

|                    |                |
|--------------------|----------------|
| $V_{DSS}$          | -30V           |
| $R_{DS(on)}(Max.)$ | 21.7m $\Omega$ |
| $I_D$              | $\pm 7.5A$     |
| $P_D$              | 2W             |

### ●Features

- 1) Low on - resistance.
- 2) High Power small mold Package (HUML2020L8).
- 3) Pb-free lead plating ; RoHS compliant.
- 4) Halogen Free.

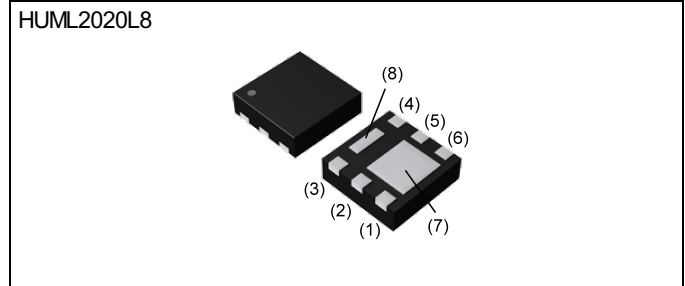
### ●Application

Switching  
Load switch

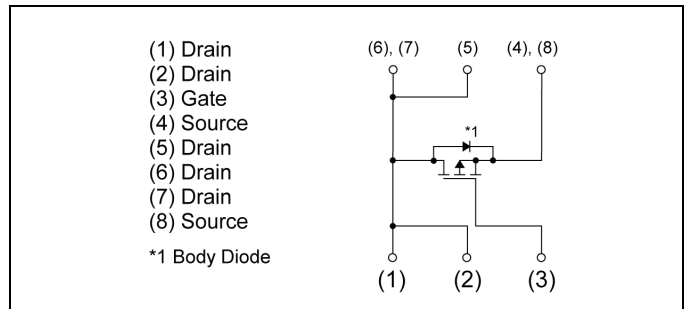
### ●Absolute maximum ratings ( $T_a = 25^\circ C$ )

| Parameter                      | Symbol             | Value       | Unit       |
|--------------------------------|--------------------|-------------|------------|
| Drain - Source voltage         | $V_{DSS}$          | -30         | V          |
| Continuous drain current       | $I_D$              | $\pm 7.5$   | A          |
| Pulsed drain current           | $I_{D,pulse}^{*1}$ | $\pm 30$    | A          |
| Gate - Source voltage          | $V_{GSS}$          | $\pm 20$    | V          |
| Avalanche energy, single pulse | $E_{AS}^{*2}$      | 10.6        | mJ         |
| Avalanche current              | $I_{AS}^{*2}$      | -2.7        | A          |
| Power dissipation              | $P_D^{*3}$         | 2           | W          |
| Junction temperature           | $T_j$              | 150         | $^\circ C$ |
| Range of storage temperature   | $T_{stg}$          | -55 to +150 | $^\circ C$ |

### ●Outline



### ●Inner circuit



### ●Packaging specifications

| Type | Packing                   | Embossed Tape |
|------|---------------------------|---------------|
|      | Reel size (mm)            | 180           |
|      | Tape width (mm)           | 8             |
|      | Basic ordering unit (pcs) | 3000          |
|      | Taping code               | TCR           |
|      | Marking                   | JT            |

### ● Thermal resistance

| Parameter                              | Symbol          | Values |      |      | Unit |
|--|-----------------|--------|------|------|------|
|  |                 | Min.   | Typ. | Max. |      |
| Thermal resistance, junction - ambient | $R_{thJA}^{*3}$ | -      | -    | 62.5 | °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      | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D = -1mA$<br>referenced to $25^\circ\text{C}$ | -      | -22  | -    | mV/°C |
| Zero gate voltage drain current                | $I_{DSS}$                               | $V_{DS} = -30V, V_{GS} = 0V$                     | -      | -    | -1   | μA    |
| Gate - Source leakage current                  | $I_{GSS}$                               | $V_{GS} = \pm 20V, V_{DS} = 0V$                  | -      | -    | ±100 | nA    |
| Gate threshold voltage                         | $V_{GS(th)}$                            | $V_{DS} = V_{GS}, I_D = -1mA$                    | -1.0   | -    | -2.5 | V     |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{GS(th)}}{\Delta T_j}$  | $I_D = -1mA$<br>referenced to $25^\circ\text{C}$ | -      | 2.9  | -    | mV/°C |
| Static drain - source on - state resistance    | $R_{DS(on)}^{*4}$                       | $V_{GS} = -10V, I_D = -7.5A$                     | -      | 16.7 | 21.7 | mΩ    |
|  |   | $V_{GS} = -4.5V, I_D = -7.5A$                    | -      | 24.4 | 31.7 |       |
| Forward Transfer Admittance                    | $ Y_{fs} ^{*4}$                         | $V_{DS} = -5.0V, I_D = -7.5A$                    | 6.5    | -    | -    | S     |

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

\*2 Tr1:  $L \approx 2\text{mH}$ ,  $V_{DD} = -15V$ ,  $R_G = 25\Omega$ , STARTING  $T_{ch} = 25^\circ\text{C}$  Fig.3-1,3-2

\*3 MOUNTED ON 40mm×40mm Cu BOARD

\*4 Pulsed

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

| Parameter                    | Symbol            | Conditions                           | Values |      |      | Unit |
|------------------------------|-------------------|--------------------------------------|--------|------|------|------|
|                              |                   |                                      | Min.   | Typ. | Max. |      |
| Input capacitance            | $C_{iss}$         | $V_{GS} = 0V$                        | -      | 1000 | -    | pF   |
| Output capacitance           | $C_{oss}$         | $V_{DS} = -15V$                      | -      | 180  | -    |      |
| Reverse transfer capacitance | $C_{rss}$         | $f = 1\text{MHz}$                    | -      | 140  | -    |      |
| Turn - on delay time         | $t_{d(on)}^{*4}$  | $V_{DD} \approx -15V, V_{GS} = -10V$ | -      | 10   | -    | ns   |
| Rise time                    | $t_r^{*4}$        | $I_D = -3.75A$                       | -      | 18   | -    |      |
| Turn - off delay time        | $t_{d(off)}^{*4}$ | $R_L \approx 4\Omega$                | -      | 60   | -    |      |
| Fall time                    | $t_f^{*4}$        | $R_G = 10\Omega$                     | -      | 35   | -    |      |

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

| Parameter            | Symbol        | Conditions                             | Values           |      |      | Unit |    |
|----------------------|---------------|--|------------------|------|------|------|----|
|                      |               |  | Min.             | Typ. | Max. |      |    |
| Total gate charge    | $Q_g^{*4}$    | $V_{DD} \approx -15V$<br>$I_D = -7.5A$ | $V_{GS} = -10V$  | -    | 22   | -    | nC |
| Gate - Source charge | $Q_{gs}^{*4}$ |  | $V_{GS} = -4.5V$ | -    | 11   | -    |    |
| Gate - Drain charge  | $Q_{gd}^{*4}$ |  |                  | -    | 3.4  | -    |    |
|                      |               |  |                  | -    | 4.2  | -    |    |

**● 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 | $I_S$         | $T_a = 25^\circ\text{C}$    | -      | -    | -1.67 | A    |
| Body diode pulse current              | $I_{SP}^{*1}$ |                             | -      | -    | -30   | A    |
| Forward voltage                       | $V_{SD}^{*4}$ | $V_{GS} = 0V, I_S = -1.67A$ | -      | -    | -1.2  | V    |

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

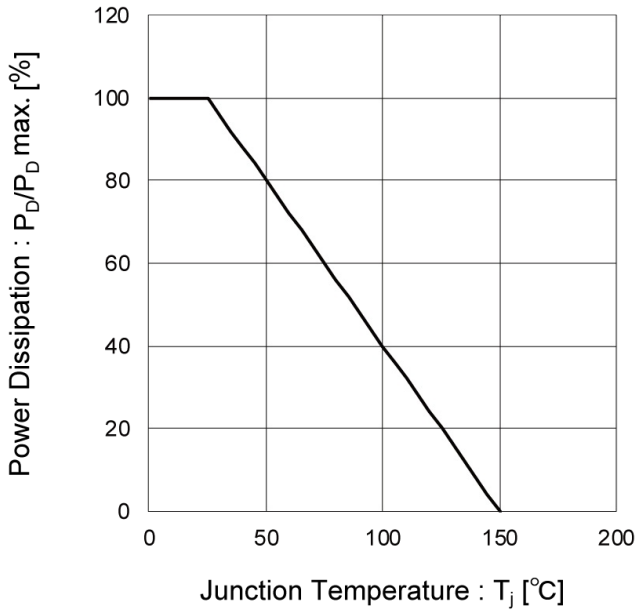


Fig.2 Maximum Safe Operating Area

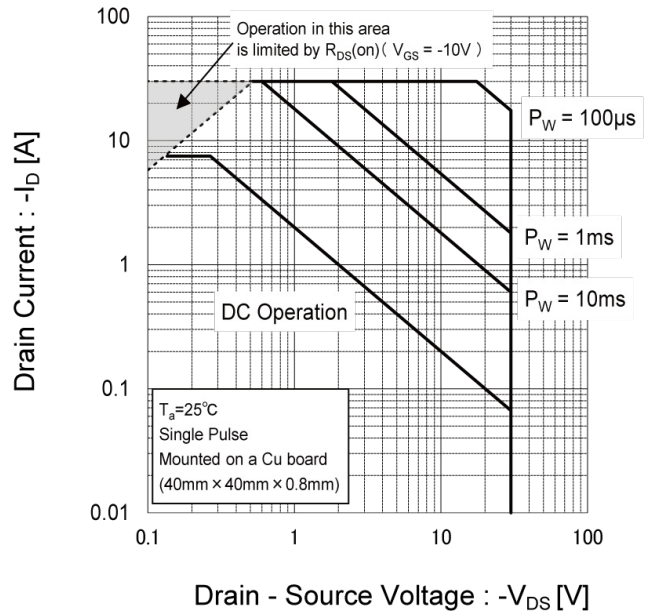


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

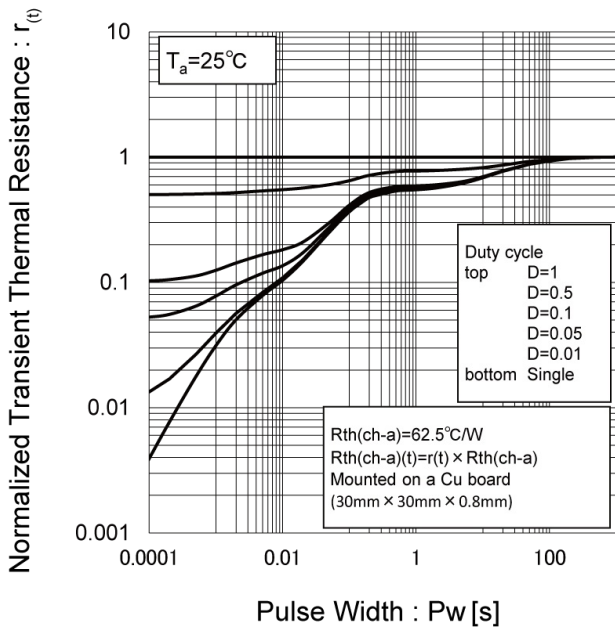
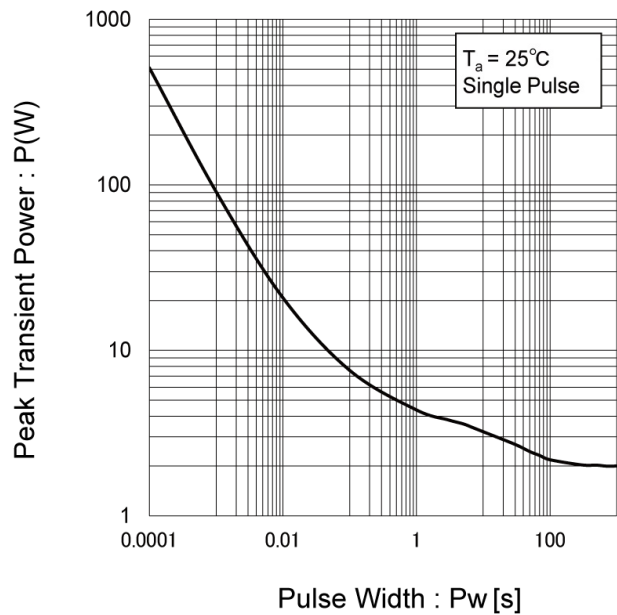


Fig.4 Single Pulse Maximum Power dissipation



● Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

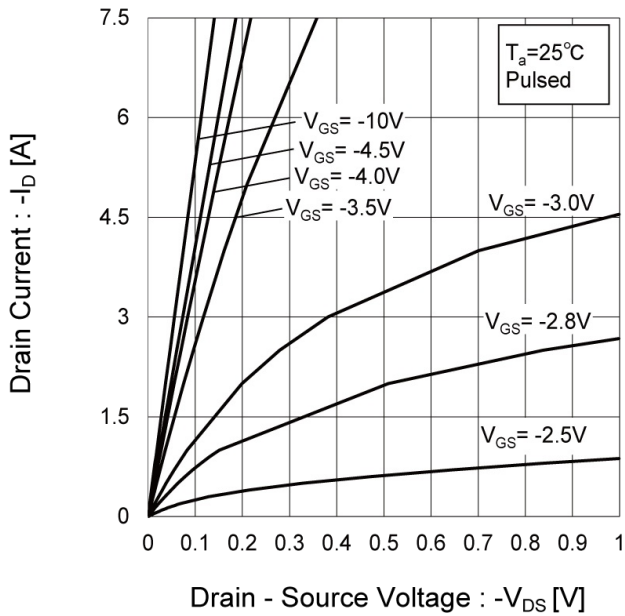


Fig.6 Typical Output Characteristics(II)

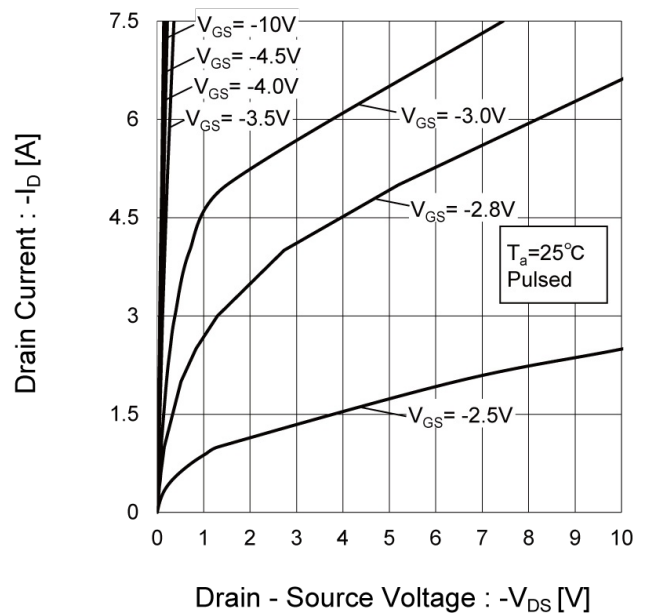
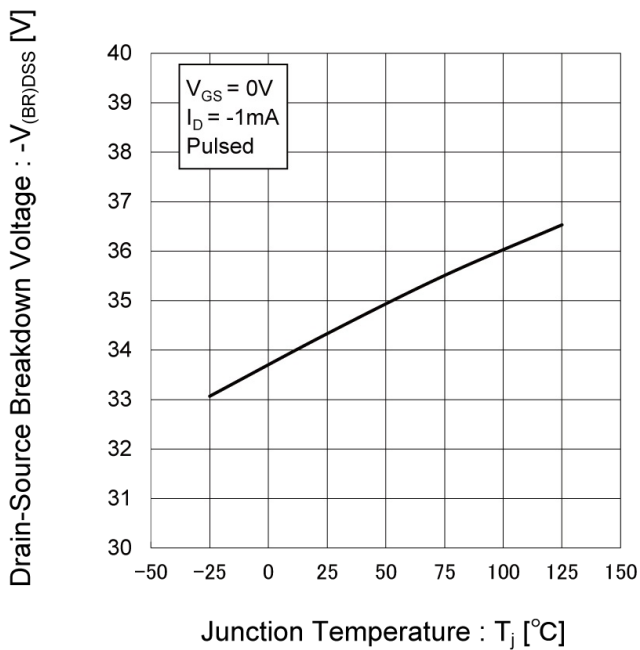


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

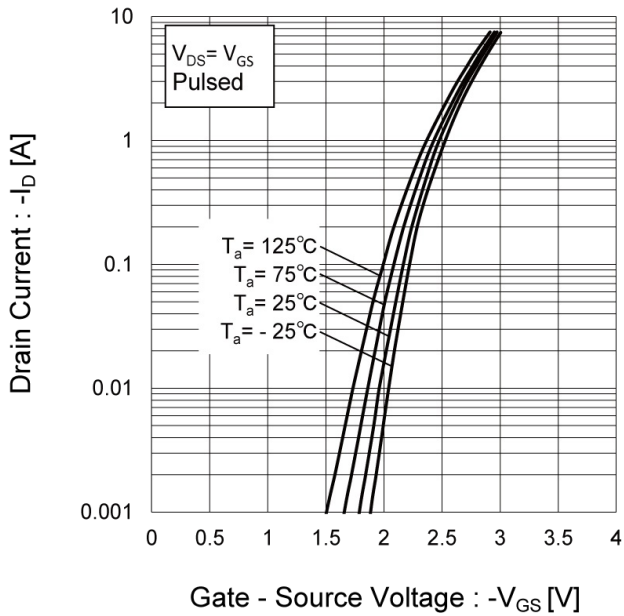


Fig.9 Gate Threshold Voltage vs. Junction Temperature

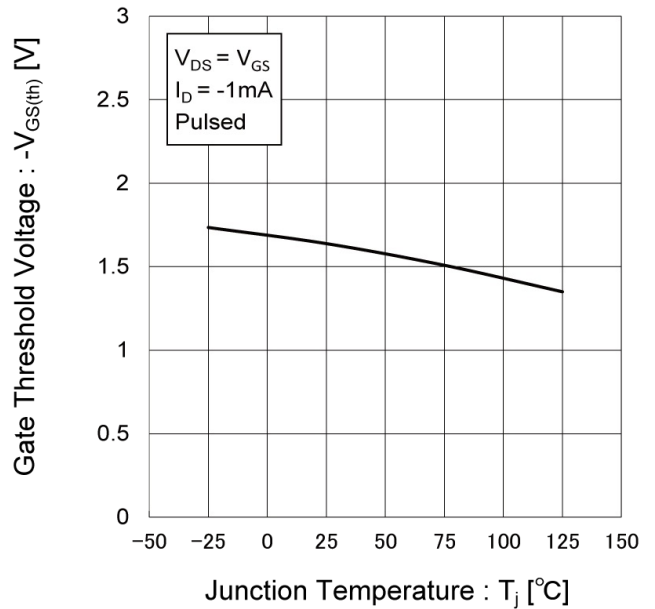
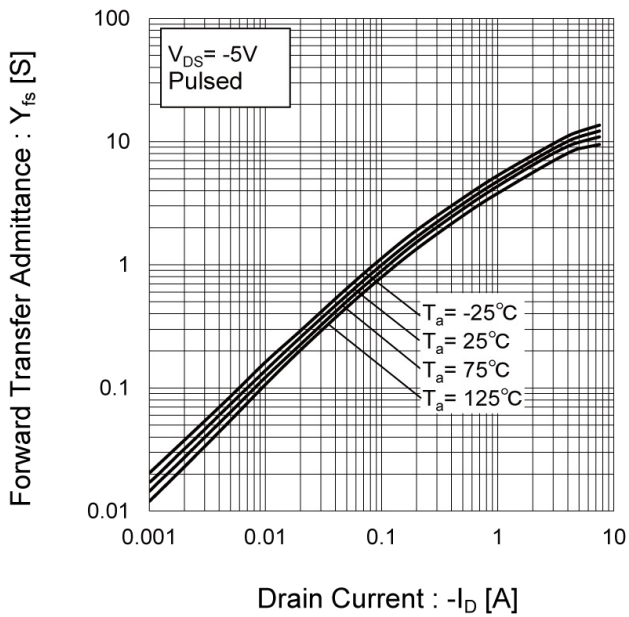


Fig.10 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.11 Drain Current Derating Curve



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

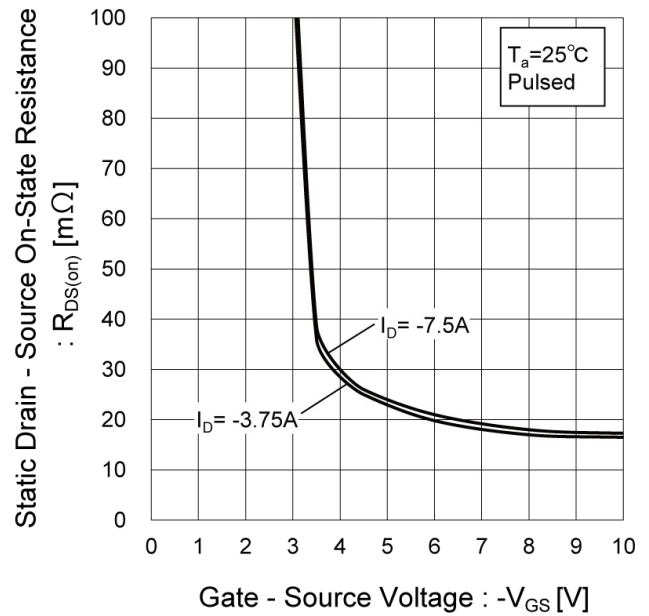
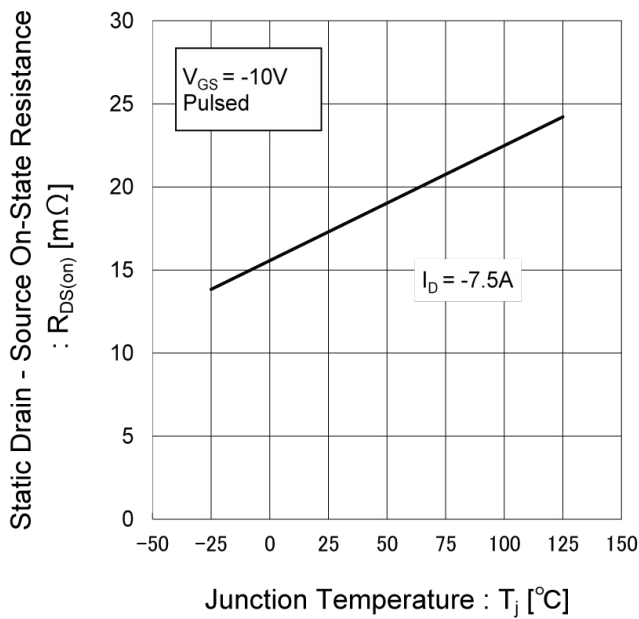


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

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

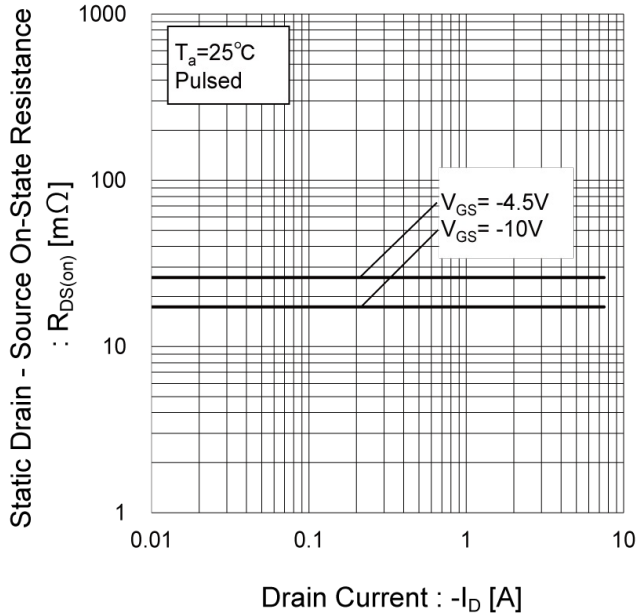


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

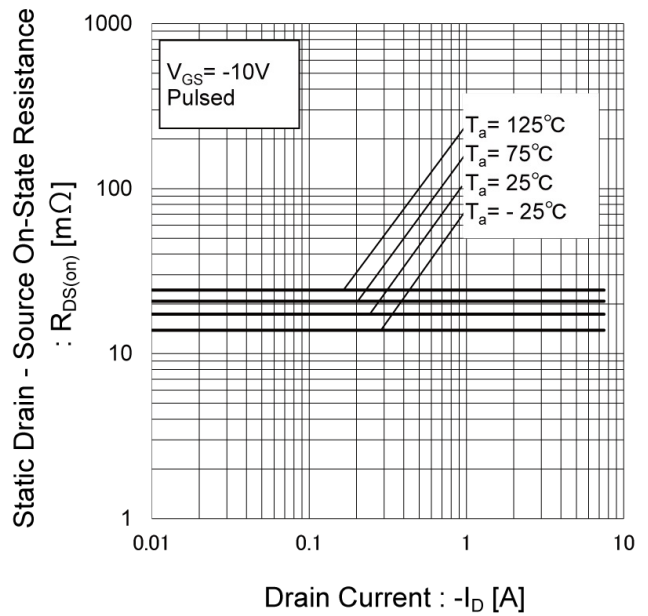
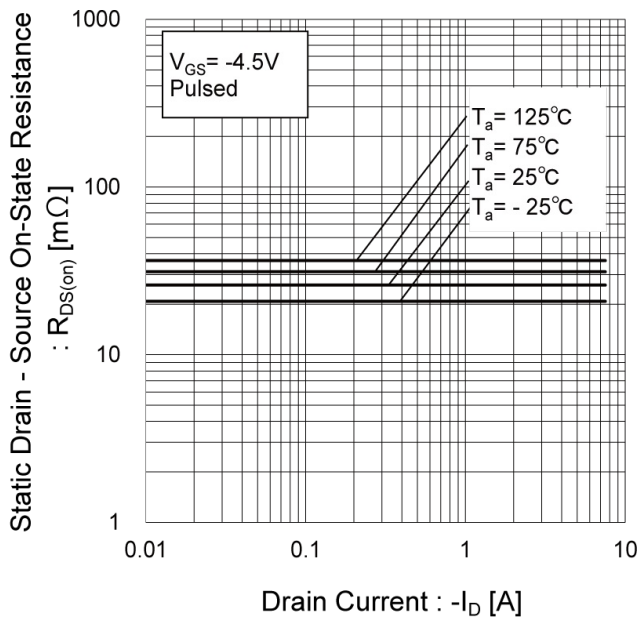


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)





● Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

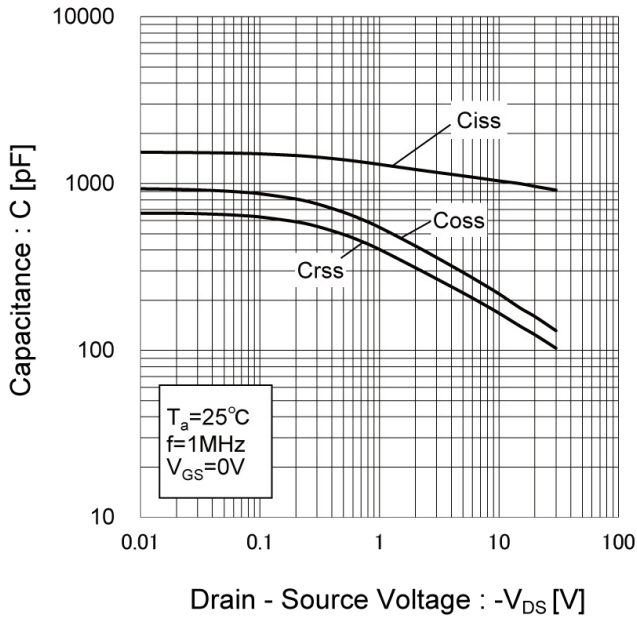


Fig.18 Switching Characteristics

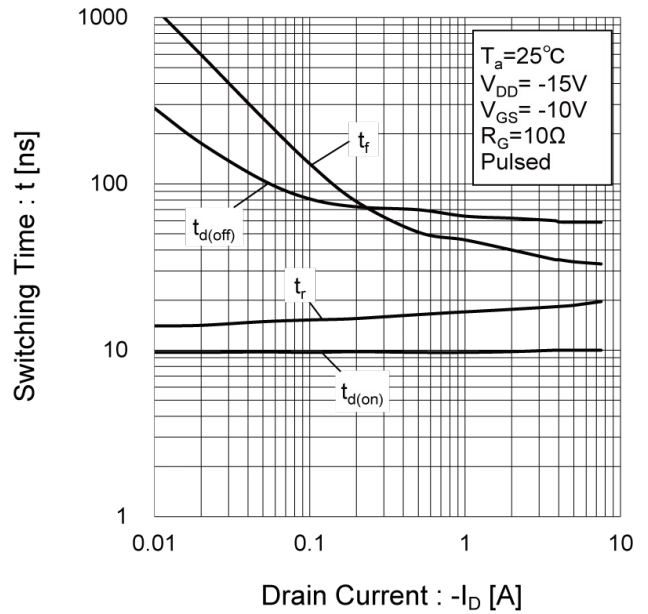


Fig.19 Dynamic Input Characteristics

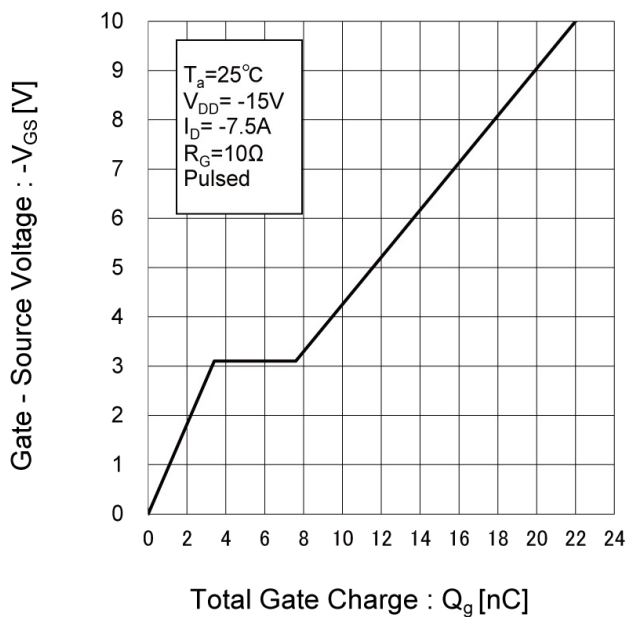
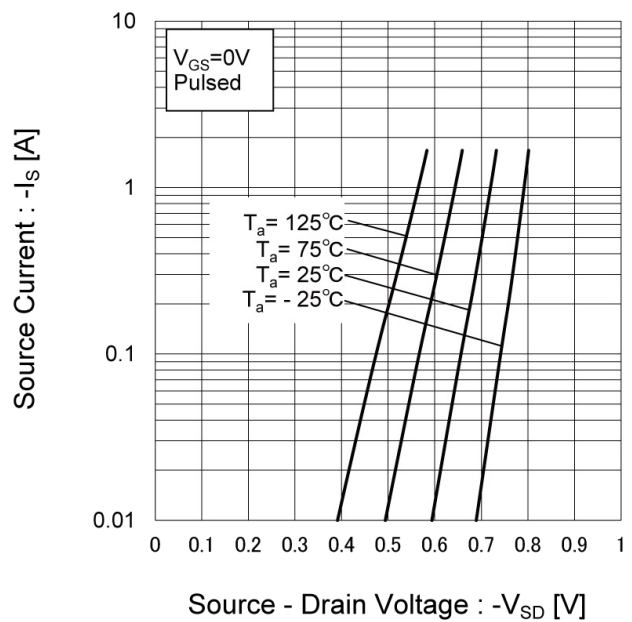


Fig.20 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

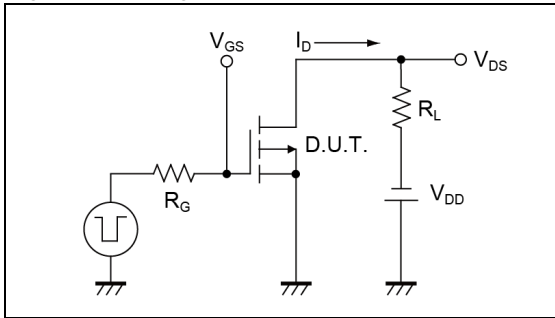


Fig.1-2 Switching Waveforms

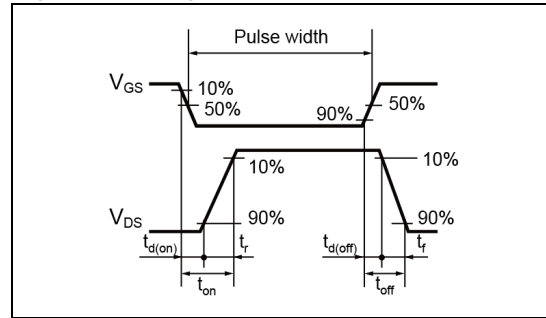


Fig.2-1 Gate Charge Measurement Circuit

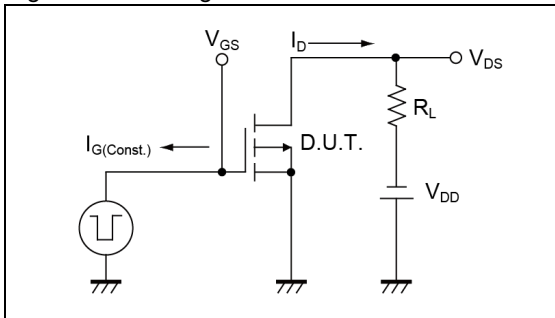


Fig.2-2 Gate Charge Waveform

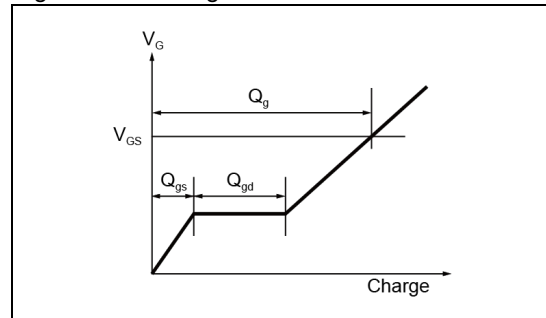


Fig.3-1 Avalanche Measurement Circuit

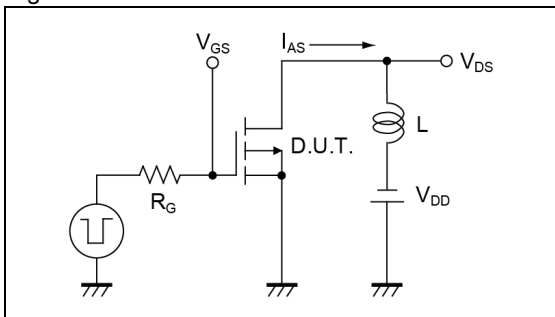
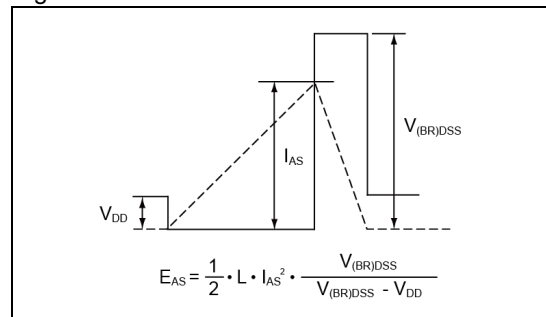


Fig.3-2 Avalanche Waveform

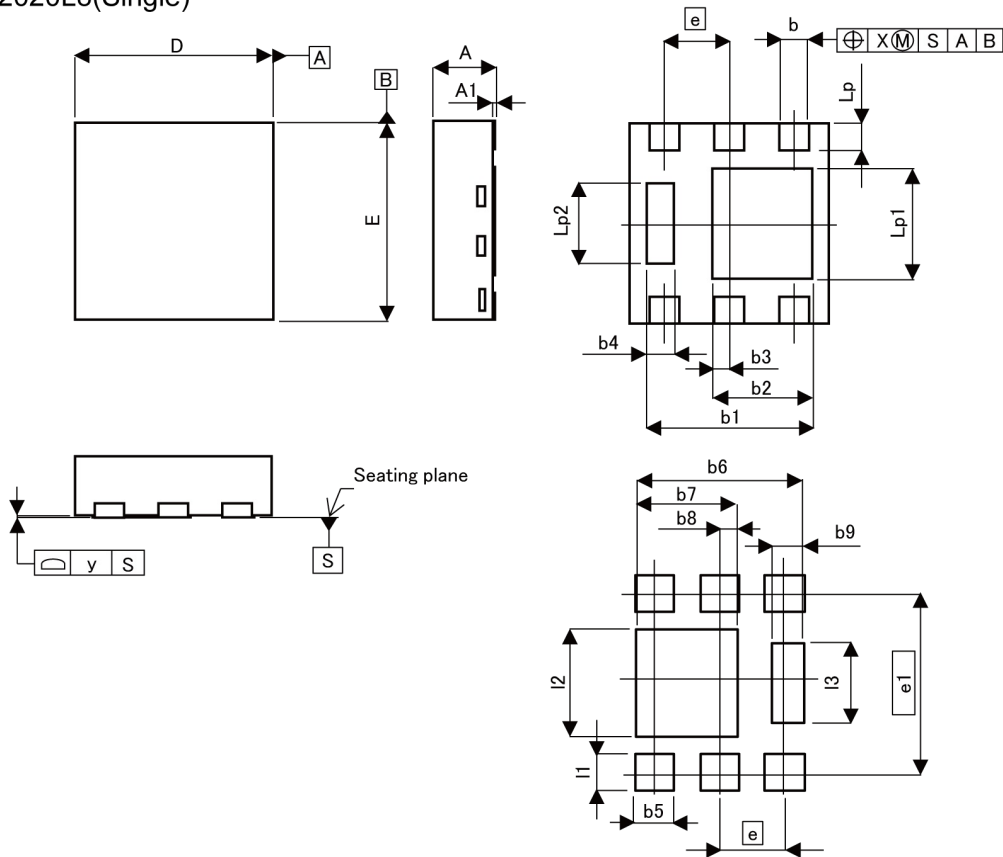


● Notice

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

●Dimensions

HUML2020L8(Single)



Pattern of terminal position areas  
[Not a recommended 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  | 1.55       | 1.75  | 0.061  | 0.069 |
| b2  | 0.95       | 1.05  | 0.037  | 0.041 |
| b3  | 0.175      |       | 0.007  |       |
| b4  | 0.20       | 0.30  | 0.008  | 0.012 |
| 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 | 1.05       | 1.15  | 0.041  | 0.045 |
| Lp2 | 0.75       | 0.85  | 0.030  | 0.033 |
| x   | -          | 0.10  | -      | 0.004 |
| y   | -          | 0.10  | -      | 0.004 |

| DIM | MILIMETERS |       | INCHES |       |
|-----|------------|-------|--------|-------|
|     | MIN        | MAX   | MIN    | MAX   |
| b5  | -          | 0.45  | -      | 0.018 |
| b6  | -          | 1.75  | -      | 0.069 |
| b7  | -          | 1.05  | -      | 0.041 |
| b8  | 0.175      |       | 0.007  |       |
| b9  | -          | 0.30  | -      | 0.012 |
| e1  | 1.725      |       | 0.068  |       |
| l1  | -          | 0.425 | -      | 0.017 |
| l2  | -          | 1.15  | -      | 0.045 |
| l3  | -          | 0.85  | -      | 0.033 |

Dimension in mm/inches

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