ROHM SEMICONDUCTOR

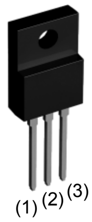
RCX330N25

Nch 250V 33A Power MOSFET Datasheet

V_{DSS}	250V
$R_{DS(on)}$ (Max.)	105mΩ
I_D	33A
P_D	40W

●Outline

TO-220FM



●Features

1) Low on-resistance.

2) Fast switching speed.

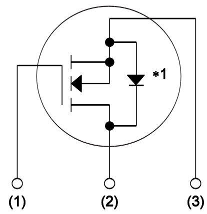
3) Drive circuits can be simple.

4) Parallel use is easy.

5) Pb-free lead plating ; RoHS compliant

6) 100% Avalanche tested

●Inner circuit



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

∗1 BODY DIODE

●Application

Switching Power Supply

Automotive Motor Drive

Automotive Solenoid Drive

●Packaging specifications

Type	Packaging	Bulk
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	500
	Taping code	-
	Marking	RCX330N25

●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	±33	A
	T_c = 100°C	I_D *1	±17.9	A
Pulsed drain current		$I_{D,pulse}$ *2	±132	A
Gate - Source voltage		V_{GSS}	±30	V
Avalanche energy, single pulse		E_{AS} *3	74.8	mJ
Avalanche current		I_{AR} *3	16.5	A
Power dissipation	T_c = 25°C	P_D	40	W
	T_a = 25°C	P_D	2.23	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 - case	R_{thJC}	-	-	3.13	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	56	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

●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	-	-	10	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 1mA	3.0	-	5.0	V
Static drain - source on - state resistance	$R_{DS(on)}$ *4	V_{GS} = 10V, I_D = 16.5A	-	77	105	mΩ
		V_{GS} = 10V, I_D = 16.5A T_j = 125°C	-	165	230	
Forward transfer admittance	g_{fs}	V_{DS} = 10V, I_D = 16.5A	10	20	-	S

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	4500	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	220	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	130	-	
Turn - on delay time	$t_{d(on)}$ *4	$V_{DD} \simeq$ 125V, V_{GS} = 10V	-	50	-	ns
Rise time	t_r *4	I_D = 16.5A	-	200	-	
Turn - off delay time	$t_{d(off)}$ *4	R_L = 7.6Ω	-	120	-	
Fall time	t_f *4	R_G = 10Ω	-	140	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *4	$V_{DD} \simeq$ 125V	-	80	-	nC
Gate - Source charge	Q_{gs} *4	I_D = 33A	-	25	-	
Gate - Drain charge	Q_{gd} *4	V_{GS} = 10V	-	27	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \simeq$ 125V, I_D = 33A	-	6.6	-	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	-	-	33	A
Pulsed source current	I_{SM} *2		-	-	132	A
Forward voltage	V_{SD} *4	V_{GS} = 0V, I_S = 33A	-	-	1.5	V
Reverse recovery time	t_{rr} *4	I_S = 16.5A di/dt = 100A/μs	-	145	-	ns
Reverse recovery charge	Q_{rr} *4		-	670	-	nC

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L $\simeq$ 500μH, V_{DD} = 50V, Rg = 25Ω, starting T_j = 25°C

*4 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

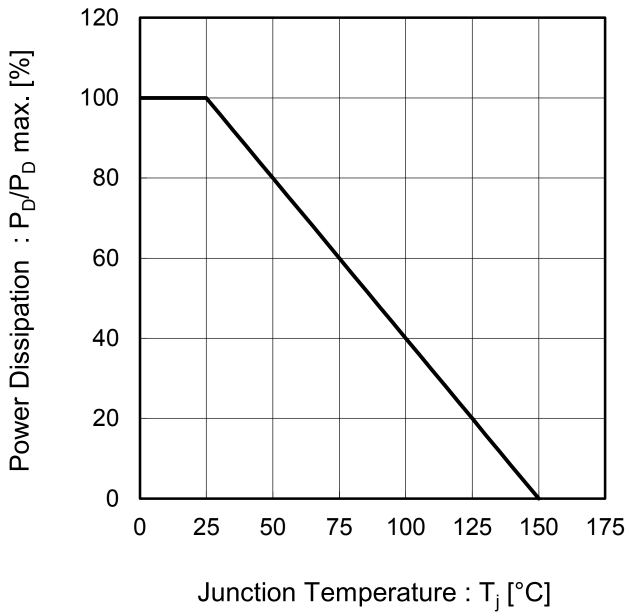


Fig.2 Maximum Safe Operating Area

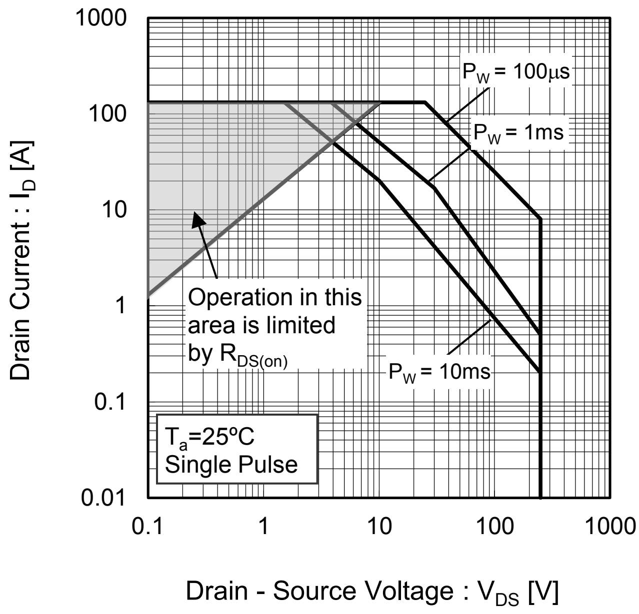
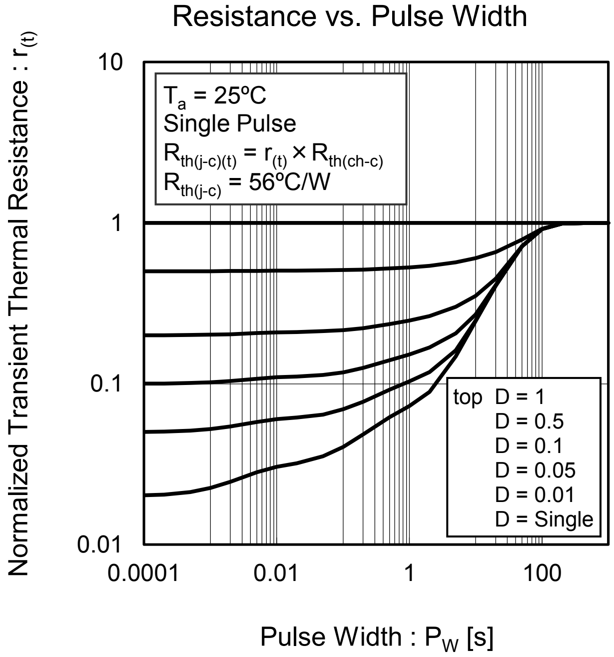


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

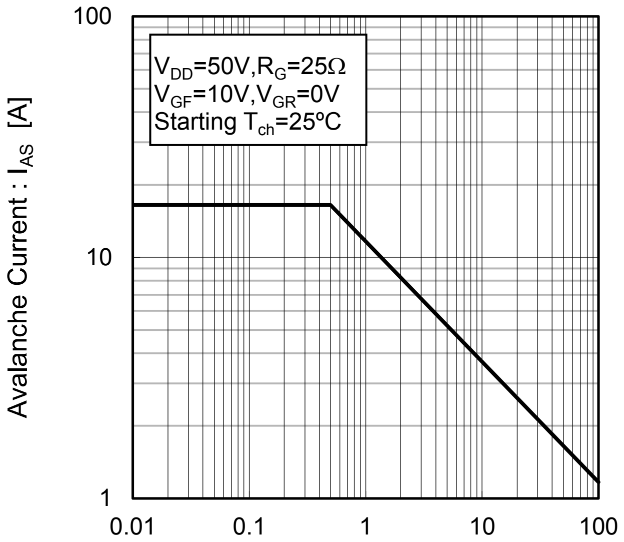


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

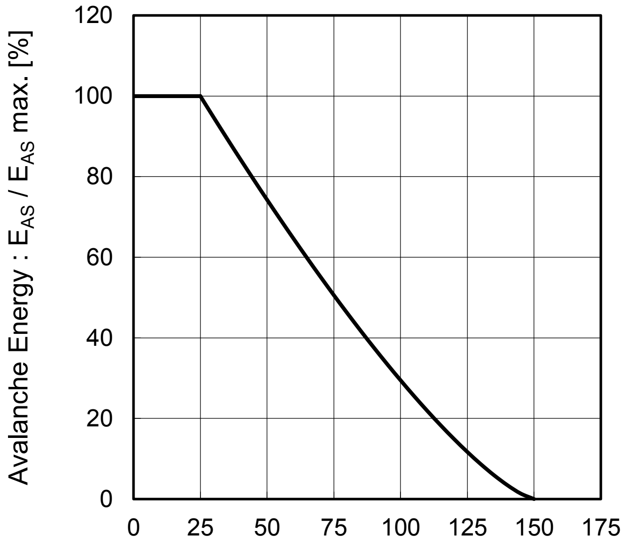


Fig.6 Typical Output Characteristics(I)

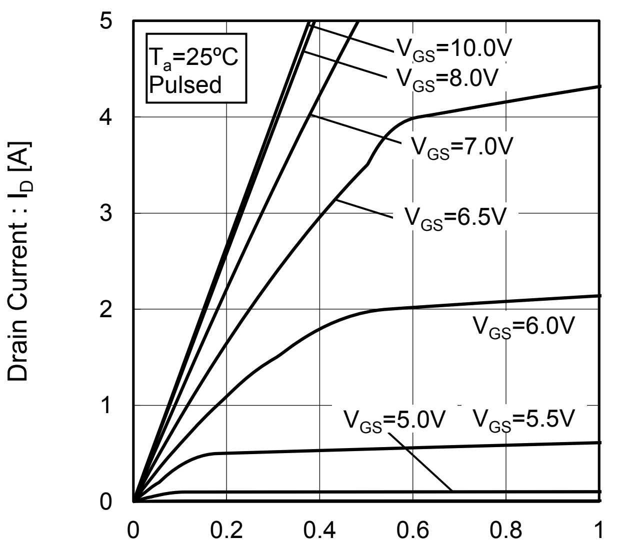
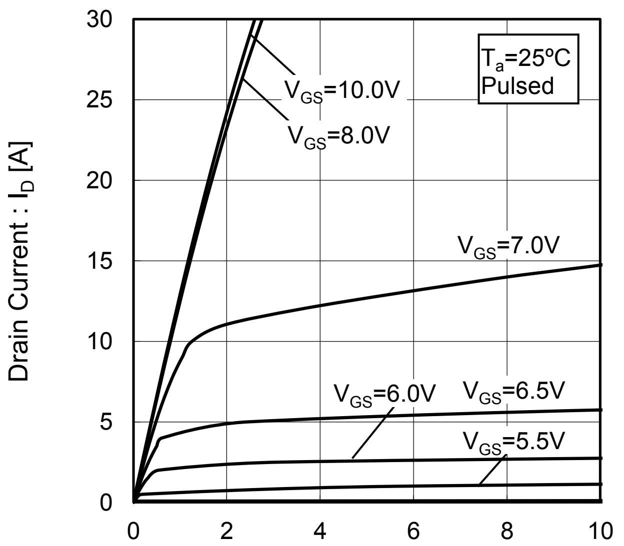


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

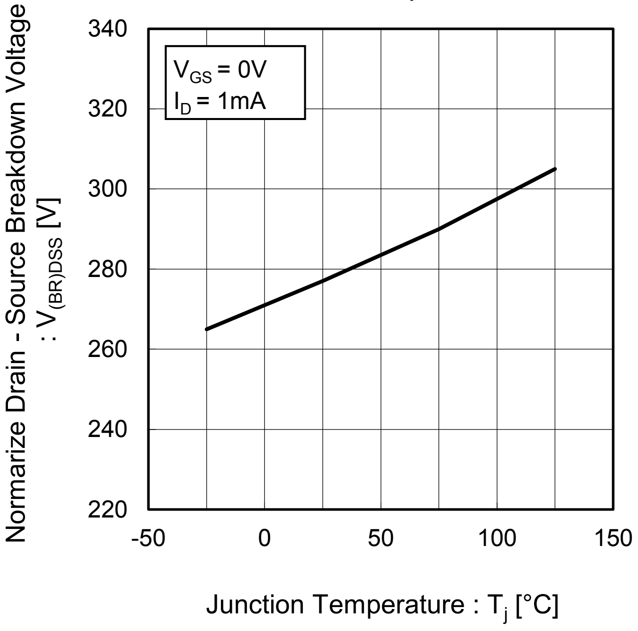


Fig.9 Typical Transfer Characteristics

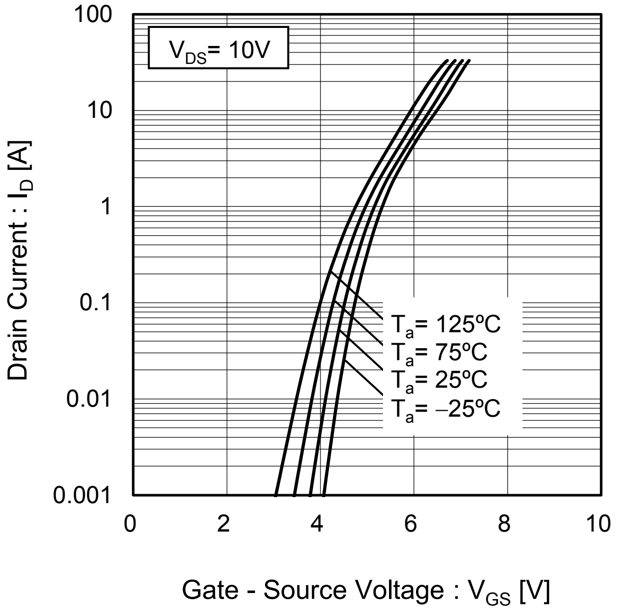


Fig.10 Gate Threshold Voltage vs. Junction Temperature

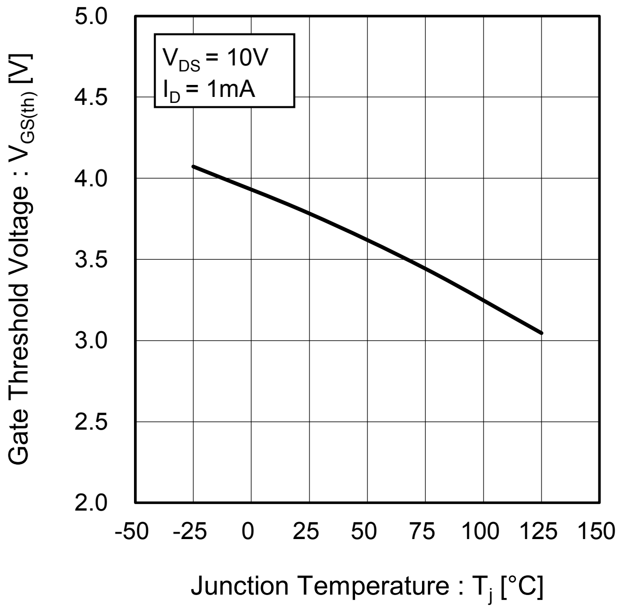
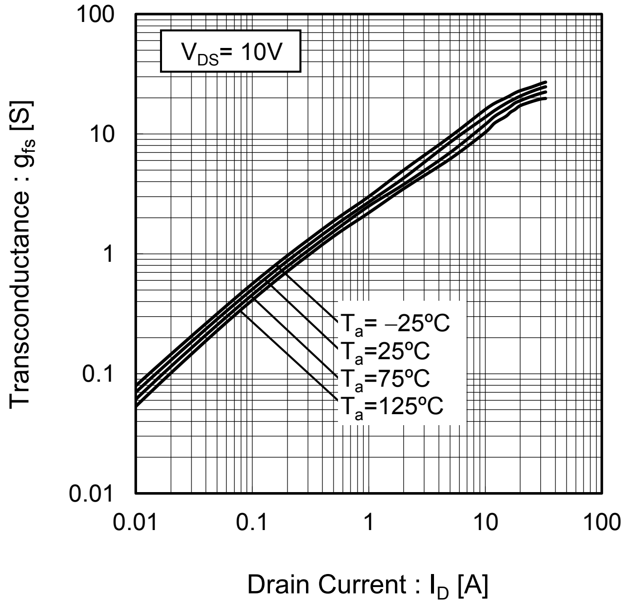


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

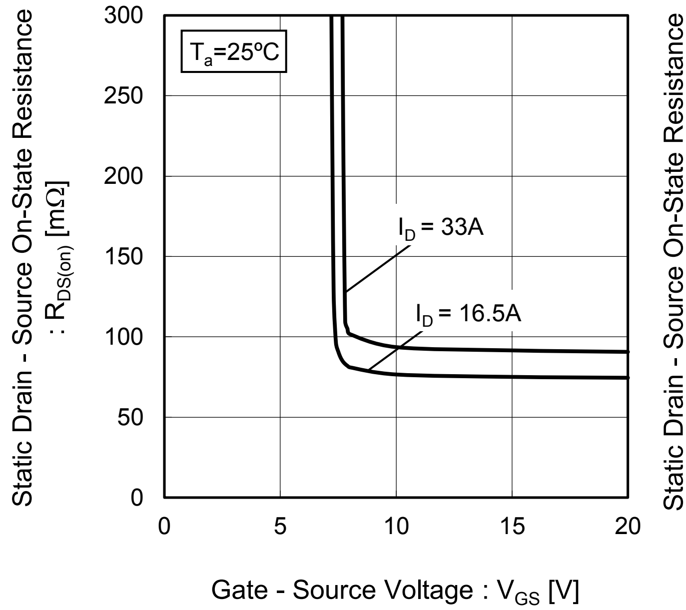


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

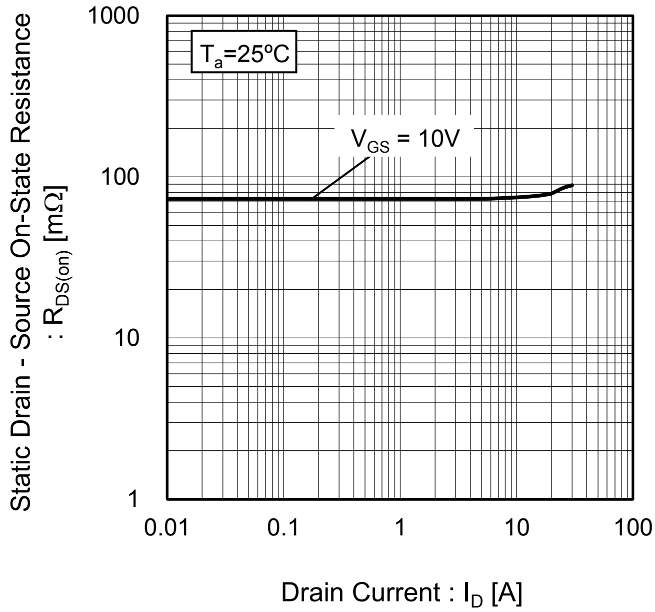
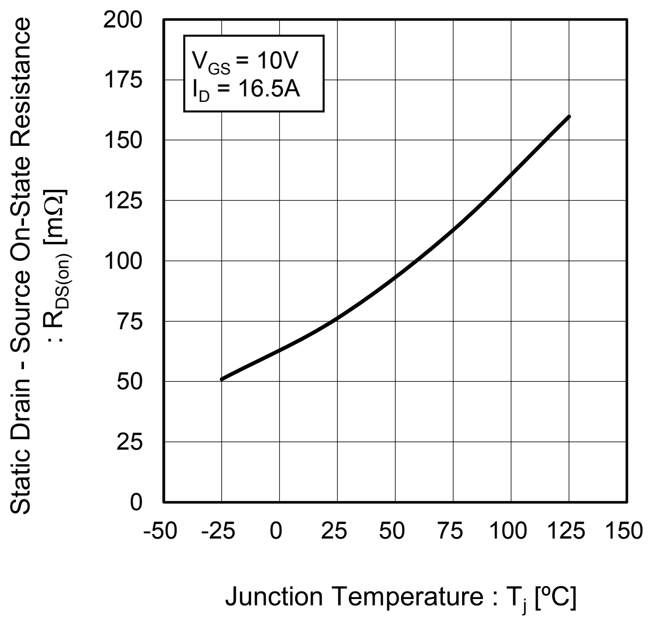


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●**Electrical characteristic curves**

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

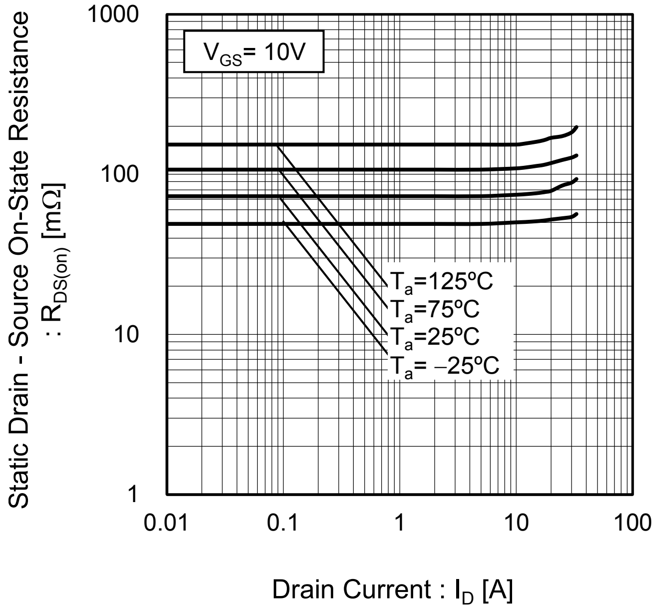
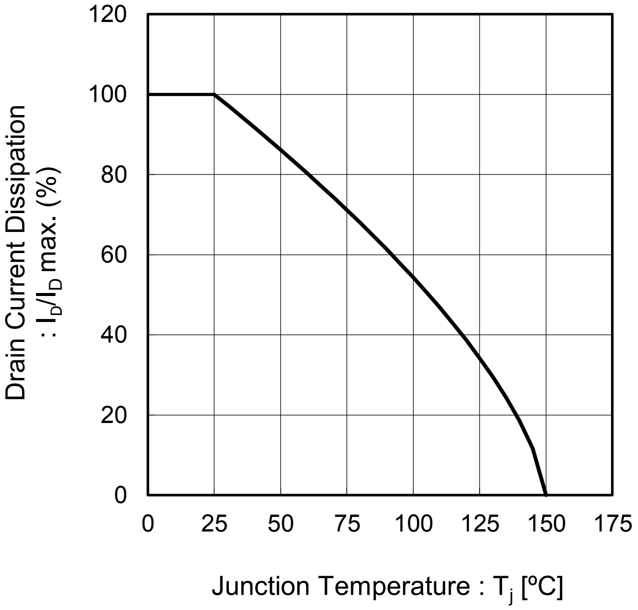


Fig.16 Drain Current Derating Curve



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

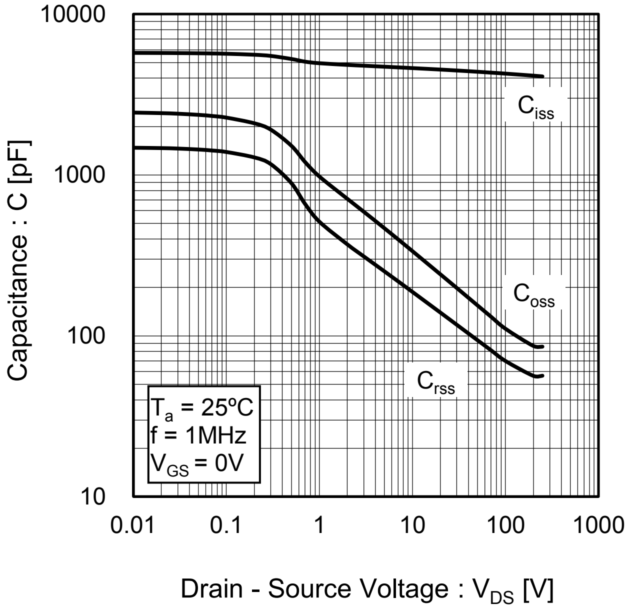


Fig.18 Switching Characteristics

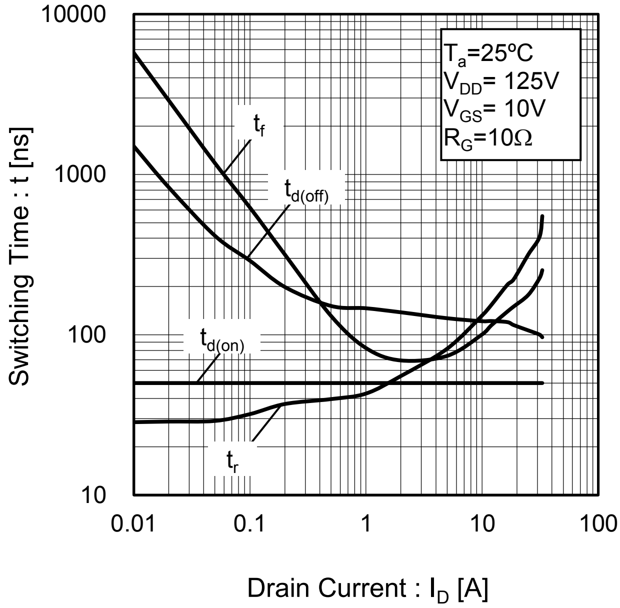
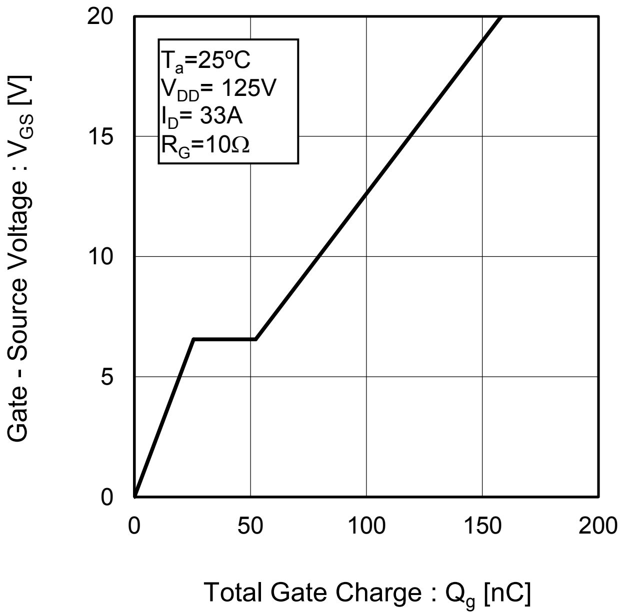


Fig.19 Dynamic Input Characteristics



●**Electrical characteristic curves**

Fig.20 Source Current vs. Source - Drain Voltage

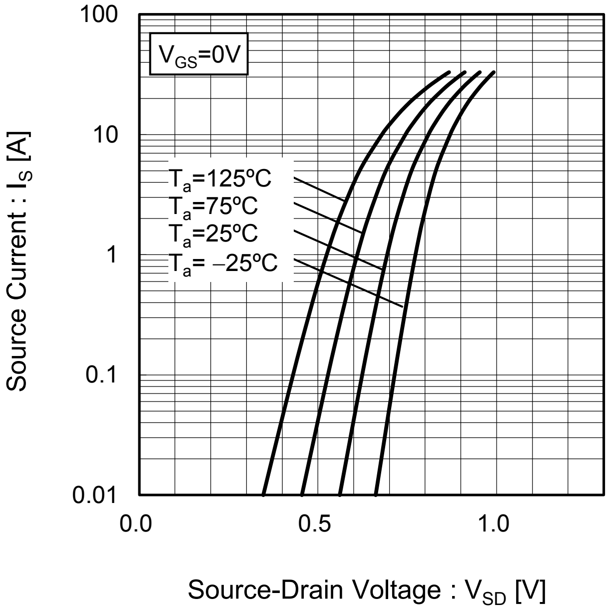
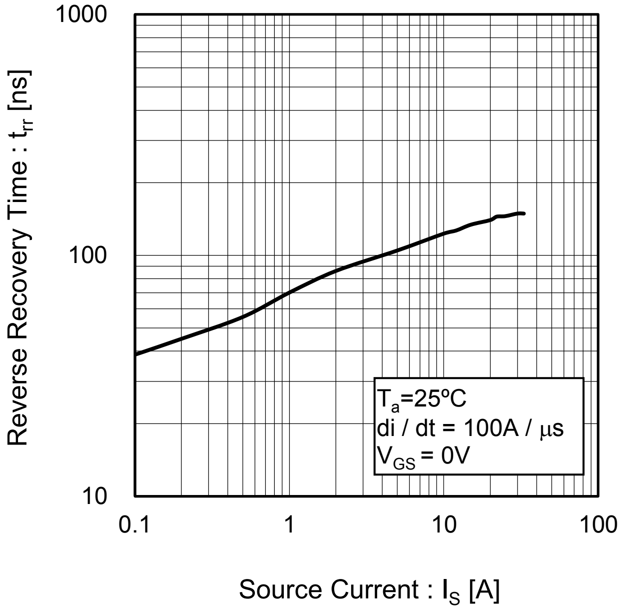


Fig21 Reverse Recovery Time vs.Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

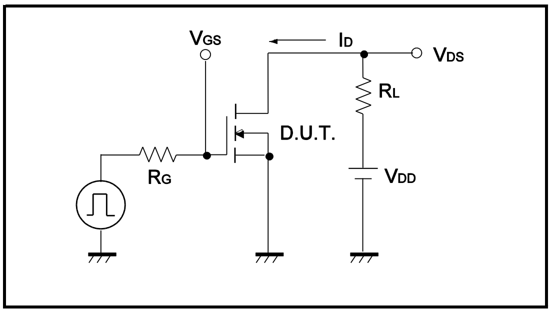


Fig.1-2 Switching Waveforms

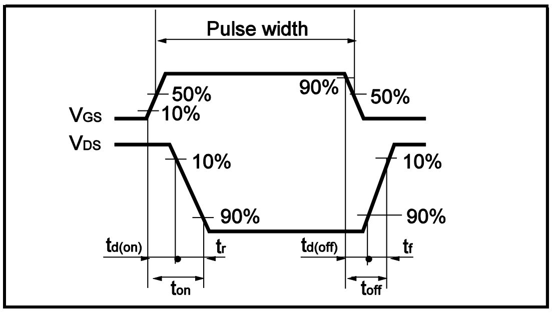


Fig.2-1 Gate Charge Measurement Circuit

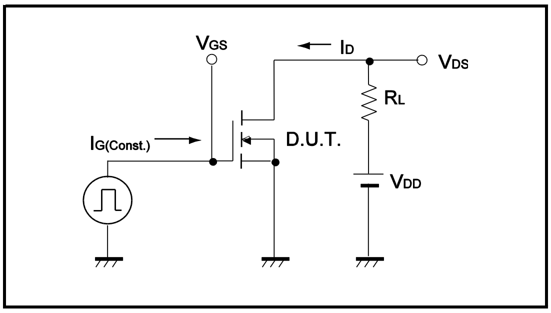


Fig.2-2 Gate Charge Waveform

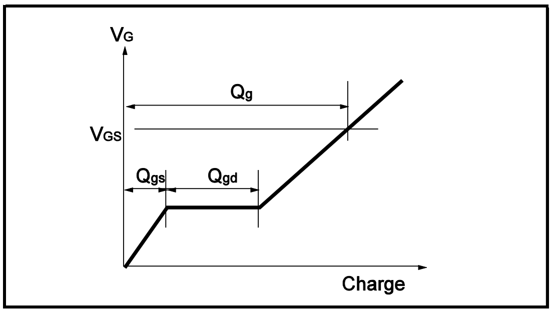


Fig.3-1 Avalanche Measurement Circuit

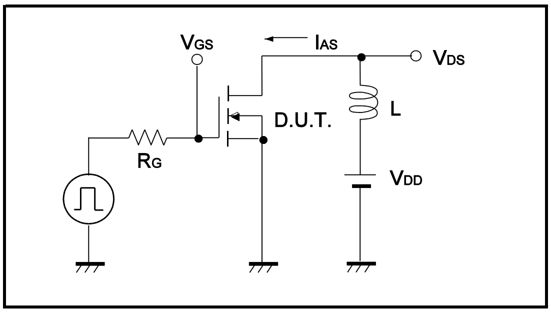
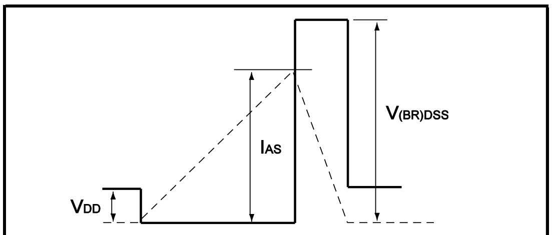


Fig.3-2 Avalanche Waveform



$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{AS}^{2} \cdot \frac{V_{(BR)DSS}}{V_{(BR)DSS} - V_{DD}}$$

●Dimensions (Unit : mm)

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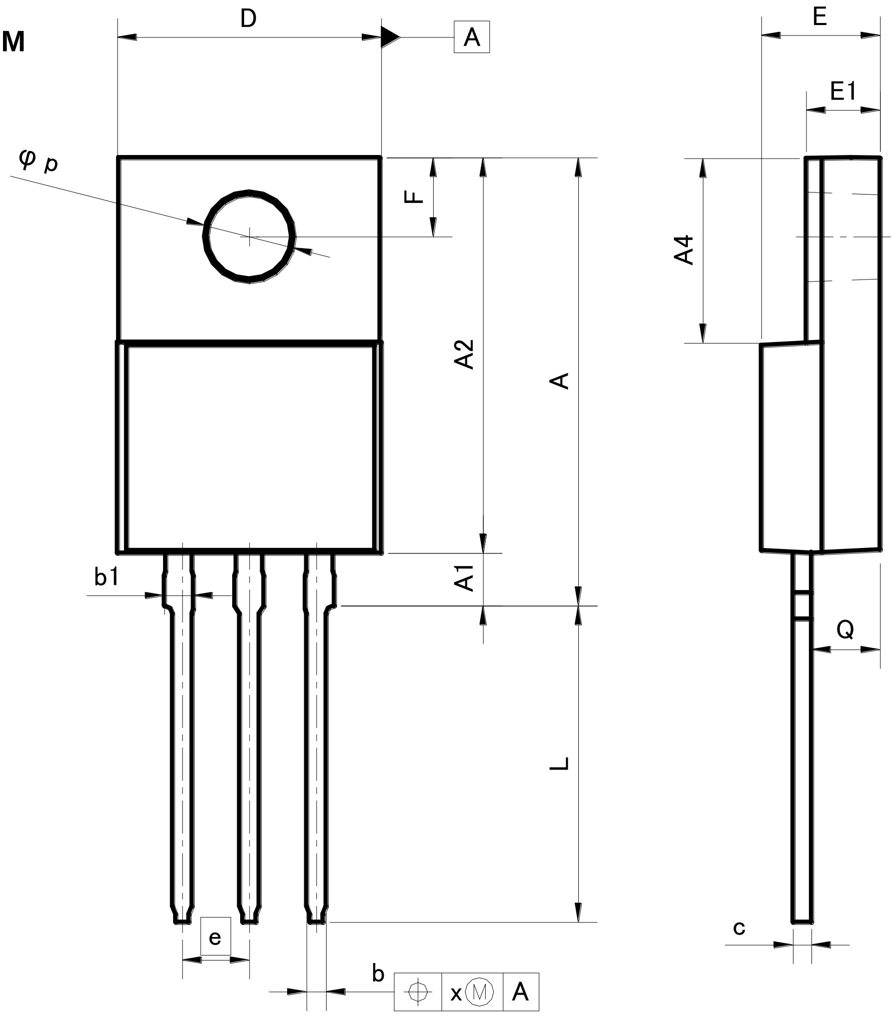

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.60	17.60	0.654	0.693
A1	1.80	2.20	0.071	0.087
A2	14.80	15.40	0.583	0.606
A4	6.80	7.20	0.268	0.283
b	0.70	0.85	0.028	0.033
b1	1.10	1.50	0.043	0.059
c	0.70	0.85	0.028	0.033
D	9.90	10.30	0.39	0.406
E	4.40	4.80	0.173	0.189
e	2.54		0.10	
E1	2.70	3.00	0.106	0.118
F	2.80	3.20	0.11	0.126
L	11.50	12.50	0.453	0.492
p	3.00	3.40	0.118	0.134
Q	2.10	3.10	0.083	0.122
x	−	0.381	−	0.015

Dimension in mm/inches

Notes

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