R6020ANJ

Nch 600V 20A Power MOSFET

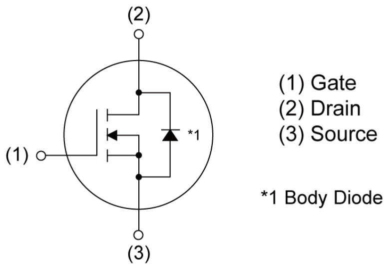
Datasheet

V_{DSS}	600V
$R_{DS(on)}$(Max.)	0.25Ω
I_D	±20A
P_D	100W

●Outline

LPT(S)

●Inner circuit



●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

●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	1000
	Taping code	TL
	Marking	R6020ANJ

●Application

Switching Power Supply

●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	±9.8	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	8.4	mJ
Avalanche current		I_{AR} *3	10	A
Power dissipation (T_c = 25°C)		P_D	100	W
Junction temperature		T_j	150	℃
Range of storage temperature		T_{stg}	-55 to +150	℃
Reverse diode dv/dt		dv/dt	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}	-	-	1.25	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	80	°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 = 10A	-	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	- -	0.19 0.37	0.25 -	Ω
Gate input resistance	R_G	f = 1MHz, open drain	-	13.4	-	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	-	69.8	-	pF
Effective output capacitance, time related	$C_{o(tr)}$		-	259	-	
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	-	5.9	-	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

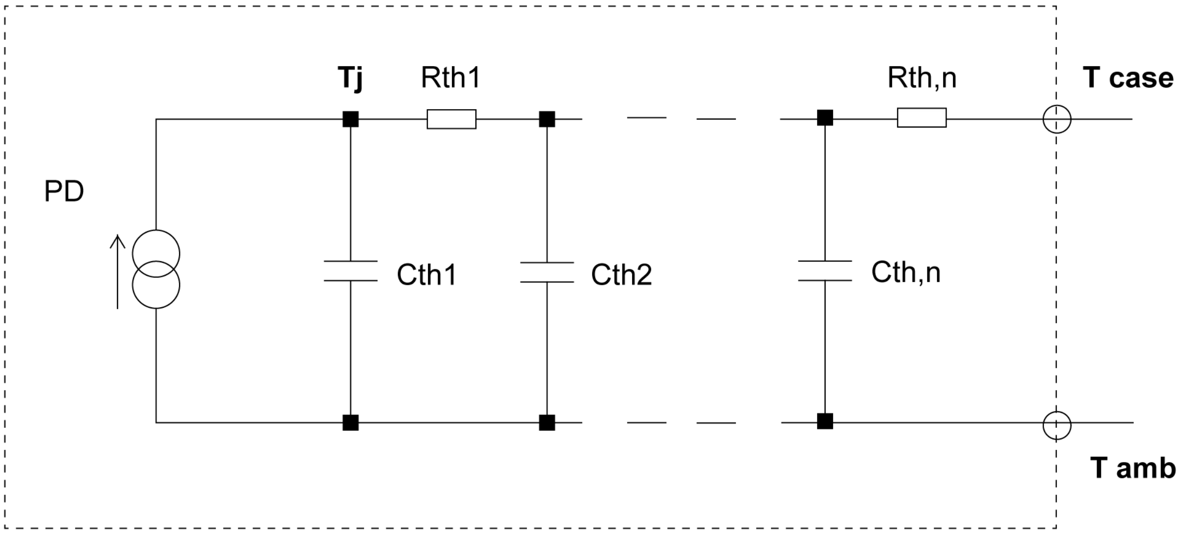
●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_C = 25℃	-	-	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	-	493	-	ns
Reverse recovery charge	Q_{rr} *6		-	7.43	-	μC
Peak reverse recovery current	I_{rrm} *6		-	30.2	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j = 25℃	-	800	-	A/μs

●Typical transient thermal characteristics

Symbol	Value	Unit
R_{th1}	0.0462	K/W
R_{th2}	0.17	
R_{th3}	0.6	

Symbol	Value	Unit
C_{th1}	0.00308	Ws/K
C_{th2}	0.0118	
C_{th3}	0.232	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

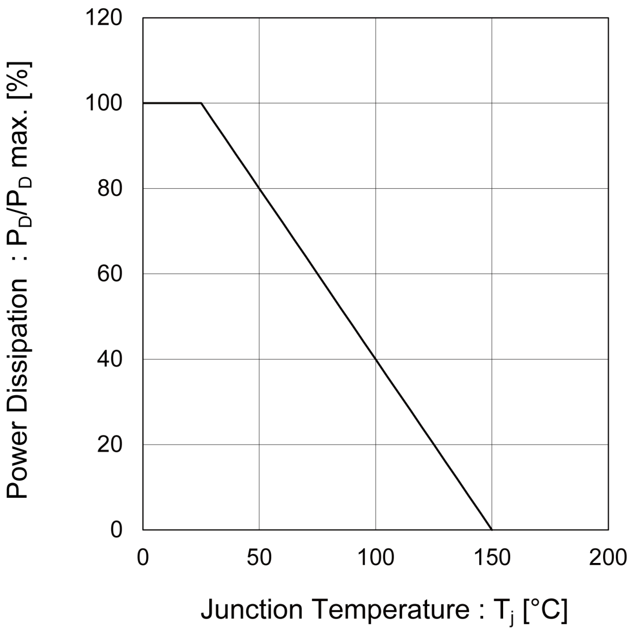


Fig.2 Maximum Safe Operating Area

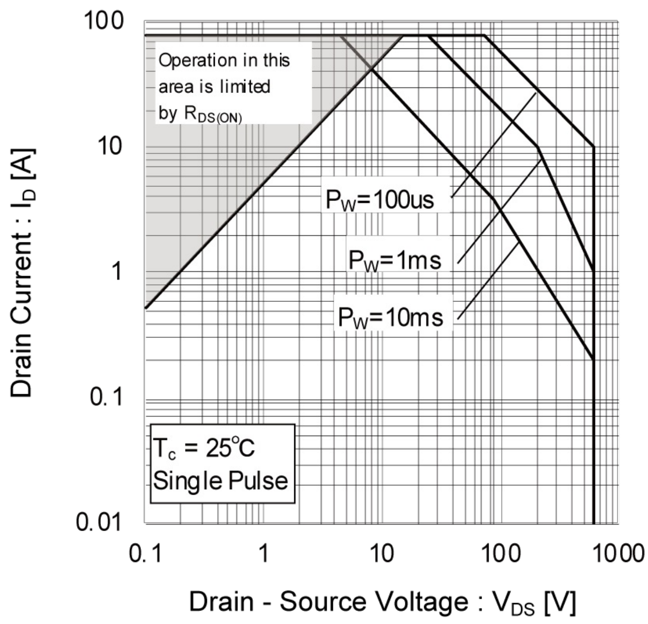
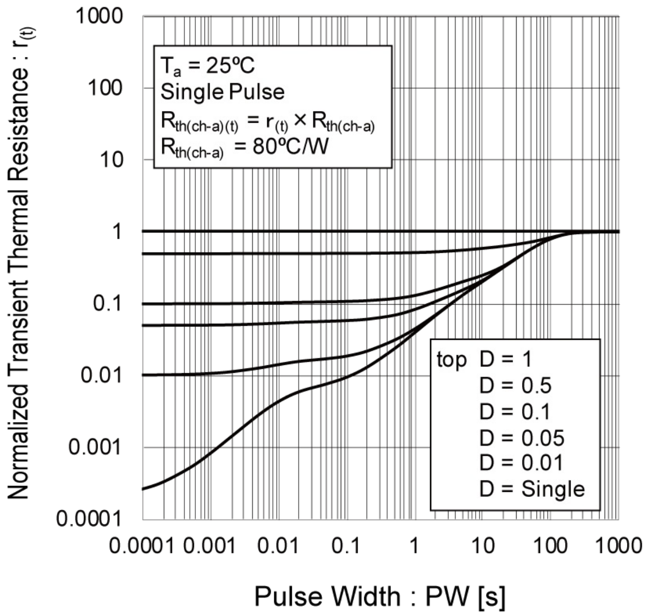


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs. Inductive Load

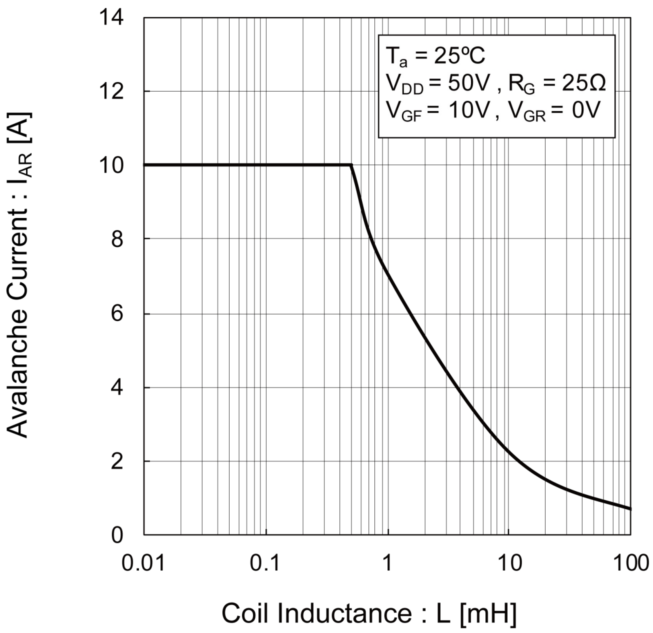


Fig.5 Avalanche Power Losses

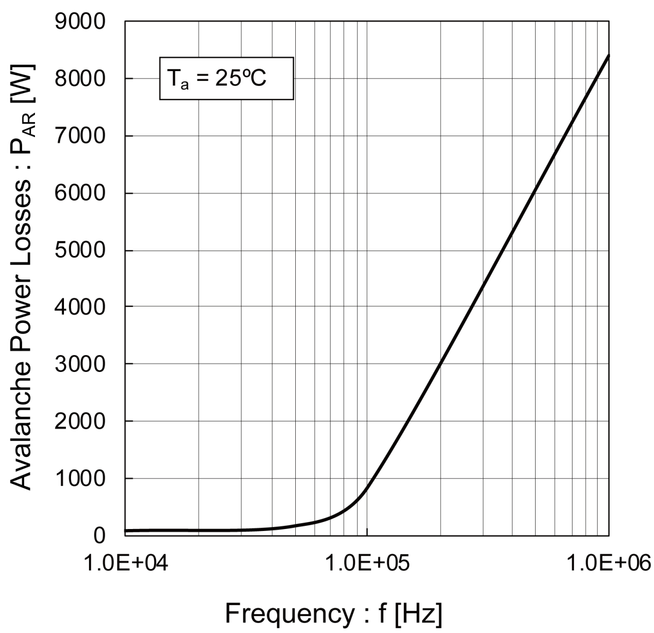
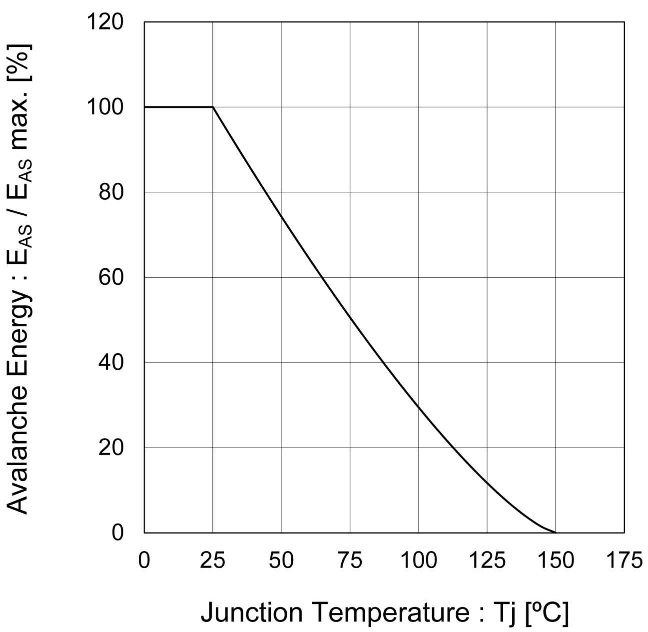


Fig.6 Avalanche Energy Derating Curve vs. Junction Temperature



●Electrical characteristic curves

Fig.7 Typical Output Characteristics(I)

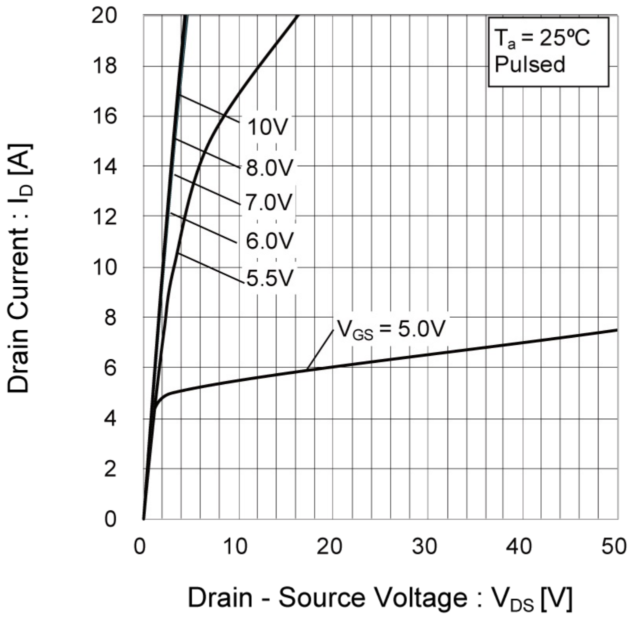


Fig.8 Typical Output Characteristics(II)

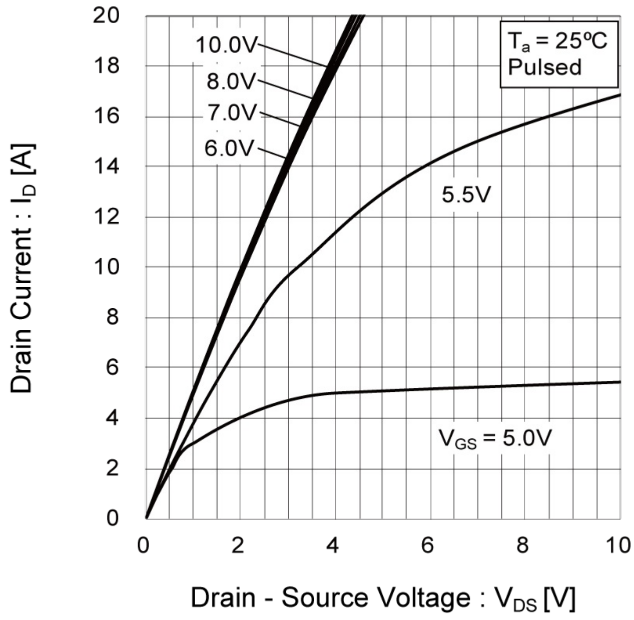


Fig.9 Tj = 150°C Typical Output Characteristics (I)

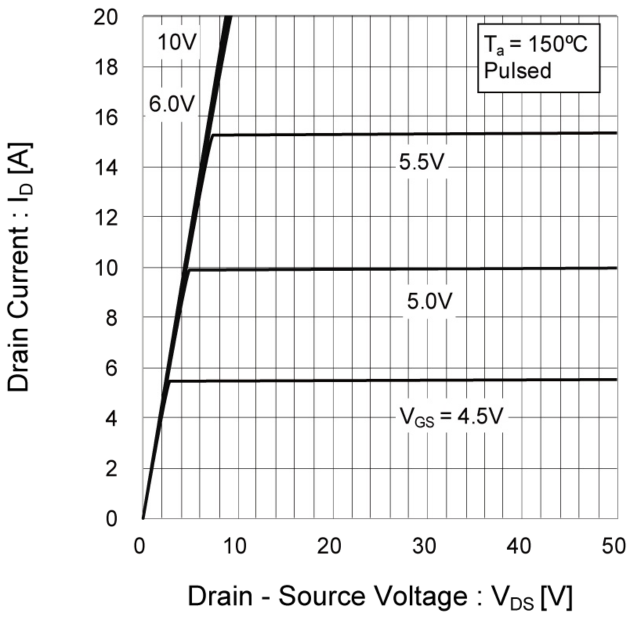
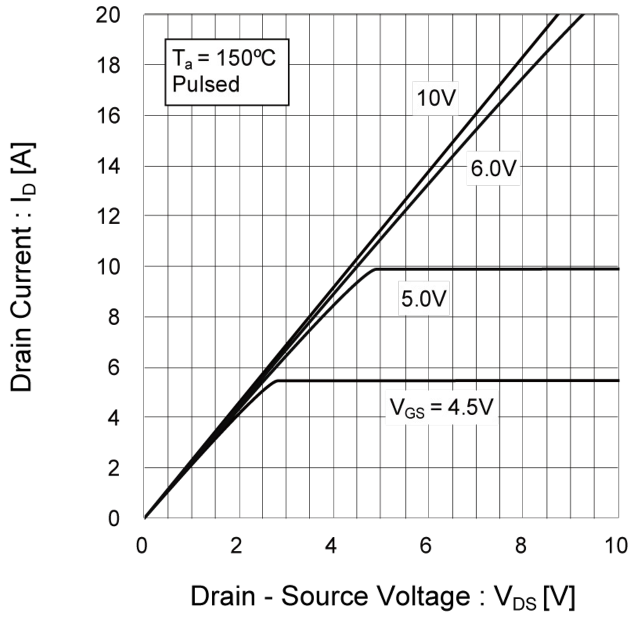


Fig.10 Tj = 150°C Typical Output Characteristics (II)



● **Electrical characteristic curves**

Fig.11 Breakdown Voltage vs. Junction Temperature

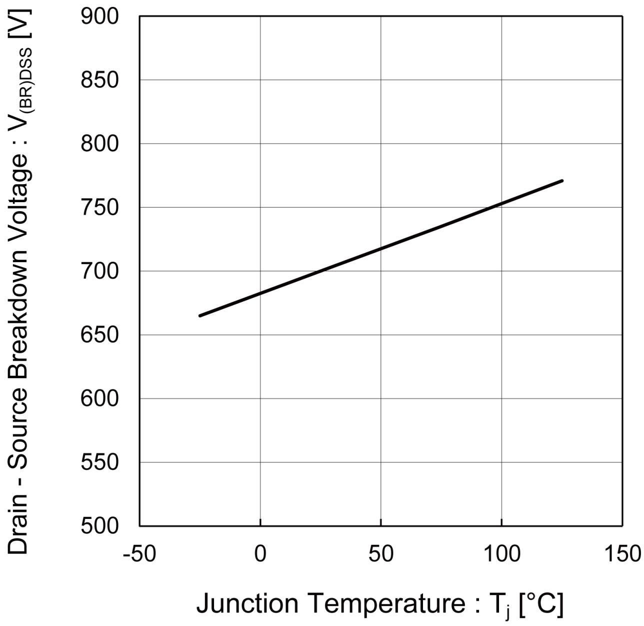


Fig.12 Typical Transfer Characteristics

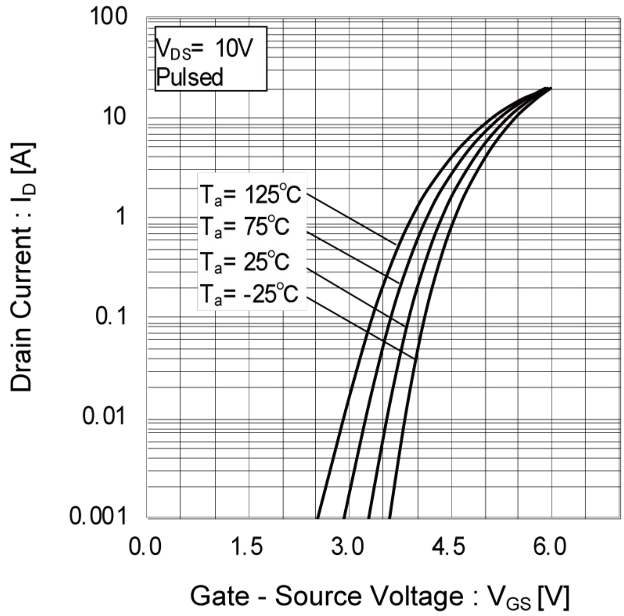


Fig.13 Gate Threshold Voltage vs. Junction Temperature

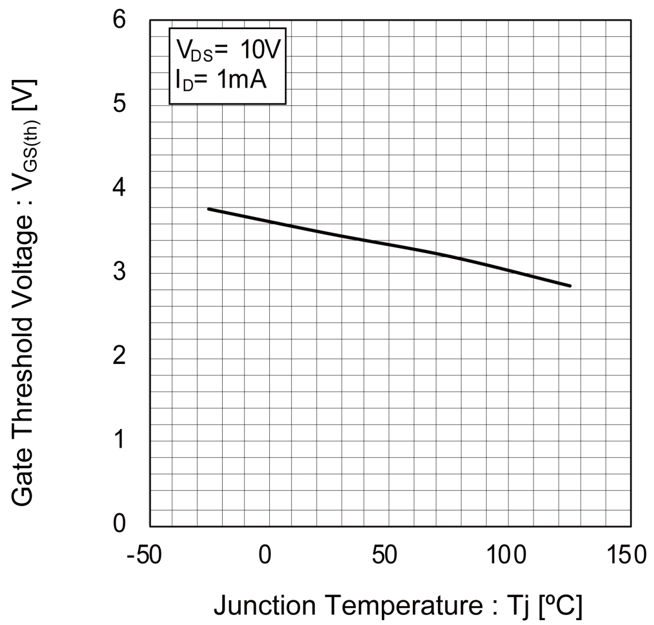
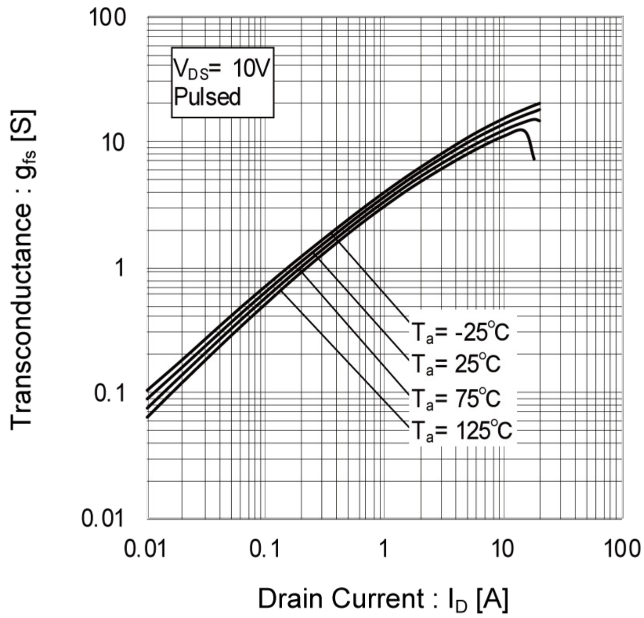


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

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

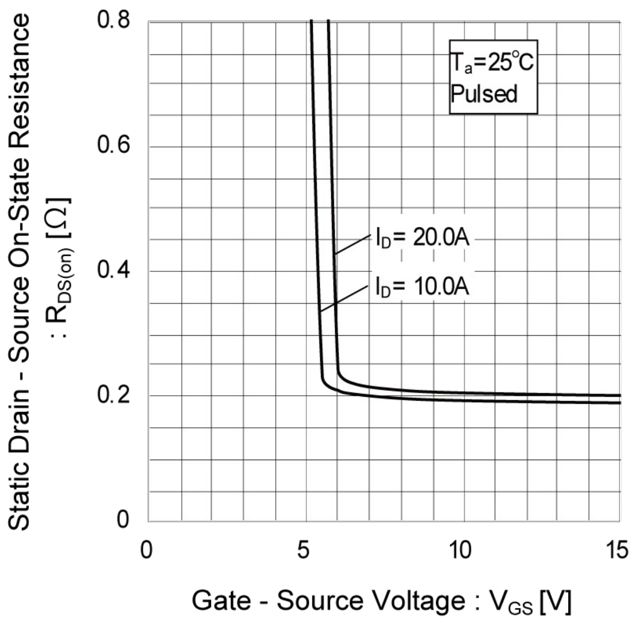


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

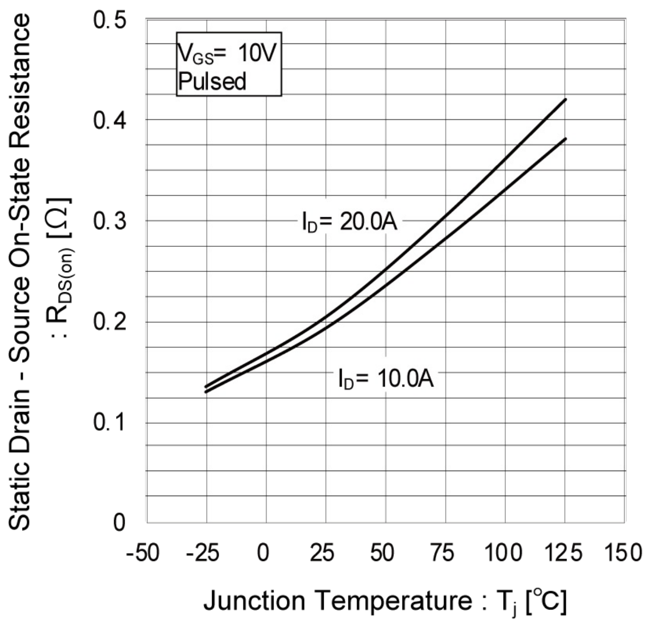
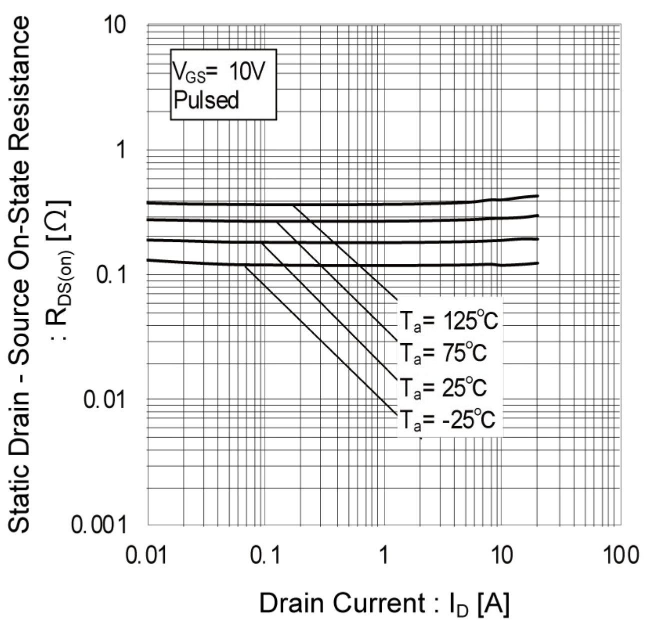


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.18 Typical Capacitance vs. Drain - Source Voltage

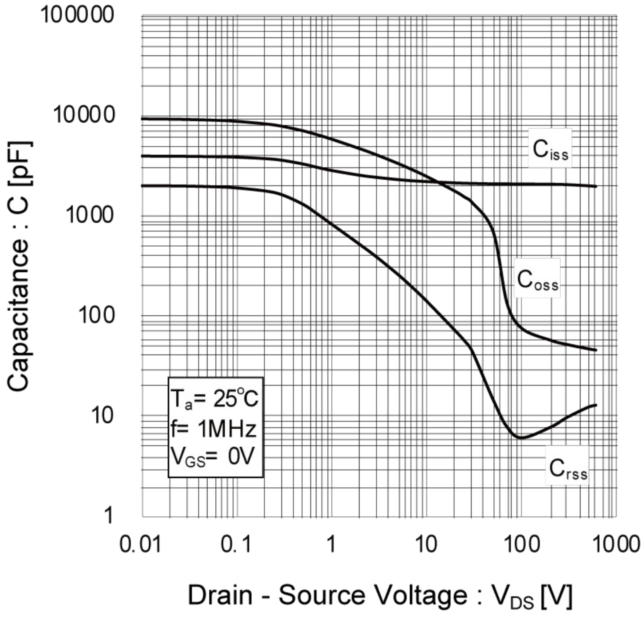


Fig.19 Coss Stored Energy

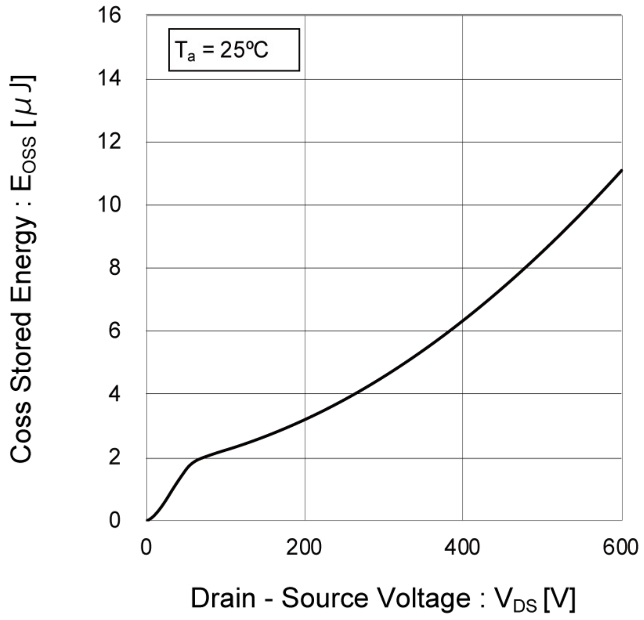


Fig.20 Switching Characteristics

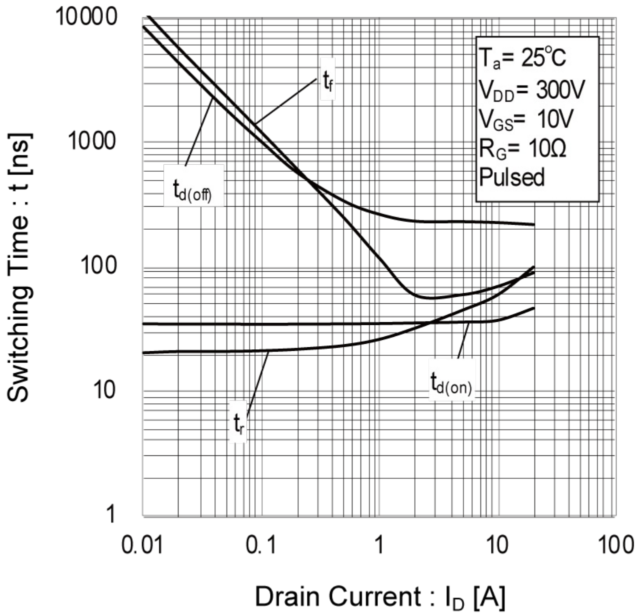
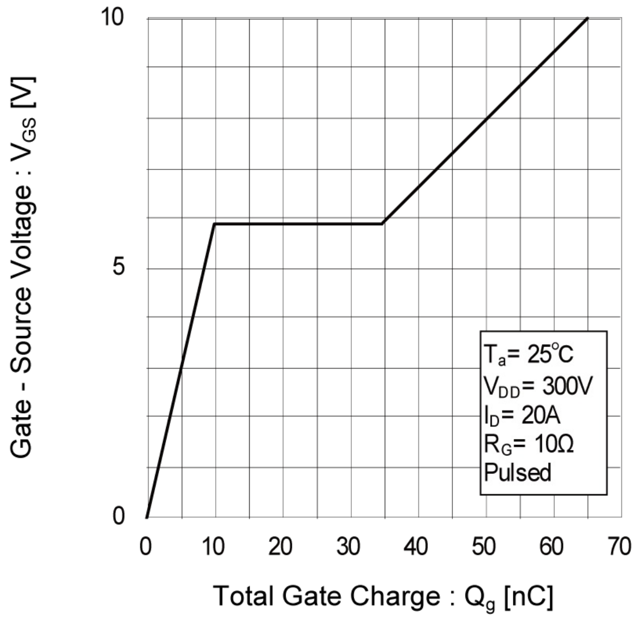


Fig.21 Dynamic Input Characteristics



●Electrical characteristic curves

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

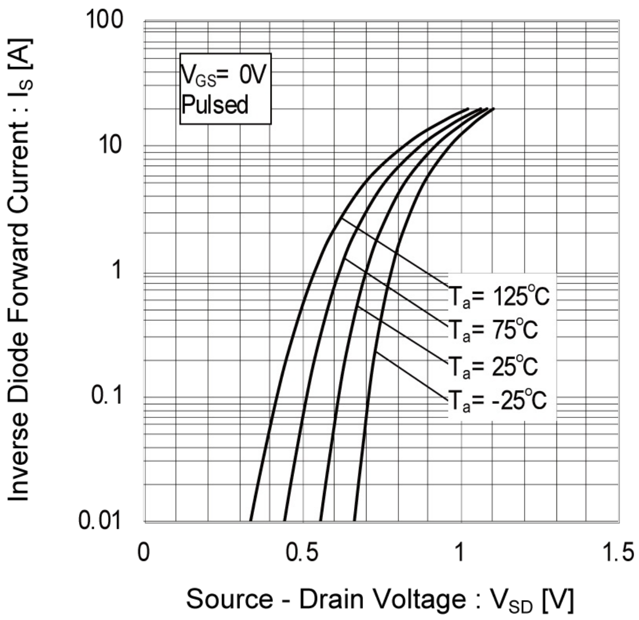
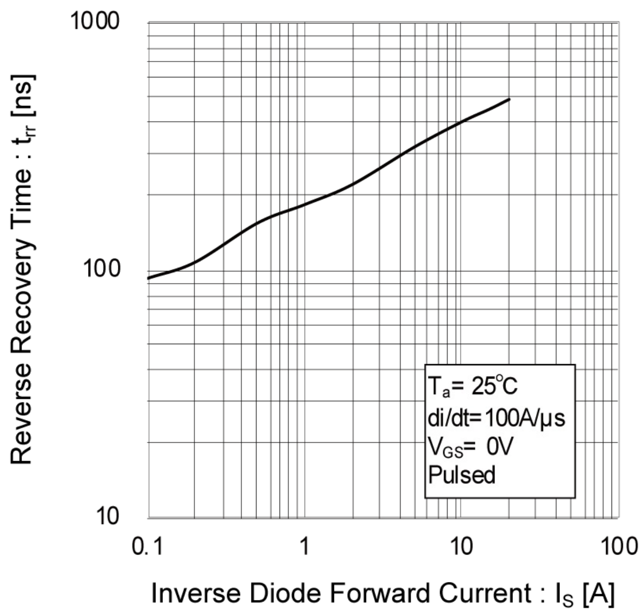


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

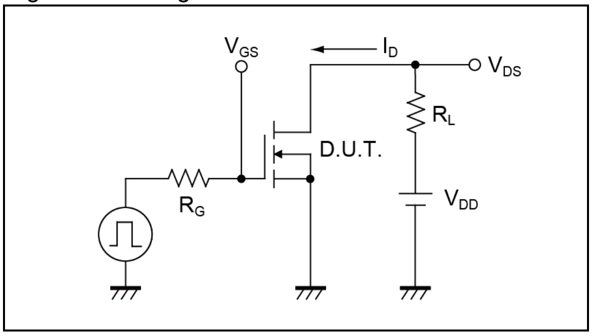


Fig.1-2 Switching Waveforms

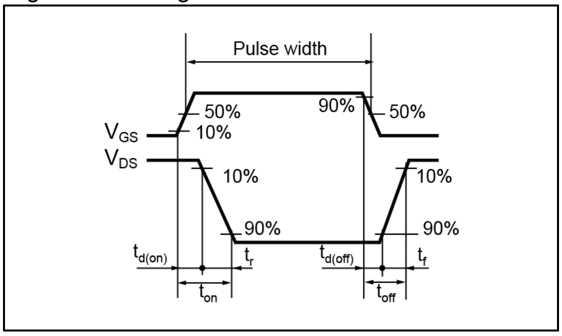


Fig.2-1 Gate Charge Measurement Circuit

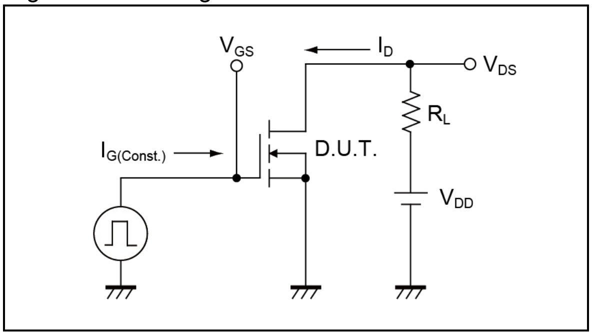


Fig.2-2 Gate Charge Waveform

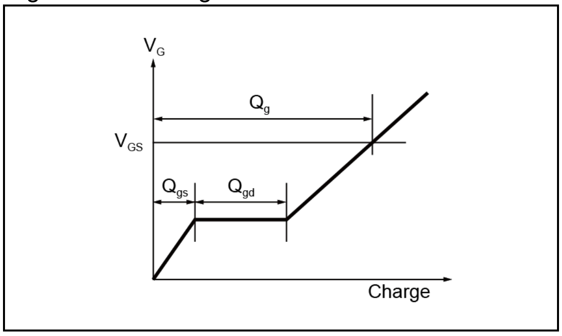


Fig.3-1 Avalanche Measurement Circuit

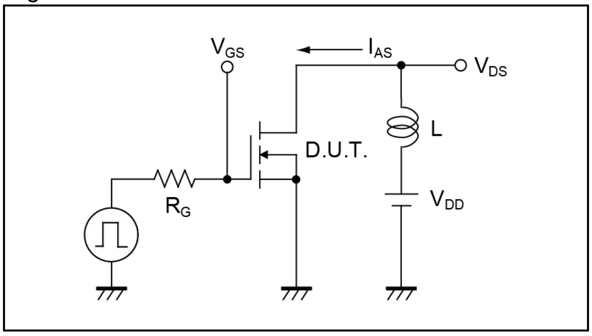


Fig.3-2 Avalanche Waveform

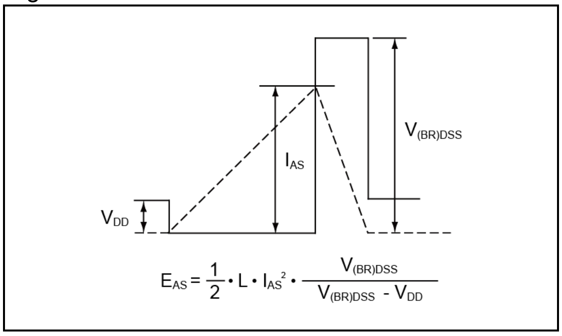


Fig.4-1 dv/dt Measurement Circuit

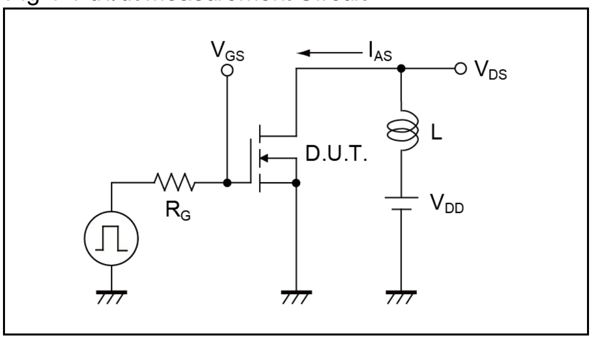


Fig.4-2 dv/dt Waveform

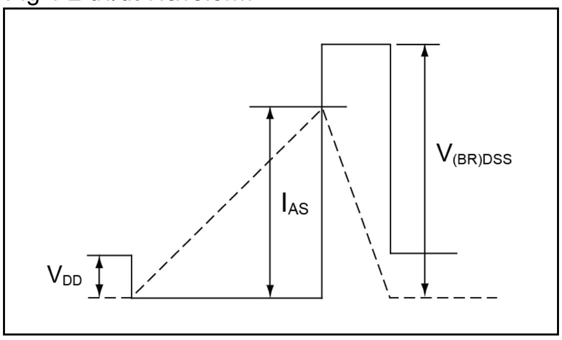


Fig.5-1 di/dt Measurement Circuit

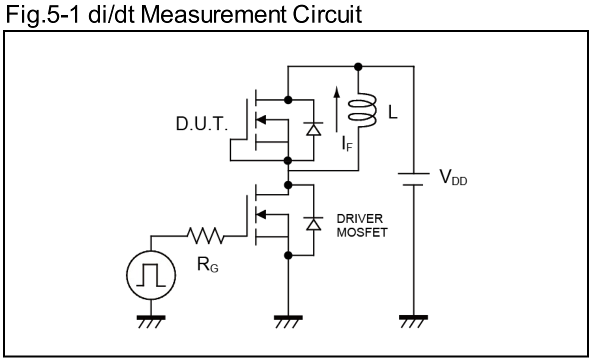
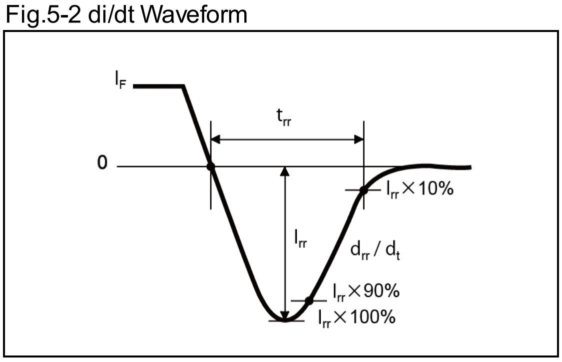
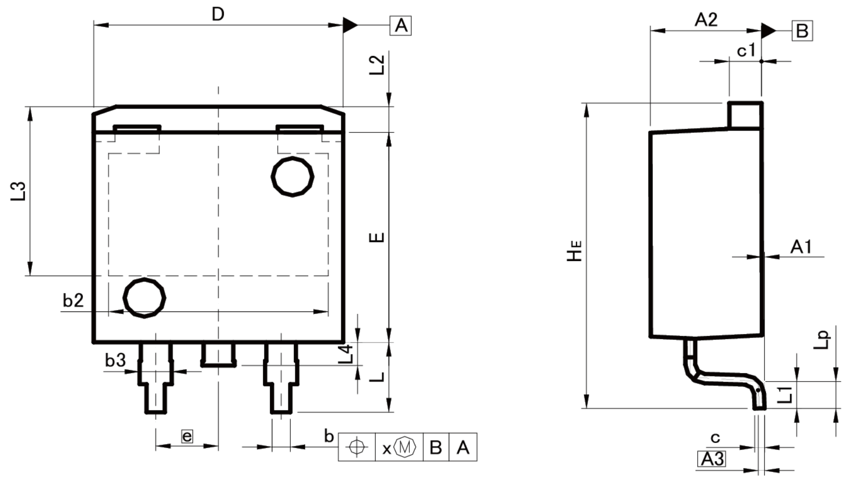


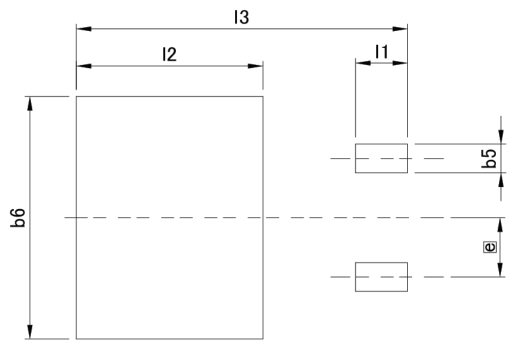
Fig.5-2 di/dt Waveform



●Dimensions

LPTS





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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A1	0.00	0.30	0.000	0.012
A2	4.30	4.70	0.169	0.185
A3	0.25		0.010	
b	0.68	0.98	0.027	0.039
b2	8.90		0.350	
b3	1.14	1.44	0.045	0.057
c	0.30	0.60	0.012	0.024
c1	1.10	1.50	0.043	0.059
D	9.80	10.40	0.386	0.409
E	8.80	9.20	0.346	0.362
e	2.54		0.100	
HE	12.80	13.40	0.504	0.528
L	2.70	3.30	0.106	0.130
L1	0.90	1.50	0.035	0.059
L2	1.10		0.043	
L3	7.25		0.285	
L4	1.00		0.039	
Lp	0.90	1.50	0.035	0.059
x	–	0.25	–	0.010

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b5	–	1.23	–	0.049
b6	–	10.40	–	0.409
l1	–	2.10	–	0.083
l2	–	7.55	–	0.297
l3	–	13.40	–	0.528

Dimension in mm/inches

Notes

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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