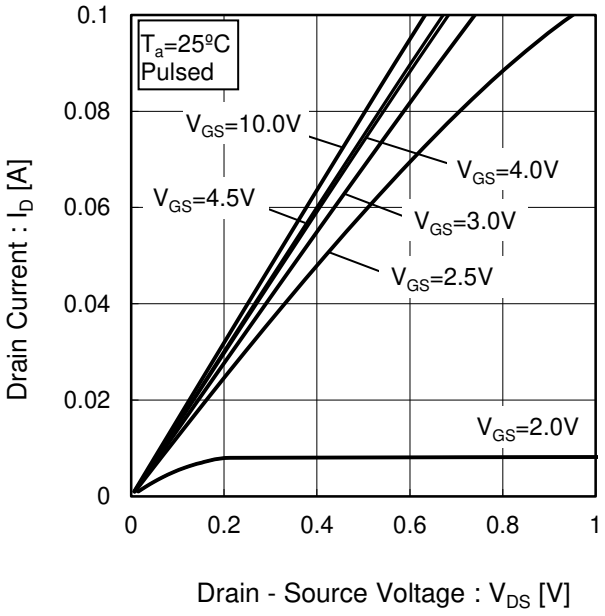
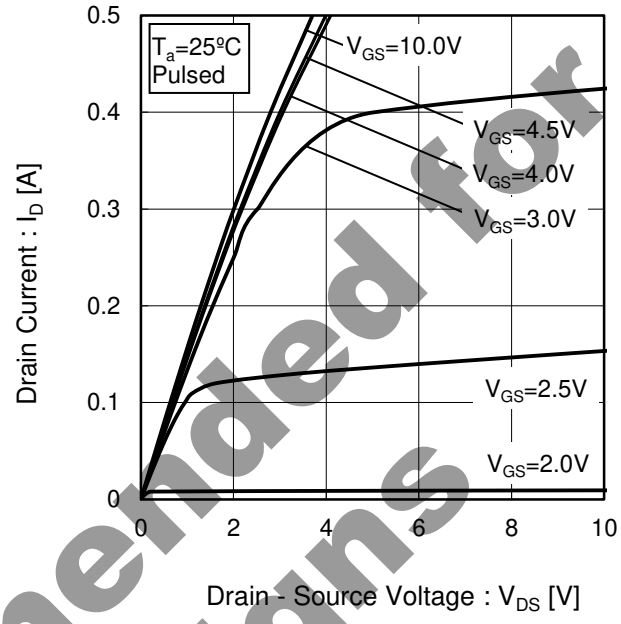


Fig.4 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.5 Breakdown Voltage vs. Junction Temperature

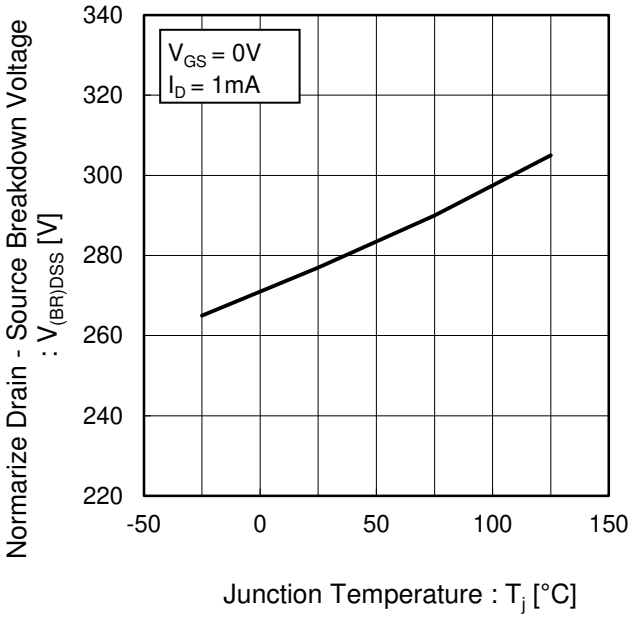


Fig.6 Typical Transfer Characteristics

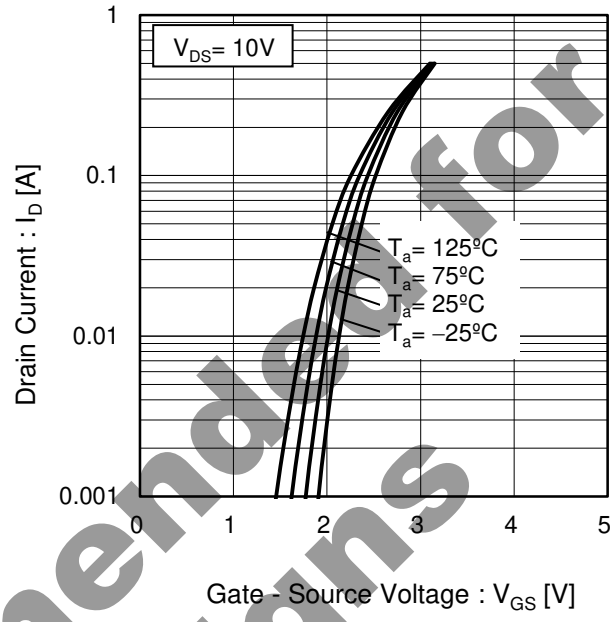


Fig.7 Gate Threshold Voltage vs. Junction Temperature

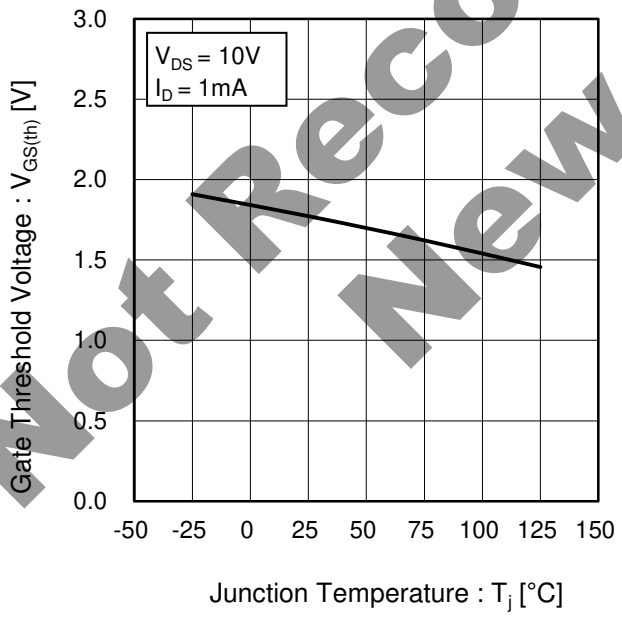
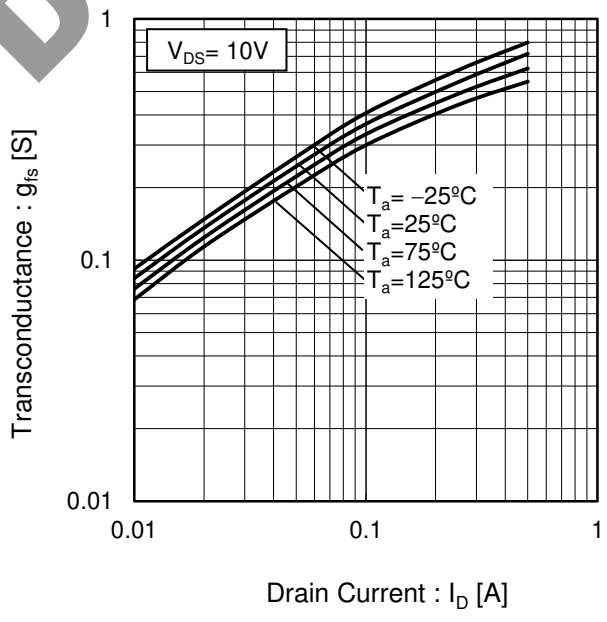


Fig.8 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.9 Static Drain - Source On - State Resistance vs. Gate Source Voltage

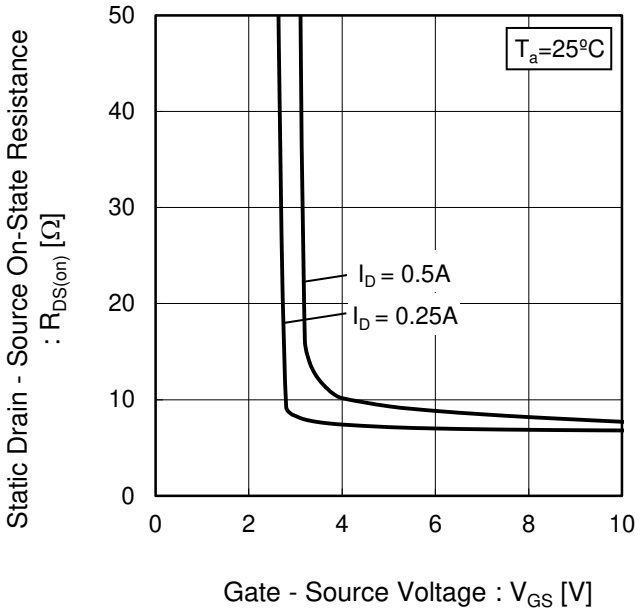


Fig.10 Static Drain - Source On - State Resistance vs. Drain Current(I)

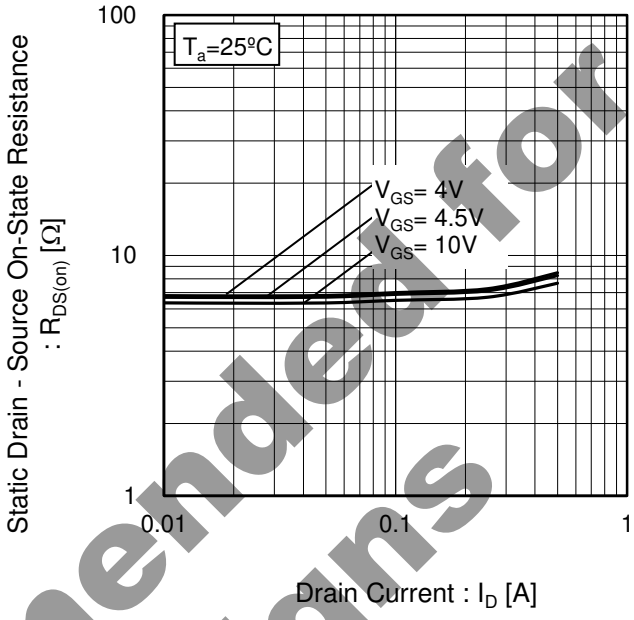
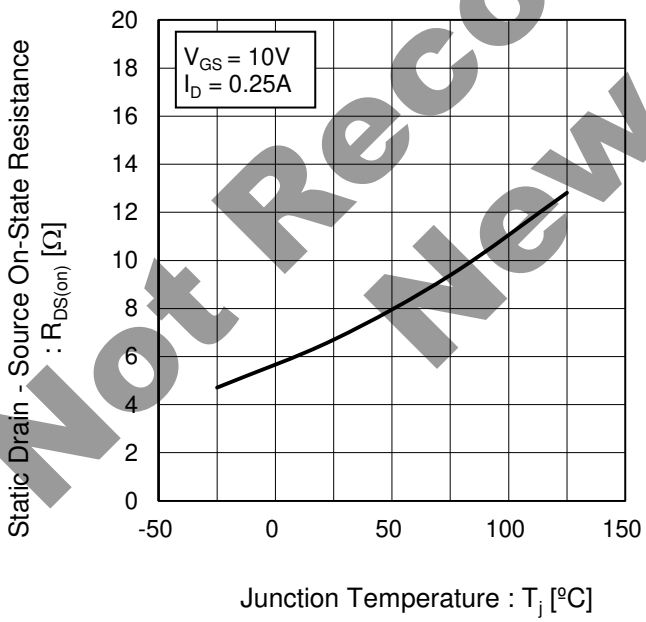


Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Drain Current(I)

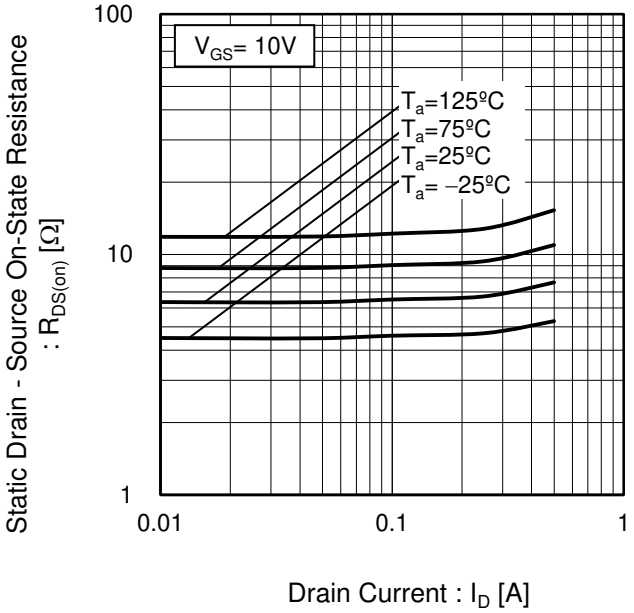


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(II)

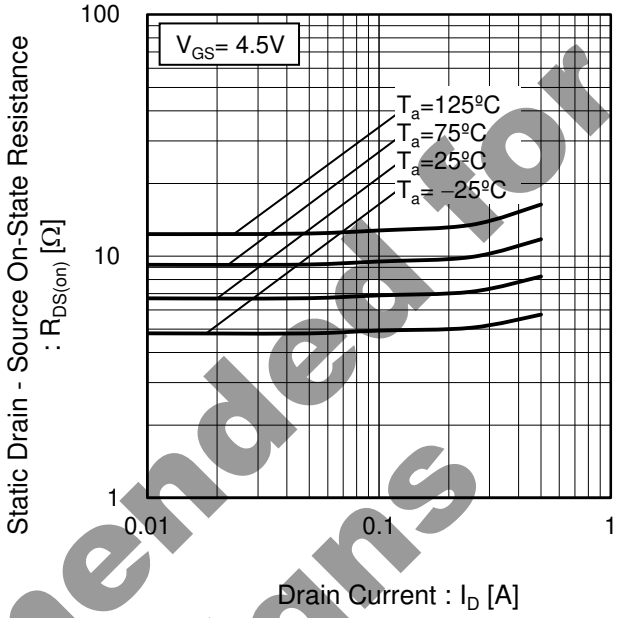


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(III)

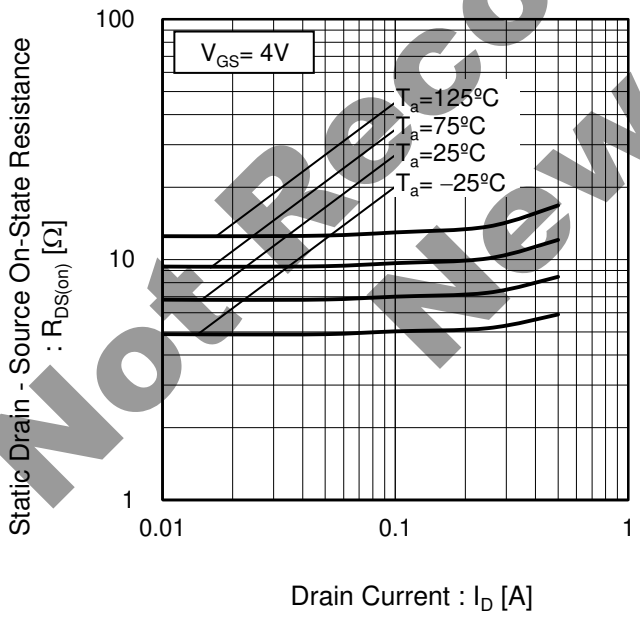
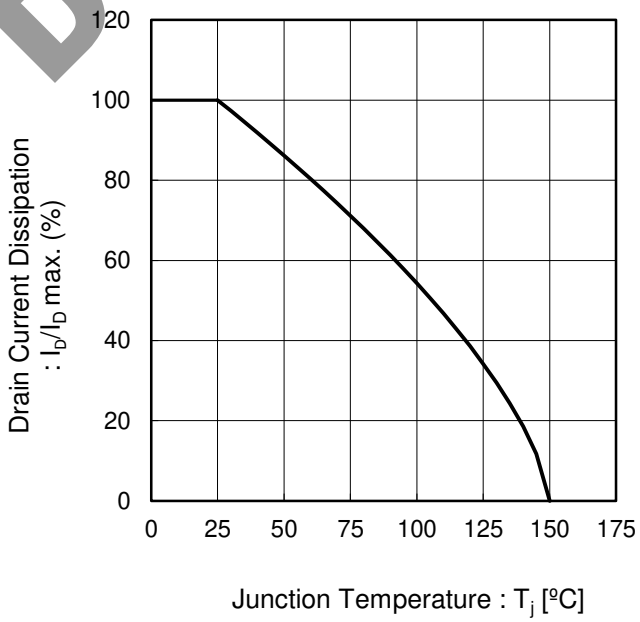


Fig.15 Drain Current Derating Curve



●Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

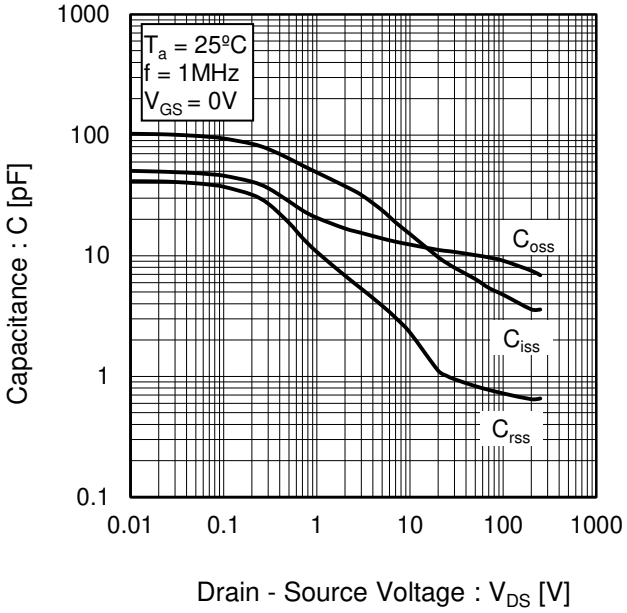


Fig.17 Switching Characteristics

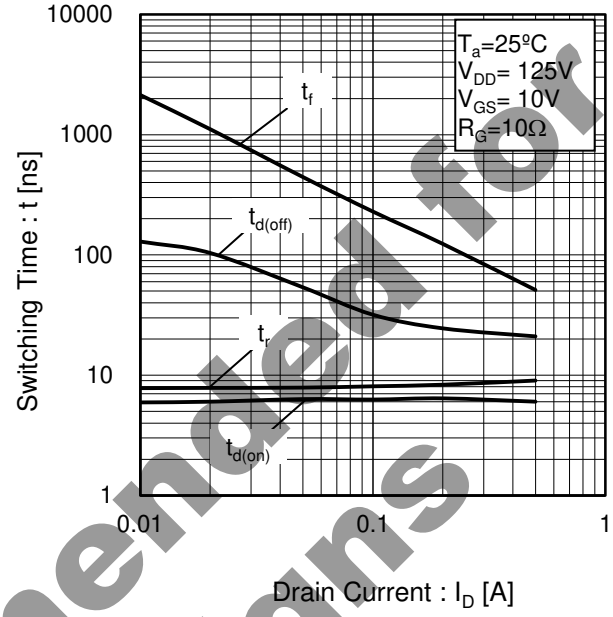
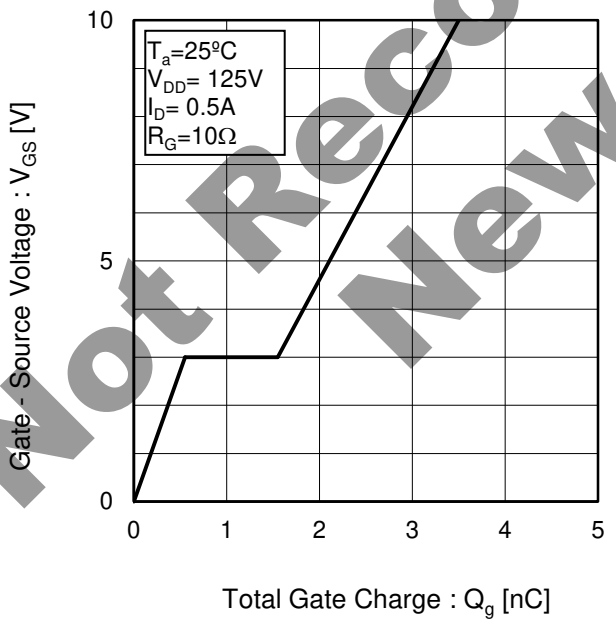


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.19 Source Current vs. Source - Drain Voltage

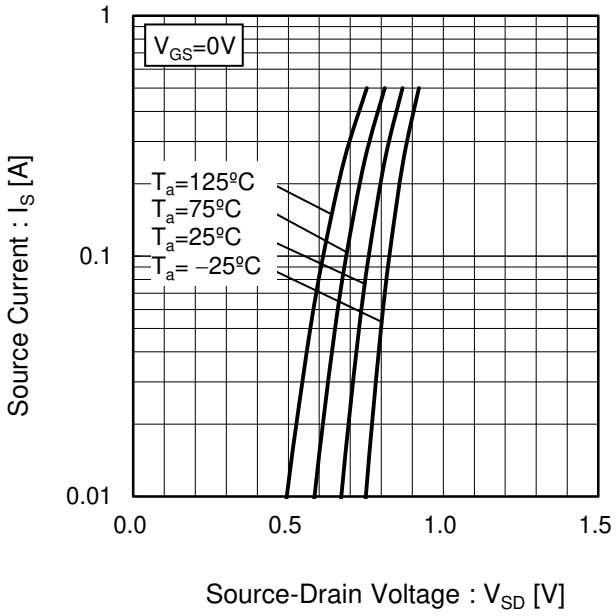
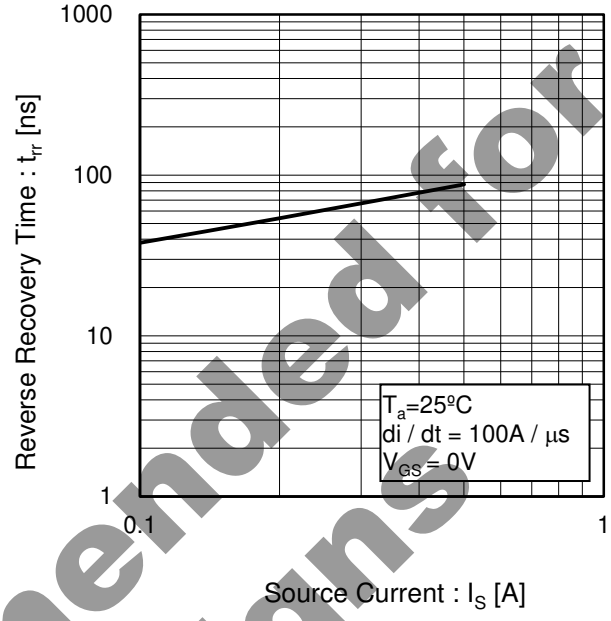


Fig20 Reverse Recovery Time vs.Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

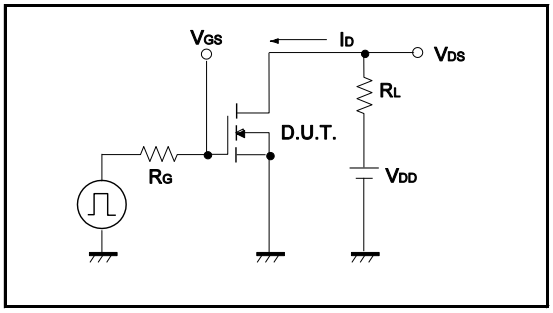


Fig.1-2 Switching Waveforms

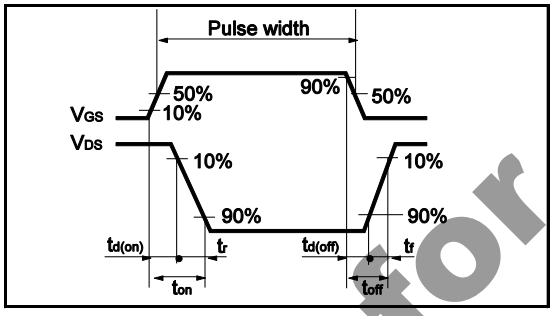


Fig.2-1 Gate Charge Measurement Circuit

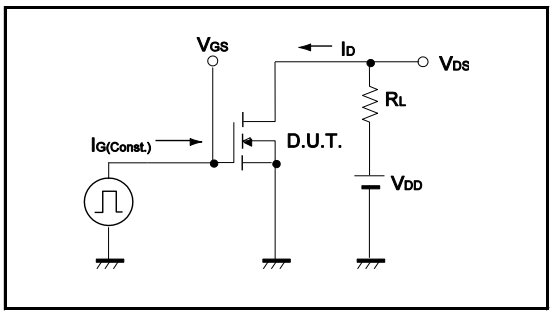
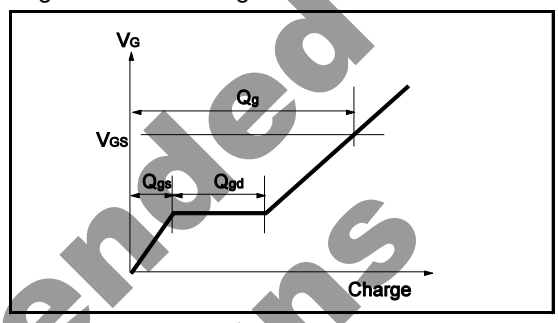
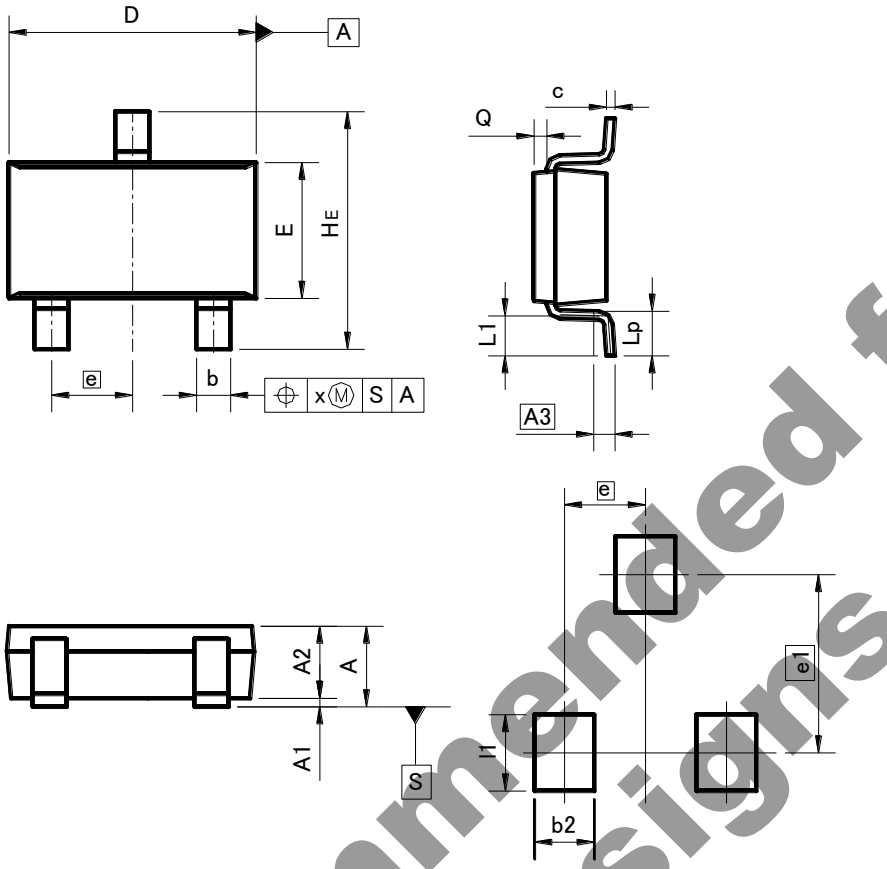


Fig.2-2 Gate Charge Waveform



●**Dimensions** (Unit : mm)

TSMT3



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	–	1.00	–	0.039
A1	0.00	0.10	0.000	0.004
A2	0.75	0.95	0.030	0.037
A3	0.25		0.010	
b	0.35	0.50	0.014	0.020
c	0.10	0.26	0.004	0.010
D	2.80	3.00	0.110	0.118
E	1.50	1.80	0.059	0.071
e	0.95		0.037	
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.05	0.25	0.002	0.010
x	–	0.20	–	0.008

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2		0.70	–	0.028
e1	2.10		0.083	
l1	–	0.90	–	0.035

Dimension in mm / inches

Notes

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3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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7) The Products specified in this document are not designed to be radiation tolerant.

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