Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

R6020ANX

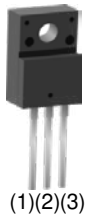
Nch 600V 20A Power MOSFET

Datasheet

V_{DSS}	600V
$R_{DS(on)}$ (Max.)	0.22Ω
I_D	20A
P_D	50W

●Outline

TO-220FM



(1)(2)(3)

●Features

1) Low on-resistance.

2) Fast switching speed.

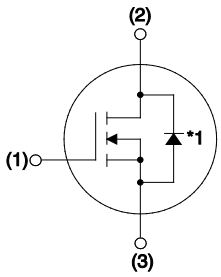
3) Gate-source voltage (V_{GSS}) guaranteed to be ±30V.

4) Drive circuits can be simple.

5) Parallel use is easy.

6) Pb-free lead plating ; RoHS compliant

●Inner circuit



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

*1 Body Diode

●Application

Switching Power Supply

●Packaging specifications

Type	Packing	Bulk
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	500
	Taping code	-
	Marking	R6020ANX

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	600	V
Continuous drain current	T_c = 25°C	I_D *1	±20	A
	T_c = 100°C	I_D *1	±9.7	A
Pulsed drain current		$I_{D,pulse}$ *2	±80	A
Gate - Source voltage		V_{GSS}	±30	V
Avalanche energy, single pulse		E_{AS} *3	26.7	mJ
Avalanche energy, repetitive		E_{AR} *4	3.5	mJ
Avalanche current		I_{AR} *3	10	A
Power dissipation (T_c = 25°C)		P_D	50	W
Junction temperature		T_j	150	°C
Range of storage temperature		T_{stg}	−55 to +150	°C
Reverse diode dv/dt		dv/dt *5	15	V/ns

●Absolute maximum ratings

Parameter	Symbol	Conditions	Values	Unit
Drain - Source voltage slope	dv/dt	V_{DS} = 480V, I_D = 20A T_j = 125°C	50	V/ns

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	-	2.5	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	70	°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	600	-	-	V
Drain - Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS} = 0V, I_D = 20A	-	700	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V T_j = 25°C T_j = 125°C	- -	0.1 -	100 1000	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	2.5	-	4.5	V
Static drain - source on - state resistance	$R_{DS(on)}$ *6	V_{GS} = 10V, I_D = 10A T_j = 25°C T_j = 125°C	- -	0.17 0.36	0.22 -	Ω
Gate input resistance	R_G	f = 1MHz, open drain	-	13.8	-	Ω

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *6	V_{DS} = 10V, I_D = 10A	7	14	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	2040	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	1660	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	70	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 480V	-	104	-	pF
Effective output capacitance, time related	$C_{o(tr)}$		-	104	-	
Turn - on delay time	$t_{d(on)}$ *6	V_{DD} ≃ 300V, V_{GS} = 10V	-	40	-	ns
Rise time	t_r *6	I_D = 10A	-	60	-	
Turn - off delay time	$t_{d(off)}$ *6	R_L = 30Ω	-	230	460	
Fall time	t_f *6	R_G = 10Ω	-	70	140	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *6	V_{DD} ≃ 300V	-	65	-	nC
Gate - Source charge	Q_{gs} *6	I_D = 20A	-	10	-	
Gate - Drain charge	Q_{gd} *6	V_{GS} = 10V	-	25	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} ≃ 300V, I_D = 20A	-	6.0	-	V

*1 Limited only by maximum temperature allowed.

*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 L ≃ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C

*4 L ≃ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C, f = 10kHz

*5 Reference measurement circuits Fig.5-1.

*6 Pulsed

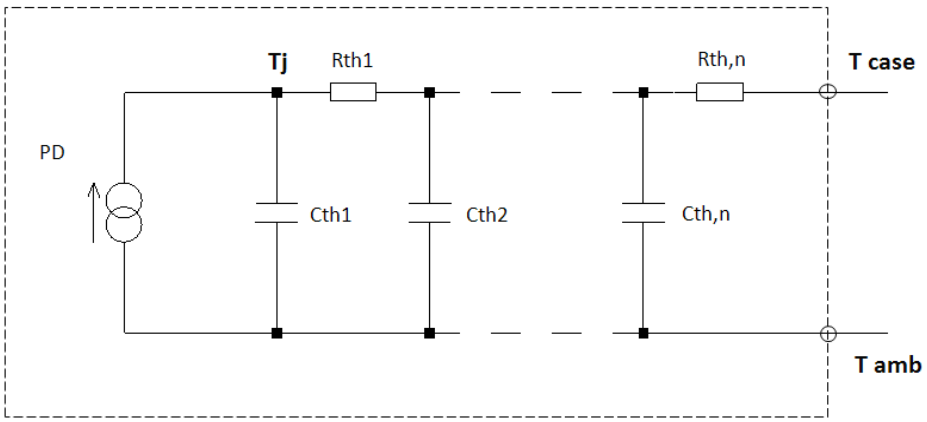
●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	20	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	80	A
Forward voltage	V_{SD} *6	V_{GS} = 0V, I_S = 10A	-	-	1.5	V
Reverse recovery time	t_{rr} *6	I_S = 20A di/dt = 100A/μs	-	486	-	ns
Reverse recovery charge	Q_{rr} *6		-	7.8	-	μC
Peak reverse recovery current	I_{rrm} *6		-	32	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j = 25°C	-	800	-	A/μs

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	0.0789	K/W
R_{th2}	0.579	
R_{th3}	2.17	

Symbol	Value	Unit
C_{th1}	0.00458	Ws/K
C_{th2}	0.0603	
C_{th3}	0.549	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

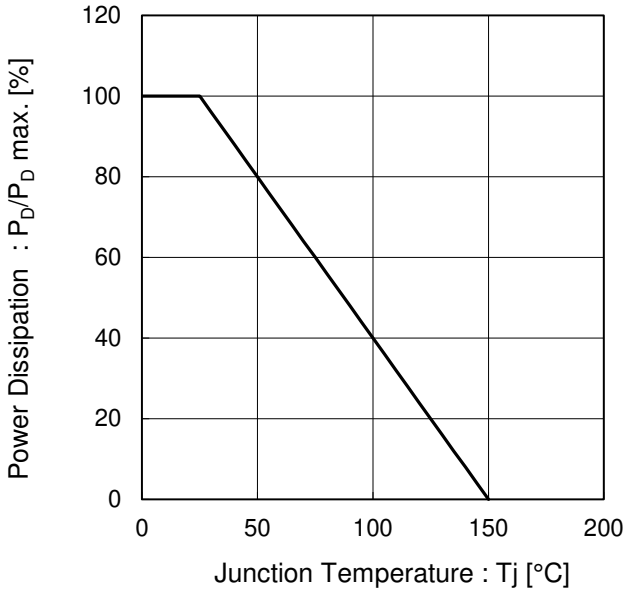


Fig.2 Maximum Safe Operating Area

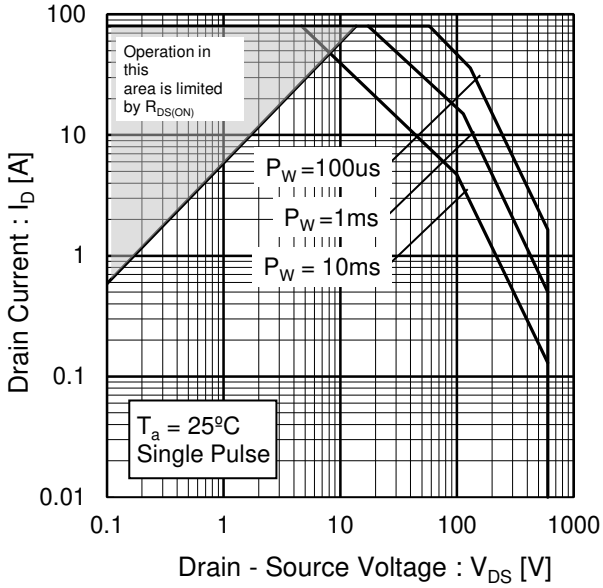
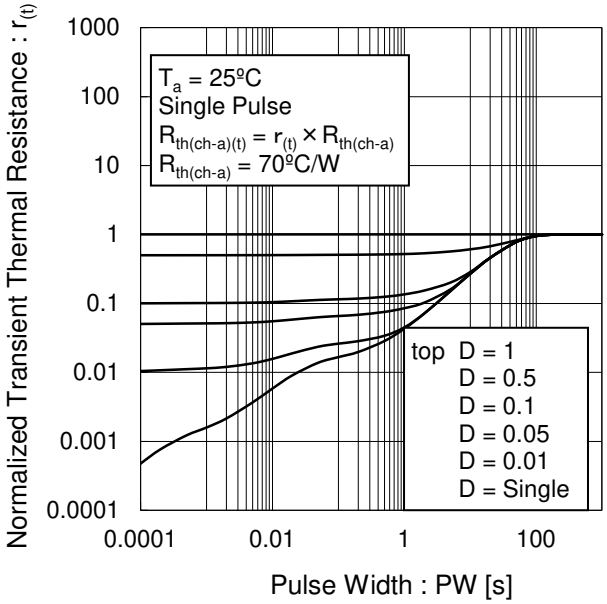


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

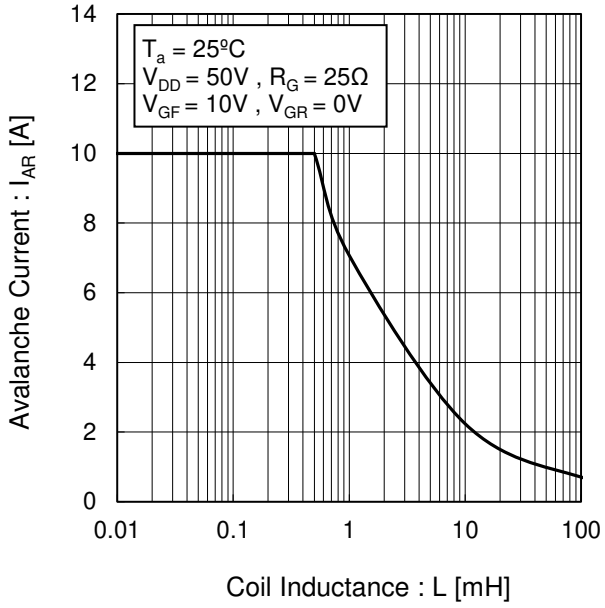


Fig.5 Avalanche Power Losses

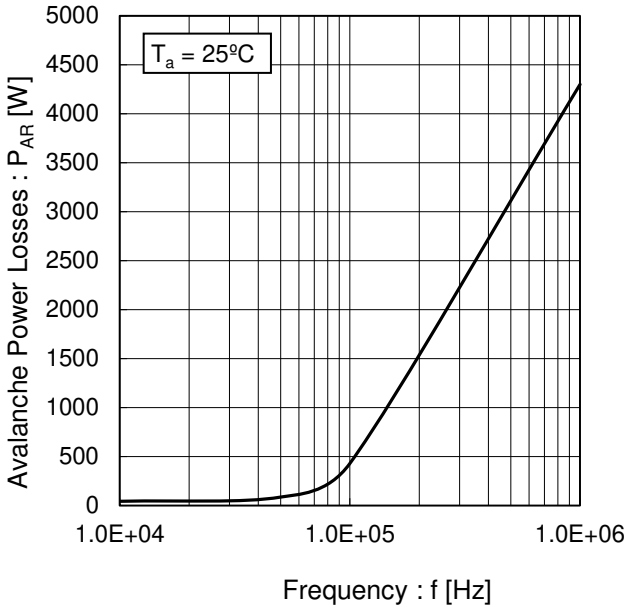
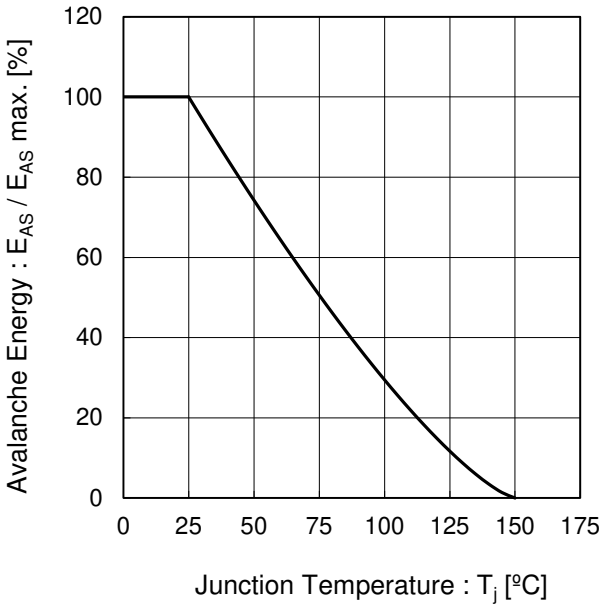


Fig.6 Avalanche Energy Derating Curve vs Junction Temperature



●Electrical characteristic curves

Fig.7 Typical Output Characteristics(I)

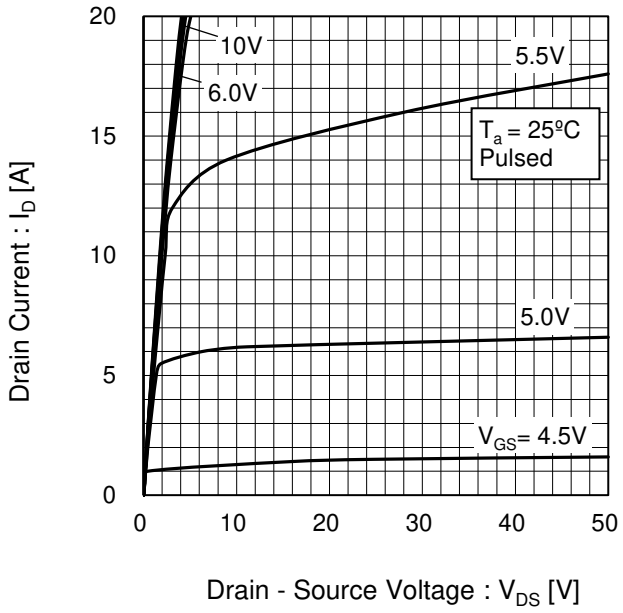


Fig.8 Typical Output Characteristics(II)

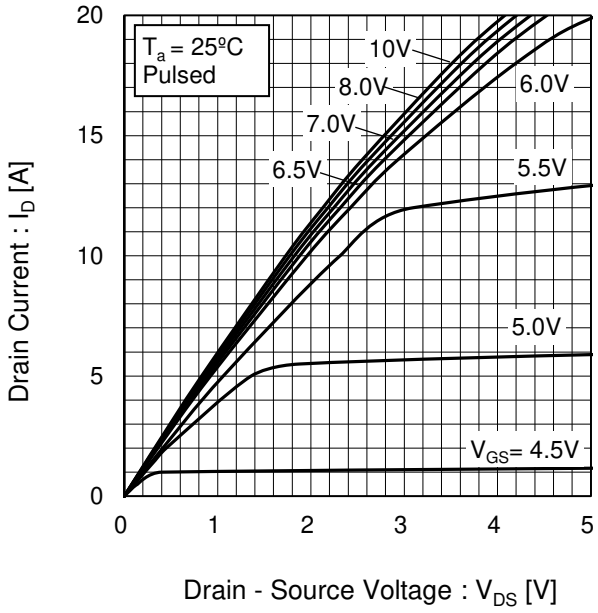


Fig.9 T_j = 150°C Typical Output Characteristics(I)

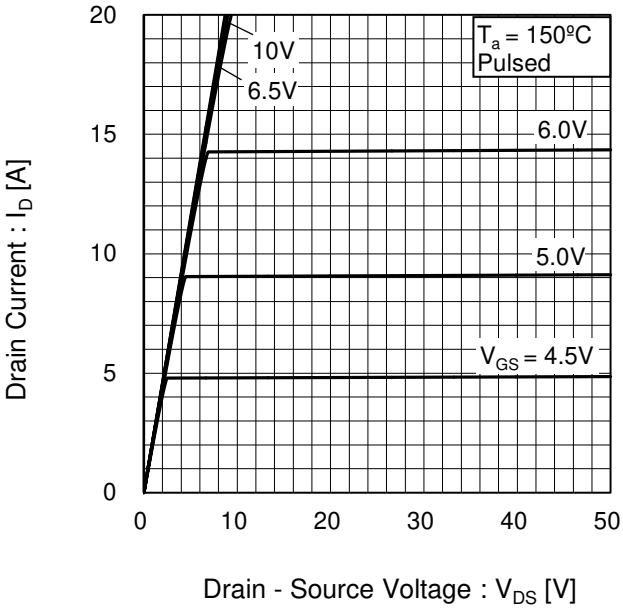
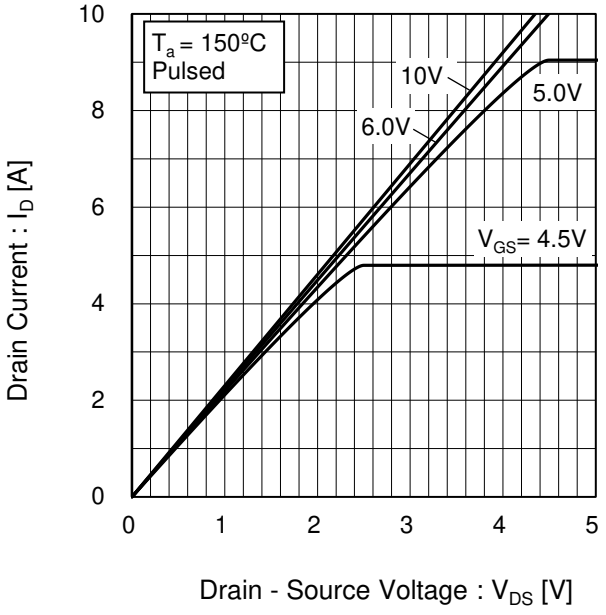


Fig.10 T_j = 150°C Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.11 Breakdown Voltage vs. Junction Temperature

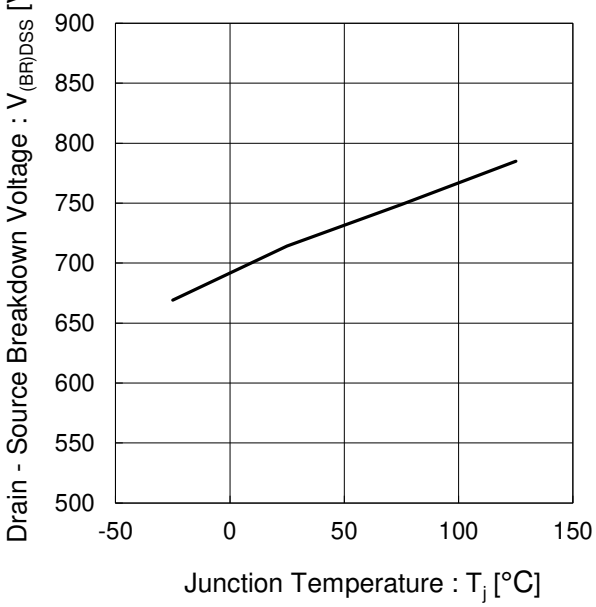


Fig.12 Typical Transfer Characteristics

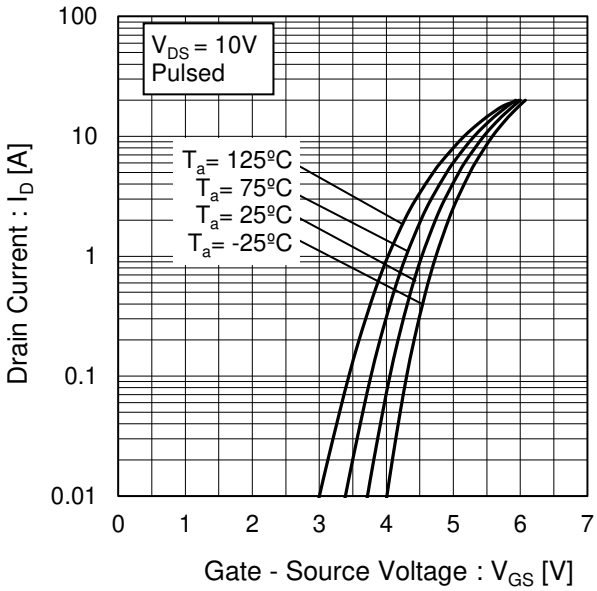


Fig.13 Gate Threshold Voltage vs. Junction Temperature

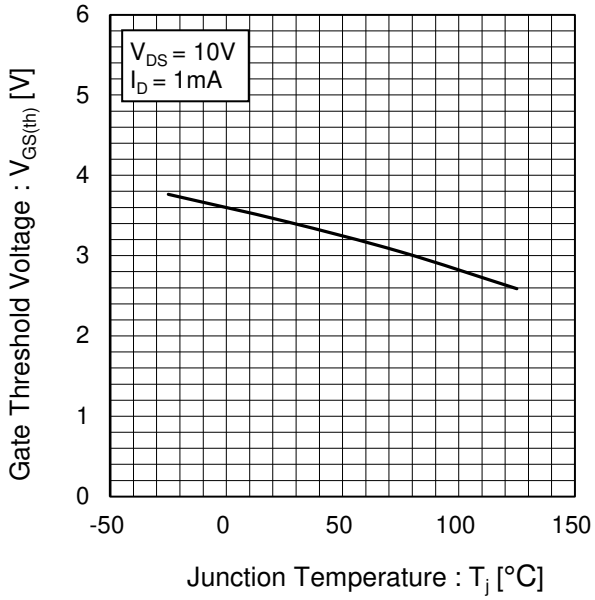
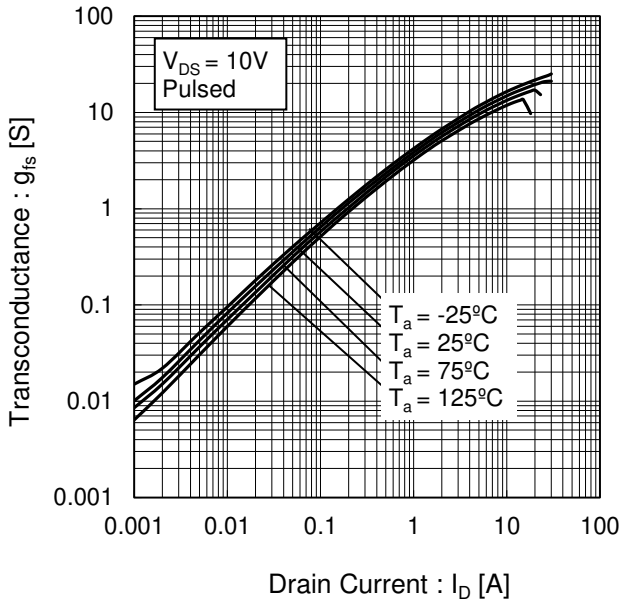


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate Source Voltage

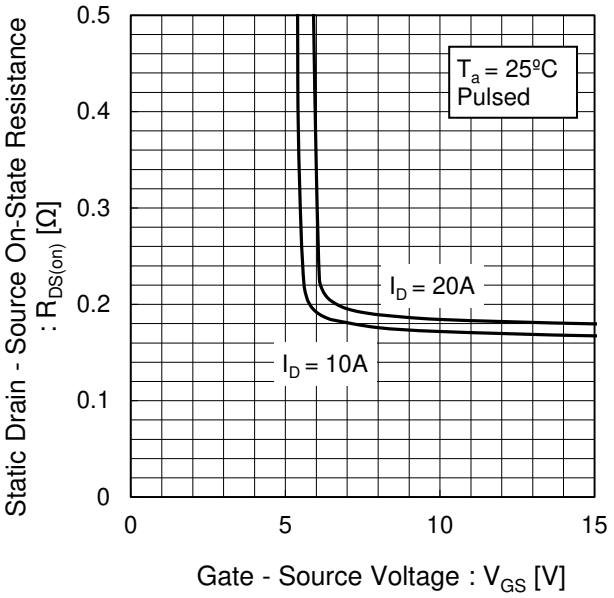


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

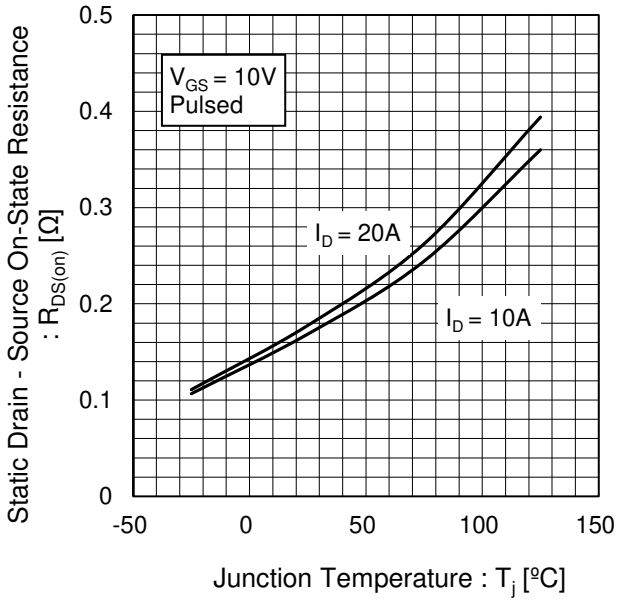
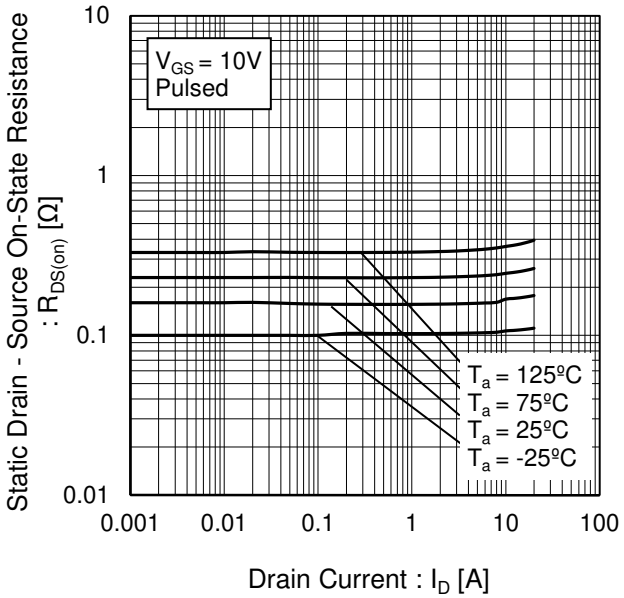


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.18 Typical Capacitance vs. Drain - Source Voltage

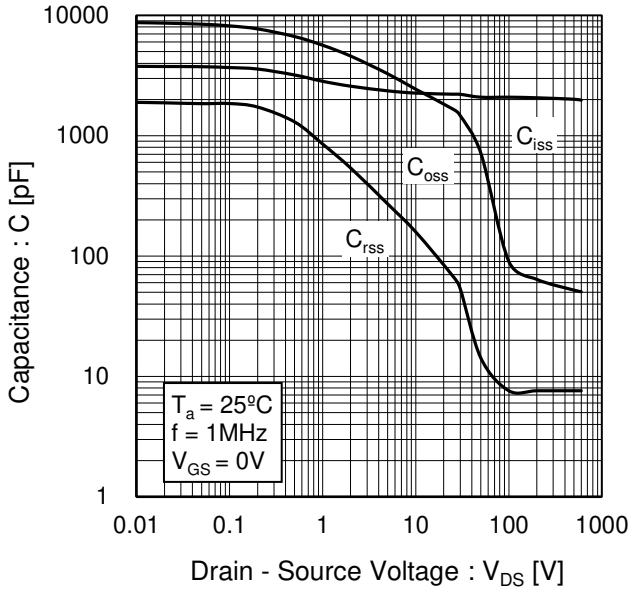


Fig.19 Coss Stored Energy

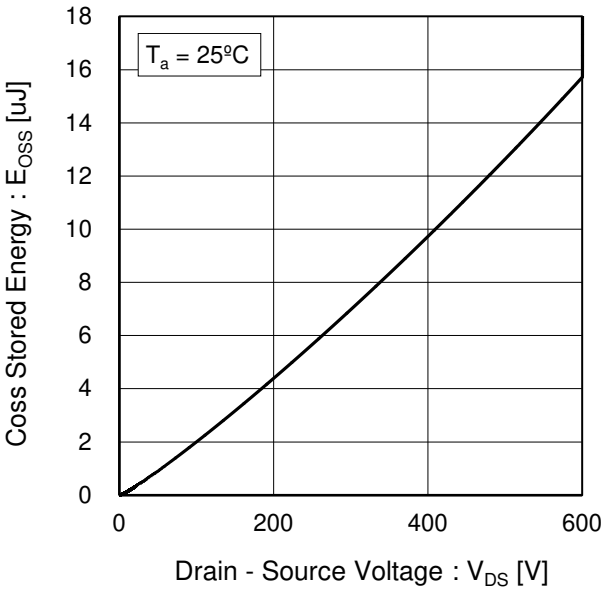


Fig.20 Switching Characteristics

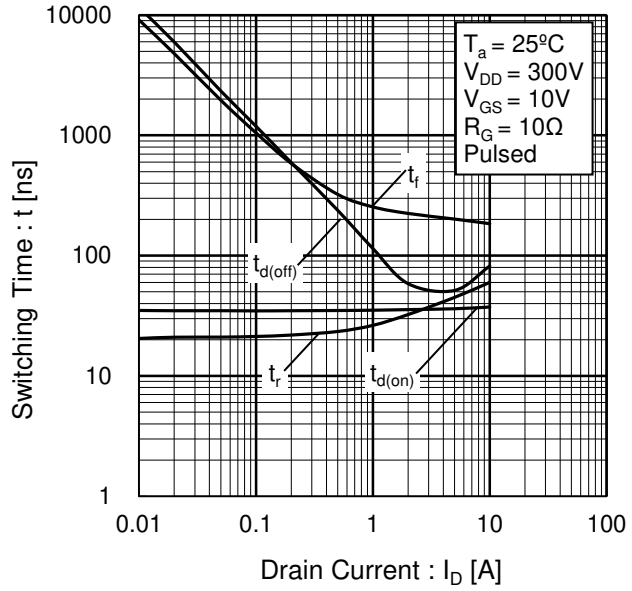
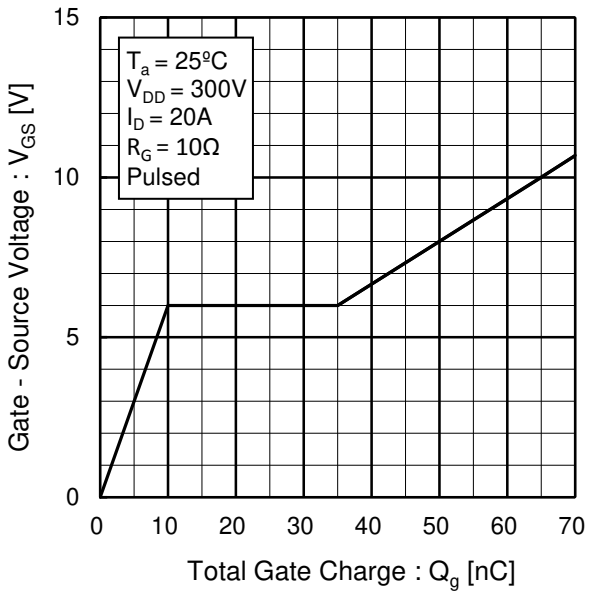


Fig.21 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

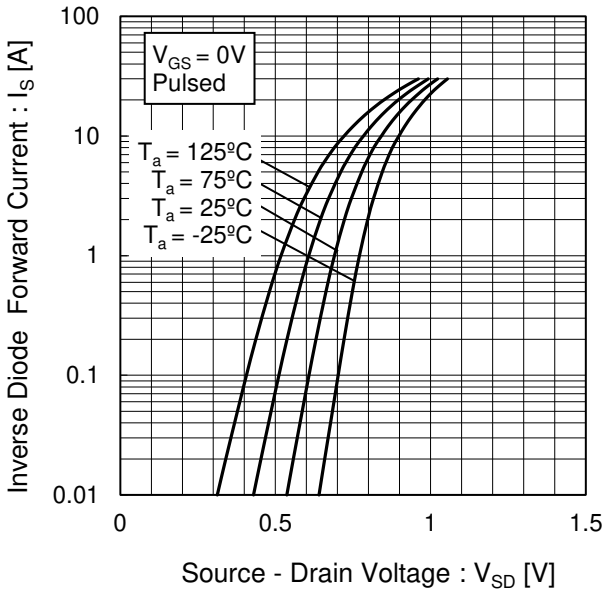
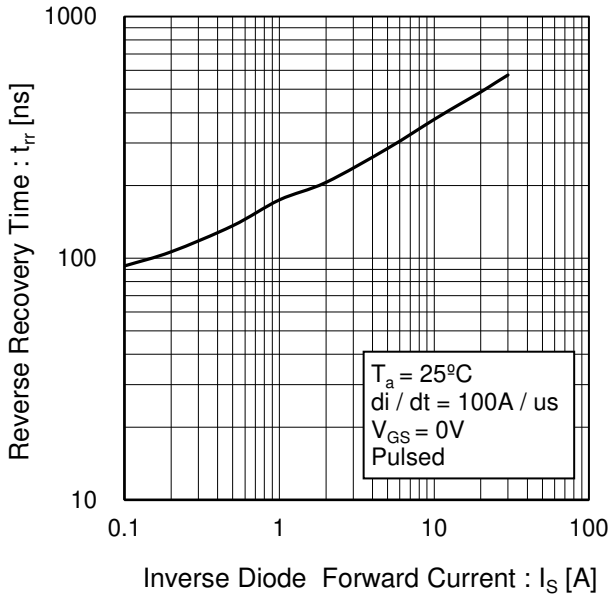


Fig.23 Reverse Recovery Time vs.Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

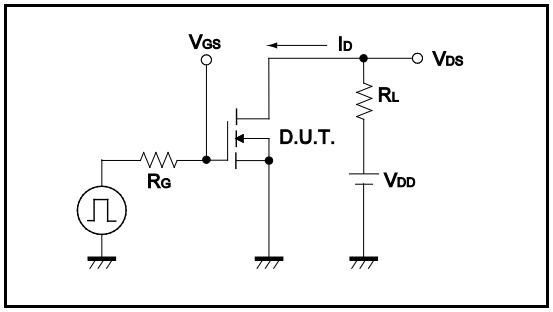


Fig.1-2 Switching Waveforms

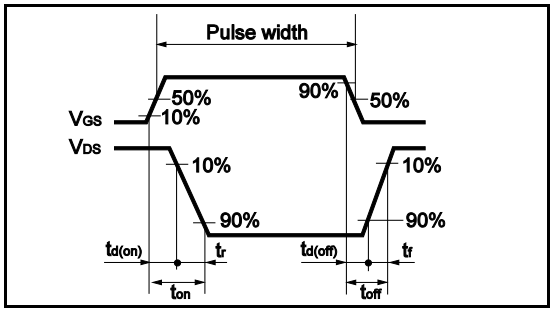


Fig.2-1 Gate Charge Measurement Circuit

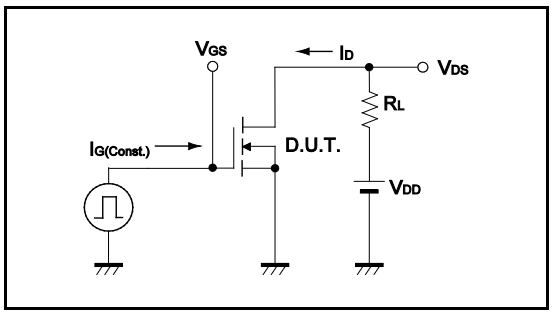


Fig.2-2 Gate Charge Waveform

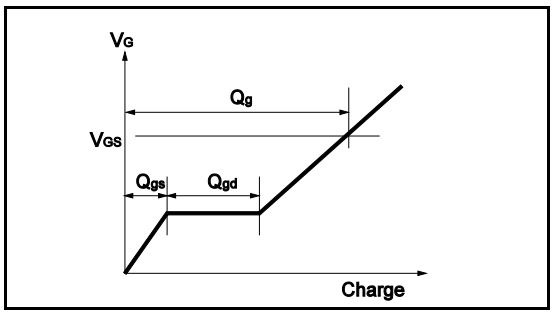


Fig.3-1 Avalanche Measurement Circuit

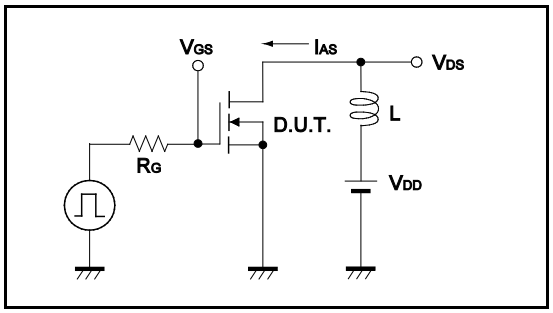


Fig.3-2 Avalanche Waveform

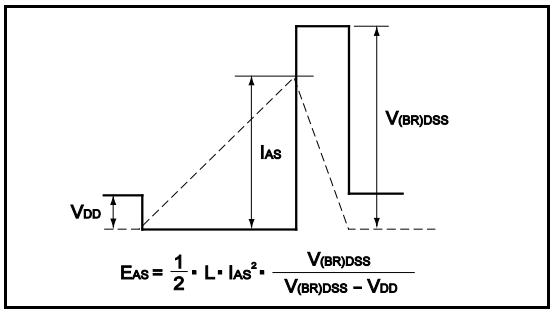


Fig.4-1 dv/dt Measurement Circuit

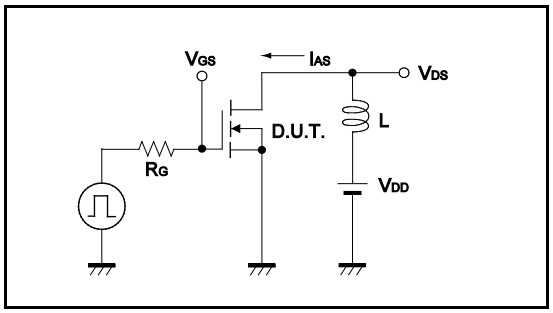


Fig.4-2 dv/dt Waveform

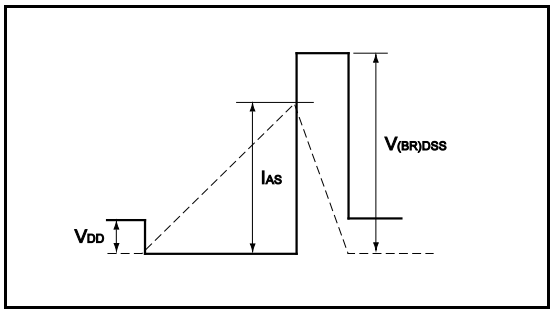


Fig.5-1 di/dt Measurement Circuit

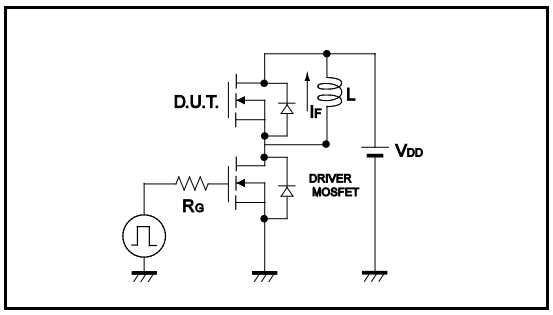
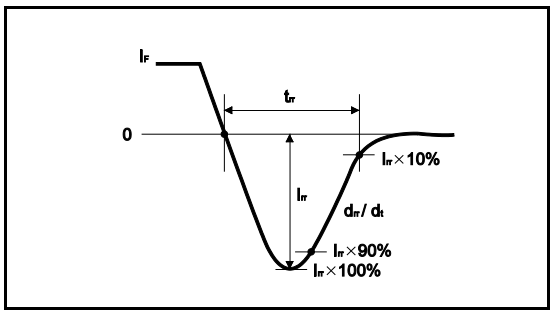
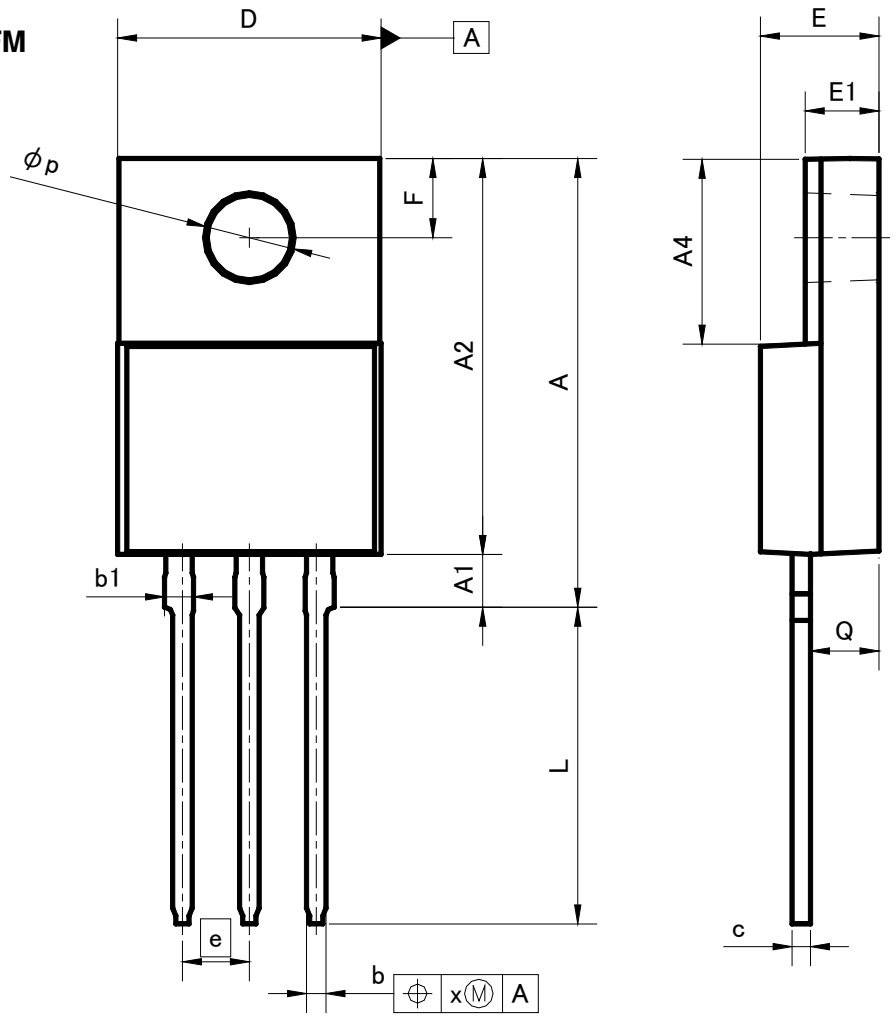


Fig.5-2 di/dt Waveform



●**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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