

$V_{DSS}$	30V
$R_{DS(on)}$ at 10V (Max.)	8.1m $\Omega$
$R_{DS(on)}$ at 4.5V (Max.)	11.6m $\Omega$
$I_D$	13A
$P_D$	2.0W

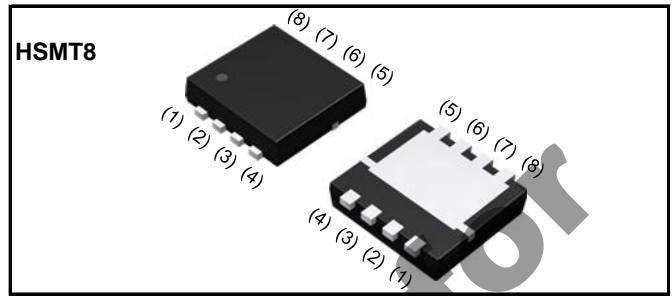
### ●Features

- 1) Low on - resistance.
- 2) High Power Small Mold Package (HSMT8).
- 3) Pb-free lead plating ; RoHS compliant
- 4) Halogen Free
- 5) 100% Rg and UIS Tested

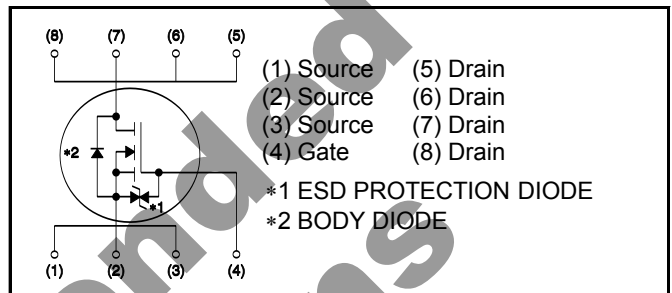
### ●Application

DC/DC converters

### ●Outline



### ●Inner circuit



### ●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	12
	Basic ordering unit (pcs)	3,000
	Taping code	TB1
	Marking	E130MN

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

Parameter	Symbol	Value	Unit
Drain - Source voltage	$V_{DSS}$	30	V
Continuous drain current	$I_D^{*1}$	$\pm 13$	A
Pulsed drain current	$I_{D,pulse}^{*2}$	$\pm 52$	A
Gate - Source voltage	$V_{GSS}$	$\pm 20$	V
Power dissipation	$P_D^{*3}$	2.0	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 - ambient	$R_{thJA}^{*3}$	-	-	62.5	°C/W
	$R_{thJC}$	-	-	-	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	30	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1mA$ referenced to $25^\circ\text{C}$	-	35.6	-	mV/°C
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 30V, V_{GS} = 0V$	-	-	1	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 10$	$\mu\text{A}$
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 $25^\circ\text{C}$	-	-4.3	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 10V, I_D = 13A$	-	5.8	8.1	m $\Omega$
		$V_{GS} = 4.5V, I_D = 13A$	-	8.3	11.6	
Gate input resistance	$R_G$	$f = 1MHz, \text{open drain}$	-	4.2	-	$\Omega$
Transconductance	$g_{fs}^{*4}$	$V_{DS} = 10V, I_D = 13A$	10.0	-	-	S

\*1 Limited only by maximum temperature allowed.

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

\*3 Mounted on a ceramic board. (30×30×0.8mm)

\*4 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	840	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 15V$	-	360	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	90	-	
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \approx 15V, V_{GS} = 10V$	-	10	-	ns
Rise time	$t_r^{*4}$	$I_D = 6.5A$	-	18	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 2.3\Omega$	-	36	-	
Fall time	$t_f^{*4}$	$R_G = 10\Omega$	-	7	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*4}$	$V_{DD} \approx 15V, I_D = 13A$ $V_{GS} = 10V$	-	14	-	nC
		$V_{DD} \approx 15V, I_D = 13A$ $V_{GS} = 4.5V$	-	6.6	-	
Gate - Source charge	$Q_{gs}^{*4}$	$V_{GS} = 4.5V$	-	2.8	-	
Gate - Drain charge	$Q_{gd}^{*4}$		-	2.4	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	$I_S^{*1}$	$T_a = 25^\circ\text{C}$	-	-	13	A
Forward voltage	$V_{SD}^{*4}$	$V_{GS} = 0V, I_S = 1.67A$	-	-	1.2	V
Reverse recovery time	$t_{rr}^{*4}$	$I_S = 13A$	-	27.2	-	ns
Reverse recovery charge	$Q_{rr}^{*4}$	$di/dt = 100A/\mu s$	-	24.3	-	$\mu C$

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

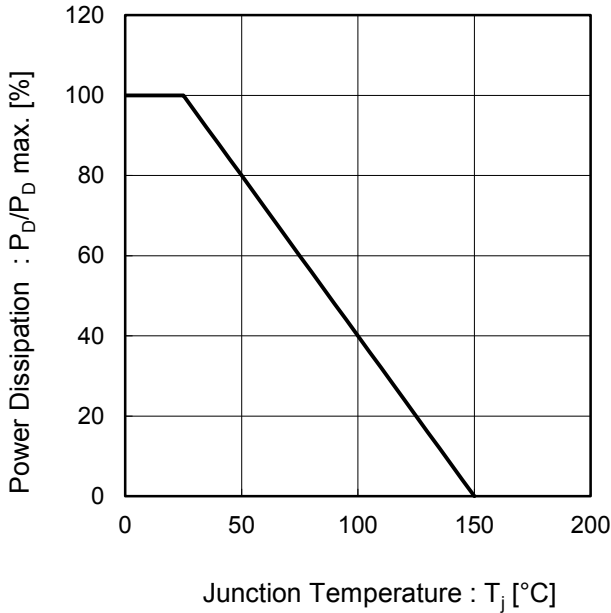


Fig.2 Maximum Safe Operating Area

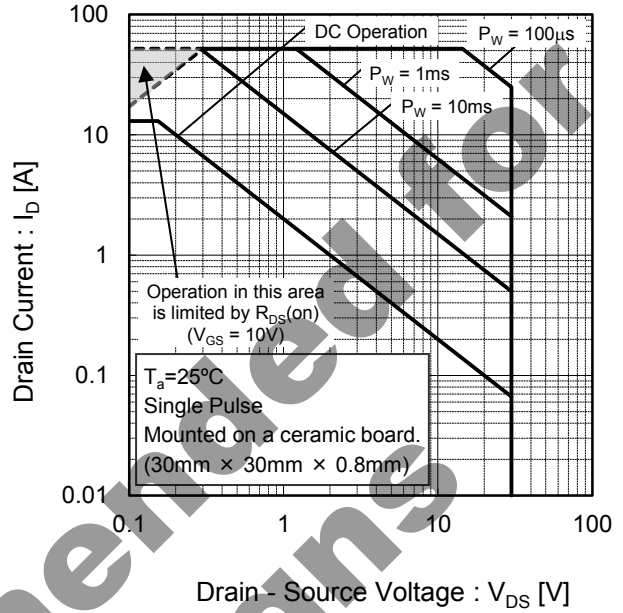


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

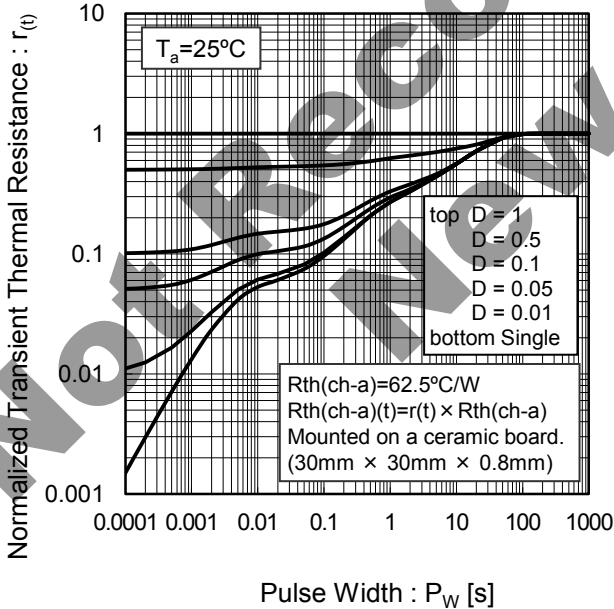
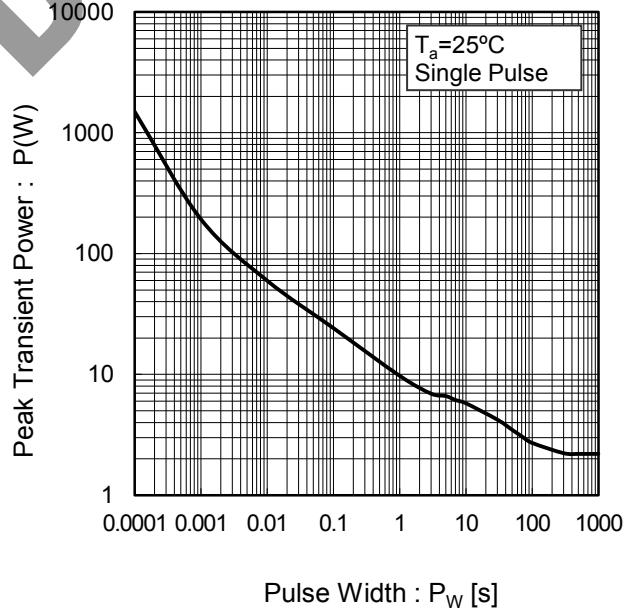


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

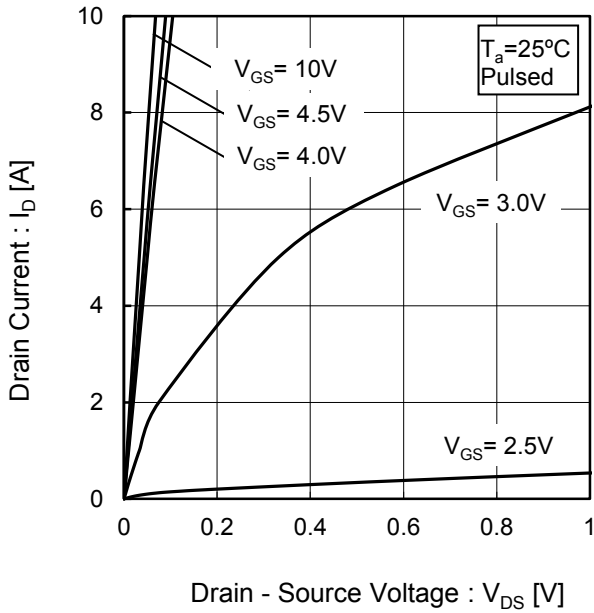


Fig.6 Typical Output Characteristics(II)

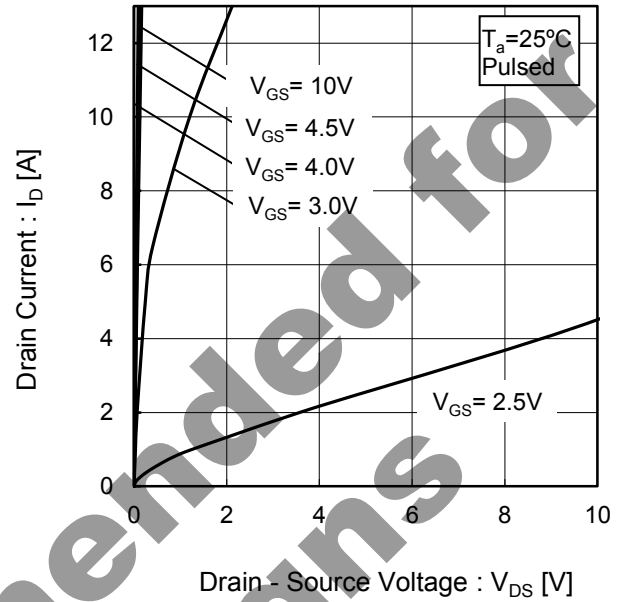


Fig.7 Breakdown Voltage vs. Junction Temperature

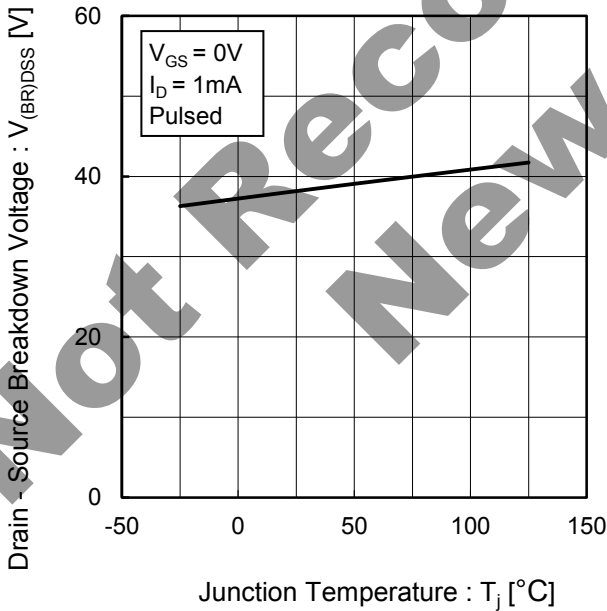
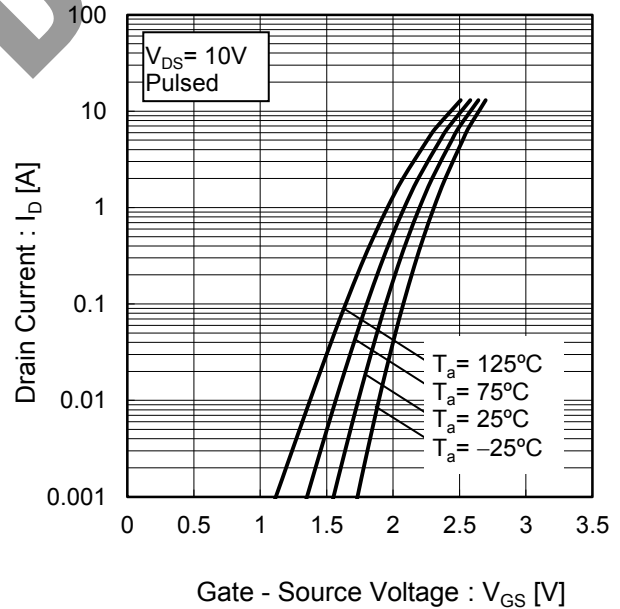


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

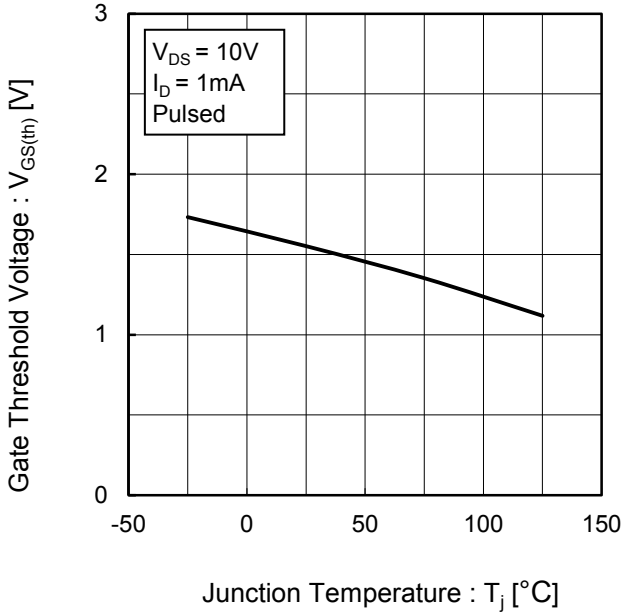


Fig.10 Transconductance vs. Drain Current

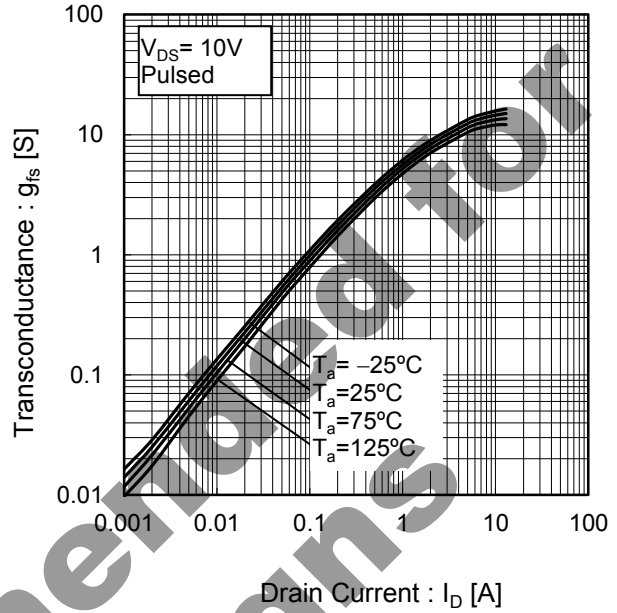


Fig.11 Drain Current Derating Curve

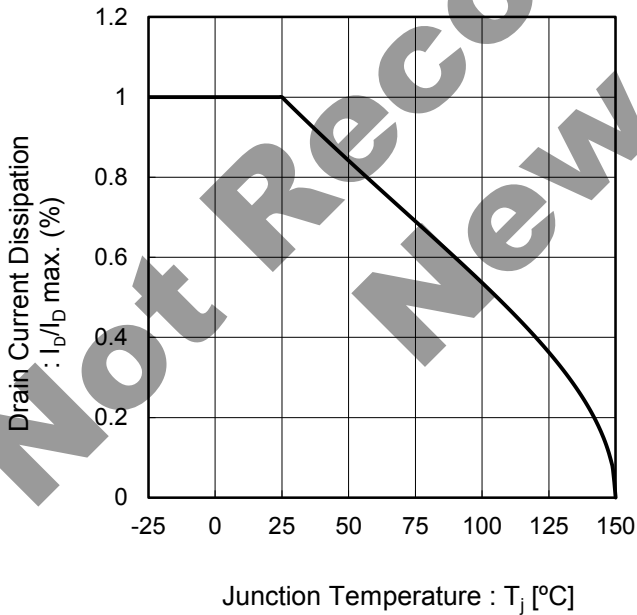
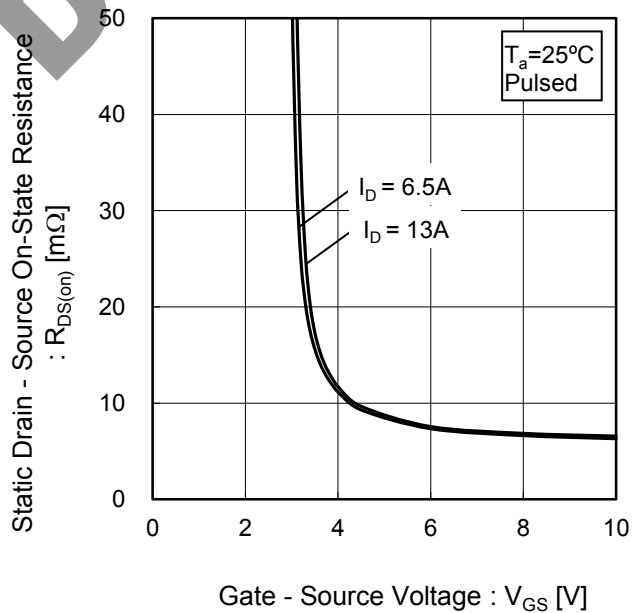


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●Electrical characteristic curves

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

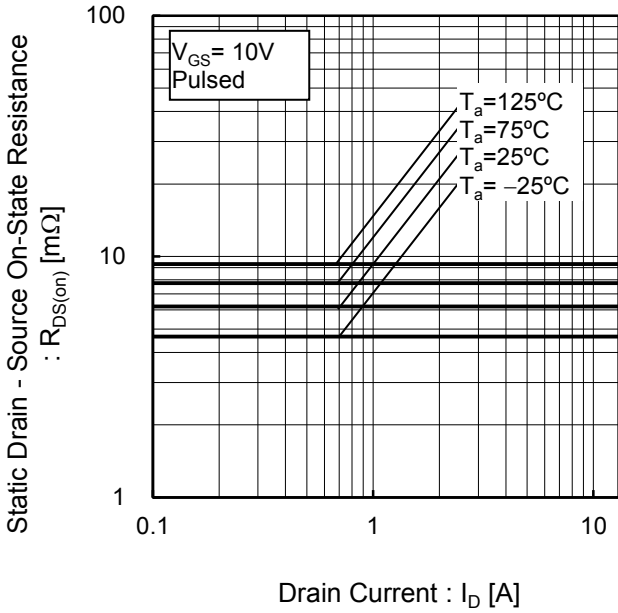


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature

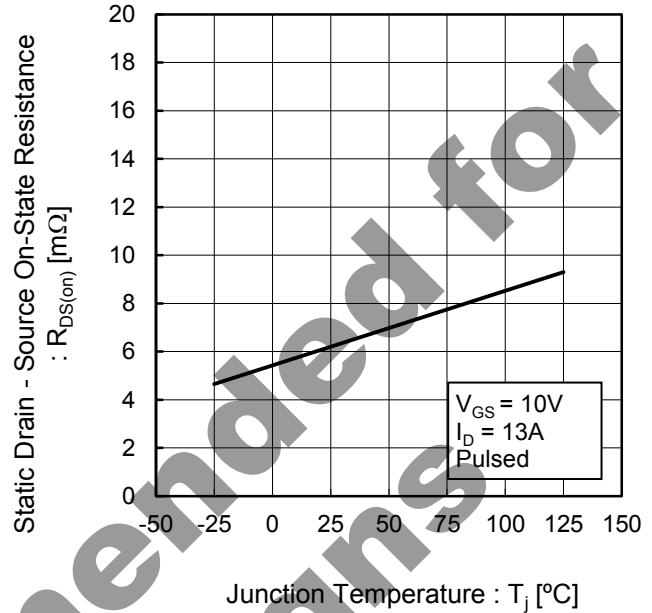
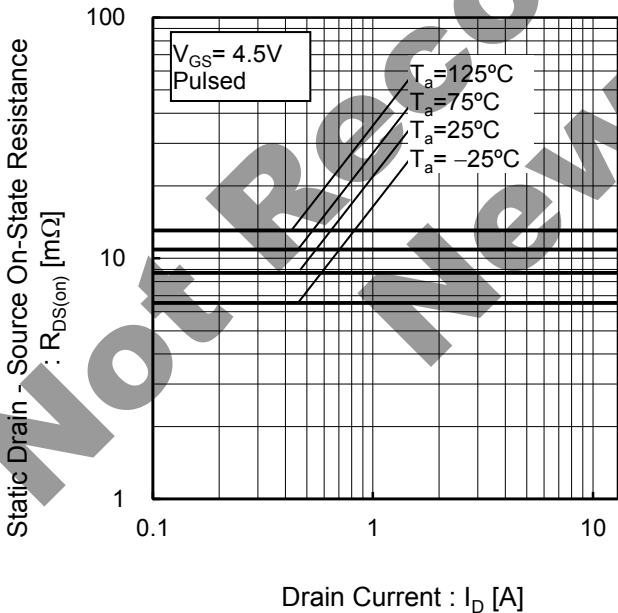


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)



●Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

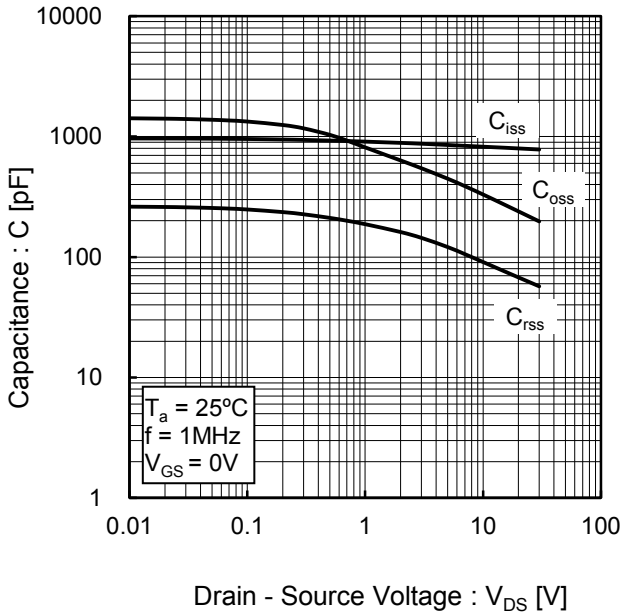


Fig.17 Switching Characteristics

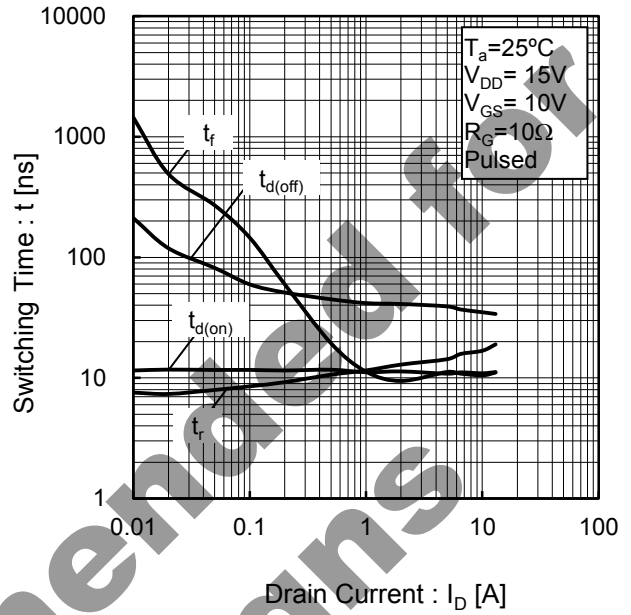


Fig.18 Dynamic Input Characteristics

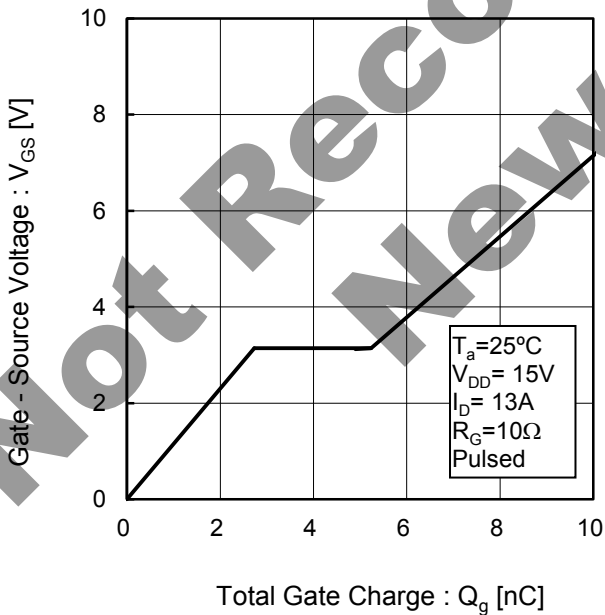
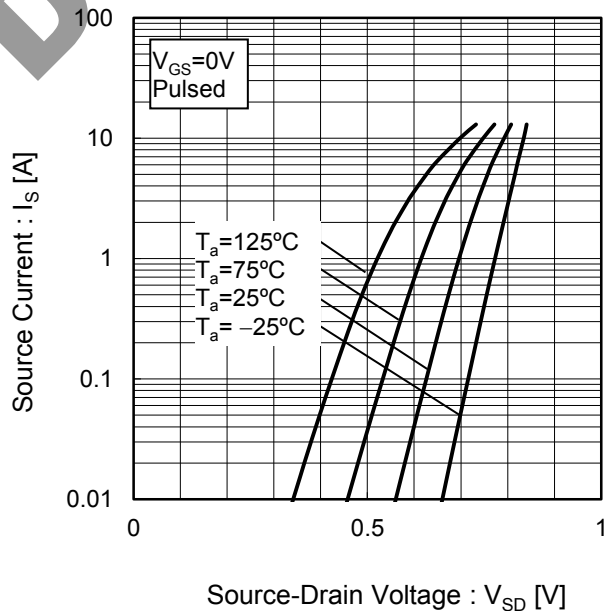


Fig.19 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

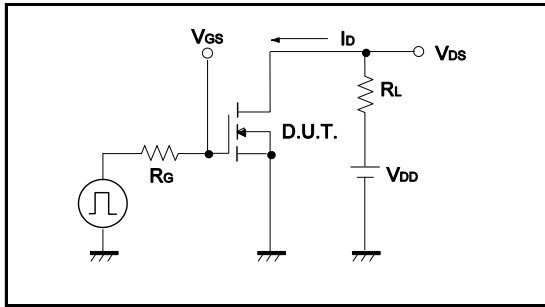


Fig.1-2 Switching Waveforms

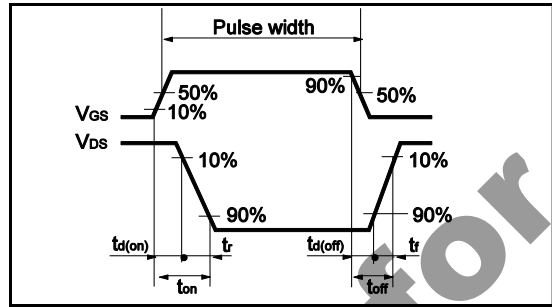


Fig.2-1 Gate Charge Measurement Circuit

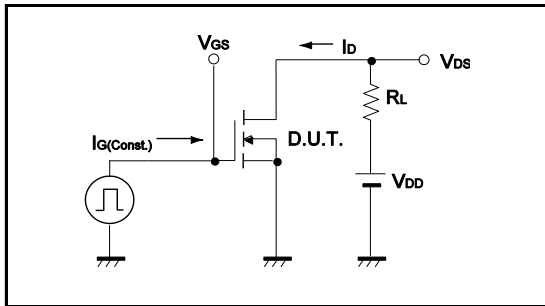
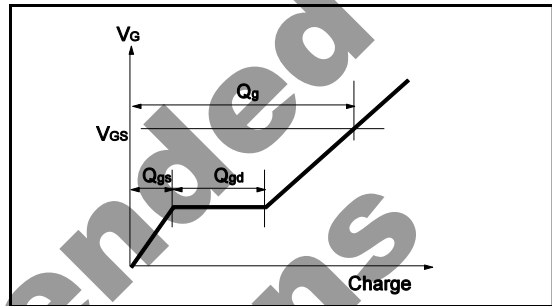
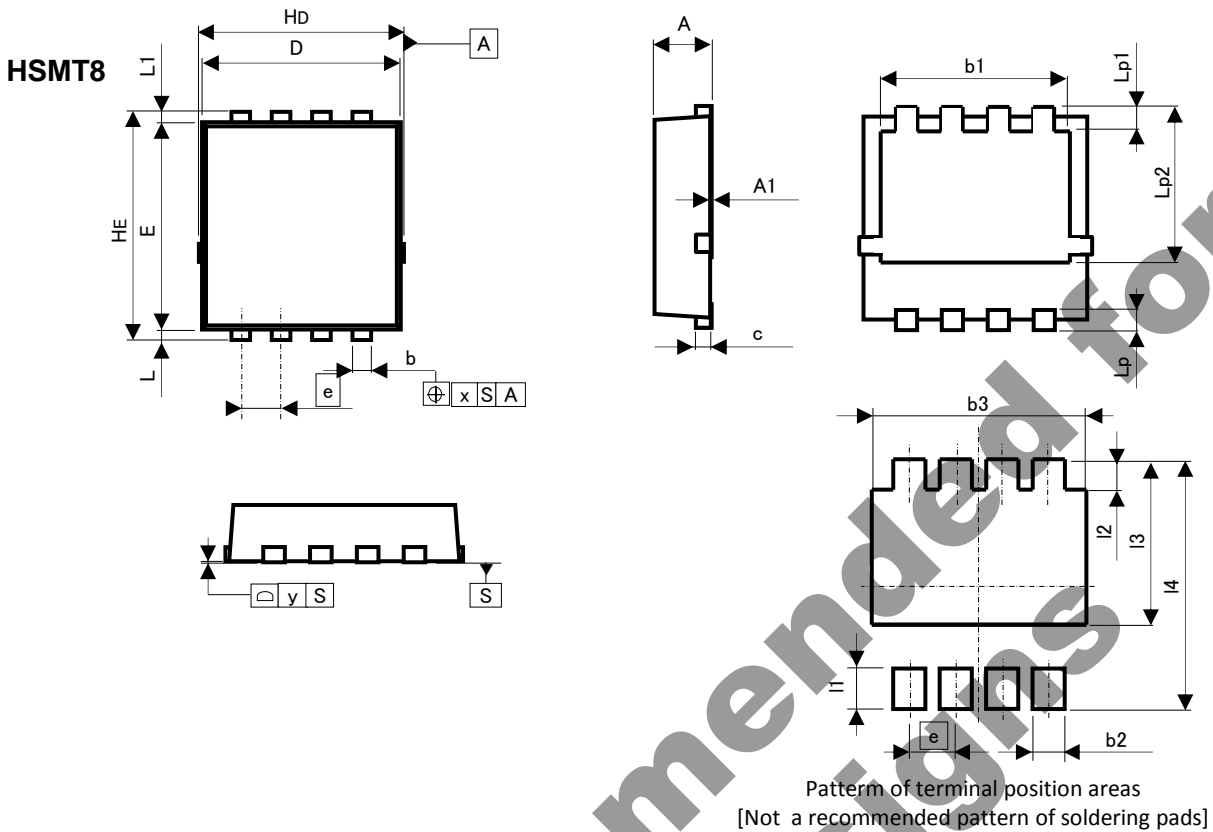


Fig.2-2 Gate Charge Waveform



Not Recommended for New Designs

●Dimensions (Unit : mm)



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.90	0.028	0.035
A1	0.00	0.05	0.000	0.002
b	0.27	0.37	0.011	0.015
b1	2.50	2.70	0.098	0.106
c	0.10	0.30	0.004	0.012
D	3.10	3.30	0.122	0.130
E	2.90	3.10	0.114	0.122
e	0.65		0.026	
Hd	3.20	3.40	0.126	0.134
HE	3.20	3.40	0.126	0.134
L	0.07	0.25	0.003	0.010
L1	0.07	0.25	0.003	0.010
Lp	0.20	0.40	0.008	0.016
Lp1	0.25	0.45	0.010	0.018
Lp2	2.20	2.40	0.087	0.094
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.47	-	0.019
b3	-	2.70	-	0.106
l1	-	0.50	-	0.020
l2	-	0.55	-	0.022
l3	-	2.40	-	0.094
l4	-	3.40	-	0.134

Dimension in mm/inches

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