

$V_{DSS}$	40V
$R_{DS(on)}(Max.)$	16.2mΩ
$I_D$	±12A
$P_D$	3W

### ●Features

- 1) Low on - resistance.
- 2) High power small mold package (HSOP8).
- 3) Pb-free lead plating ; RoHS compliant
- 4) Halogen free
- 5) 100% Rg and UIS tested.

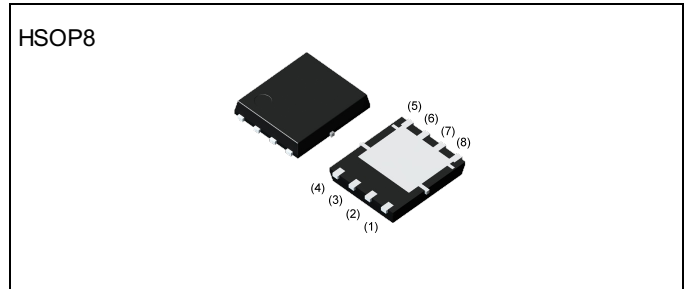
### ●Application

Switching

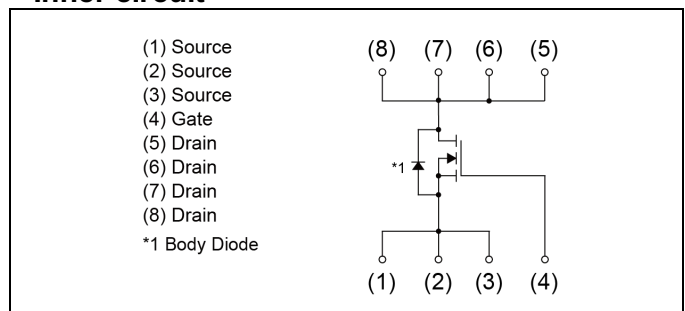
### ●Absolute maximum ratings ( $T_a = 25^{\circ}C$ )

Parameter	Symbol	Value	Unit	
Drain - Source voltage	$V_{DSS}$	40	V	
Continuous drain current	$T_c = 25^{\circ}C$	$I_D^{*1}$	±40	A
	$T_a = 25^{\circ}C$	$I_D$	±12	A
Pulsed drain current	$I_{D,pulse}^{*2}$	±48	A	
Gate - Source voltage	$V_{GSS}$	±20	V	
Avalanche energy, single pulse	$E_{AS}^{*3}$	11.2	mJ	
Avalanche current	$I_{AS}^{*3}$	12	A	
Power dissipation	$P_D^{*1}$	25	W	
	$P_D^{*4}$	3	W	
Junction temperature	$T_j$	150	°C	
Range of storage temperature	$T_{stg}$	-55 to +150	°C	

### ●Outline



### ●Inner circuit



### ●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	330
	Tape width (mm)	12
	Basic ordering unit (pcs)	2500
	Taping code	TB
	Marking	RS1G120MN

### ● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	$R_{thJA}^{*4}$	-	-	41.7	°C/W
Thermal resistance, junction - case	$R_{thJC}^{*1}$	-	-	5.0	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	40	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1mA$ referenced to $25^\circ\text{C}$	-	27.3	-	mV/°C
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 40V, V_{GS} = 0V$	-	-	1	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	1.0	-	2.5	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	$I_D = 1mA$ referenced to $25^\circ\text{C}$	-	-4.6	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 10V, I_D = 12A$	-	11.6	16.2	m $\Omega$
		$V_{GS} = 4.5V, I_D = 12A$	-	15.6	20.7	
Gate input resistance	$R_G$	f=1MHz, open drain	-	3.4	-	$\Omega$
Forward Transfer Admittance	$ Y_{fs} ^{*5}$	$V_{DS} = 10V, I_D = 12A$	4	-	-	S

\*1  $T_C = 25^\circ\text{C}$

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

\*3  $L \approx 0.1\text{mH}$ ,  $V_{DD} = 20V$ ,  $R_G = 25\Omega$ , STARTING  $T_j = 25^\circ\text{C}$  Fig.3-1,3-2

\*4 Mounted on a Cu board (40×40×0.8mm)

\*5 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	570	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 20V$	-	134	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	32	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx 20V, V_{GS} = 10V$	-	9.7	-	ns
Rise time	$t_r^{*5}$	$I_D = 6A$	-	4.3	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L \approx 3.3\Omega$	-	23.8	-	
Fall time	$t_f^{*5}$	$R_G = 10\Omega$	-	3.2	-	

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

Parameter	Symbol	Conditions	Values			Unit	
			Min.	Typ.	Max.		
Total gate charge	$Q_g^{*5}$	$V_{DD} \approx 20V$ $I_D = 12A$	$V_{GS} = 10V$	-	9.4	-	nC
Gate - Source charge	$Q_{gs}^{*5}$		$V_{GS} = 4.5V$	-	4.4	-	
Gate - Drain charge	$Q_{gd}^{*5}$		$V_{GS} = 4.5V$	-	2.4	-	
				-	1.1	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	$I_S$	$T_a = 25^\circ\text{C}$	-	-	2.5	A
Body diode pulse current	$I_{SP}^{*2}$		-	-	48	A
Forward voltage	$V_{SD}^{*5}$	$V_{GS} = 0V, I_S = 2.5A$	-	-	1.2	V

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

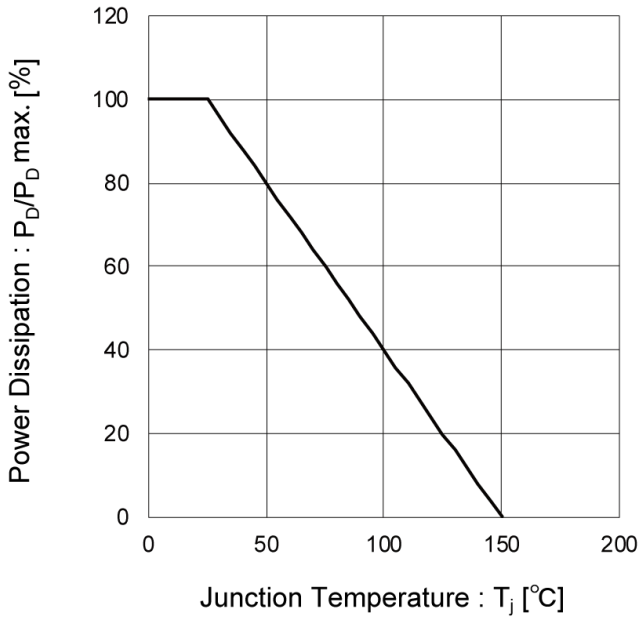


Fig.2 Maximum Safe Operating Area

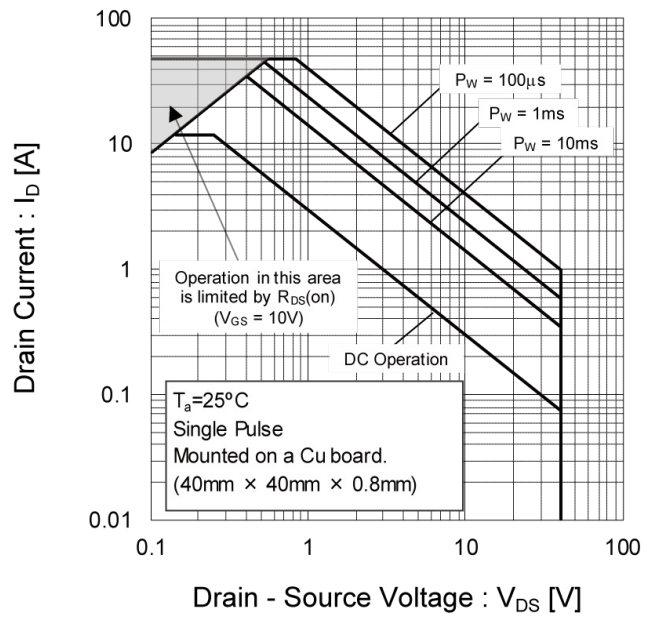


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

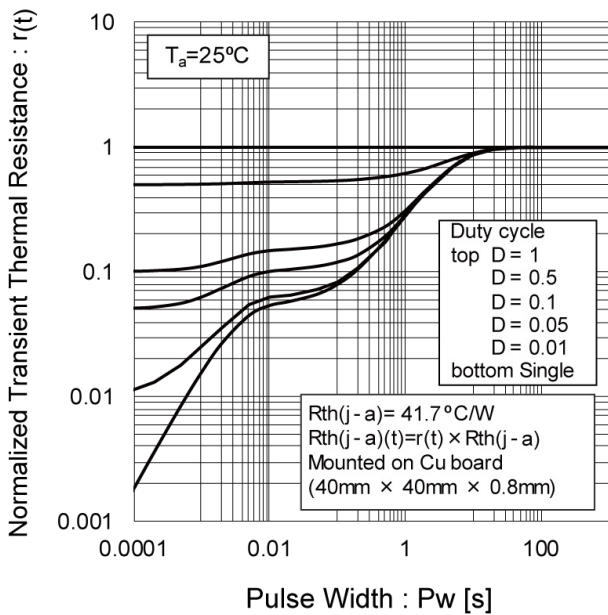
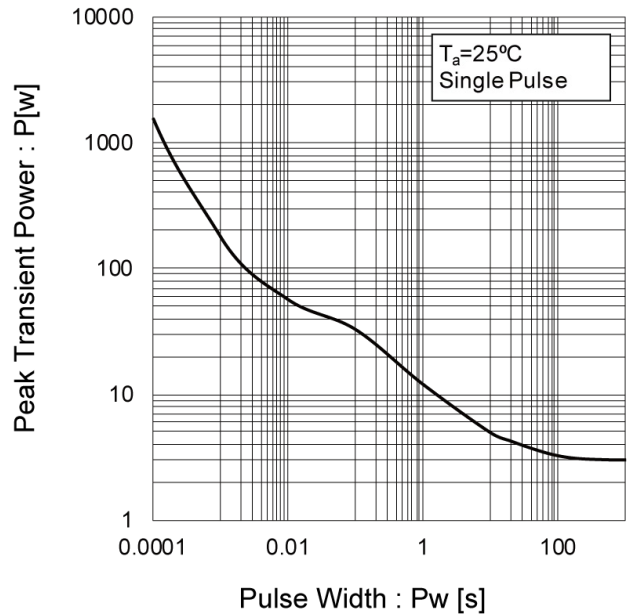


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

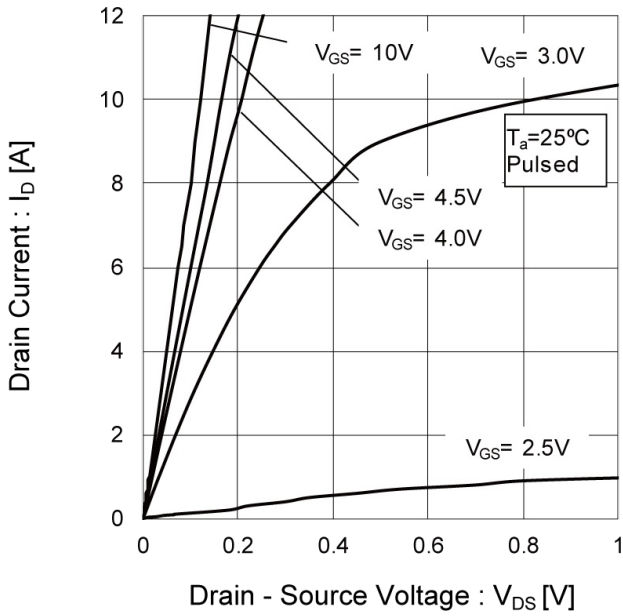


Fig.6 Typical Output Characteristics(II)

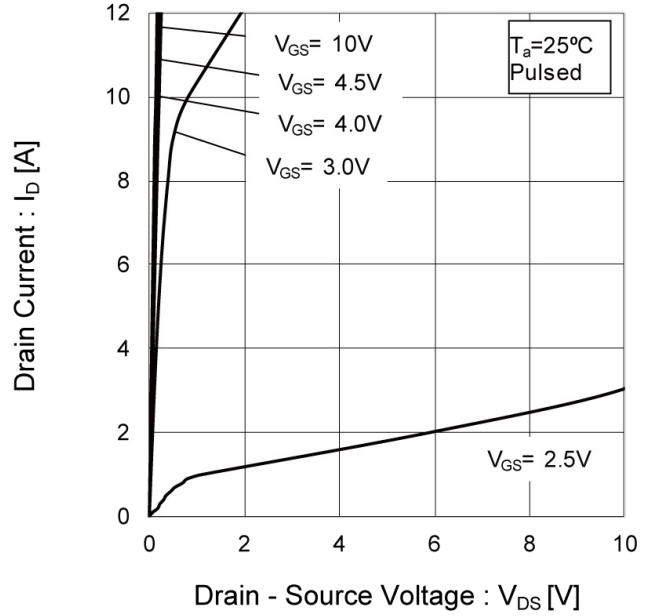


Fig.7 Breakdown Voltage vs. Junction Temperature

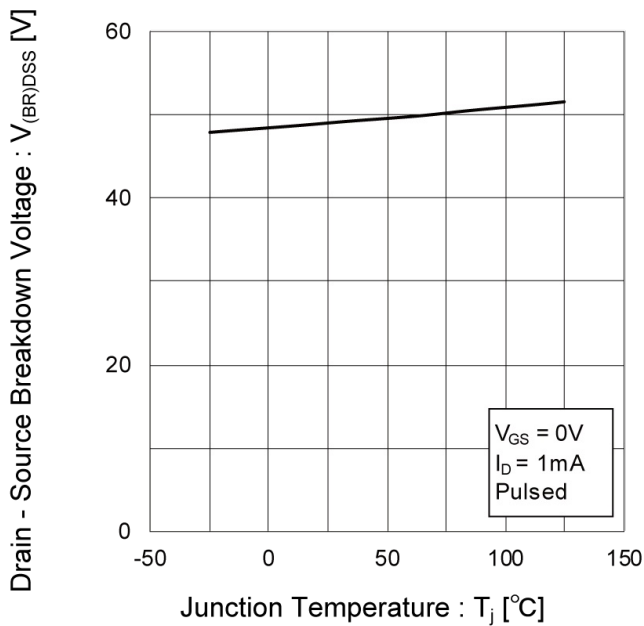
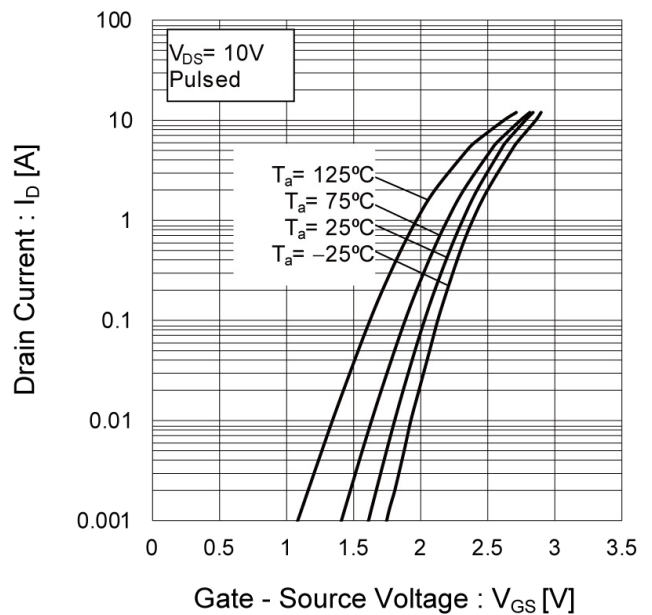


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

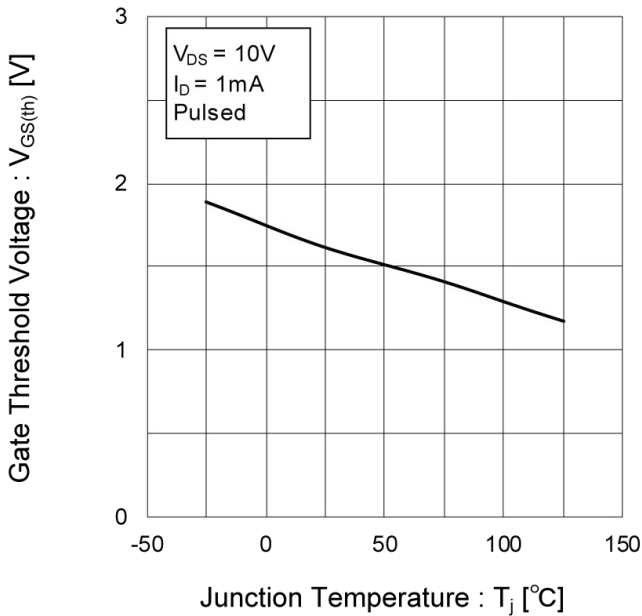


Fig.10 Forward Transfer Admittance vs. Drain Current

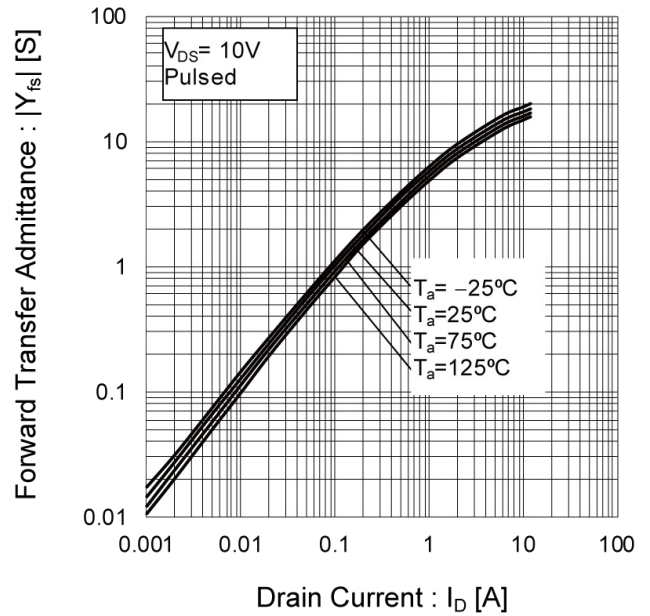


Fig.11 Drain Current Derating Curve

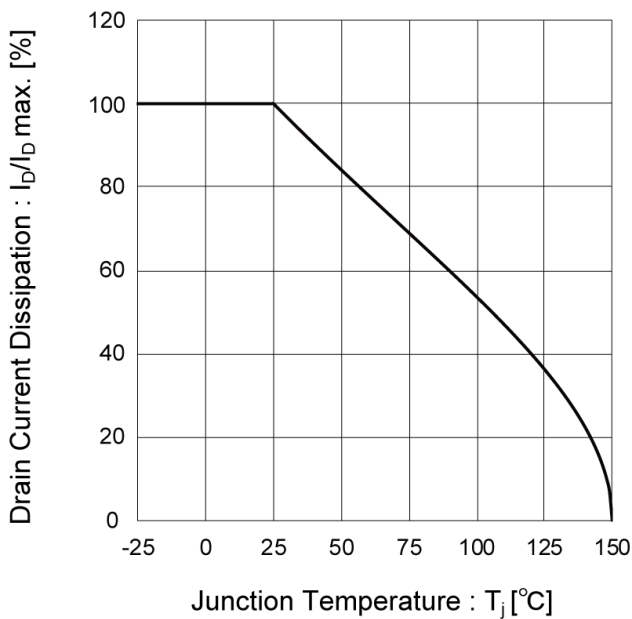
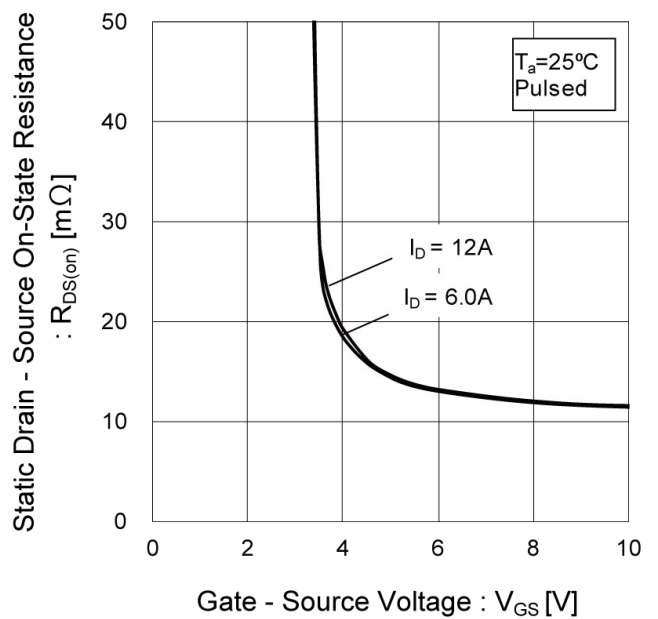


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



● Electrical characteristic curves

Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

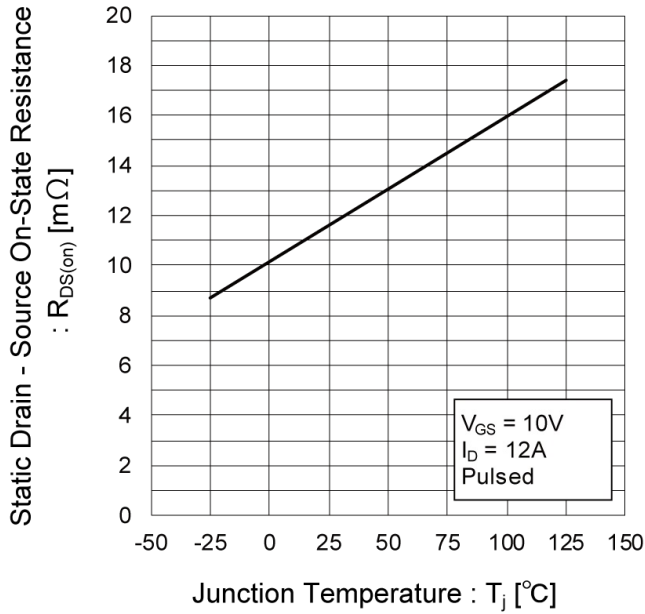


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)

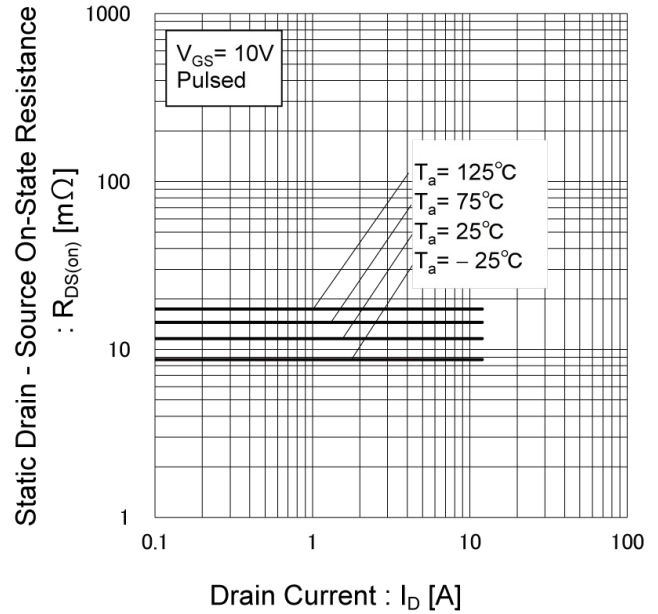
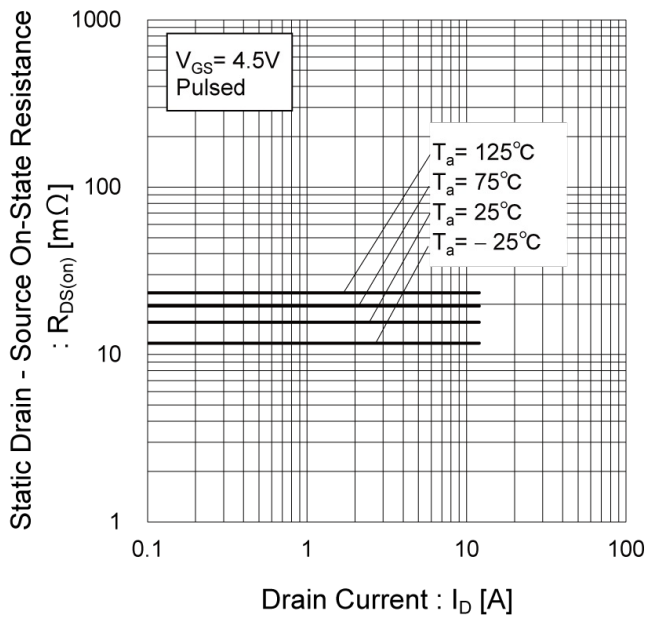


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current (II)



● Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

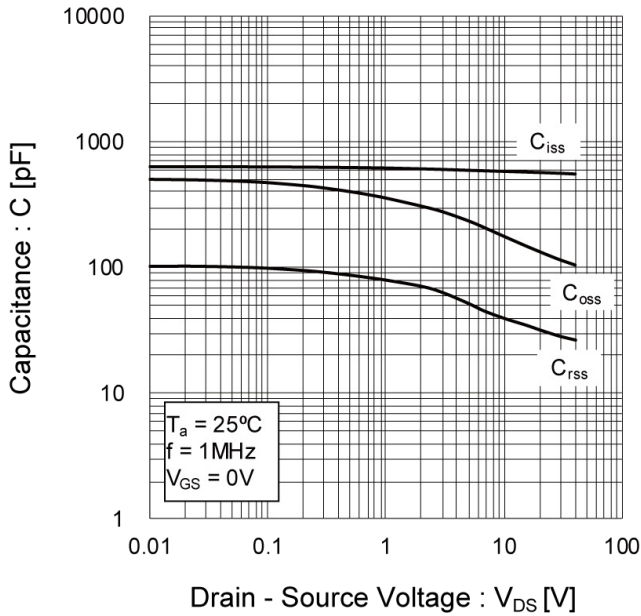


Fig.17 Switching Characteristics

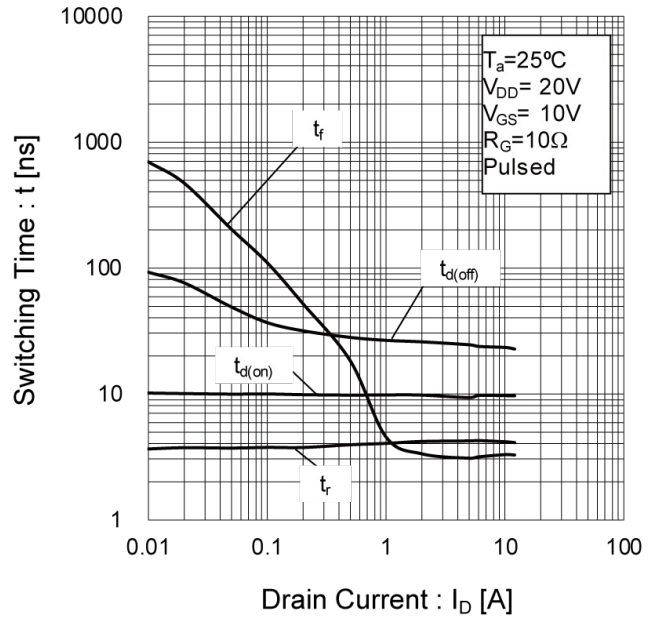


Fig.18 Dynamic Input Characteristics

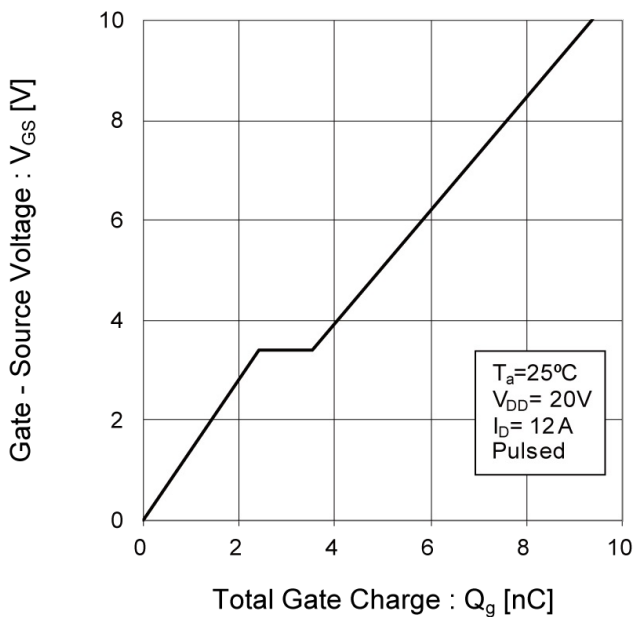
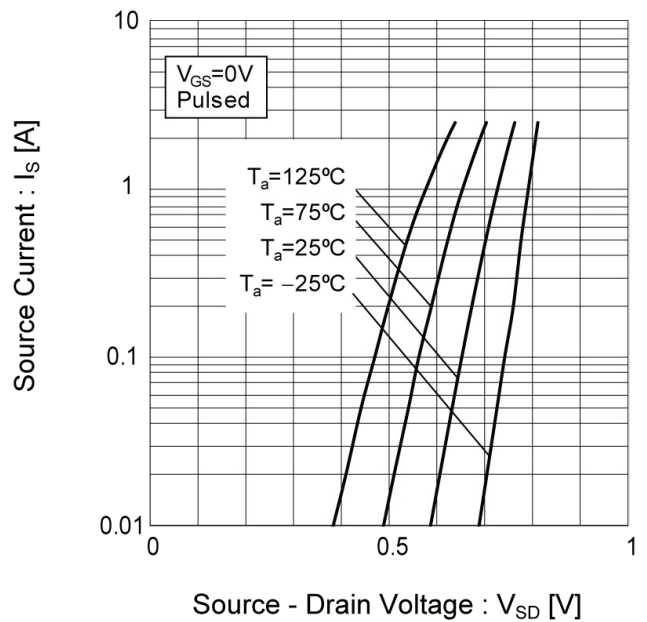


Fig.19 Source Current vs. Source Drain Voltage





● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

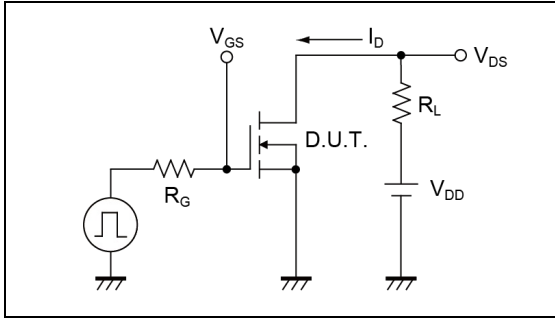


Fig.1-2 Switching Waveforms

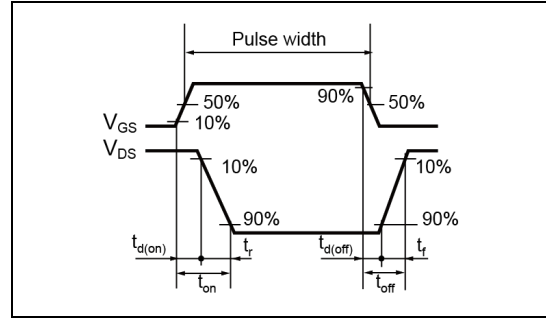


Fig.2-1 Gate Charge Measurement Circuit



Fig.2-2 Gate Charge Waveform

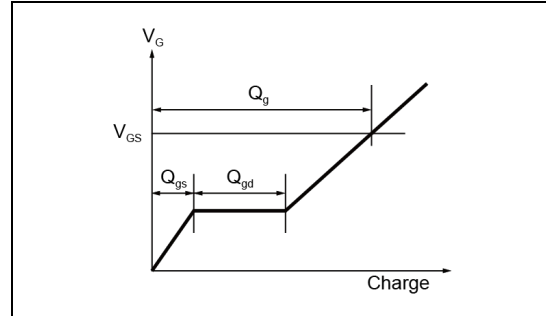


Fig.3-1 Avalanche Measurement Circuit

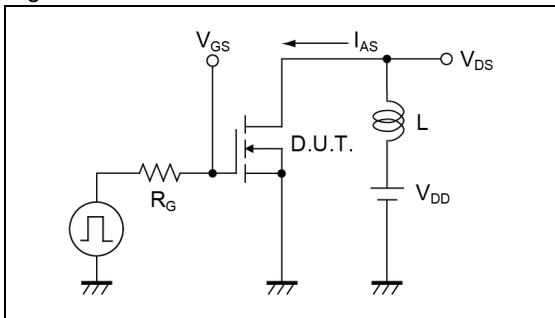
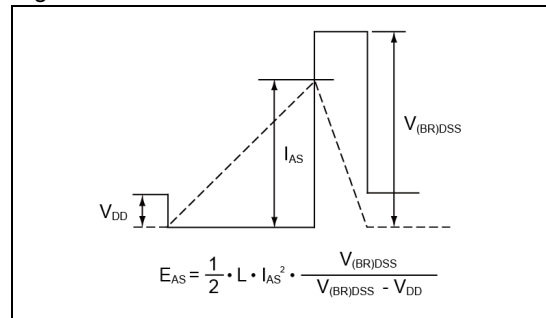


Fig.3-2 Avalanche Waveform

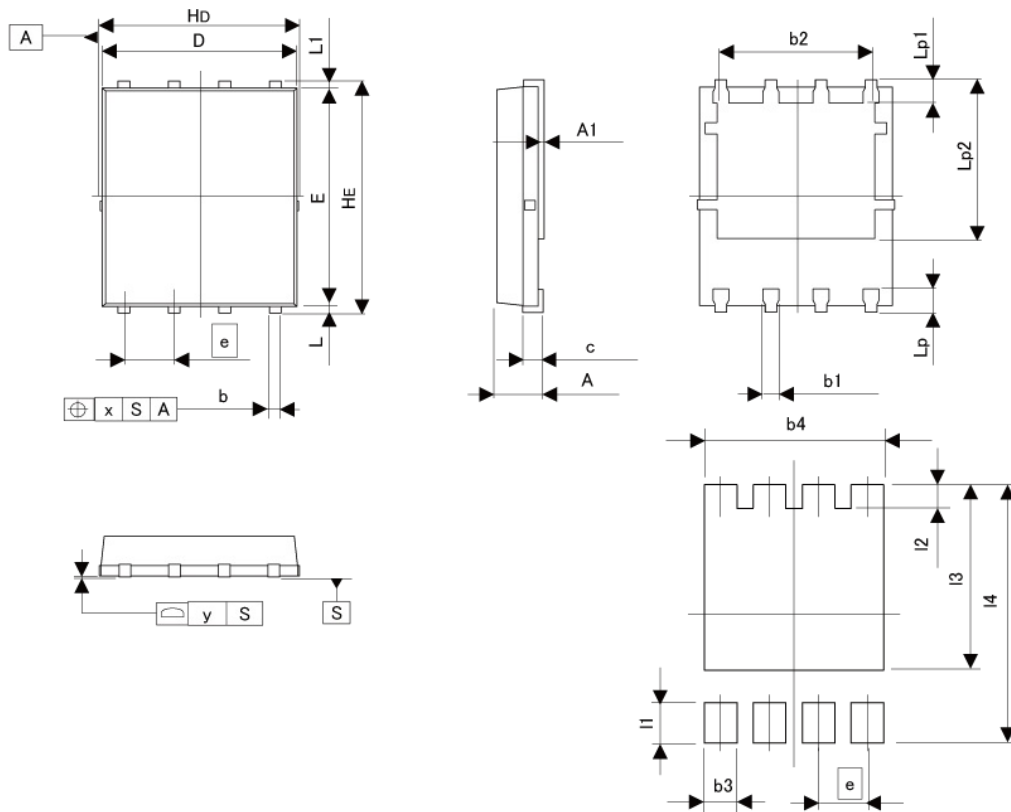


● Notice

This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

●Dimensions

HSOP8 (5 x 6)



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
A1	0.00	0.05	0.000	0.002
b	0.24	0.42	0.009	0.017
b1	0.29	0.49	0.011	0.019
b2	3.81	4.21	0.150	0.166
c	0.20	0.30	0.008	0.012
D	4.80	5.00	0.189	0.197
E	5.60	5.80	0.220	0.228
e	1.27		0.050	
Hd	4.90	5.10	0.193	0.201
HE	5.90	6.10	0.232	0.240
L	0.07	0.25	0.003	0.010
L1	0.07	0.25	0.003	0.010
Lp	0.50	0.70	0.020	0.028
Lp1	0.52	0.72	0.020	0.028
Lp2	3.92	4.32	0.154	0.170
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b3	-	0.59	-	0.023
b4	-	4.21	-	0.166
I1	-	0.80	-	0.031
I2	-	0.82	-	0.032
I3	-	4.32	-	0.170
I4	-	6.10	-	0.240

Dimension in mm/inches

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