

V_{DSS}	250V
$R_{DS(on)}$ (Max.)	1360m Ω
I_D	5.0A
P_D	30W

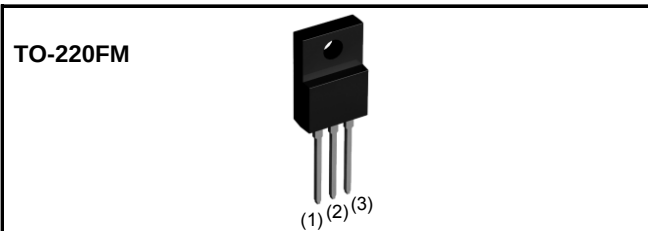
●Features

- 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

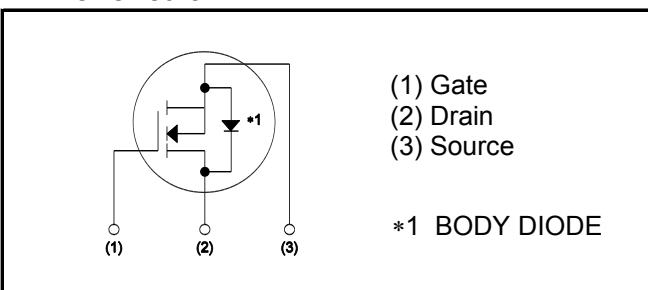
●Application

Switching Power Supply
Automotive Motor Drive
Automotive Solenoid Drive

●Outline



●Inner circuit



●Packaging specifications

Type	Packaging	Bulk
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	500
	Taping code	-
	Marking	RCX051N25

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

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	250	V
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	± 5.0	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	± 2.7	A
Pulsed drain current		$I_{D,pulse}^{*2}$	± 20	A
Gate - Source voltage		V_{GSS}	± 30	V
Avalanche energy, single pulse		E_{AS}^{*3}	1.82	mJ
Avalanche current		I_{AR}^{*3}	2.5	A
Power dissipation	$T_c = 25^\circ\text{C}$	P_D	30	W
	$T_a = 25^\circ\text{C}$	P_D	2.23	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 - case	R_{thJC}	-	-	4.16	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	56	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

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

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}	$V_{DS} = 250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	10	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	3.5	-	5.5	V
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 10V, I_D = 2.5A$	-	970	1360	m Ω
		$V_{GS} = 10V, I_D = 2.5A$ $T_j = 125^\circ\text{C}$	-	2100	2950	
Forward transfer admittance	g_{fs}	$V_{DS} = 10V, I_D = 2.5A$	1.25	2.50	-	S

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	350		pF
Output capacitance	C_{oss}	$V_{DS} = 25V$	-	30		
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	15		
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \approx 125V, V_{GS} = 10V$	-	15	-	ns
Rise time	t_r^{*4}	$I_D = 2.5A$	-	16	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 49.9\Omega$	-	18	-	
Fall time	t_f^{*4}	$R_G = 10\Omega$	-	10	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*4}	$V_{DD} \approx 125V$	-	8.5	-	nC
Gate - Source charge	Q_{gs}^{*4}	$I_D = 5.0A$	-	3.5	-	
Gate - Drain charge	Q_{gd}^{*4}	$V_{GS} = 10V$	-	3.5	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \approx 125V, I_D = 5.0A$	-	8.0	-	V

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous source current	I_S^{*1}	$T_c = 25^\circ\text{C}$	-	-	5	A
Pulsed source current	I_{SM}^{*2}		-	-	20	A
Forward voltage	V_{SD}^{*4}	$V_{GS} = 0V, I_S = 5.0A$	-	-	1.5	V
Reverse recovery time	t_{rr}^{*4}	$I_S = 2.5A$	-	90	-	ns
Reverse recovery charge	Q_{rr}^{*4}	$di/dt = 100A/\mu s$	-	225	-	nC

*1 Limited only by maximum temperature allowed.

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

*3 $L \approx 500\mu H$, $V_{DD} = 50V$, $R_g = 10\Omega$, starting $T_j = 25^\circ\text{C}$

*4 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

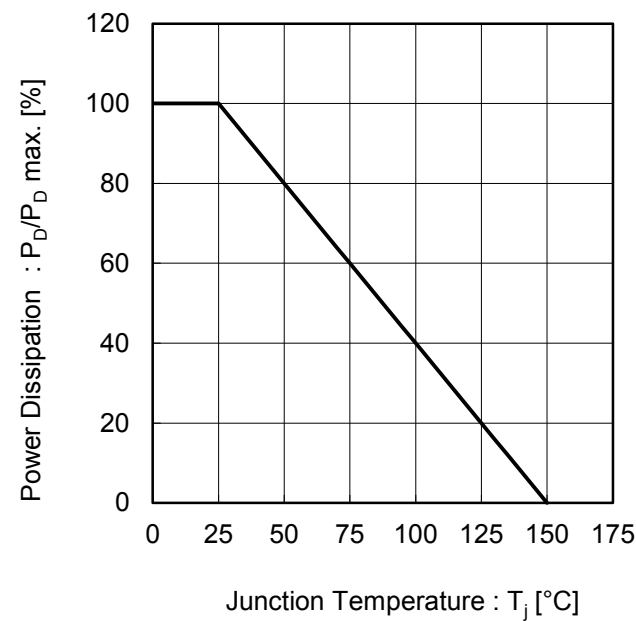


Fig.2 Maximum Safe Operating Area

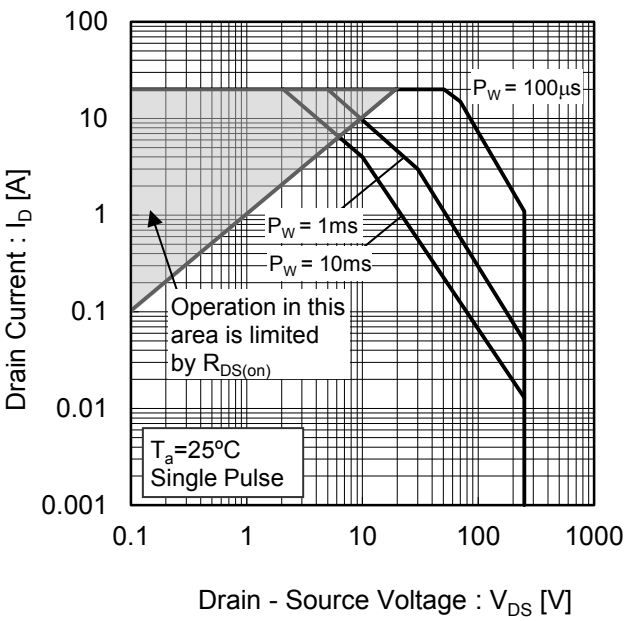
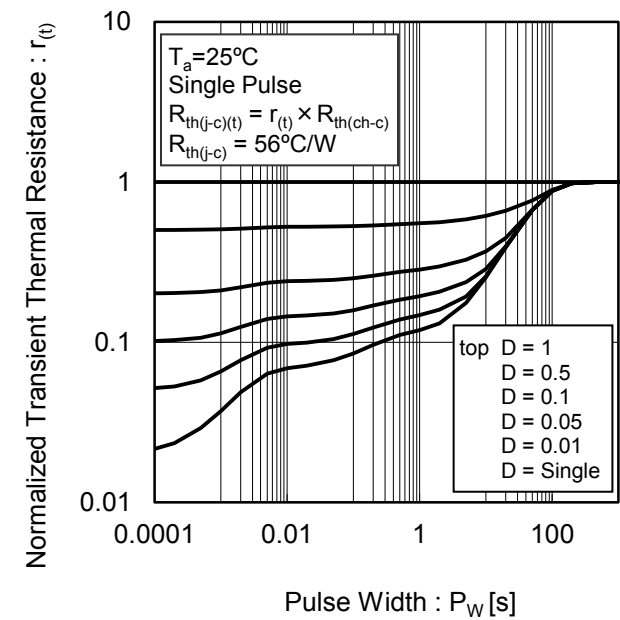


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

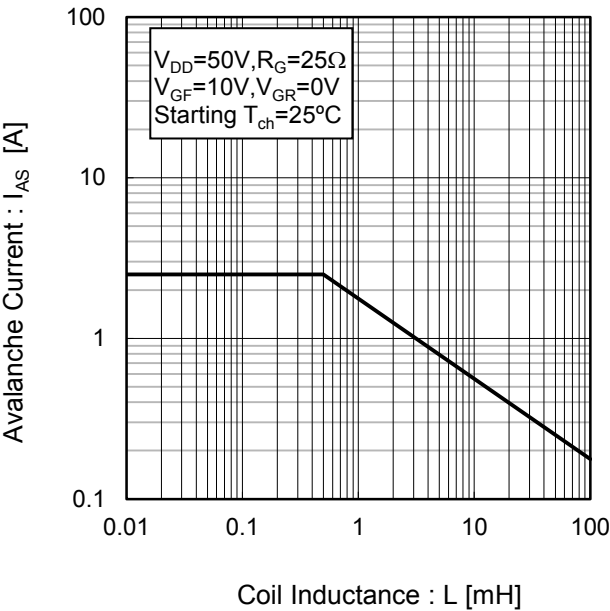


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

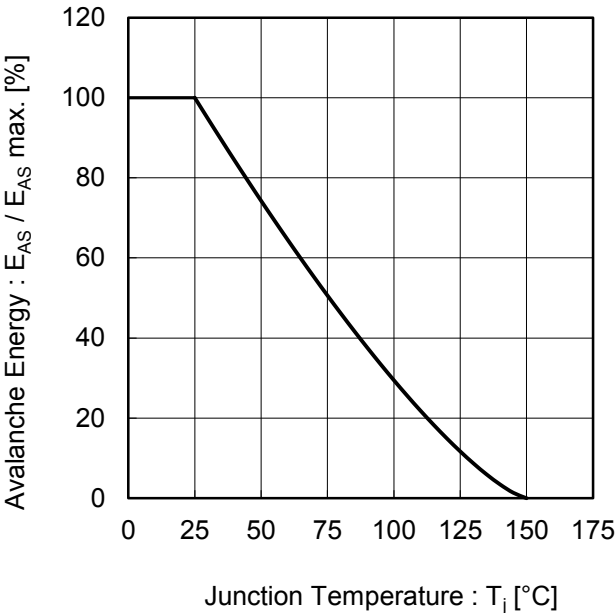


Fig.6 Typical Output Characteristics(I)

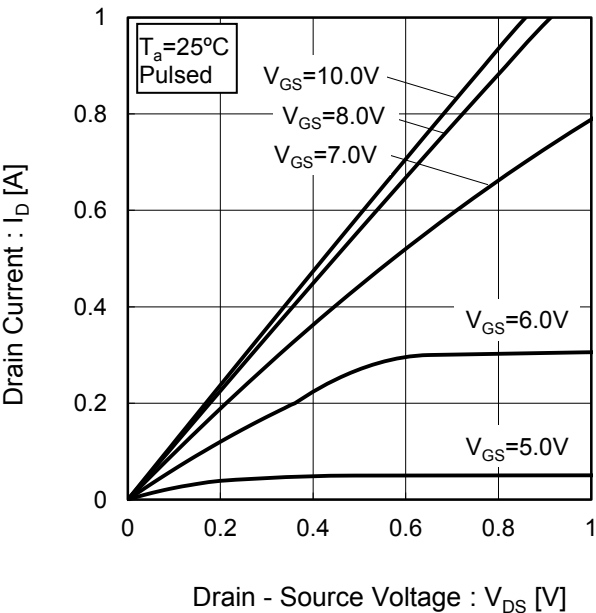
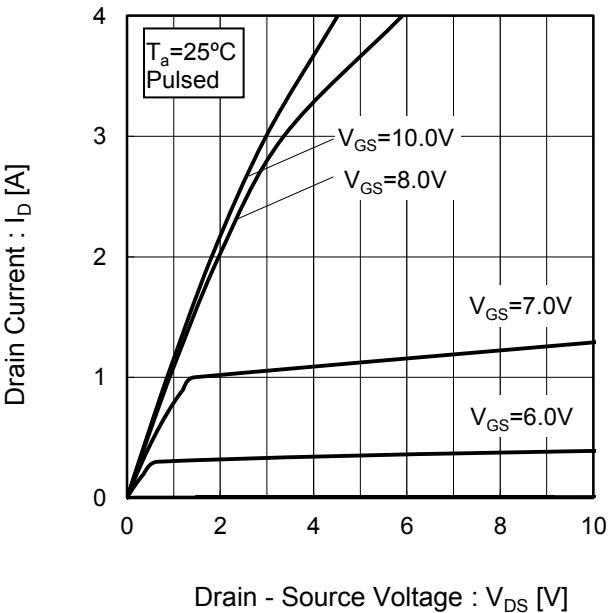


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage
vs. Junction Temperature

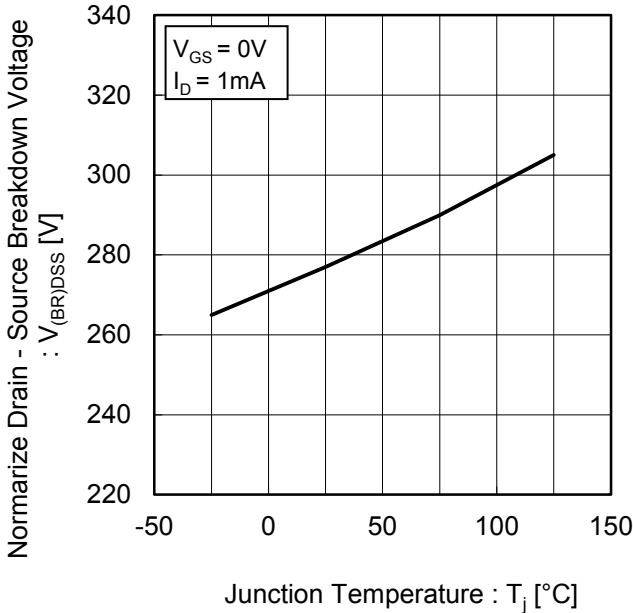


Fig.9 Typical Transfer Characteristics

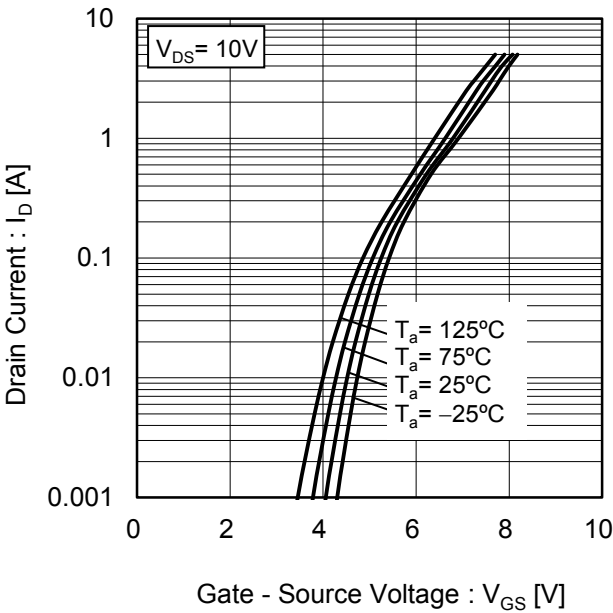


Fig.10 Gate Threshold Voltage
vs. Junction Temperature

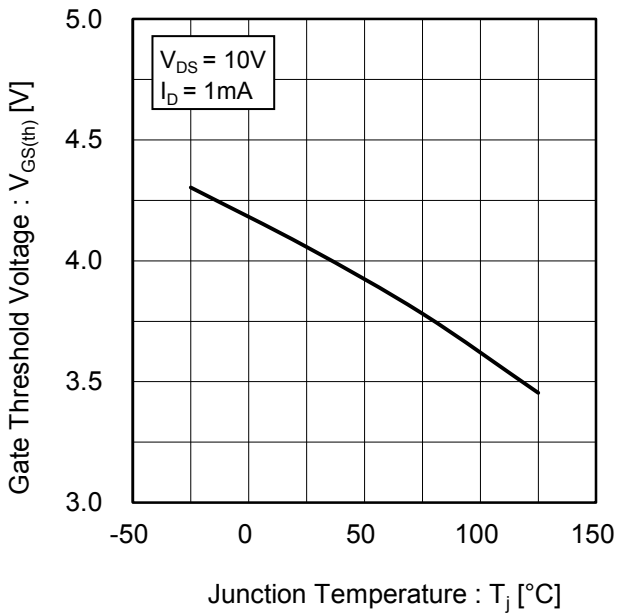
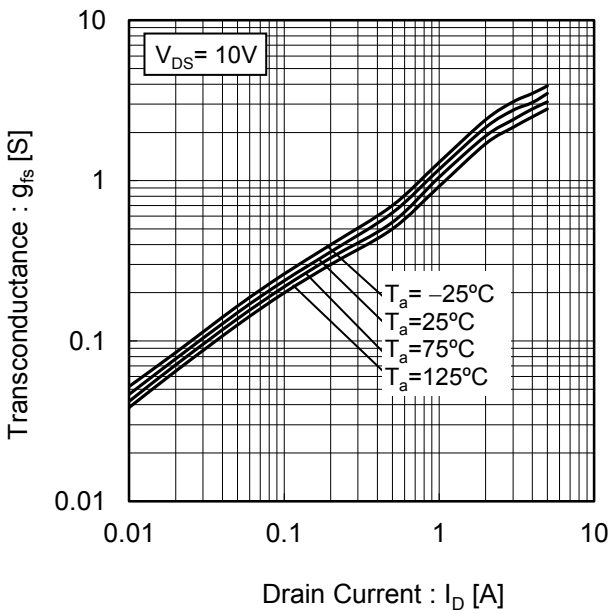


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

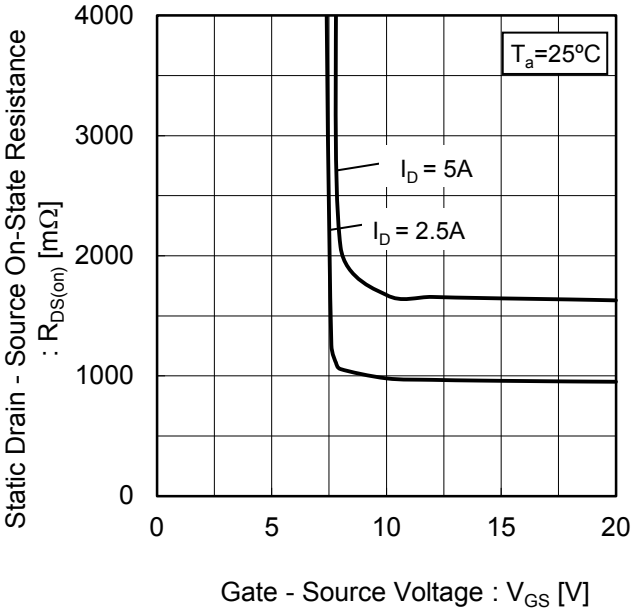


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

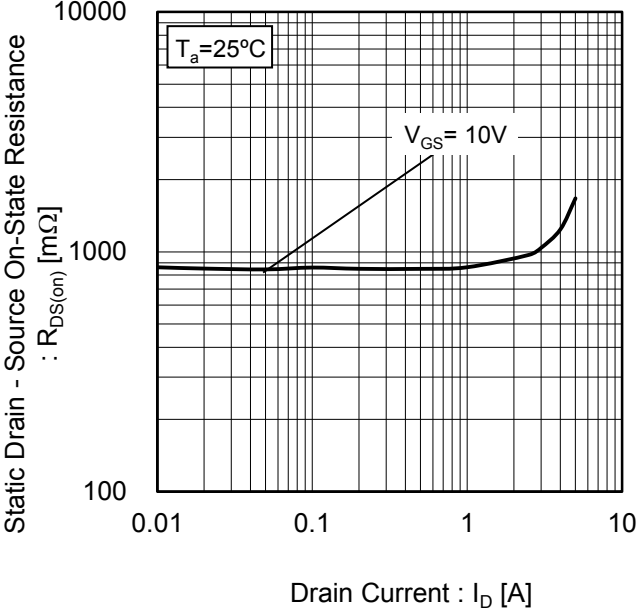
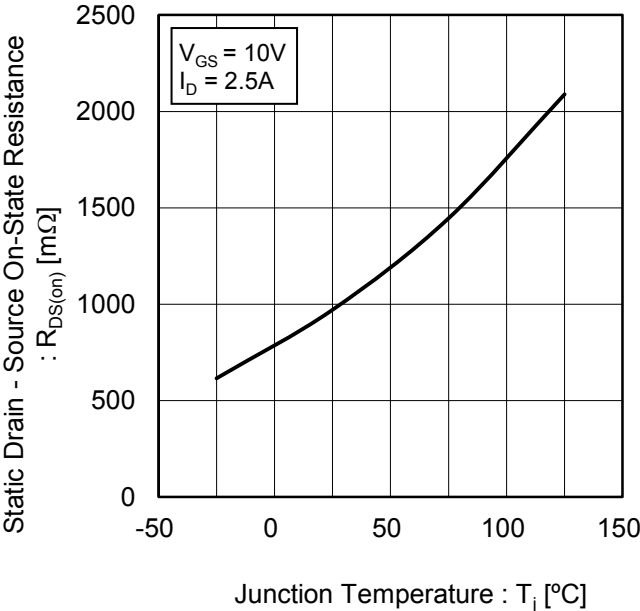


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

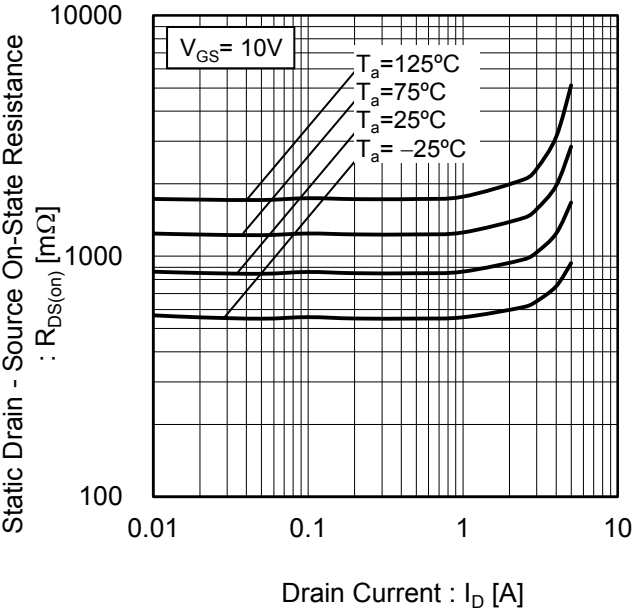
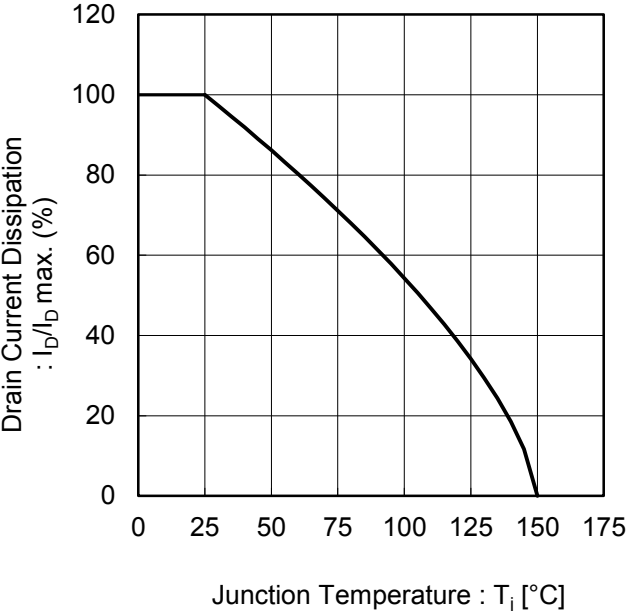


Fig.16 Drain Current Derating Curve



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

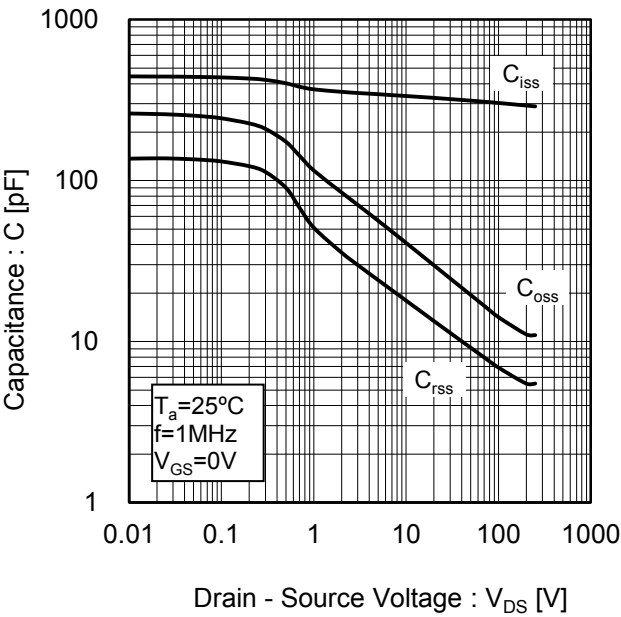


Fig.18 Switching Characteristics

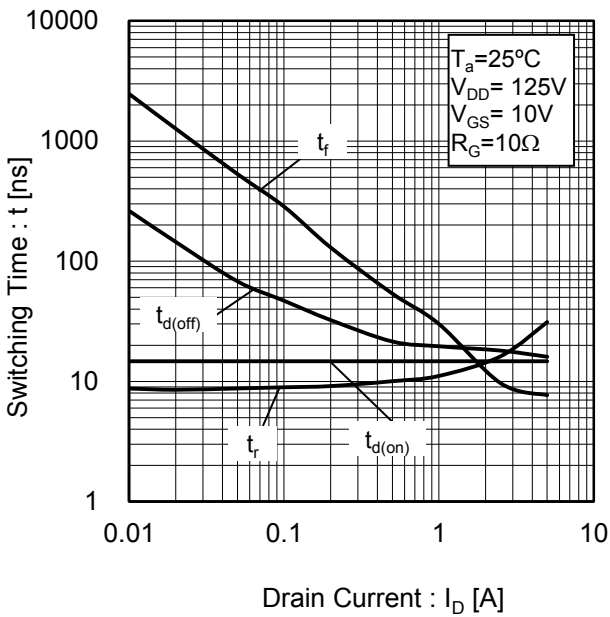
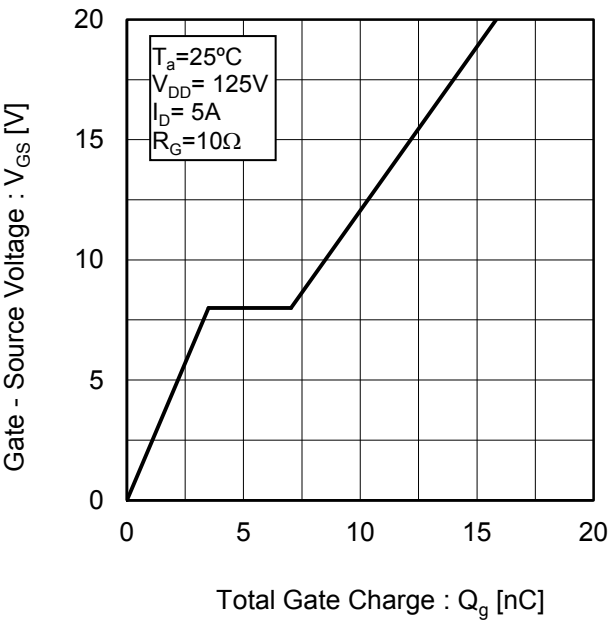


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.20 Source Current
vs. Source - Drain Voltage

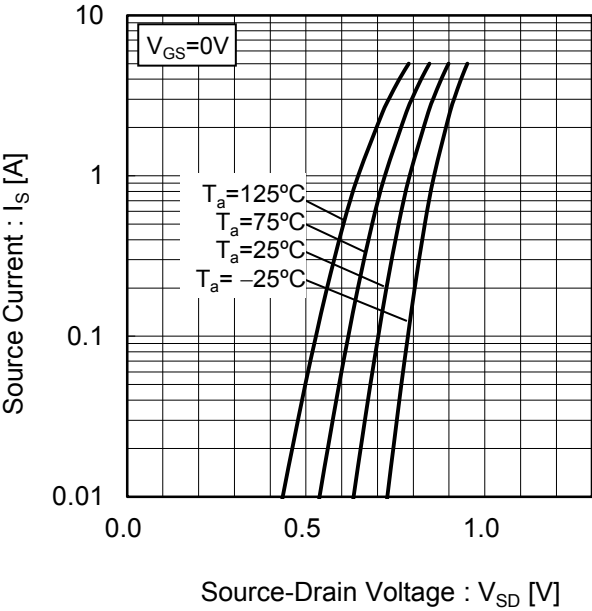
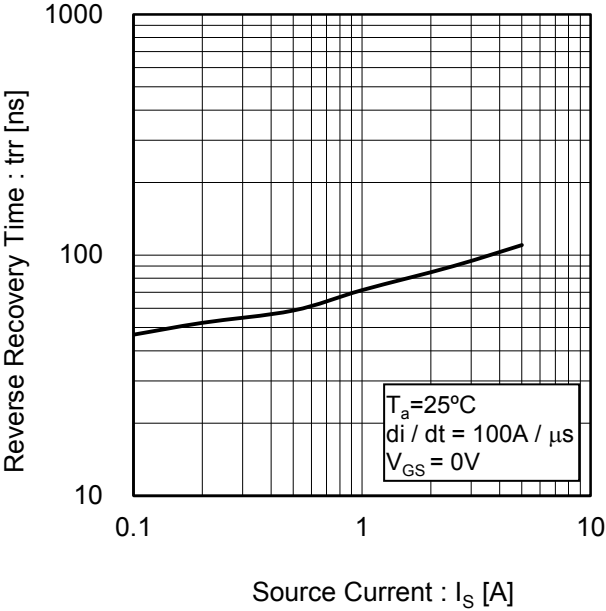


Fig.21 Reverse Recovery Time
vs. Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

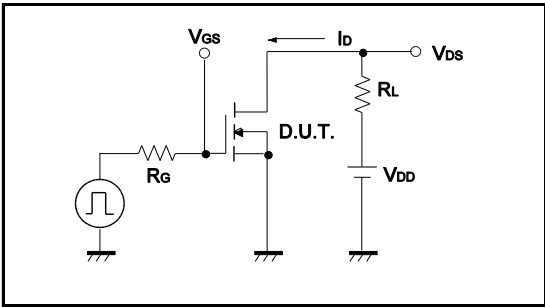


Fig.1-2 Switching Waveforms

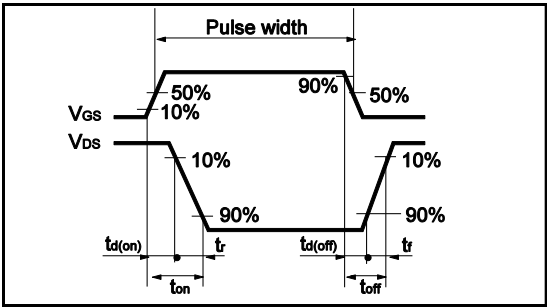


Fig.2-1 Gate Charge Measurement Circuit

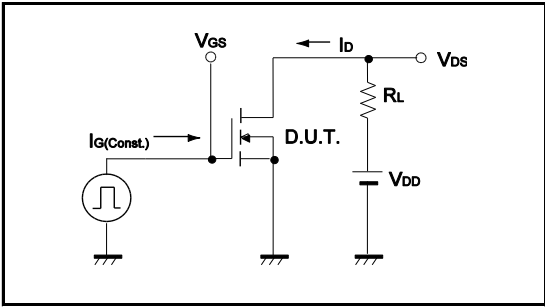


Fig.2-2 Gate Charge Waveform

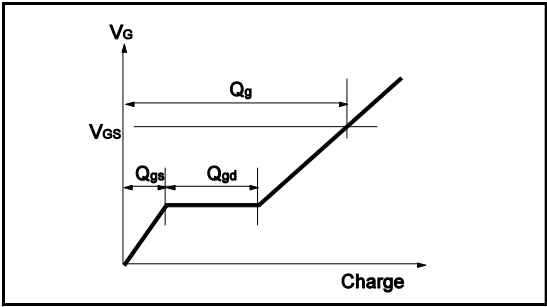


Fig.3-1 Avalanche Measurement Circuit

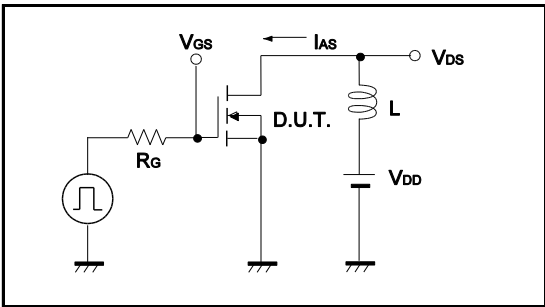
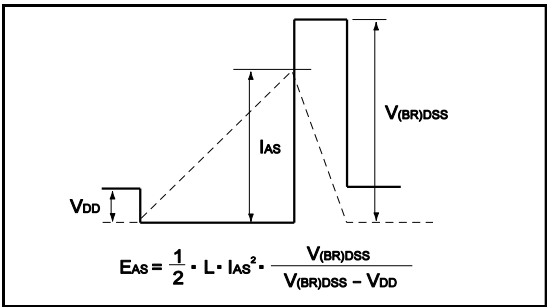
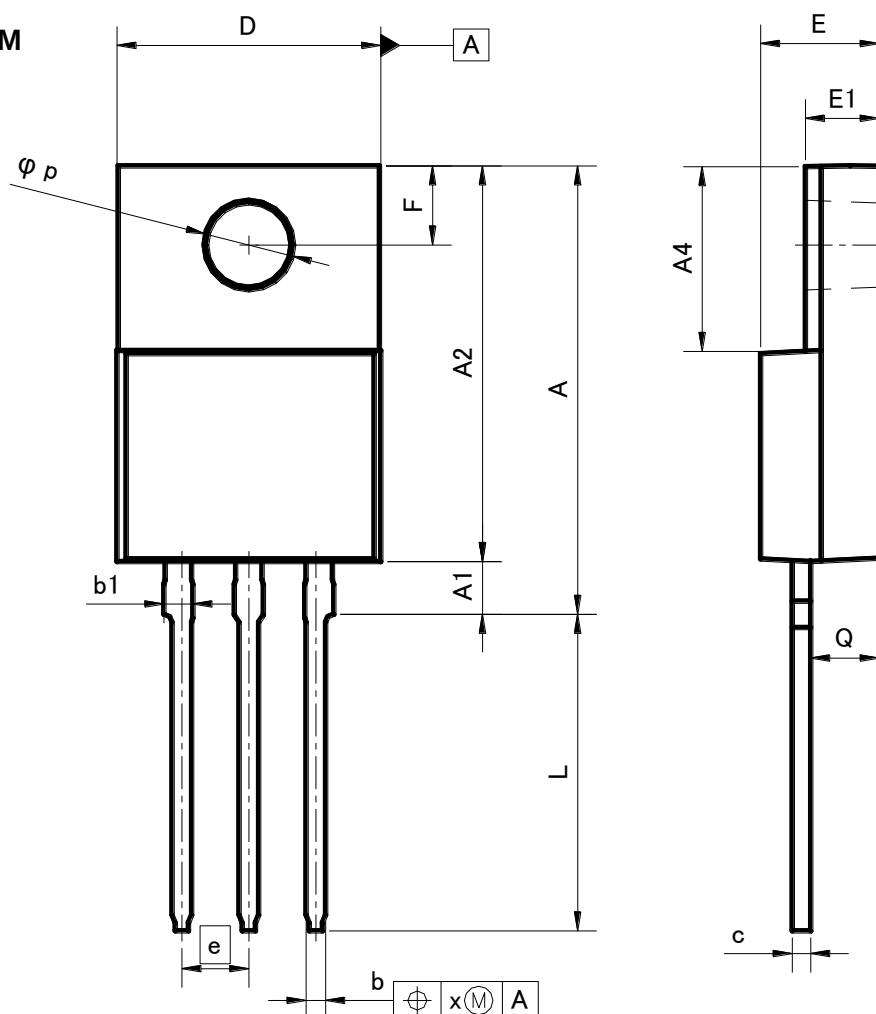


Fig.3-2 Avalanche Waveform



●Dimensions (Unit : mm)

TO-220FM



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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