

V_{DSS}	600V
$R_{DS(on)}(Max.)$	0.165Ω
I_D	±24A
P_D	245W

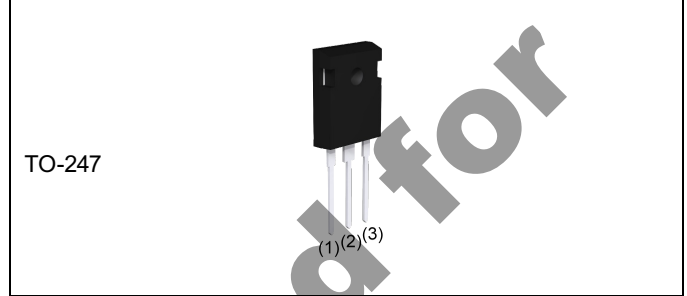
●Features

- 1) Low on-resistance.
- 2) Ultra fast switching speed.
- 3) Parallel use is easy.
- 4) Pb-free lead plating ; RoHS compliant

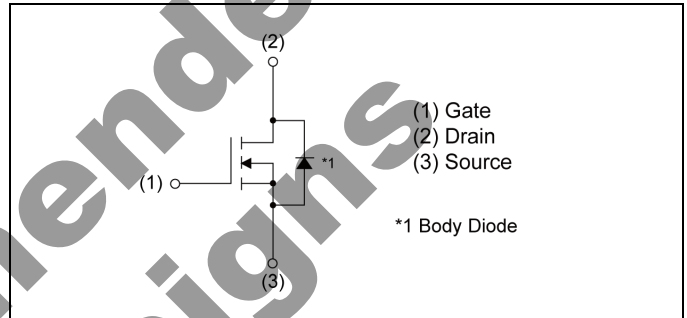
●Application

Switching

●Outline



●Inner circuit



●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	450
	Taping code	C9
	Marking	R6024KNZ1

●Absolute maximum ratings ($T_a = 25^\circ C$, unless otherwise specified)

Parameter	Symbol	Value	Unit	
Drain - Source voltage	V_{DSS}	600	V	
Continuous drain current ($T_c = 25^\circ C$)	I_D^{*1}	±24	A	
Pulsed drain current	I_{DP}^{*2}	±72	A	
Gate - Source voltage	V_{GSS}	static	±20	V
		AC($f > 1Hz$)	±30	V
Avalanche current, single pulse	I_{AS}	4.1	A	
Avalanche energy, single pulse	E_{AS}^{*3}	497	mJ	
Power dissipation ($T_c = 25^\circ C$)	P_D	245	W	
Junction temperature	T_j	150	°C	
Operating junction and storage temperature range	T_{stg}	-55 to +150	°C	

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}^{*4}	-	-	0.51	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	30	°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	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	600	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	-	100 1000	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	3	-	5	V
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 10V, I_D = 11.3A$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	0.150 0.32	0.165 -	Ω
Gate resistance	R_G	$f = 1MHz, \text{open drain}$	-	1.9	-	Ω

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward Transfer Admittance	$ Y_{fs} ^{*5}$	V _{DS} = 10V, I _D = 12A	6.5	13.0	-	S
Input capacitance	C _{iss}	V _{GS} = 0V	-	2000	-	pF
Output capacitance	C _{oss}	V _{DS} = 25V	-	1500	-	
Reverse transfer capacitance	C _{rss}	f = 1MHz	-	60	-	
Turn - on delay time	t _{d(on)} ^{*5}	V _{DD} ≈ 300V, V _{GS} = 10V	-	30	-	ns
Rise time	t _r ^{*5}	I _D = 12A	-	50	-	
Turn - off delay time	t _{d(off)} ^{*5}	R _L ≈ 27.4Ω	-	60	-	
Fall time	t _f ^{*5}	R _G = 10Ω	-	12	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q _g ^{*5}	V _{DD} ≈ 300V	-	45	-	nC
Gate - Source charge	Q _{gs} ^{*5}	I _D = 24A	-	13	-	
Gate - Drain charge	Q _{gd} ^{*5}	V _{GS} = 10V	-	20	-	
Gate plateau voltage	V _(plateau)	V _{DD} ≈ 300V, I _D = 24A	-	6.8	-	V

*1 Limited only by maximum channel temperature allowed.

*2 P_w ≤ 10μs, Duty cycle ≤ 1%

*3 L ≐ 70mH, V_{DD}=50V, R_G=25Ω, STARTING T_j=25°C

*4 T_C=25°C

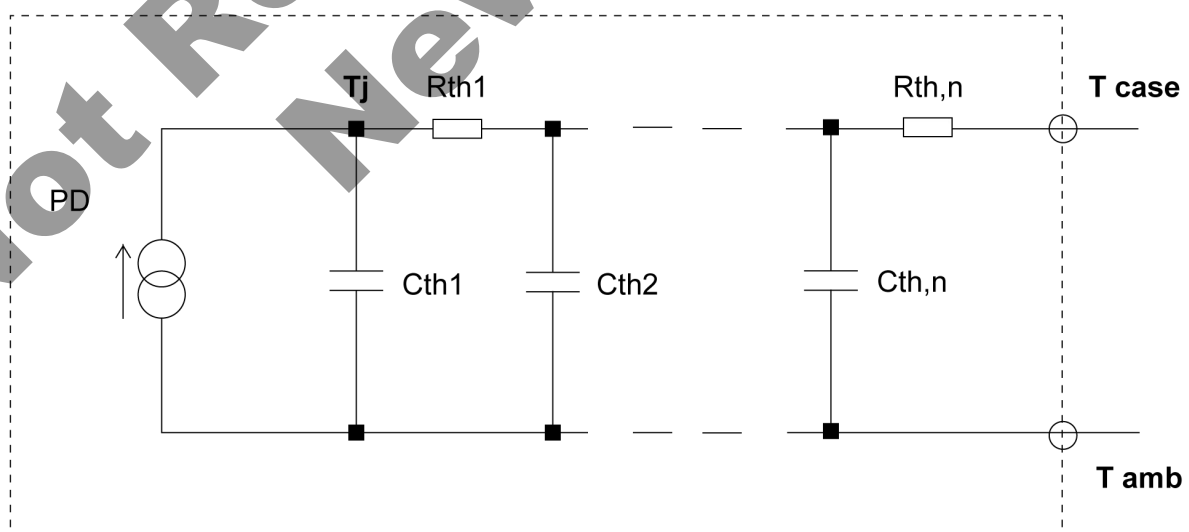
*5 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous forward current	I_S^{*1}	$T_C = 25^\circ\text{C}$	-	-	24	A
Pulse forward current	I_{SP}^{*2}		-	-	72	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0\text{V}, I_S = 24\text{A}$	-	-	1.5	V
Reverse recovery time	t_{rr}^{*5}	$I_S = 24\text{A}$ $di/dt = 100\text{A}/\mu\text{s}$	-	625	-	ns
Reverse recovery charge	Q_{rr}^{*5}		-	13.3	-	μC
Peak reverse recovery current	I_{rrm}^{*5}		-	42	-	A

●Typical transient thermal characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	0.237	K/W	C_{th1}	0.0115	Ws/K
R_{th2}	0.430		C_{th2}	0.264	
R_{th3}	0.250		C_{th3}	14.2	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

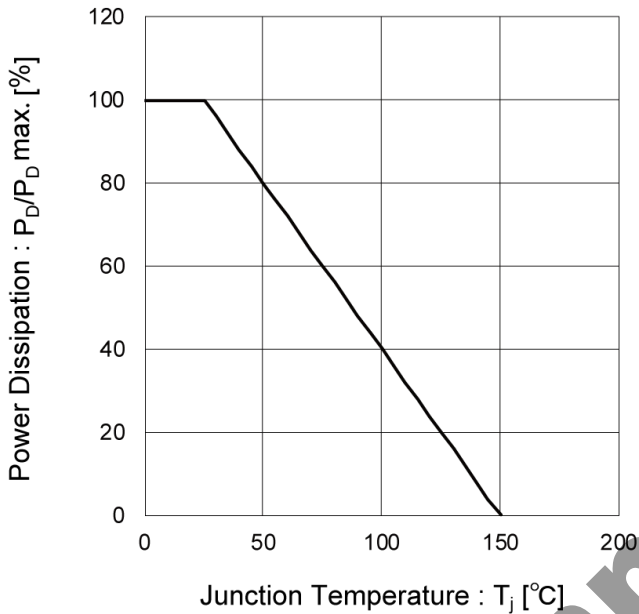


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

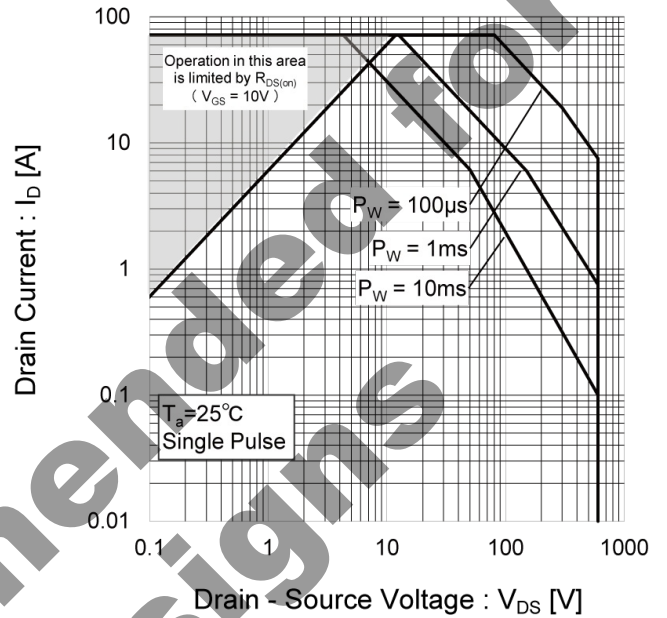
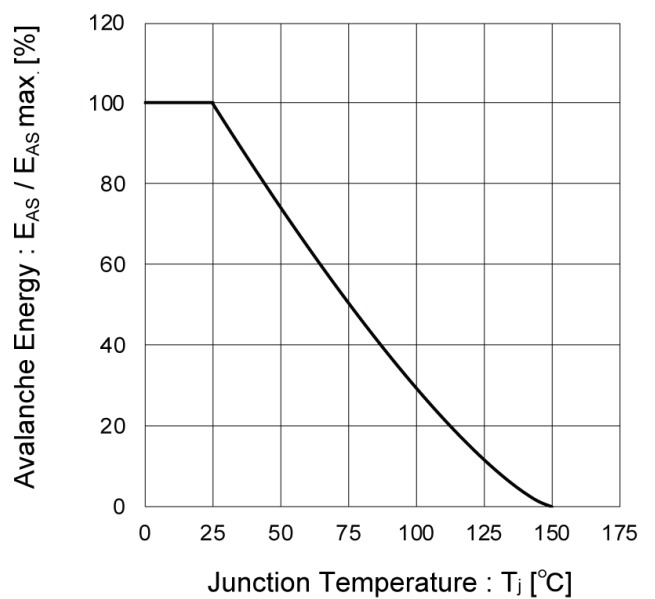


Fig.3 Avalanche Energy Derating Curve vs. Junction Temperature



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

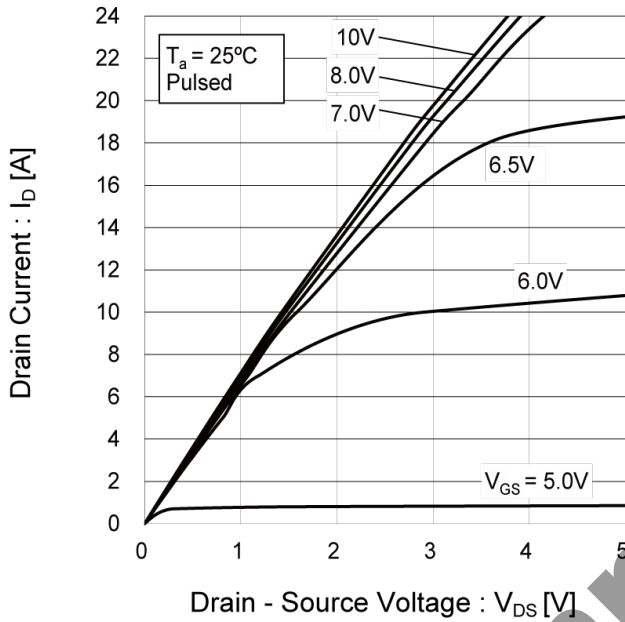
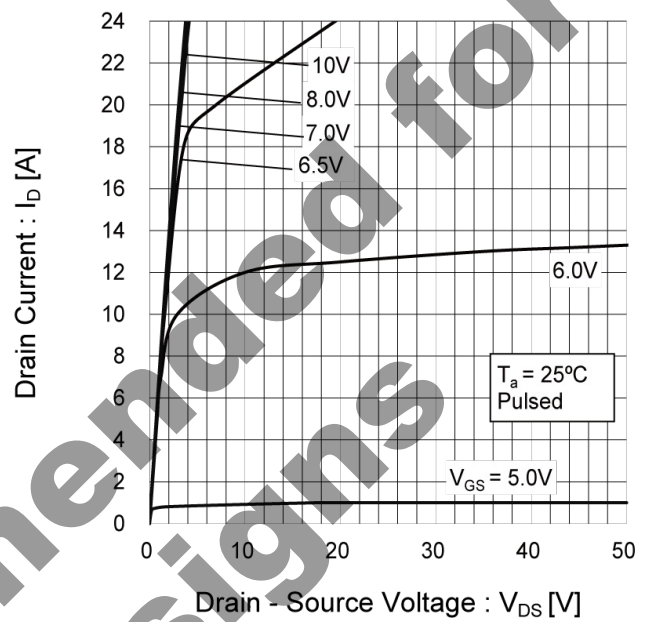


Fig.5 Typical Output Characteristics(II)



Not Recommended for New Designs

● Electrical characteristic curves

Fig.6 Breakdown Voltage vs. Junction Temperature

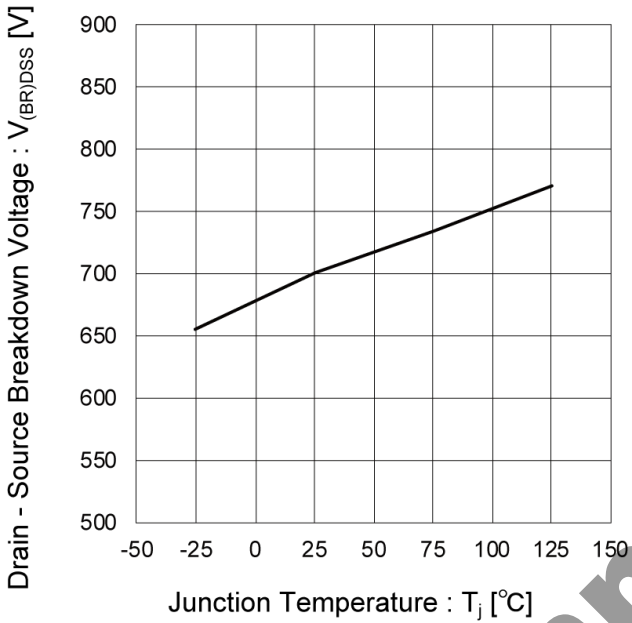


Fig.7 Typical Transfer Characteristics

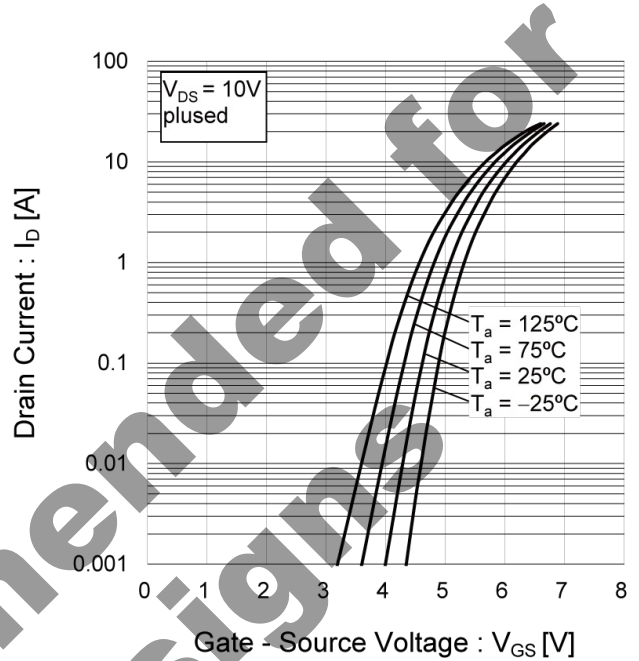


Fig.8 Gate Threshold Voltage vs. Junction Temperature

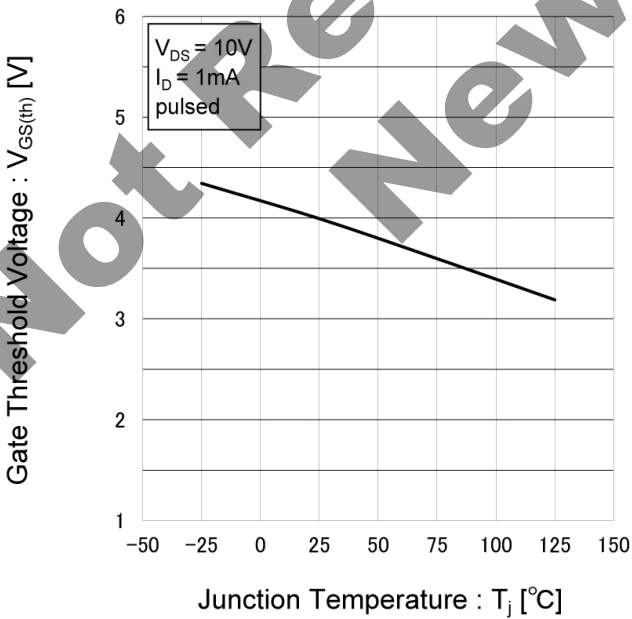
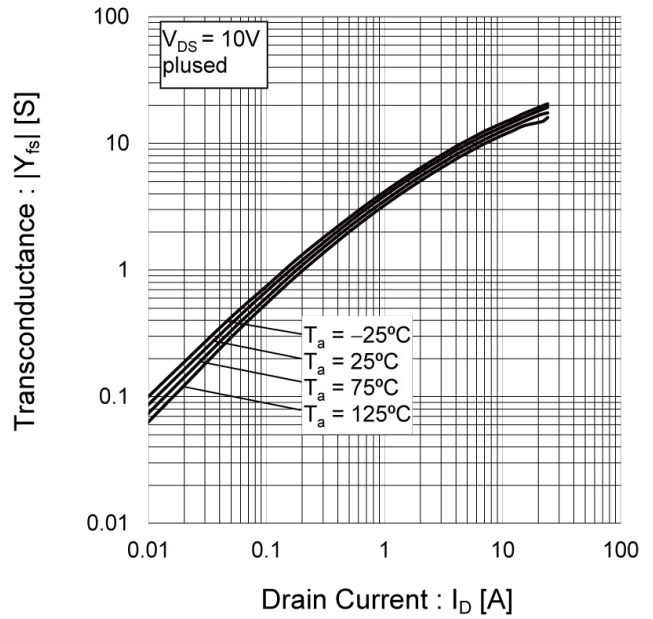


Fig.9 Forward Transfer Admittance vs. Drain Current



● Electrical characteristic curves

Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage

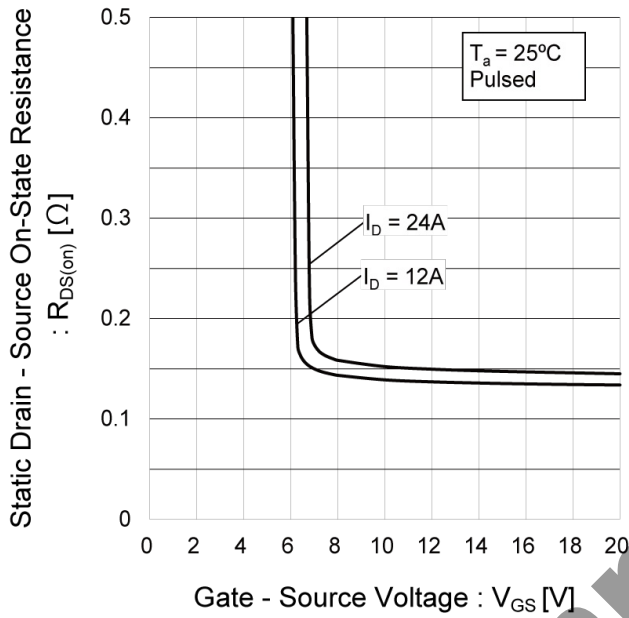


Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature

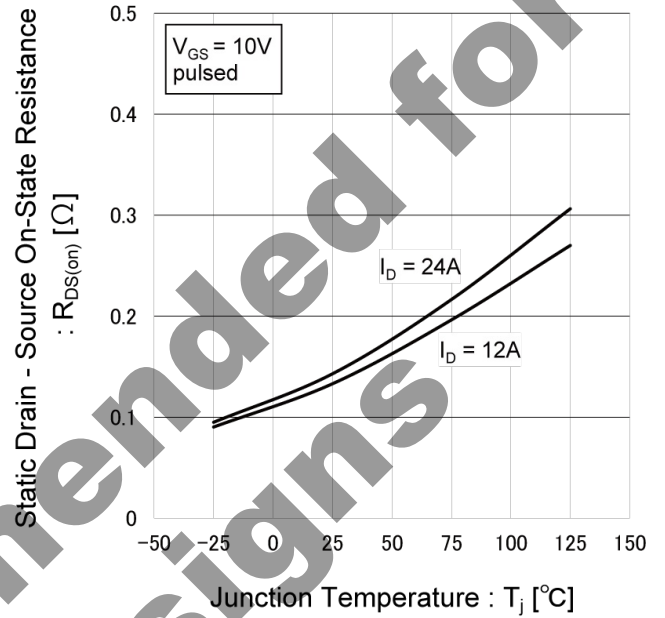
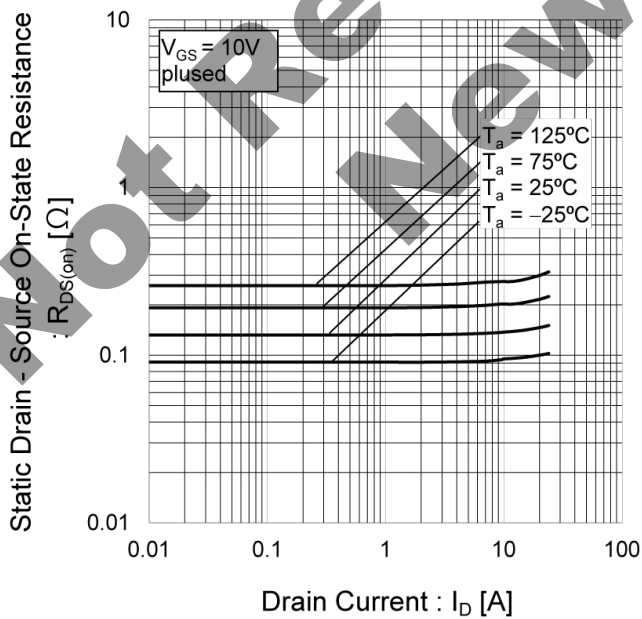


Fig.12 Static Drain - Source On - State Resistance vs. Drain Current(I)



● Electrical characteristic curves

Fig.13 Typical Capacitance vs. Drain - Source Voltage

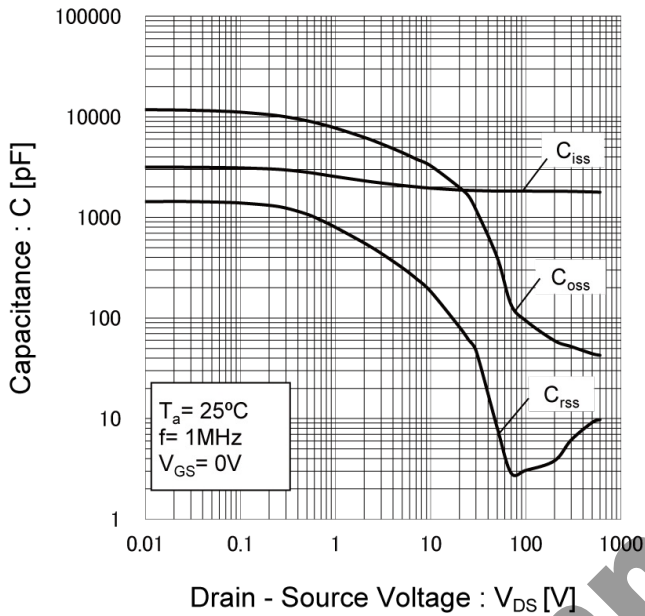


Fig.14 Switching Characteristics

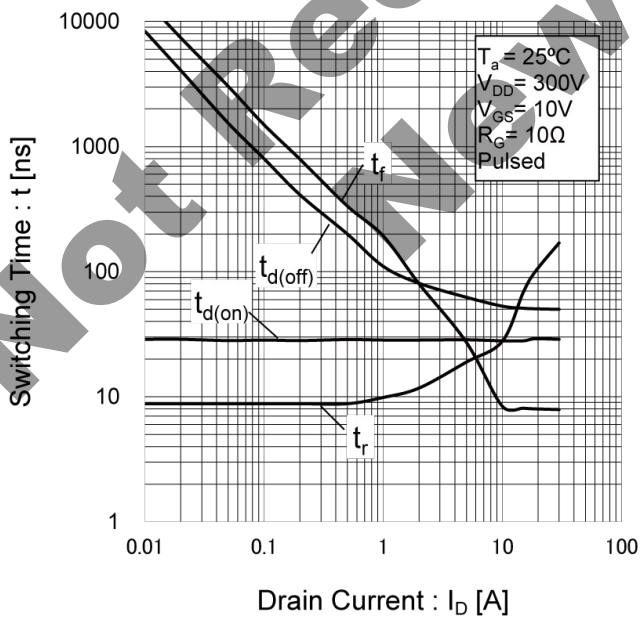
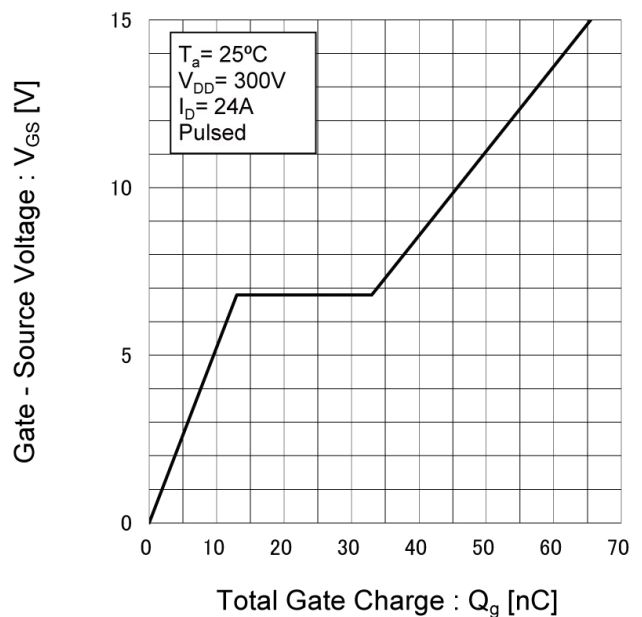


Fig.15 Dynamic Input Characteristics



● Electrical characteristic curves

Fig.16 Inverse Diode Forward Current vs. Source - Drain Voltage

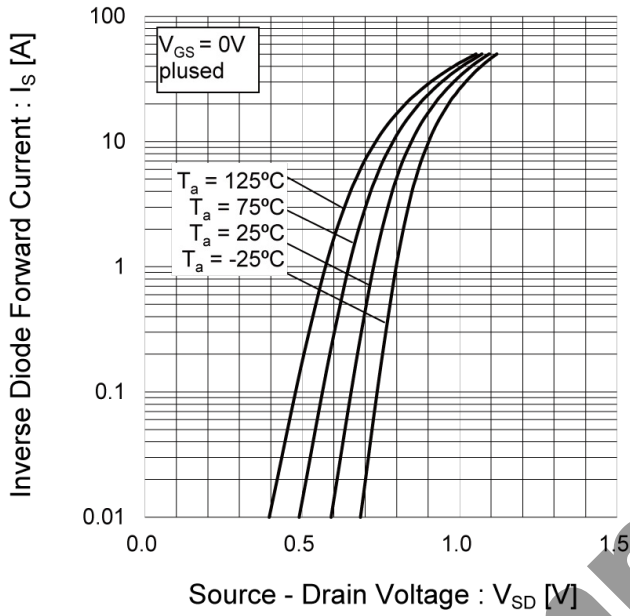
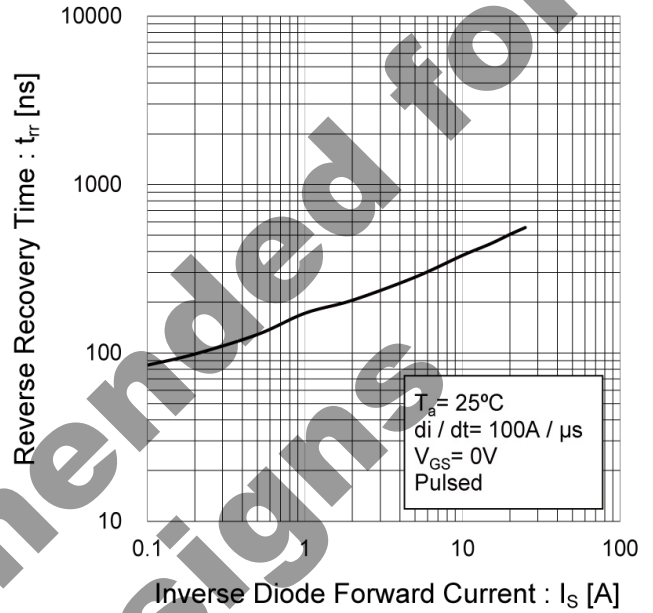


Fig.17 Reverse Recovery Time vs. Inverse Diode Forward Current



Not Recommended for New Designs

● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

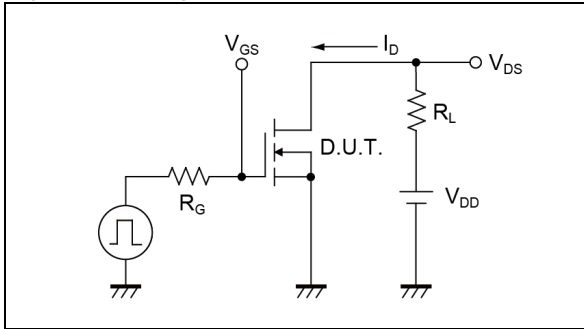


Fig.1-2 Switching Waveforms

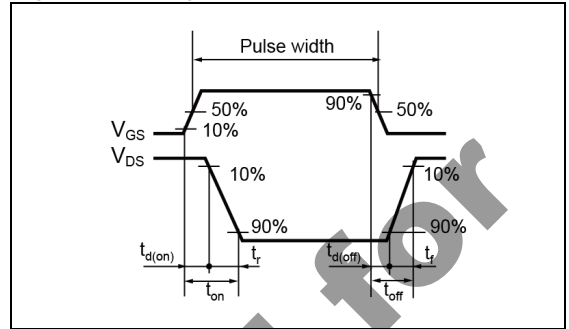


Fig.2-1 Gate Charge Measurement Circuit

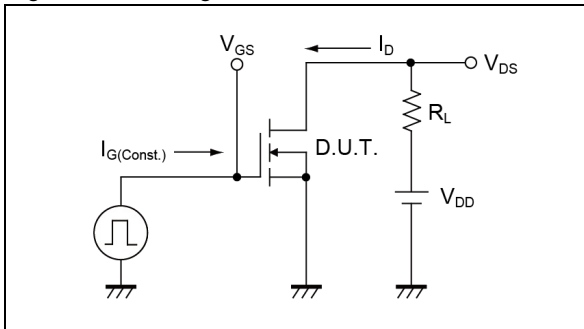


Fig.2-2 Gate Charge Waveform

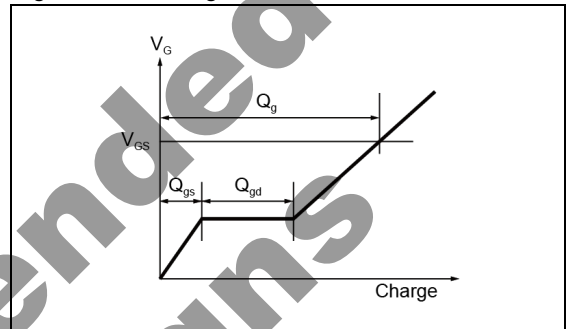


Fig.3-1 Avalanche Measurement Circuit

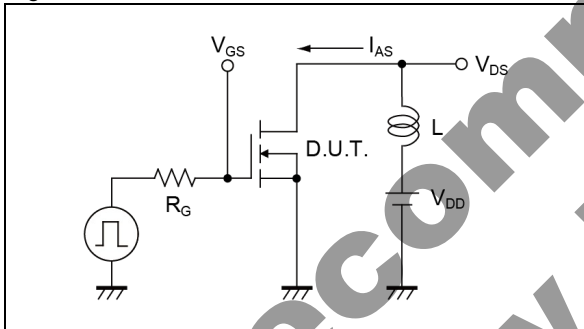


Fig.3-2 Avalanche Waveform

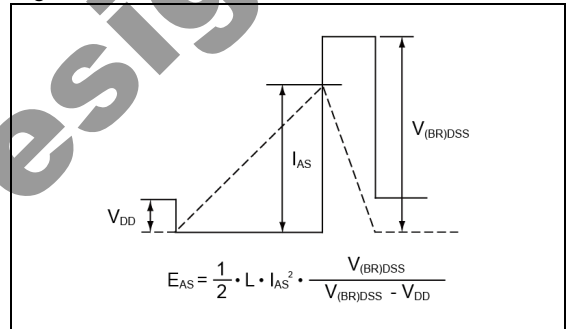


Fig.4-1 dv/dt Measurement Circuit

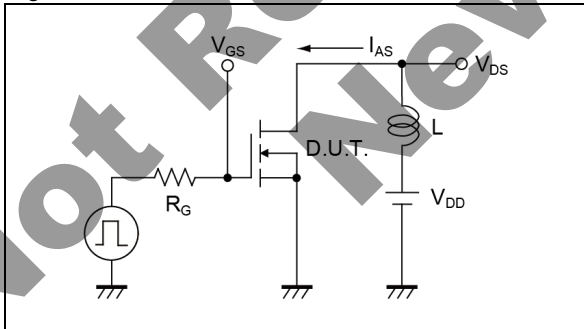


Fig.4-2 dv/dt Waveform

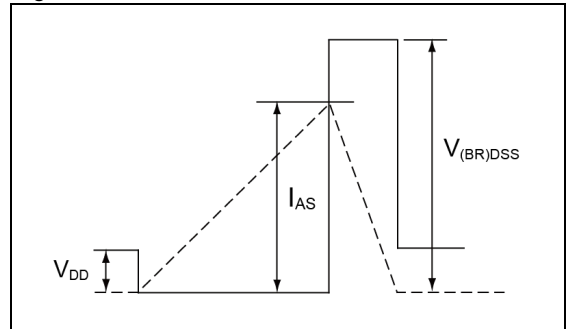


Fig.5-1 dv/dt Measurement Circuit

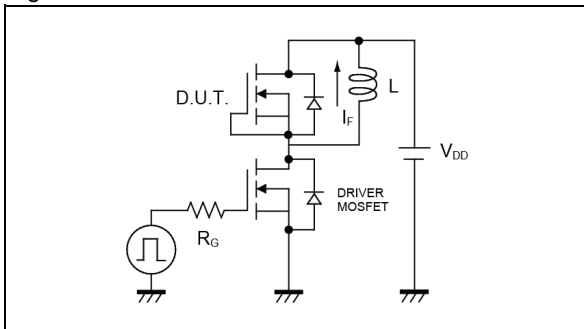
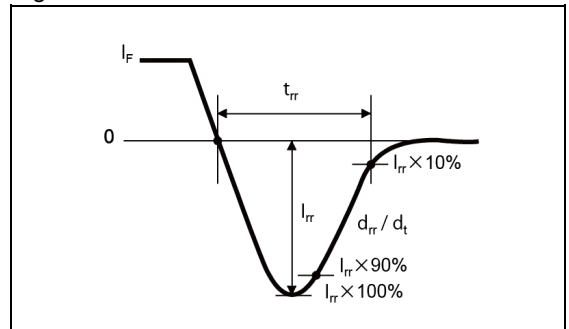
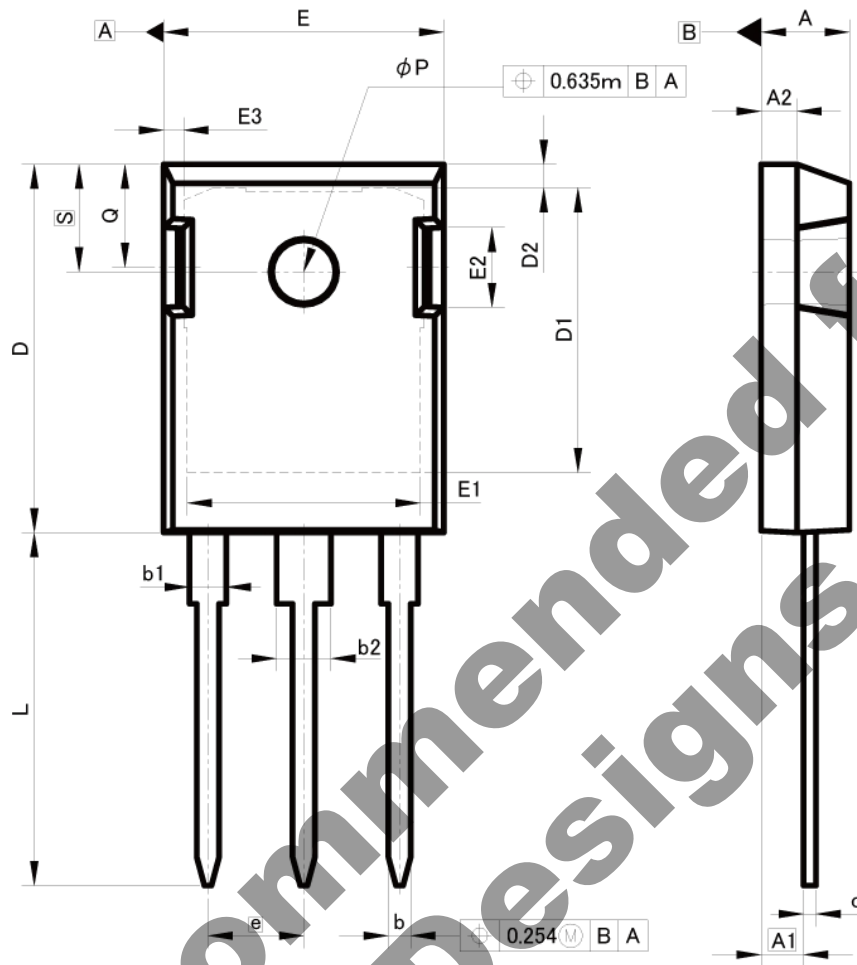


Fig.5-2 dv/dt Waveform



●Dimensions

TO-247



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.19	0.205
A1	2.29	2.54	0.09	0.1
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b1	1.91	2.20	0.075	0.087
b2	2.92	3.20	0.115	0.126
c	0.61	0.80	0.024	0.031
D	20.80	21.34	0.819	0.84
D1	17.43	17.83	0.686	0.702
E	15.75	16.13	0.62	0.635
e	5.45		0.22	
N	3		3	
L	19.81	20.57	0.78	0.81
L1	3.81	4.07	0.15	0.16
ΦP	3.55	3.65	0.14	0.144
Q	5.59	6.20	0.22	0.244
S	6.15		0.24	

Dimension in mm/inches

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