



**THE DATASHEET OF  
RQ3E180AJTB**



$V_{DSS}$	30V
$R_{DS(on)(Max.)}$	4.5mΩ
$I_D$	±30A
$P_D$	2W

### ●Features

- 1) Low on - resistance.
- 2) Small Surface Mount Package.
- 3) Pb-free lead plating ; RoHS compliant

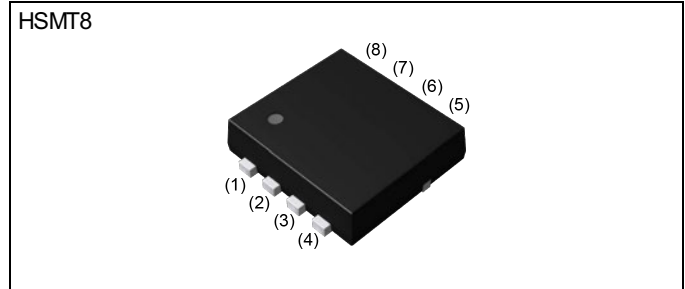
### ●Application

Switching

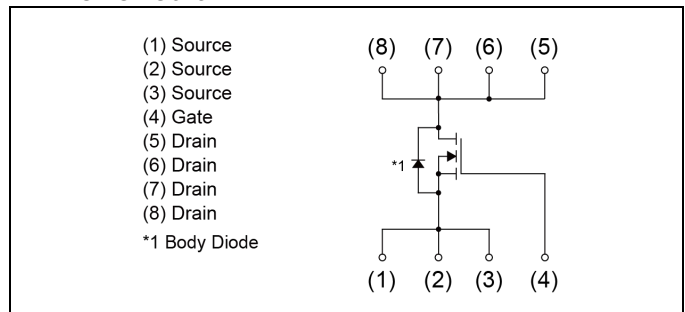
### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Value	Unit	
Drain - Source voltage	$V_{DSS}$	30	V	
Continuous drain current	$T_c = 25^\circ\text{C}$	$I_D^{*4}$	±30	A
	$T_a = 25^\circ\text{C}$	$I_D$	±18	A
Pulsed drain current	$I_{D,pulse}^{*1}$	±72	A	
Gate - Source voltage	$V_{GSS}$	±12	V	
Avalanche energy, single pulse	$E_{AS}^{*2}$	24.6	mJ	
Avalanche current	$I_{AS}^{*2}$	18	A	
Power dissipation	$P_D^{*3}$	2	W	
	$P_D^{*4}$	30	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)	3000
	Taping code	TB
	Marking	E180AJ

### ● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	$R_{thJA}^{*3}$	-	62.5	-	°C/W
Thermal resistance, junction - case	$R_{thJC}^{*4}$	-	4.17	-	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	30	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = 1mA$ referenced to $25^\circ\text{C}$	-	18	-	mV/°C
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 24V, V_{GS} = 0V$	-	-	1	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = \pm 12V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 11mA$	0.5	-	1.5	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	$I_D = 1mA$ referenced to $25^\circ\text{C}$	-	-2.0	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 4.5V, I_D = 18A$	-	3.5	4.5	m $\Omega$
		$V_{GS} = 2.5V, I_D = 18A$	-	4.5	5.8	
Forward Transfer Admittance	$ Y_{fs} ^{*5}$	$V_{DS} = 5V, I_D = 18A$	24	-	-	S

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

\*2  $L \approx 100\mu\text{H}$ ,  $V_{DD} = 15V$ ,  $R_G = 25\Omega$ , STARTING  $T_{ch} = 25^\circ\text{C}$  Fig.3-1,3-2

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

\*4  $T_c = 25^\circ\text{C}$

\*5 Pulsed

**●Electrical characteristics (T<sub>a</sub> = 25°C)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0V	-	4290	-	pF
Output capacitance	C <sub>oss</sub>	V <sub>DS</sub> = 15V	-	490	-	
Reverse transfer capacitance	C <sub>rss</sub>	f = 1MHz	-	320	-	
Turn - on delay time	t <sub>d(on)</sub> <sup>*5</sup>	V <sub>DD</sub> ≈ 15V, V <sub>GS</sub> = 4.5V	-	28	-	ns
Rise time	t <sub>r</sub> <sup>*5</sup>	I <sub>D</sub> = 9A	-	22	-	
Turn - off delay time	t <sub>d(off)</sub> <sup>*5</sup>	R <sub>L</sub> ≈ 1.67Ω	-	150	-	
Fall time	t <sub>f</sub> <sup>*5</sup>	R <sub>G</sub> = 10Ω	-	160	-	

**●Gate charge characteristics (T<sub>a</sub> = 25°C)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q <sub>g</sub> <sup>*5</sup>	V <sub>DD</sub> ≈ 15V, I <sub>D</sub> = 18A, V <sub>GS</sub> = 4.5V	-	39	-	nC
Gate - Source charge	Q <sub>gs</sub> <sup>*5</sup>		-	10	-	
Gate - Drain charge	Q <sub>gd</sub> <sup>*5</sup>		-	10	-	

**●Body diode electrical characteristics (Source-Drain) (T<sub>a</sub> = 25°C)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I <sub>S</sub> <sup>*1</sup>	T <sub>a</sub> = 25°C	-	-	1.67	A
Body diode pulse current	I <sub>SP</sub> <sup>*2</sup>		-	-	72	A
Forward voltage	V <sub>SD</sub> <sup>*5</sup>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.67A	-	-	1.2	V

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

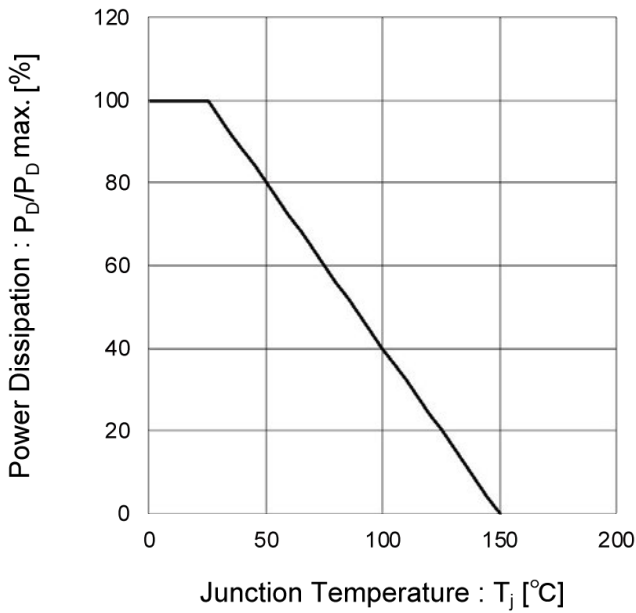


Fig.2 Maximum Safe Operating Area

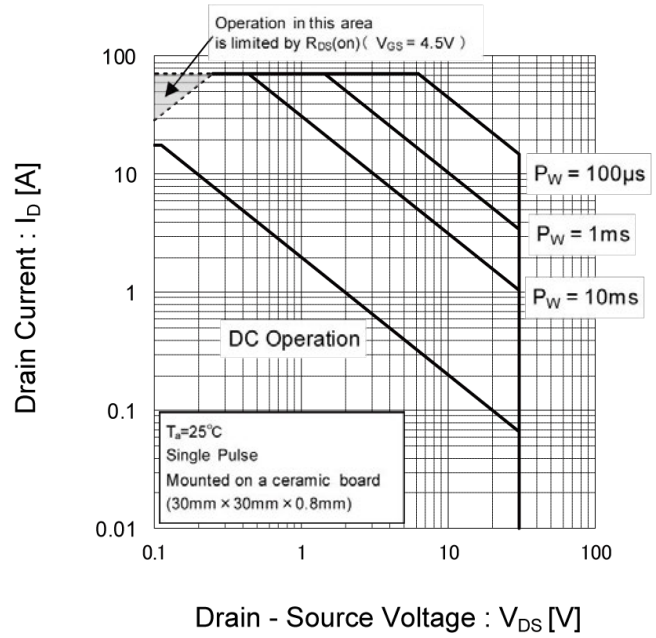


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

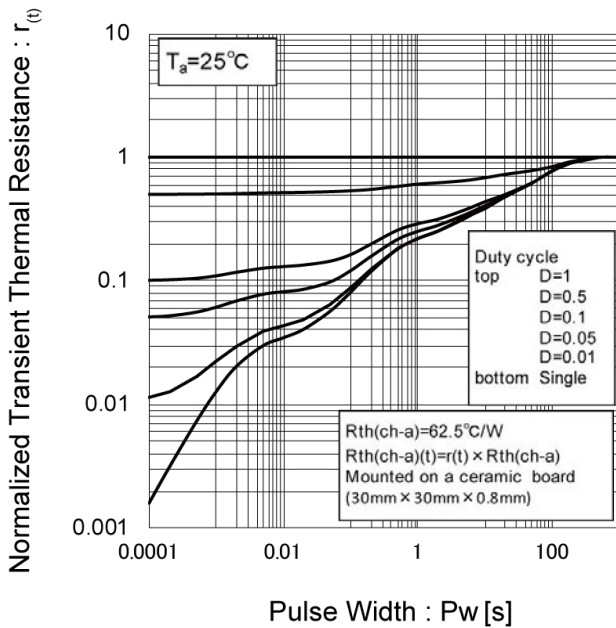
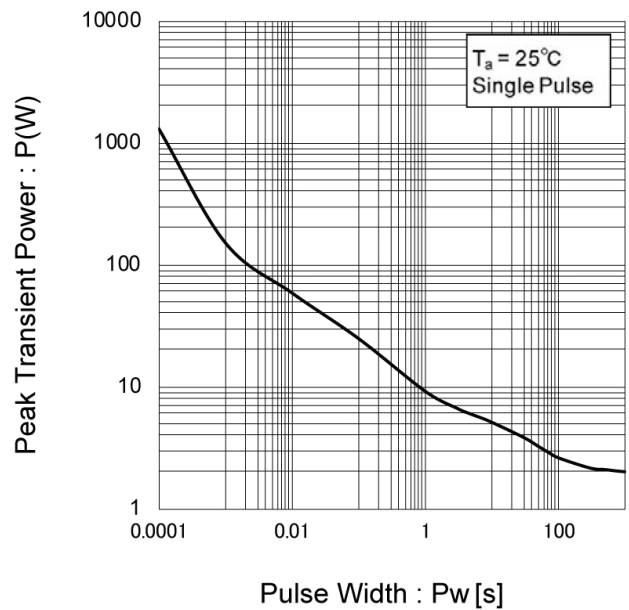


Fig.4 Single Pulse Maximum Power dissipation



● Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

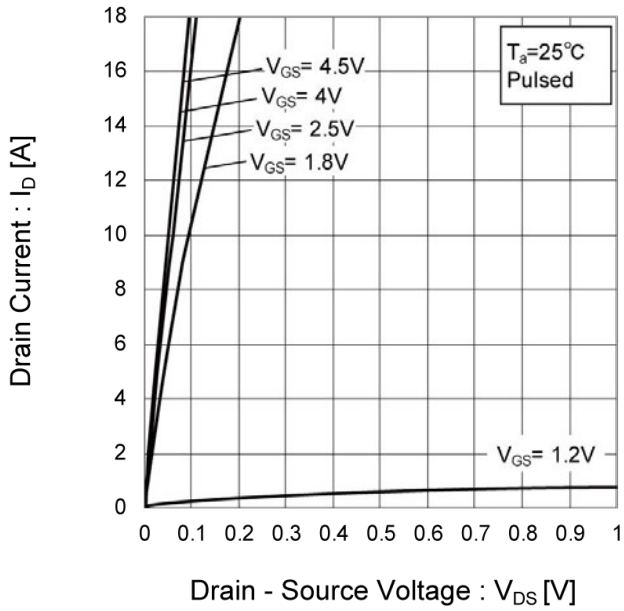


Fig.6 Typical Output Characteristics(II)

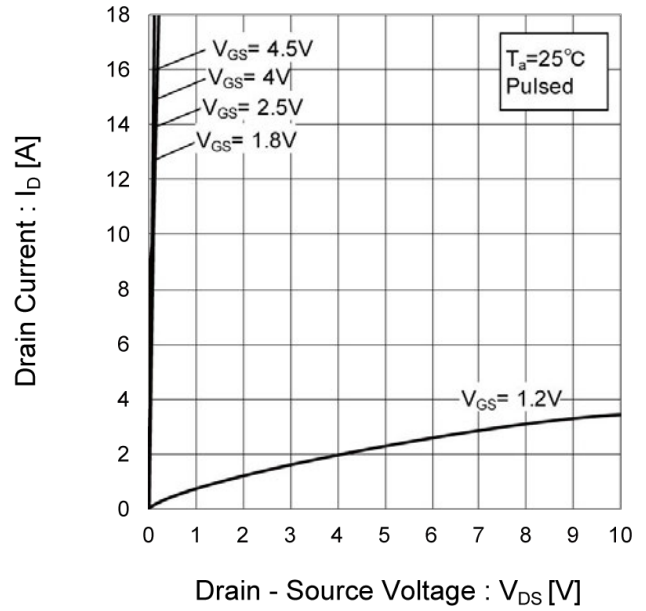
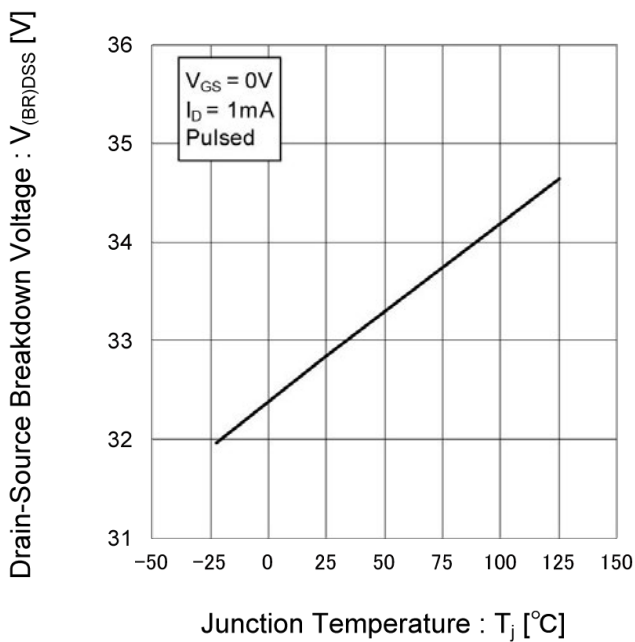


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

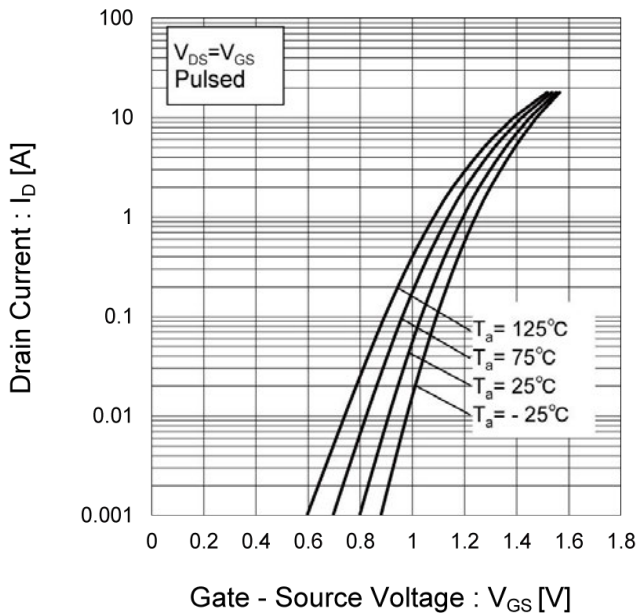


Fig.9 Gate Threshold Voltage vs. Junction Temperature

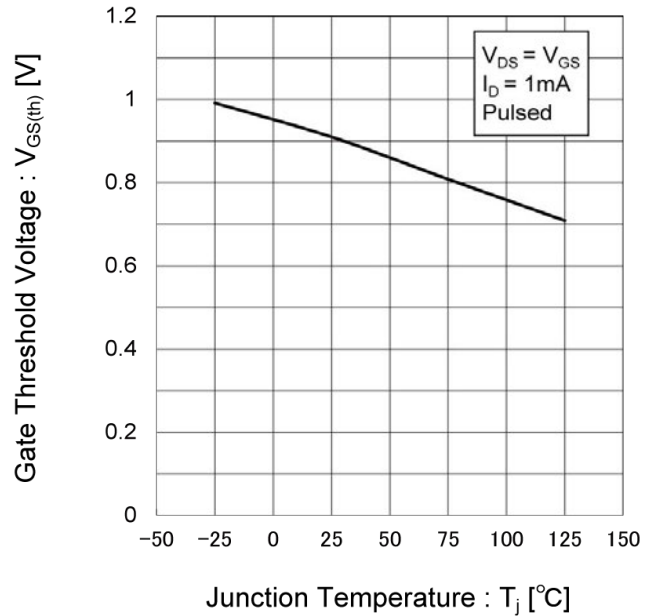
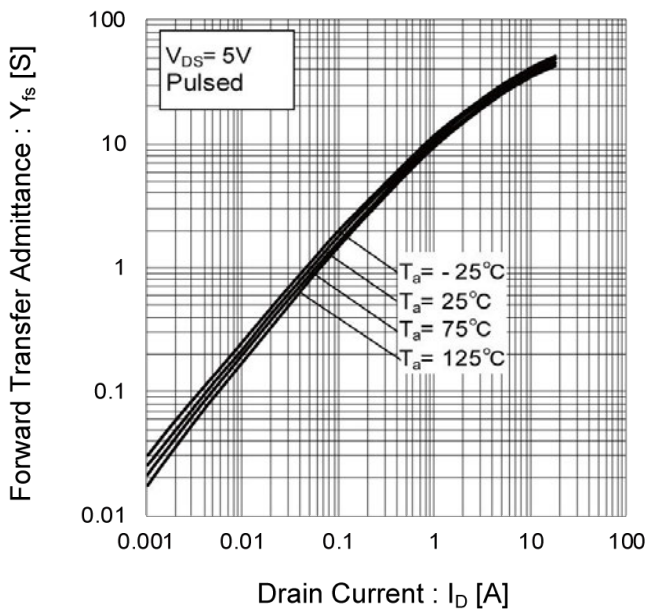


Fig.10 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.11 Drain Current Derating Curve

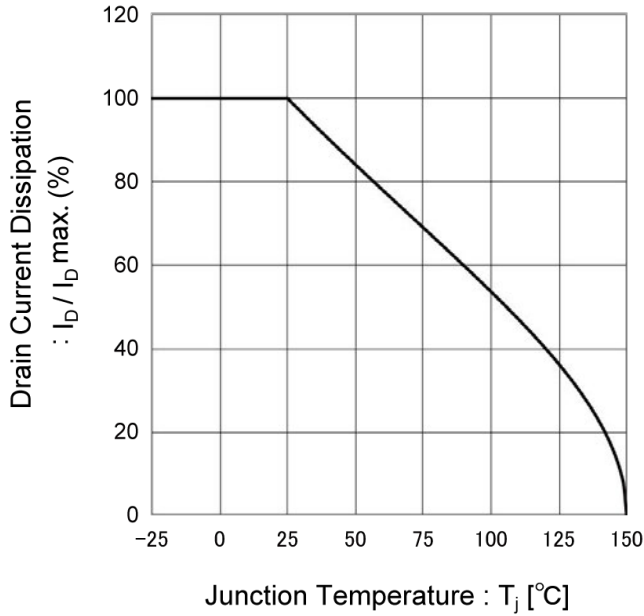


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

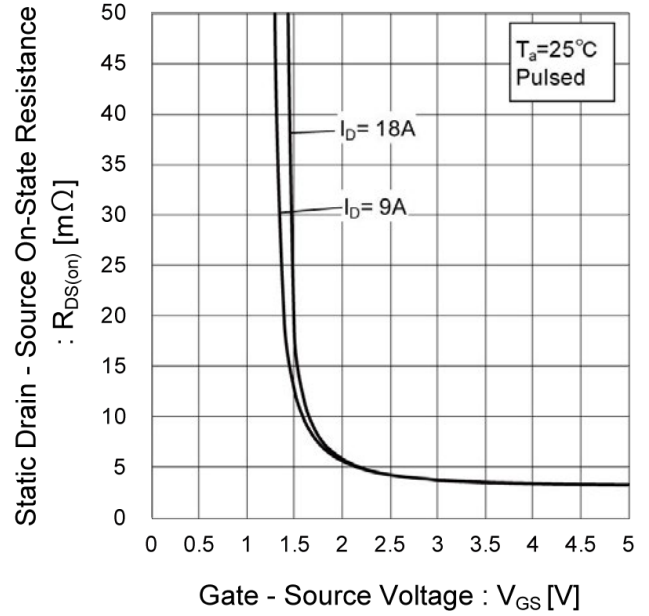
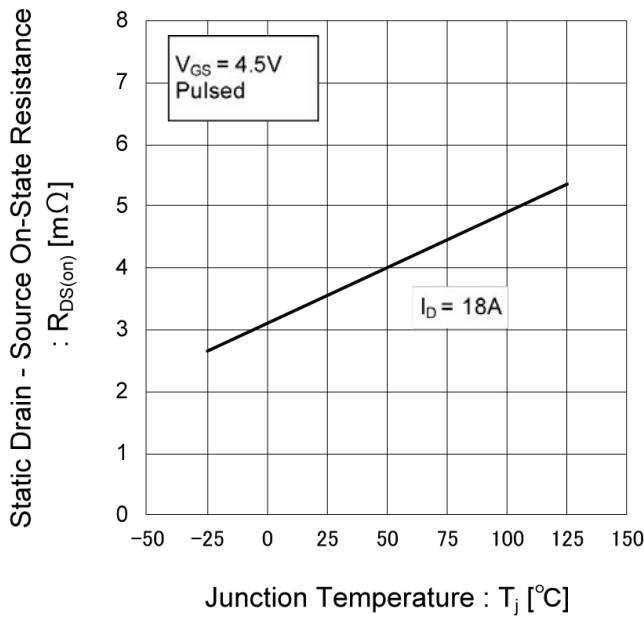


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

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

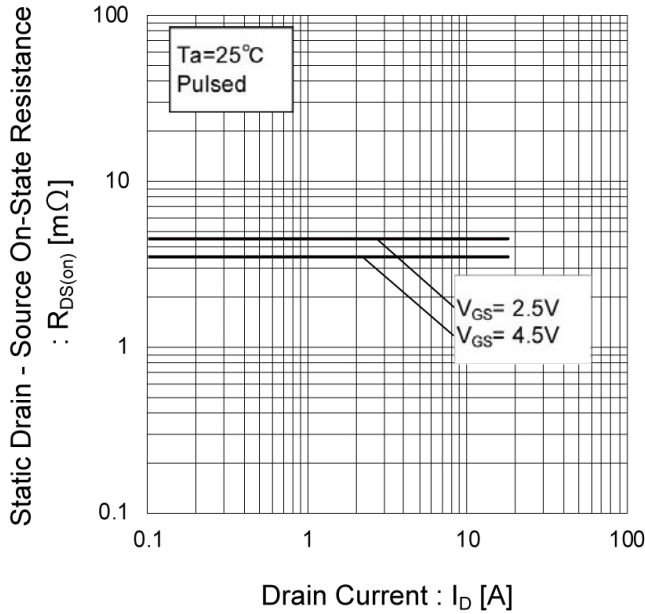


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

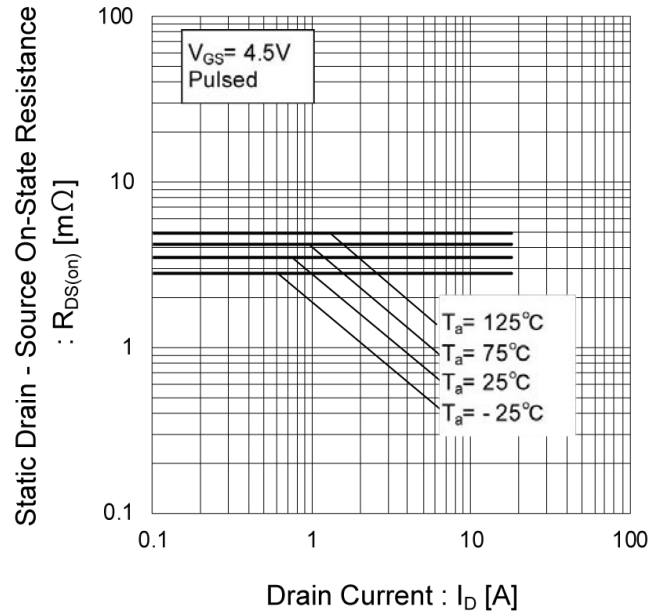
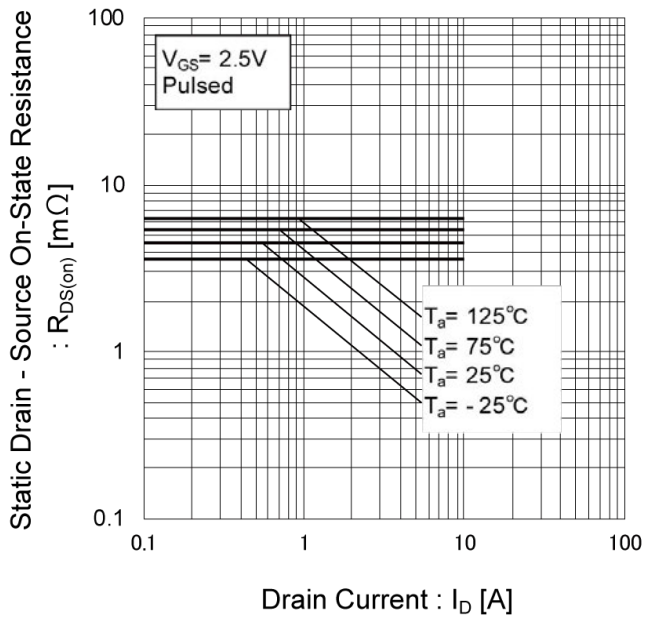


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

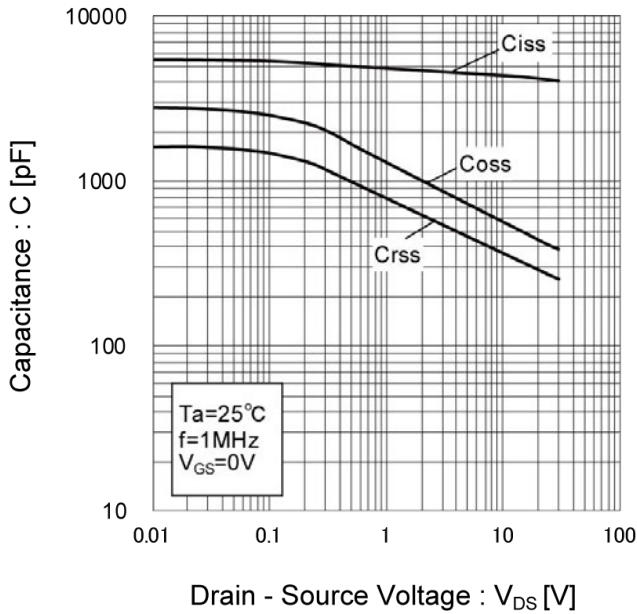


Fig.18 Switching Characteristics

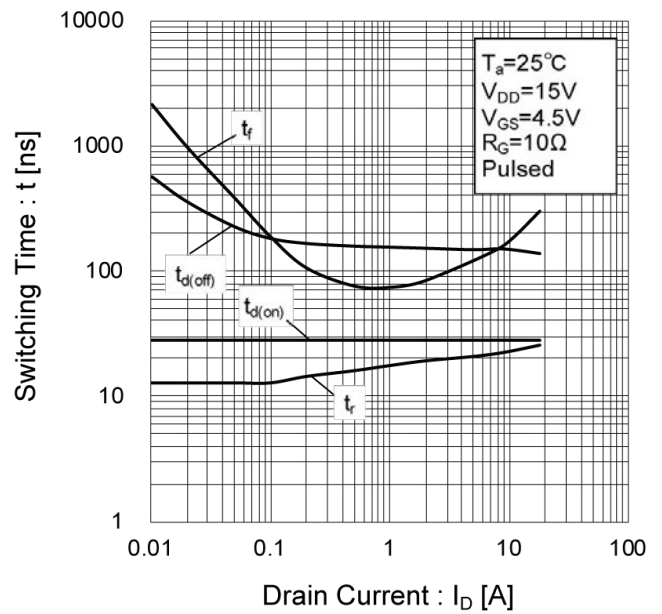


Fig.19 Dynamic Input Characteristics

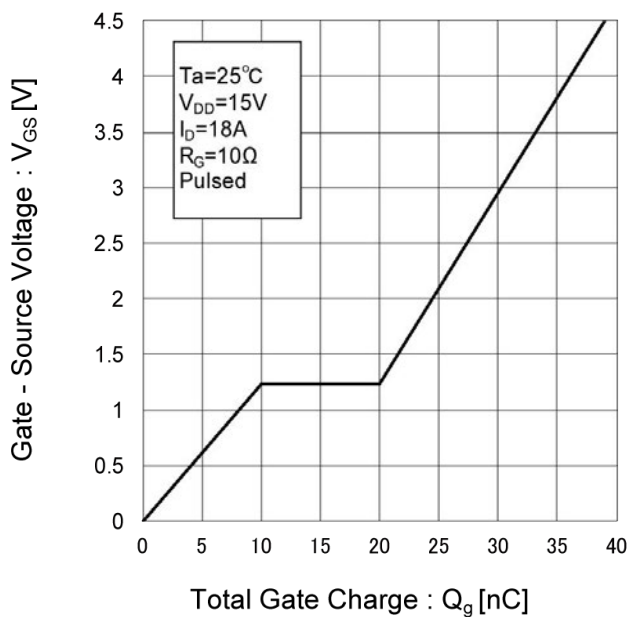
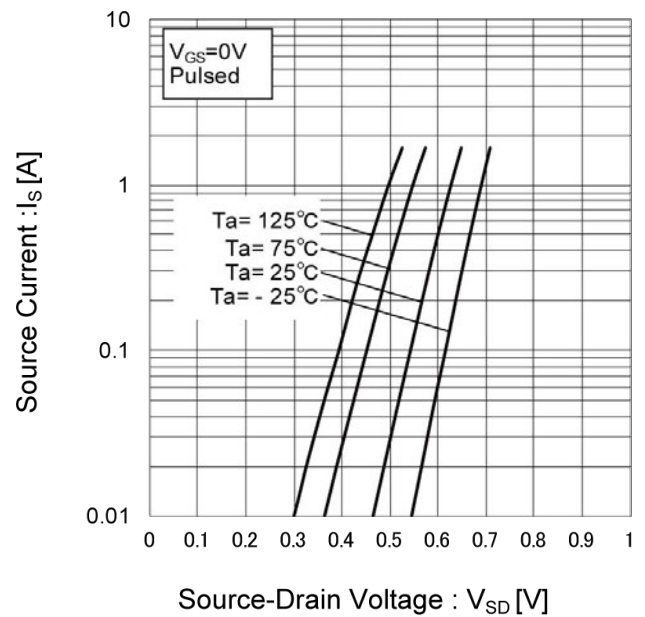


Fig.20 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

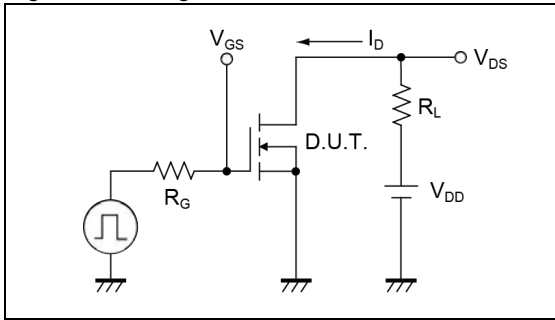


Fig.1-2 Switching Waveforms

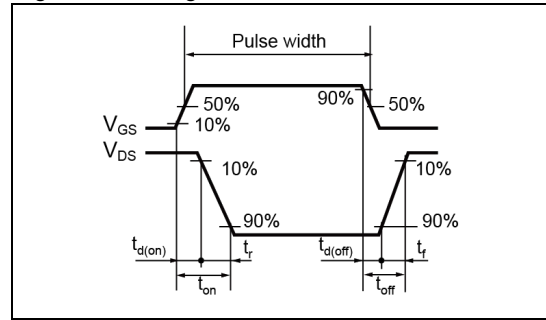


Fig.2-1 Gate Charge Measurement Circuit

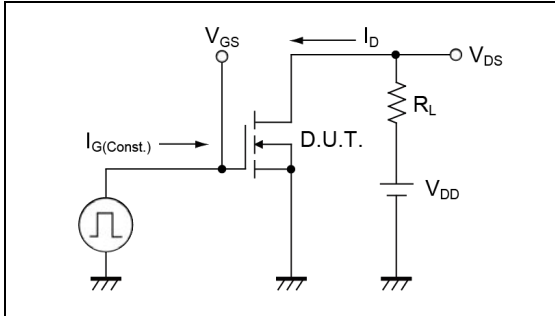


Fig.2-2 Gate Charge Waveform

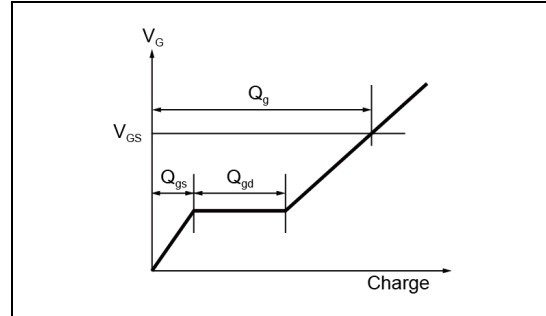


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

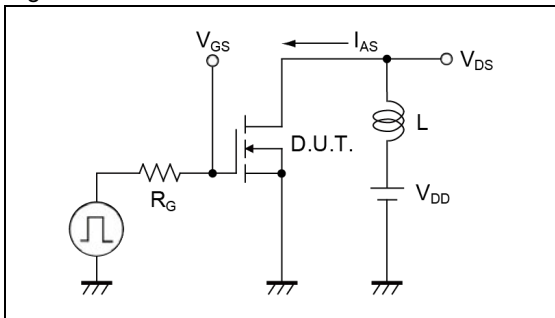
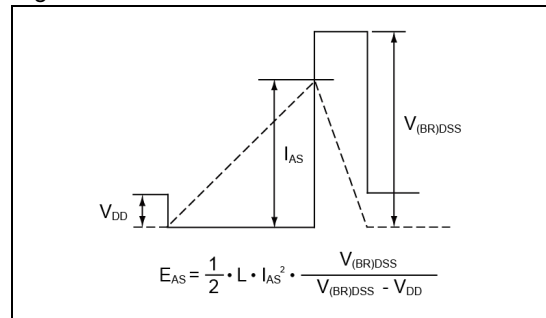


Fig.3-2 AVALANCHE WAVEFORM

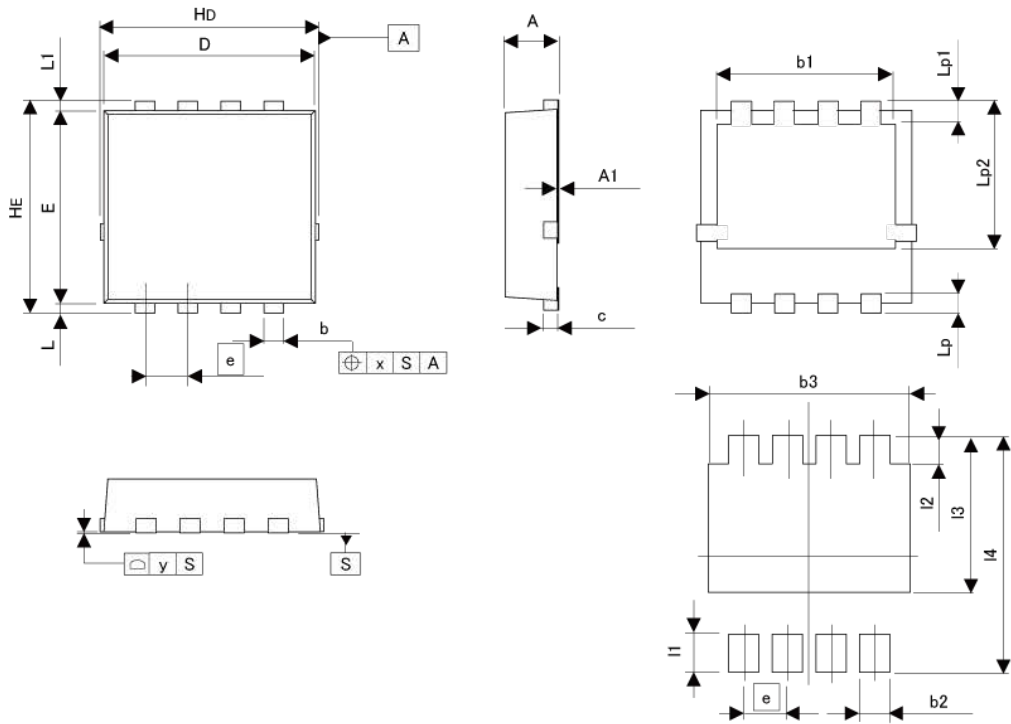


● Notice

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

●Dimensions

HSMT8  
(3.3x3.3)



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

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
I1	-	0.50	-	0.020
I2	-	0.55	-	0.022
I3	-	2.40	-	0.094
I4	-	3.40	-	0.134

Dimension in mm/inches

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