

V_{DSS}	-20V
$R_{DS(on)}(Max.)$	85mΩ
I_D	±3A
P_D	2W

●Features

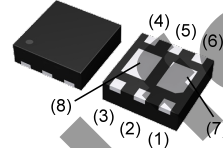
- 1) Low on - resistance.
- 2) Small Surface Mount Package .
- 3) Pb-free lead plating ; RoHS compliant.
- 4) Halogen Free.

●Application

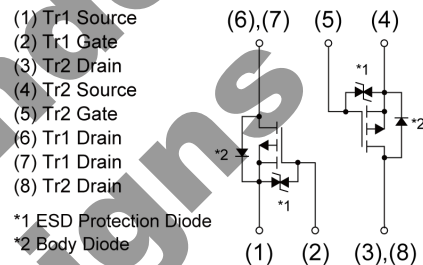
Switching

●Outline

HUML2020L8



●Inner circuit



●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3000
	Taping code	TR
	Marking	J03

●Absolute maximum ratings ($T_a = 25^\circ\text{C}$) <It is the same ratings for the Tr1 and Tr2>

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-20	V
Continuous drain current	I_D^{*1}	±3	A
Pulsed drain current	$I_{D, pulse}^{*2}$	±12	A
Gate - Source voltage	V_{GSS}	0~-8	V
Avalanche energy, single pulse	E_{AS}^{*3}	0.6	mJ
Avalanche current	I_{AS}^{*3}	-3	A
Power dissipation	P_D^{*4}	2	W
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}^{*4}	-	62.5	-	

● Electrical characteristics ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -1mA$	-20	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = -1mA$ referenced to 25°C	-	-9.3	-	mV/°C
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-1	μA
Gate - Source leakage current	I_{GSS}	$V_{DS} = 0V, V_{GS} = -8V$	-	-	-10	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = -10V, I_D = -1mA$	-0.3	-	-1.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	$I_D = -1mA$ referenced to 25°C	-	1.8	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = -4.5V, I_D = -3.0A$	-	60	85	mΩ
		$V_{GS} = -2.5V, I_D = -1.5A$	-	65	95	
		$V_{GS} = -1.8V, I_D = -1.5A$	-	95	155	
		$V_{GS} = -1.5V, I_D = -0.6A$	-	130	260	
Transconductance	g_{fs}^{*5}	$V_{DS} = -10V, I_D = -3A$	4	-	-	S

*1 Limited only by maximum temperature allowed.

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

*3 $L \approx 100\mu\text{H}$, $V_{DD} = -10V$, $R_G = 25\Omega$, STARTING $T_{ch} = 25^\circ\text{C}$ Fig.3-1,3-2

*4 Mounted on a Copper board (40mm×40mm)

*5 Pulsed

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	2000	-	pF
Output capacitance	C_{oss}	$V_{DS} = -10V$	-	75	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	70	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx -10V, V_{GS} = -4.5V$	-	10	-	ns
Rise time	t_r^{*5}	$I_D = -1.5A$	-	30	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 66.5\Omega$	-	120	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	35	-	

● **Gate charge characteristics** ($T_a = 25^\circ\text{C}$) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx -10V, I_D = -3.0A$ $V_{GS} = -4.5V$	-	8.5	-	nC
Gate - Source charge	Q_{gs}^{*5}		-	3.5	-	
Gate - Drain charge	Q_{gd}^{*5}		-	1.5	-	

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

<It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I_S^{*1}	$T_a = 25^\circ\text{C}$	-	-	-3	A
Body diode pulse current	I_{SP}^{*2}		-	-	-12	
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0V, I_S = -3.0A$	-	-	-1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

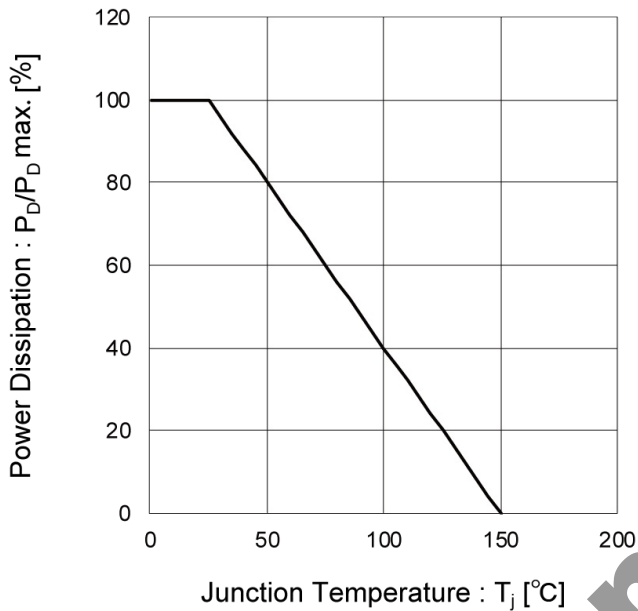


Fig.2 Maximum Safe Operating Area

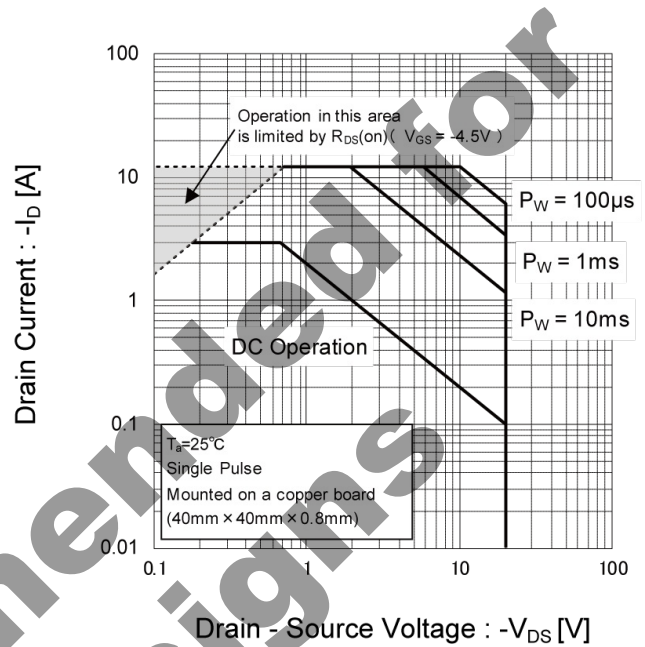


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

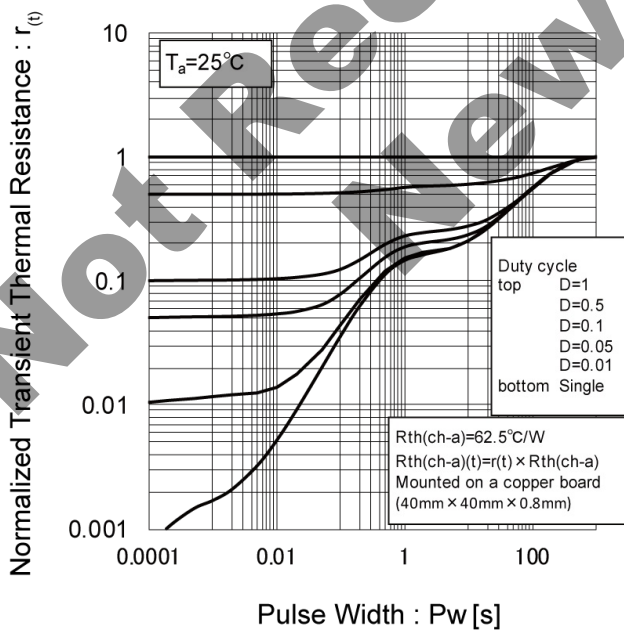
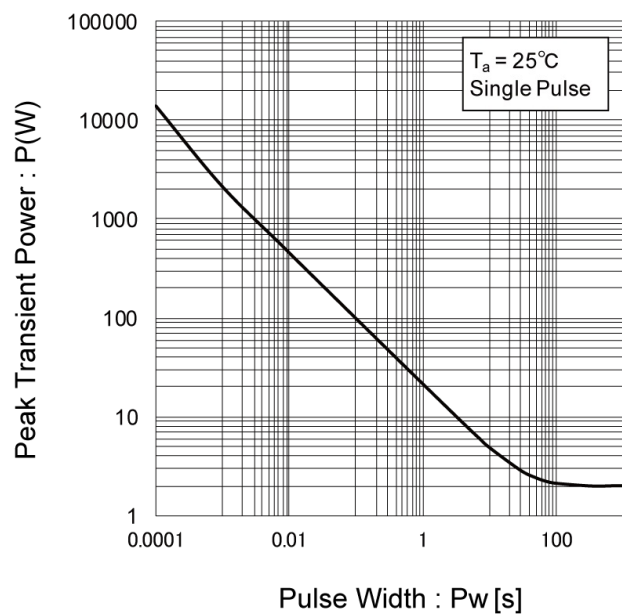


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

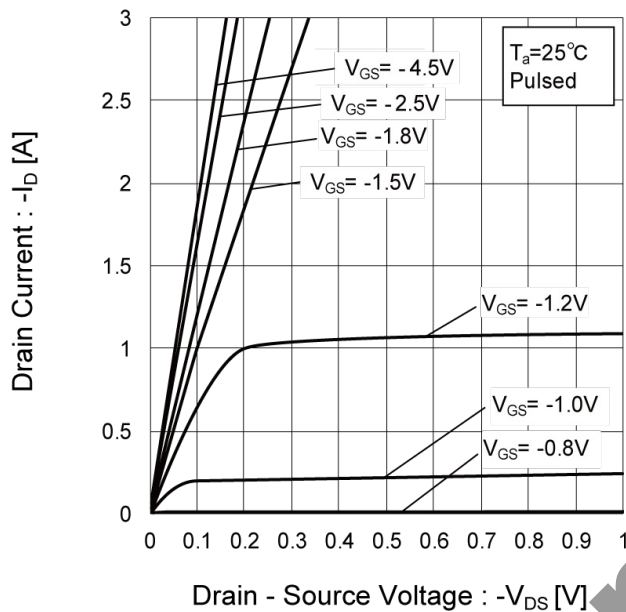


Fig.6 Typical Output Characteristics(II)

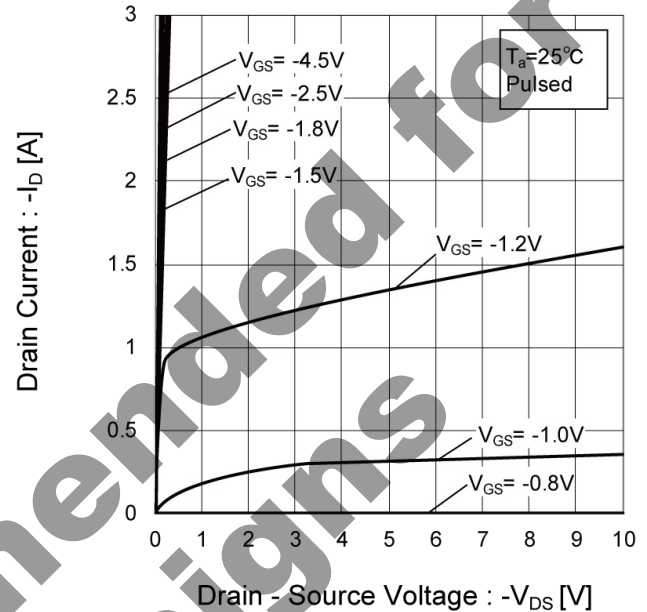
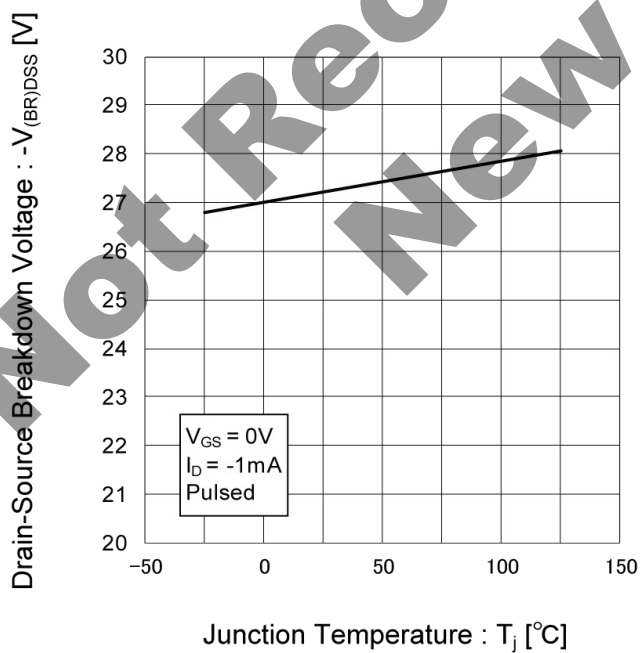


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

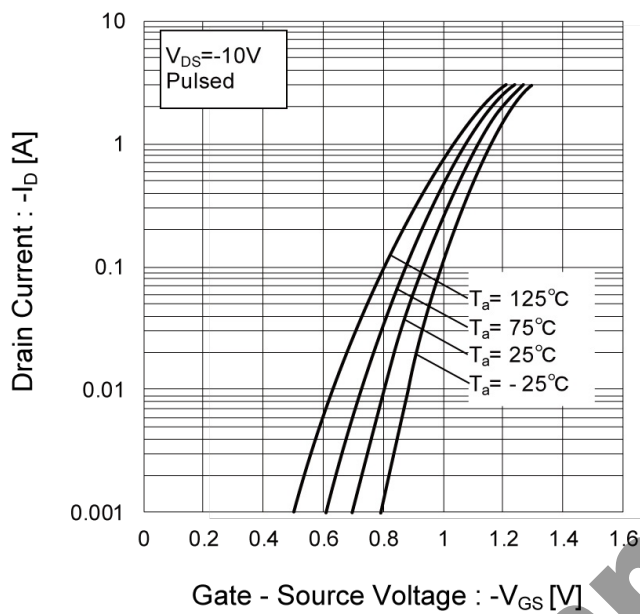


Fig.9 Gate Threshold Voltage vs. Junction Temperature

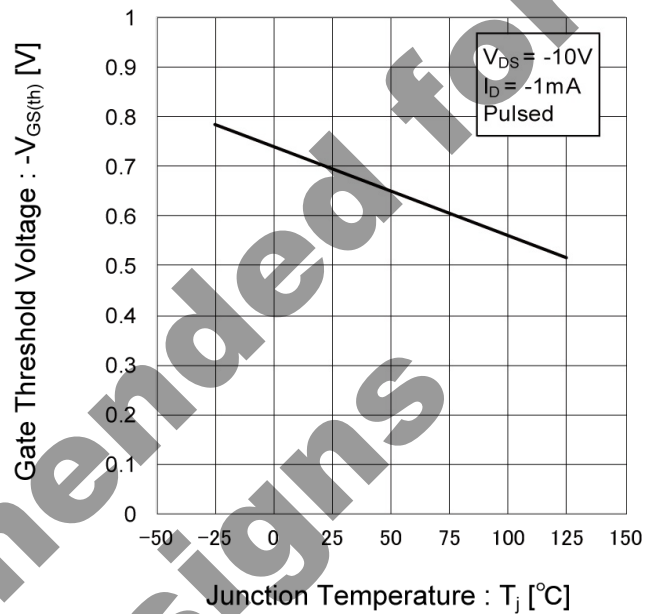
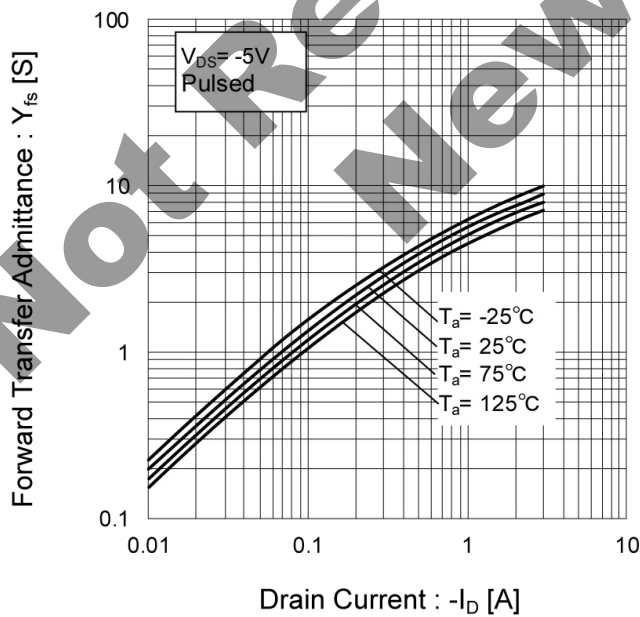


Fig.10 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

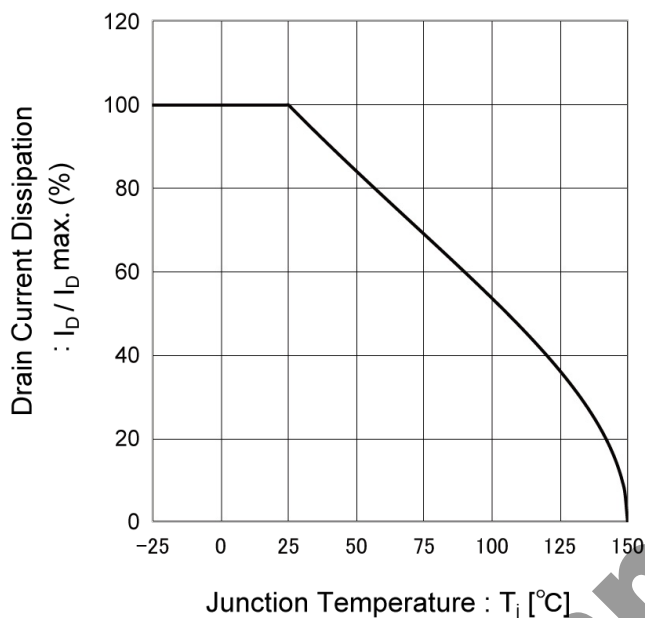


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

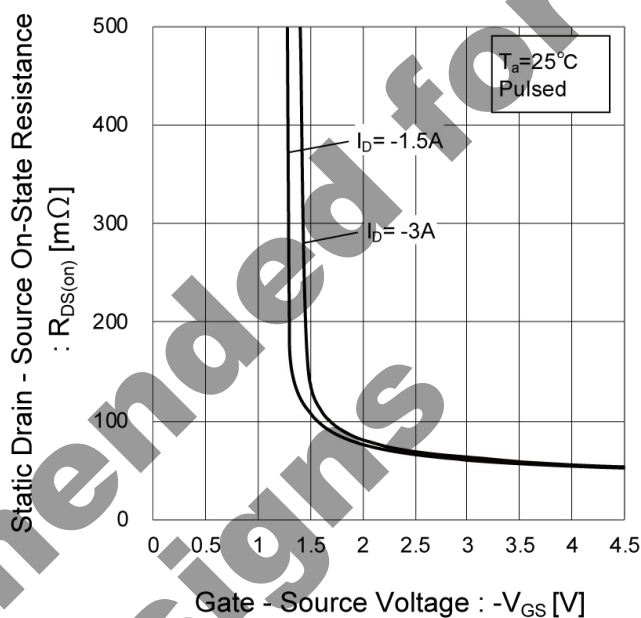


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

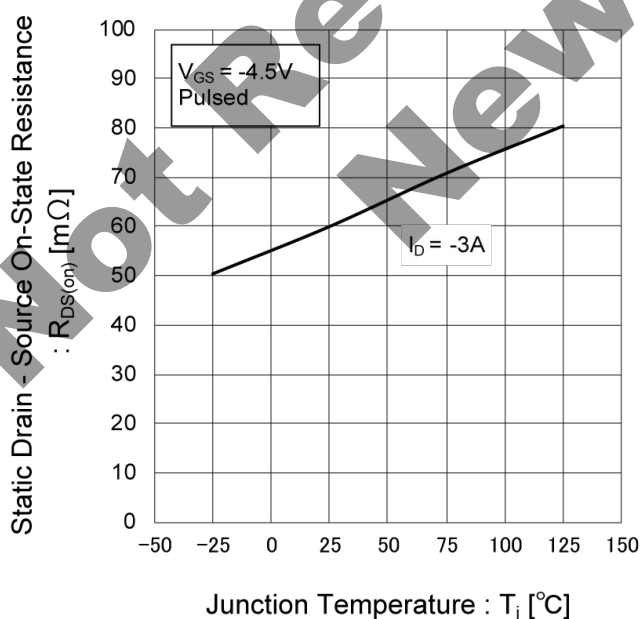
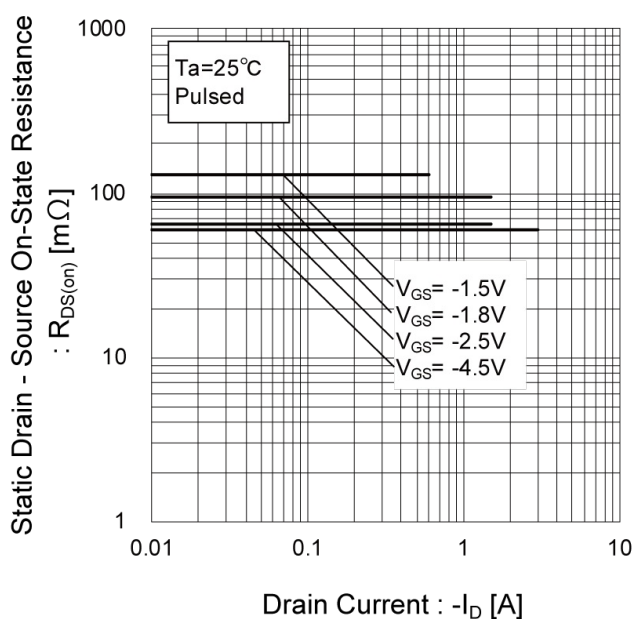


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(I)



●Electrical characteristic curves

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

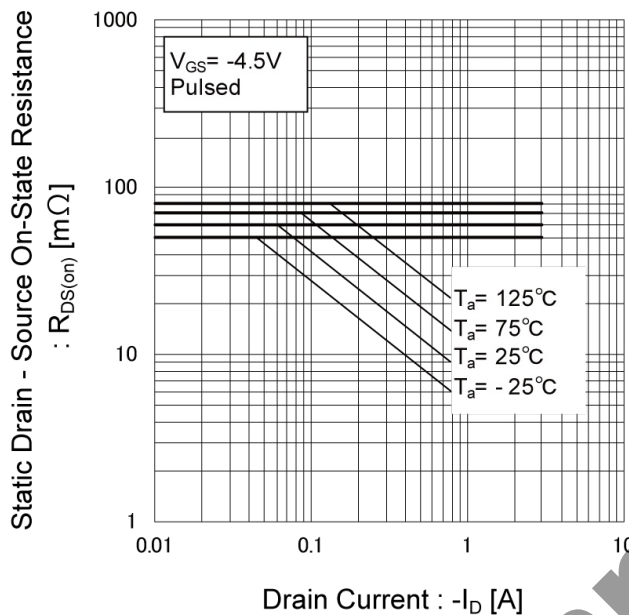


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

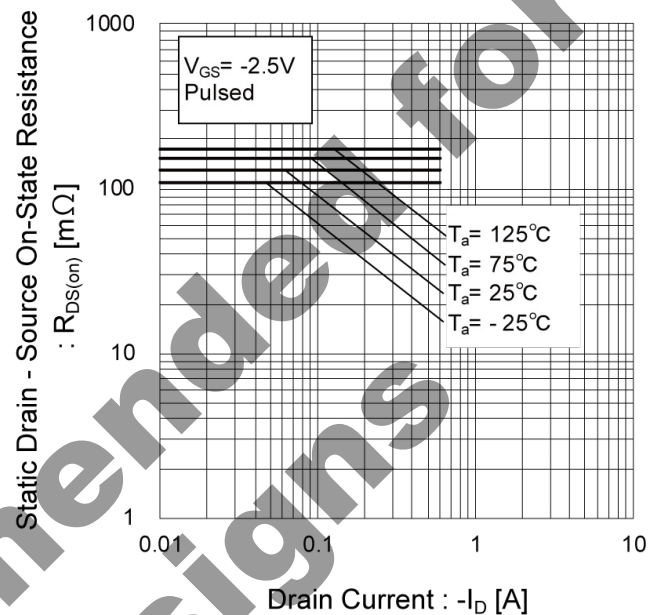


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

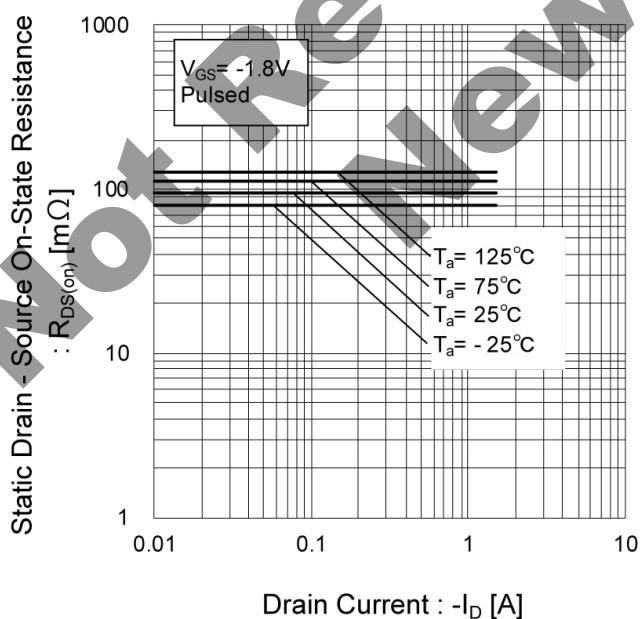
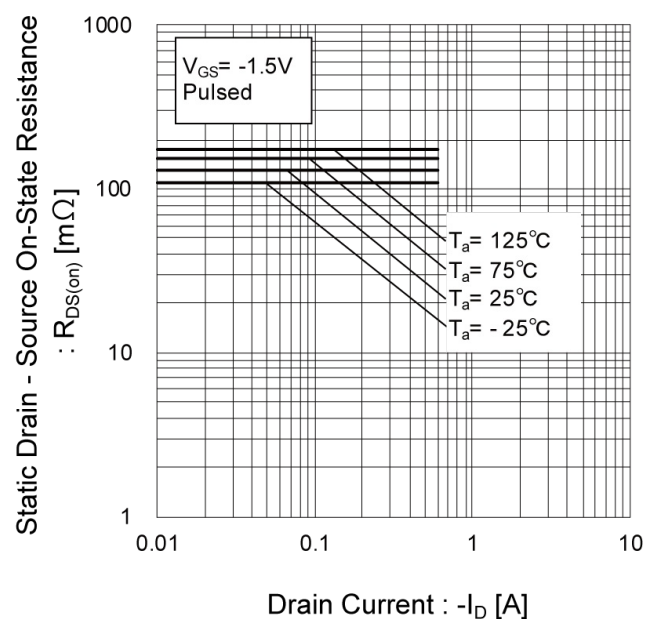


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

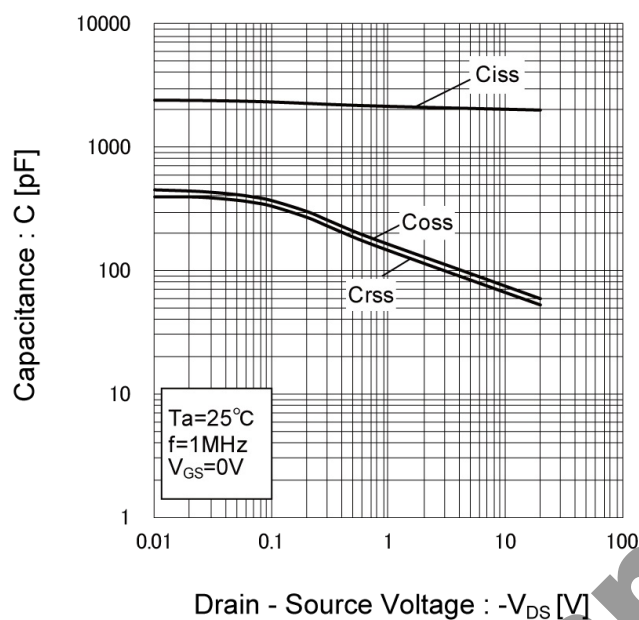


Fig.20 Switching Characteristics

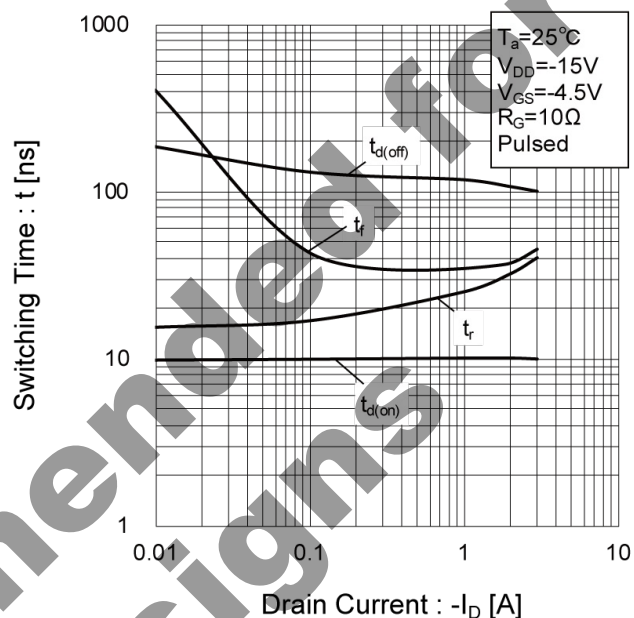


Fig.21 Dynamic Input Characteristics

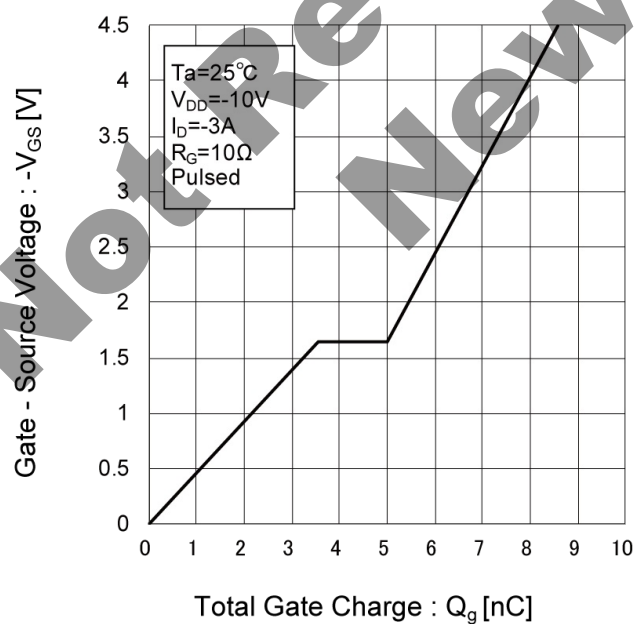
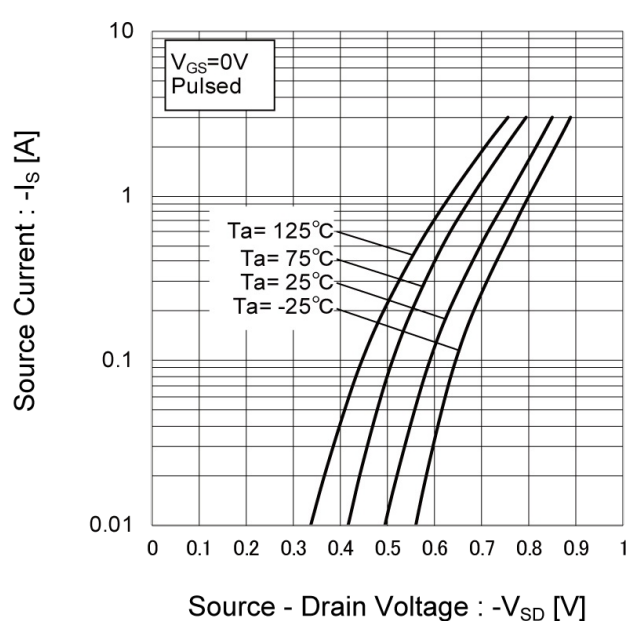


Fig.22 Source Current vs. Source Drain Voltage



● **Measurement circuits** <It is the same for the Tr1 and Tr2>

Fig.1-1 Switching Time Measurement Circuit

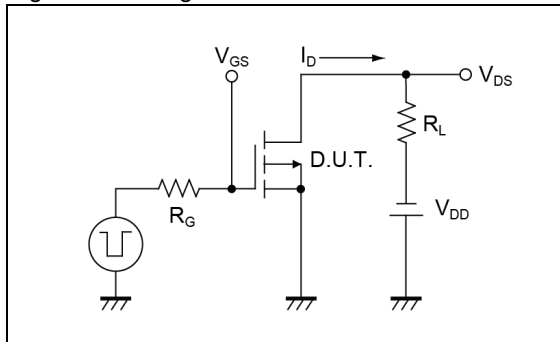


Fig.1-2 Switching Waveforms

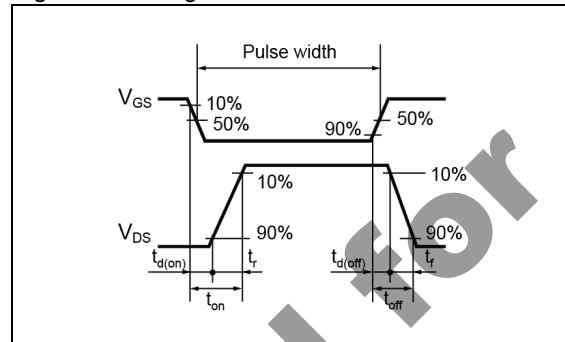


Fig.2-1 Gate Charge Measurement Circuit

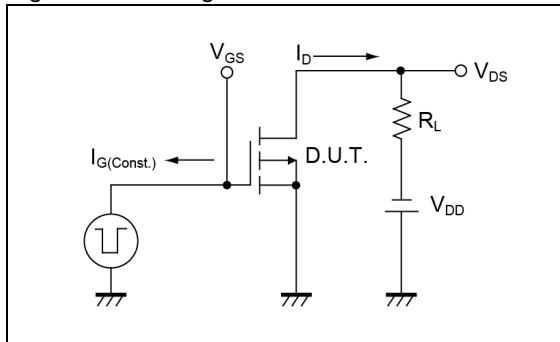


Fig.2-2 Gate Charge Waveform

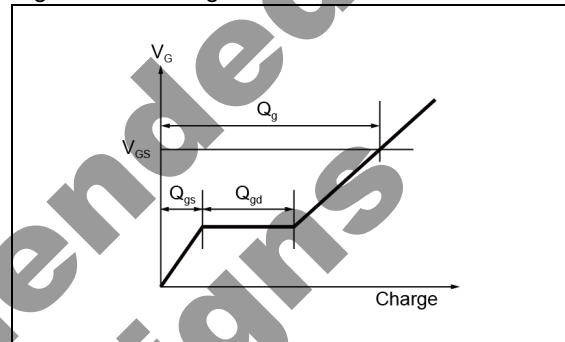


Fig.3-1 Avalanche Measurement Circuit

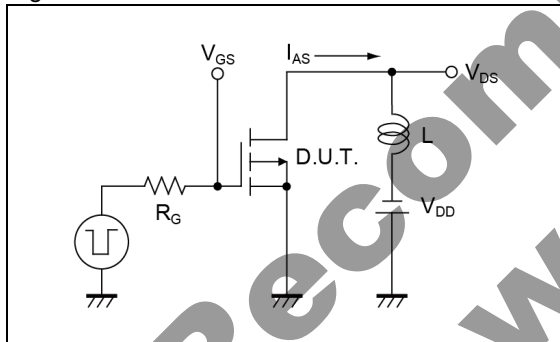
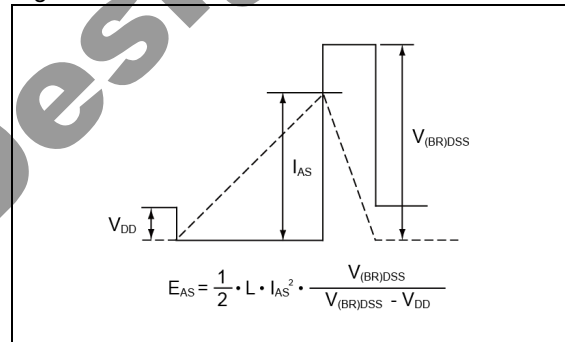


Fig.3-2 Avalanche Waveform



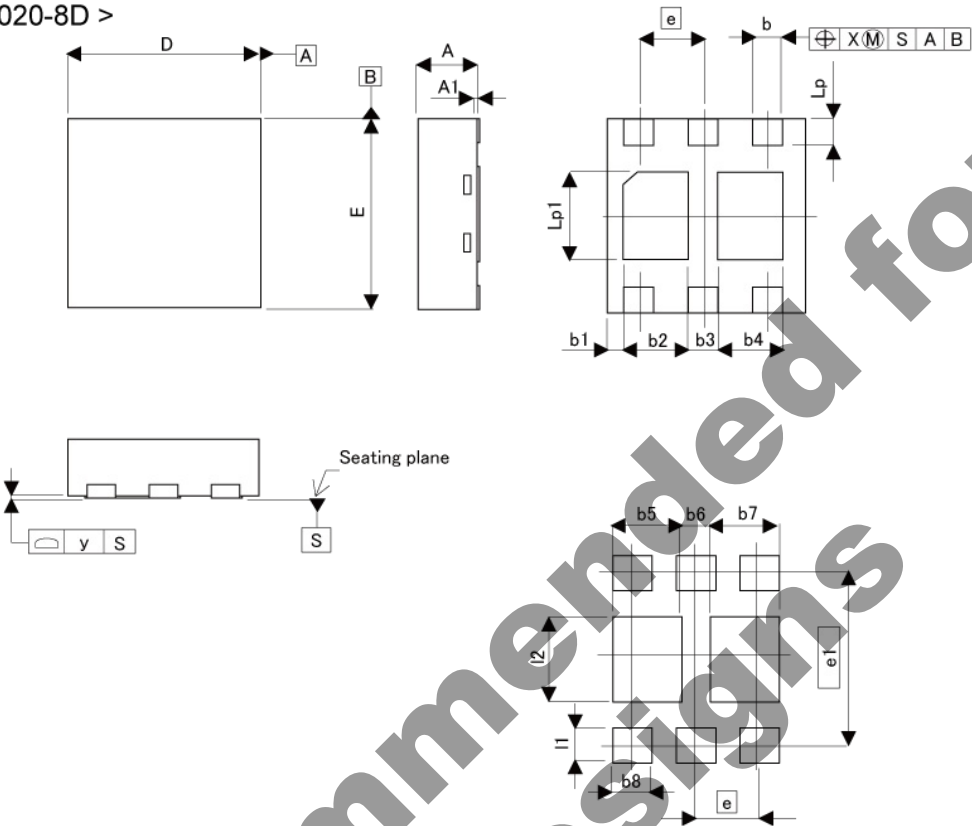
● **Notice**

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

●Dimensions

HUML2020L8 (Dual)

< DFN2020-8D >



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.55	0.65	0.022	0.026
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
b1	0.25		0.010	
b2	0.60	0.70	0.024	0.028
b3	0.3		0.012	
b4	0.60	0.70	0.024	0.028
D	1.90	2.10	0.075	0.083
E	1.90	2.10	0.075	0.083
e	0.65		0.026	
Lp	0.225	0.325	0.009	0.013
Lp1	0.80	1.00	0.031	0.039
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b5	-	0.70	-	0.028
b6	0.20	0.30	0.008	0.012
b7	-	0.70	-	0.028
b8	-	0.45	-	0.018
e1	1.725		0.068	
l1	-	0.425	-	0.017
l2	-	1.00	-	0.039

Dimension in mm/inches

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