

$V_{DSS}$	-20V
$R_{DS(on)(Max.)}$	26m $\Omega$
$I_D$	$\pm 10A$
$P_D$	2W

### ●Features

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

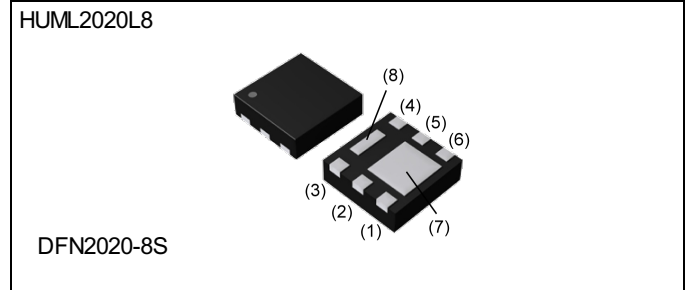
### ●Application

Switching  
Load switch

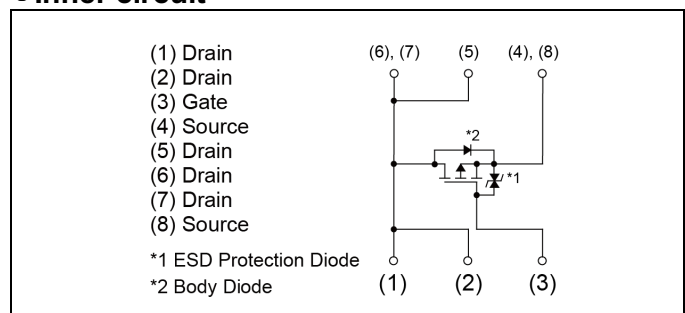
### ●Absolute maximum ratings ( $T_a = 25^\circ C$ )

Parameter	Symbol	Value	Unit
Drain - Source voltage	$V_{DSS}$	-20	V
Continuous drain current	$I_D$	$\pm 10$	A
Pulsed drain current	$I_{D,pulse}^{*1}$	$\pm 20$	A
Gate - Source voltage	$V_{GSS}$	0 ~ -8	V
Power dissipation	$P_D^{*2}$	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	TR	
Marking	SJ	

## RF4C050AP

### ● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	$R_{thJA}^{*2}$	-	62.5	-	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -1mA$	-20	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = -1mA$ referenced to $25^\circ\text{C}$	-	-9.3	-	mV/°C
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-10	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = -8V, V_{DS} = 0V$	-	-	-10	$\mu\text{A}$
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 $25^\circ\text{C}$	-	1.8	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*3}$	$V_{GS} = -4.5V, I_D = -5.0A$	-	18	26	mΩ
		$V_{GS} = -2.5V, I_D = -2.5A$	-	22	31	
		$V_{GS} = -1.8V, I_D = -2.5A$	-	27	45	
		$V_{GS} = -1.5V, I_D = -1.0A$	-	32	65	
Forward Transfer Admittance	$ Y_{fs} ^{*3}$	$V_{DS} = -10V, I_D = -5.0A$	8	-	-	S

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

\*2 MOUNTED ON 40mm×40mm Cu BOARD

\*3 Pulsed

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	5500	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = -10V$	-	230	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	210	-	
Turn - on delay time	$t_{d(on)}^{*3}$	$V_{DD} \approx -10V, V_{GS} = -4.5V$	-	16	-	ns
Rise time	$t_r^{*3}$	$I_D = -2.5A$	-	16	-	
Turn - off delay time	$t_{d(off)}^{*3}$	$R_L \approx 4.02\Omega$	-	580	-	
Fall time	$t_f^{*3}$	$R_G = 10\Omega$	-	160	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*3}$	$V_{DD} \approx -10V,$	-	55	-	nC
Gate - Source charge	$Q_{gs}^{*3}$	$I_D = -5.0A,$	-	6.4	-	
Gate - Drain charge	$Q_{gd}^{*3}$	$V_{GS} = -4.5V$	-	8.4	-	

**●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	$I_S$	$T_a = 25^\circ\text{C}$	-	-	-1.6	A
Body diode pulse current	$I_{SP}^{*1}$		-	-	-20	A
Forward voltage	$V_{SD}^{*3}$	$V_{GS} = 0V, I_S = -1.6A$	-	-	-1.2	V

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

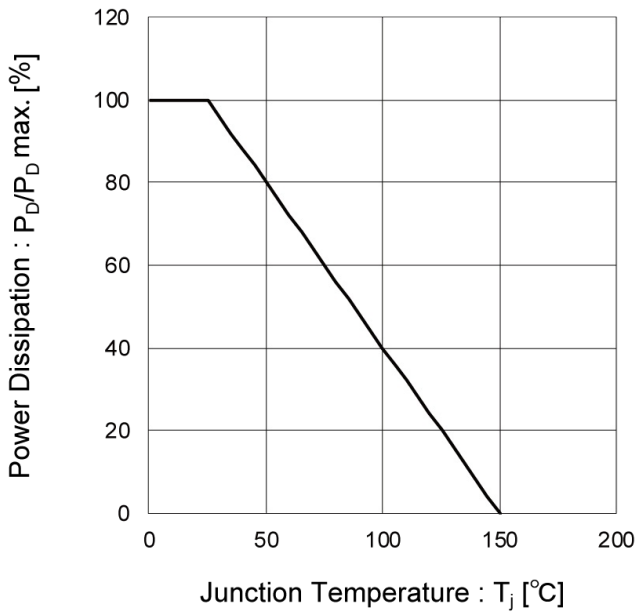


Fig.2 Maximum Safe Operating Area

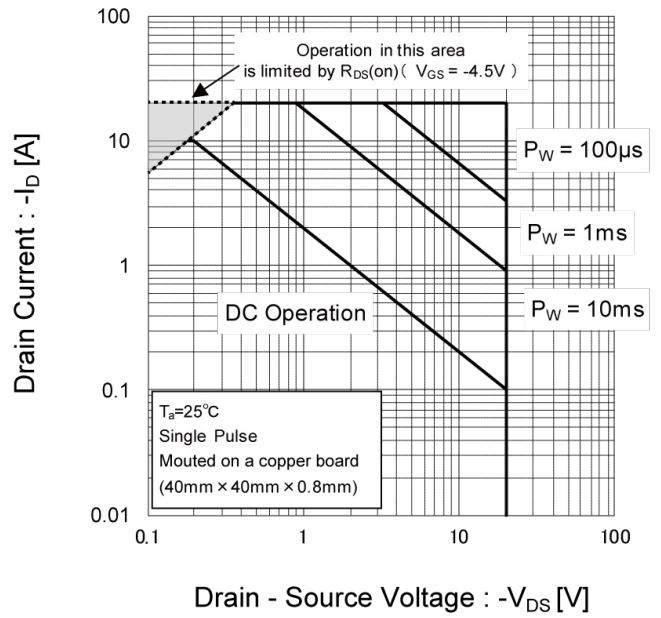


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

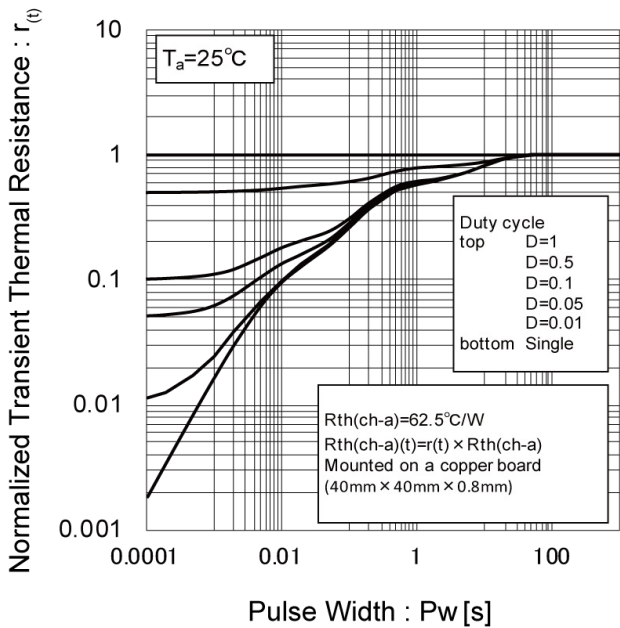
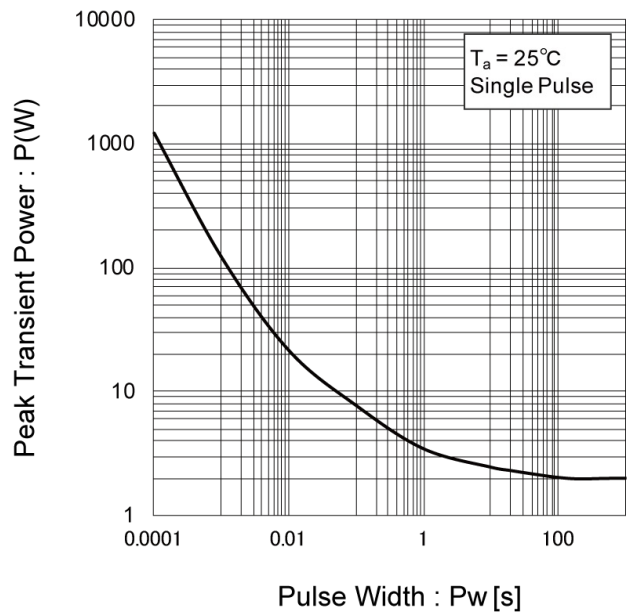


Fig.4 Single Pulse Maximum Power dissipation



● Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

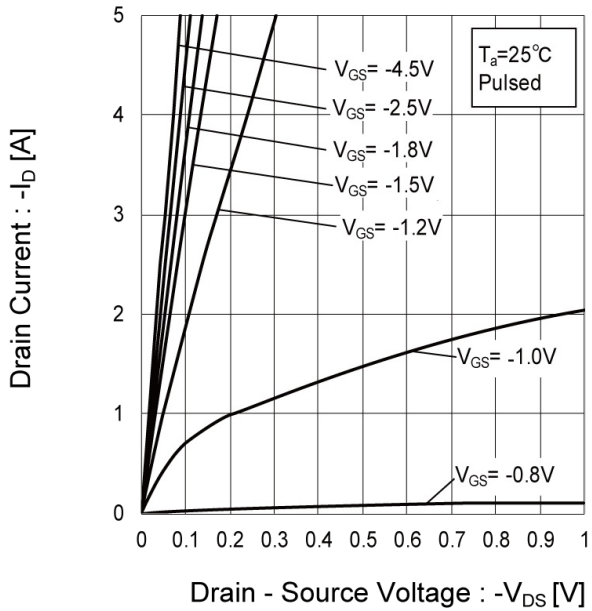


Fig.6 Typical Output Characteristics(II)

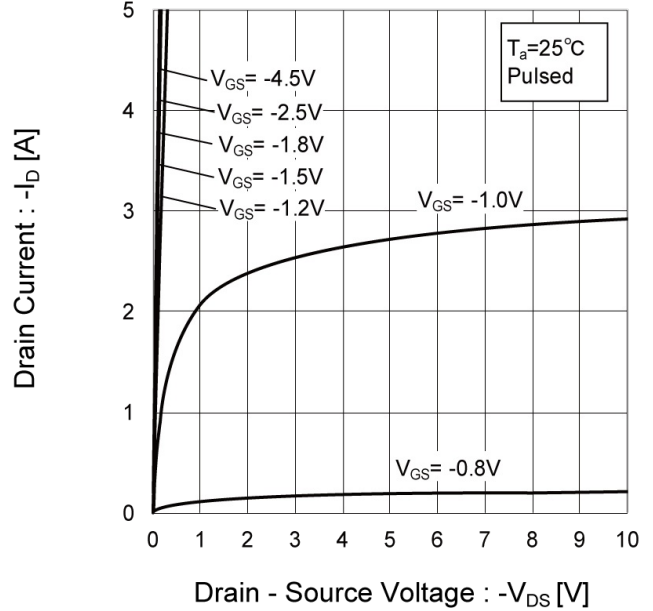


Fig.7 Breakdown Voltage vs. Junction Temperature

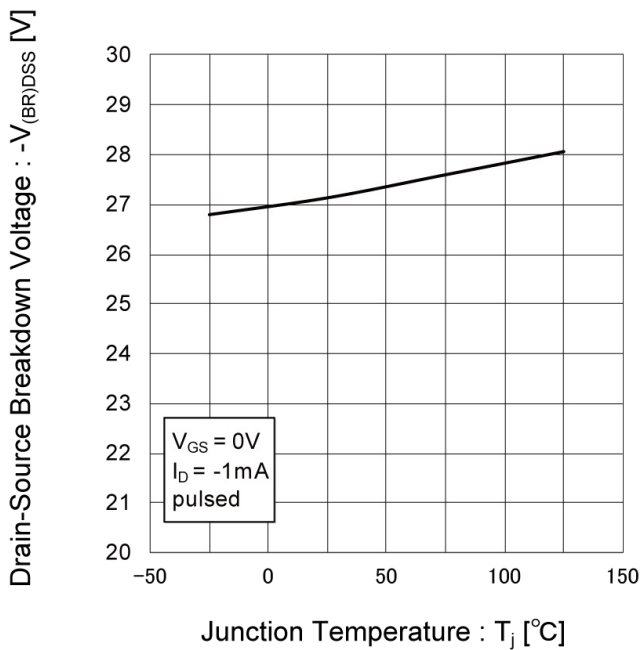
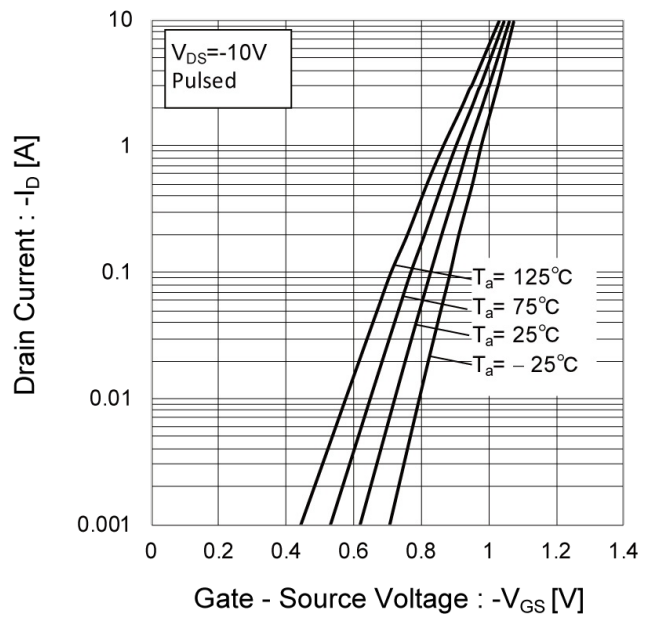


Fig.8 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

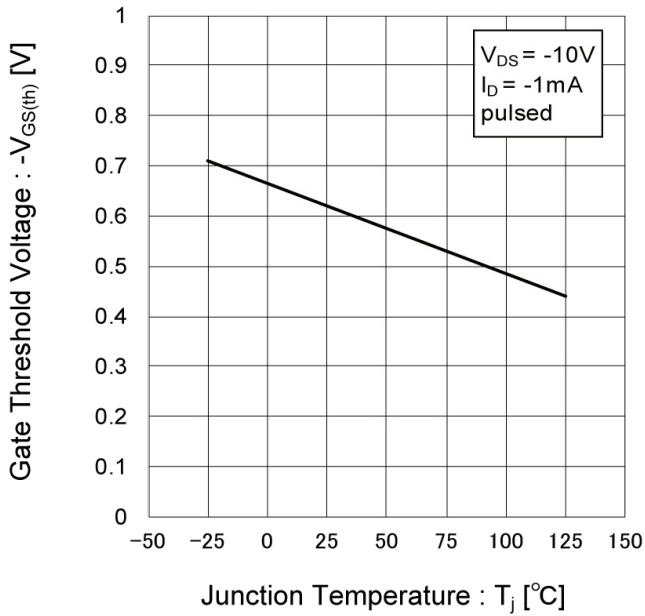


Fig.10 Transconductance vs. Drain Current

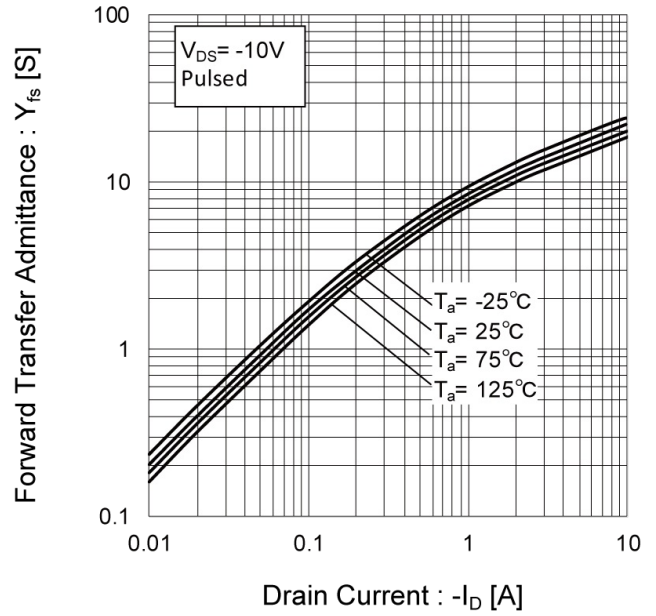


Fig.11 Drain Current Derating Curve

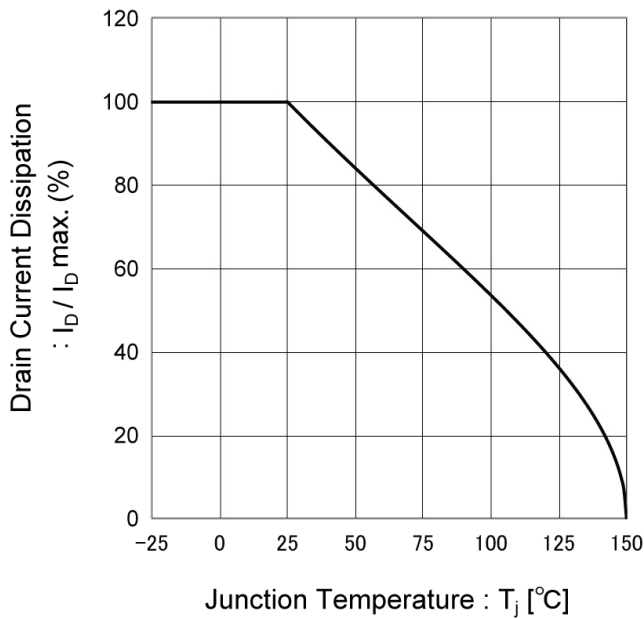
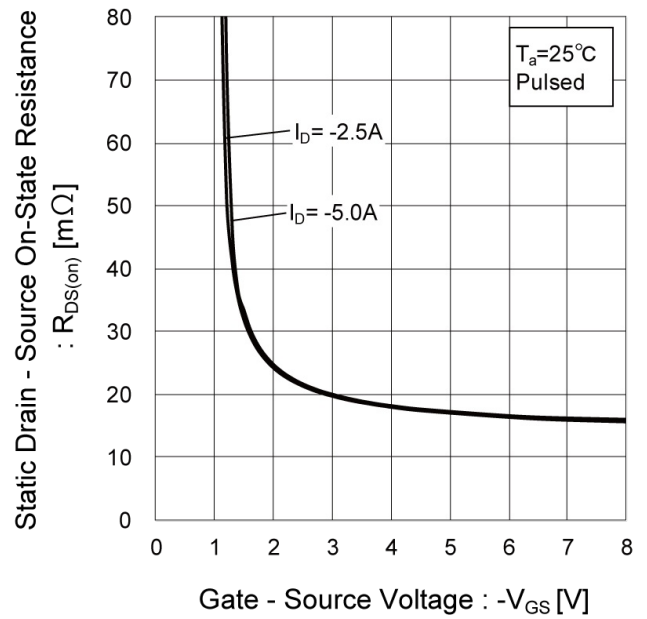


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



● Electrical characteristic curves

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

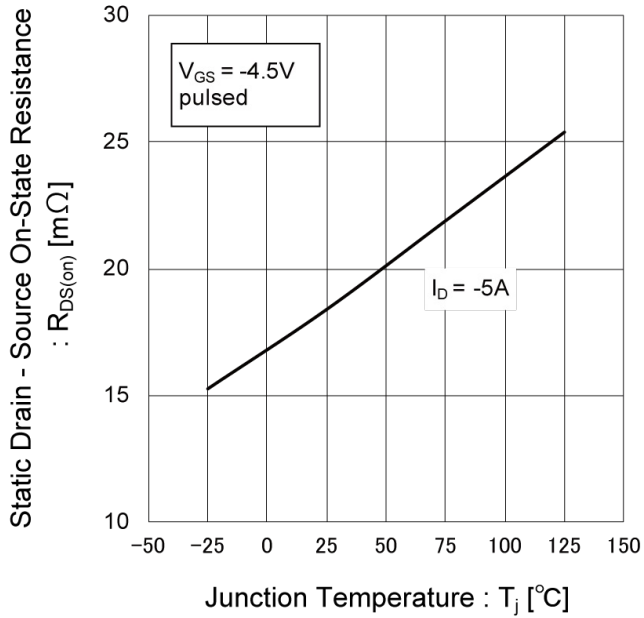


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(I)

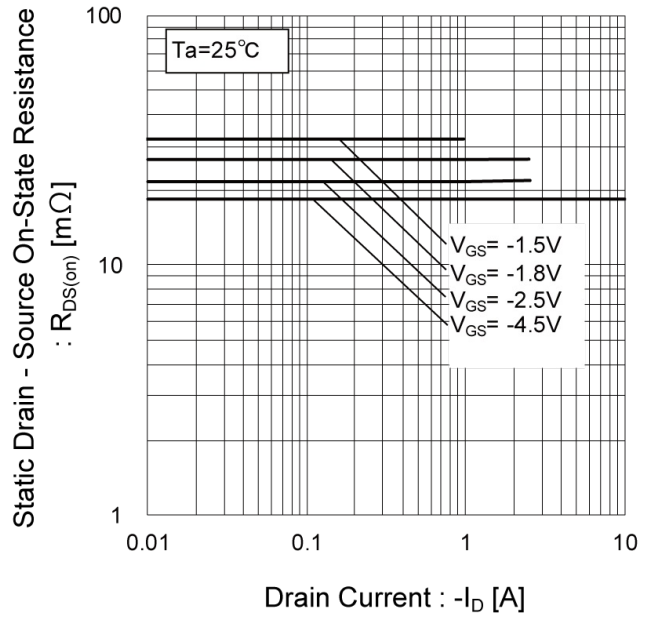


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

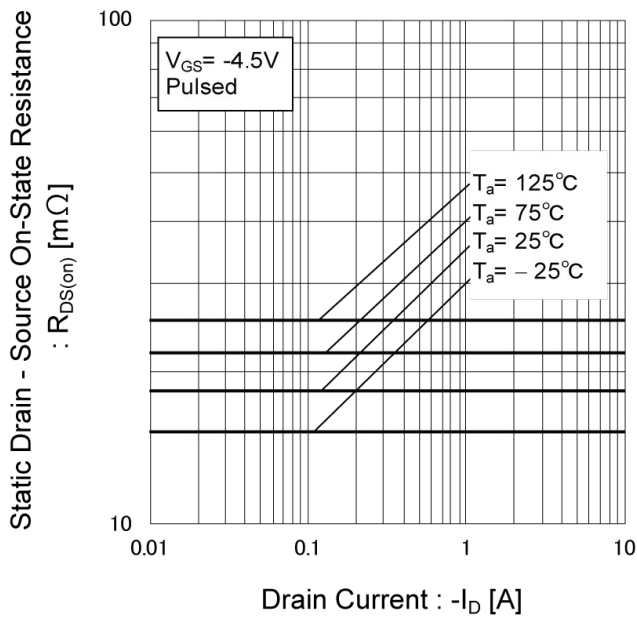
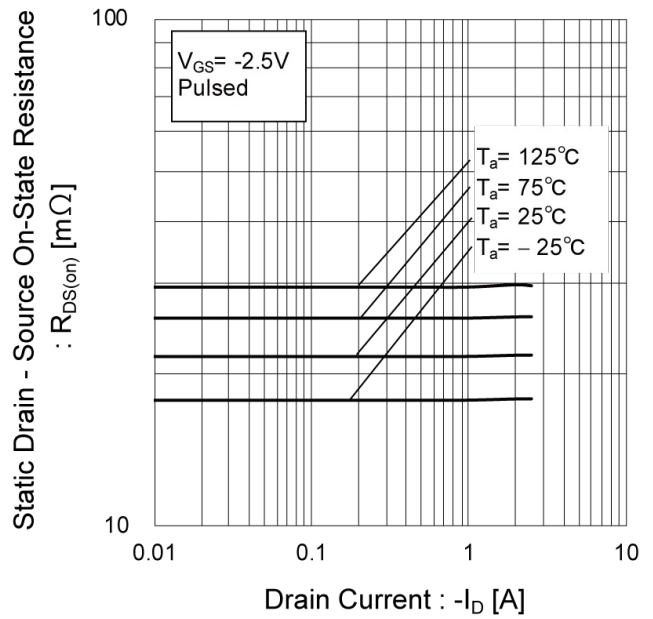


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



● Electrical characteristic curves

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

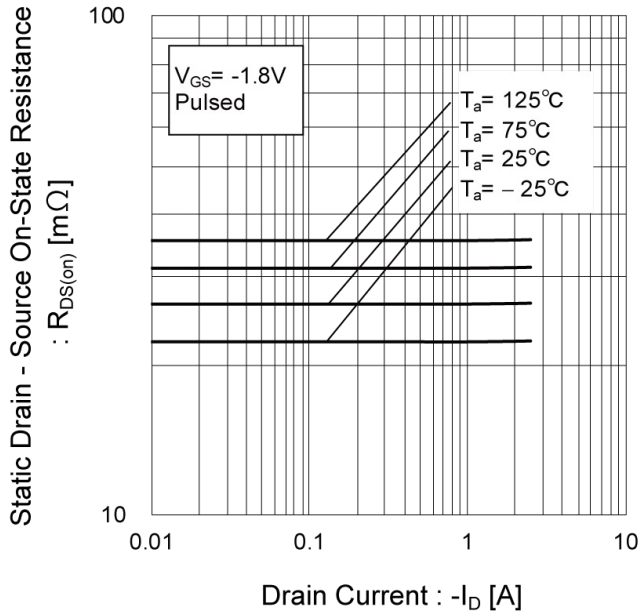


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)

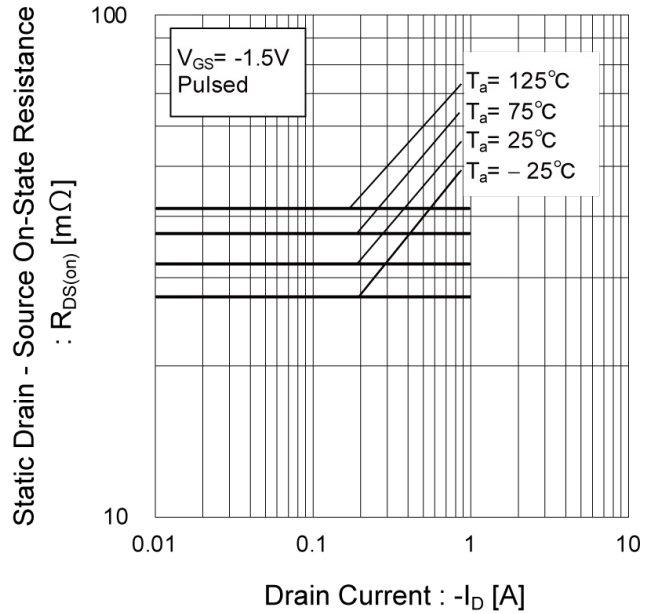


Fig.19 Typical Capacitance vs. Drain - Source Voltage

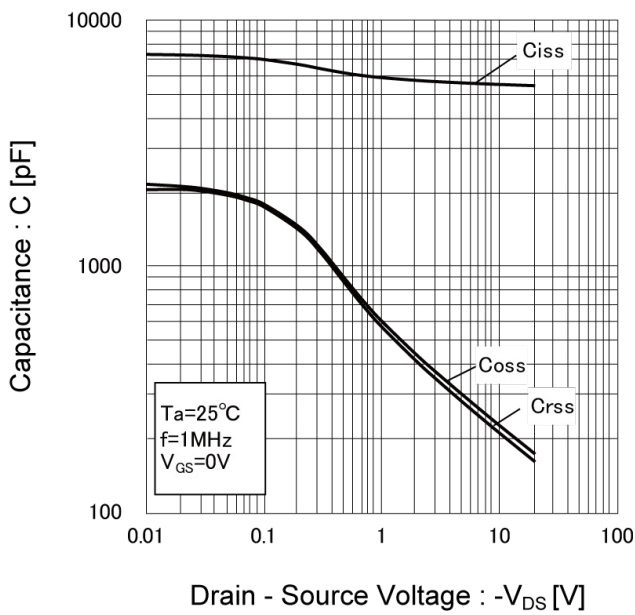
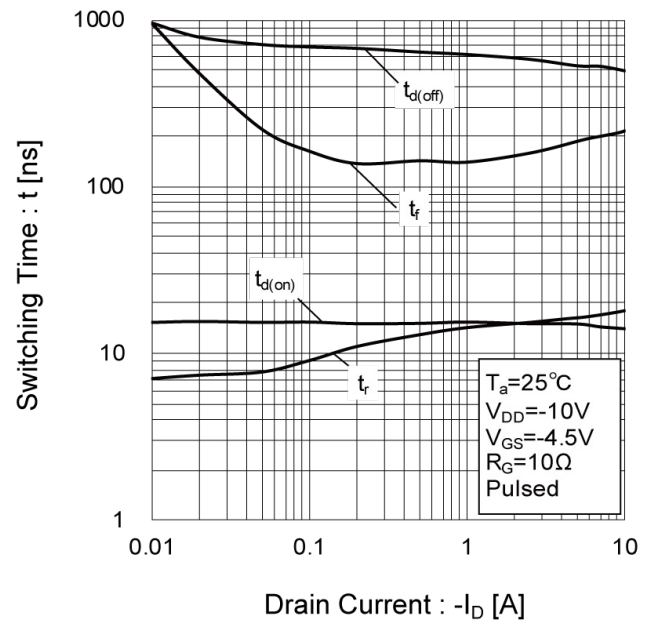


Fig.20 Switching Characteristics





● Electrical characteristic curves

Fig.21 Dynamic Input Characteristics

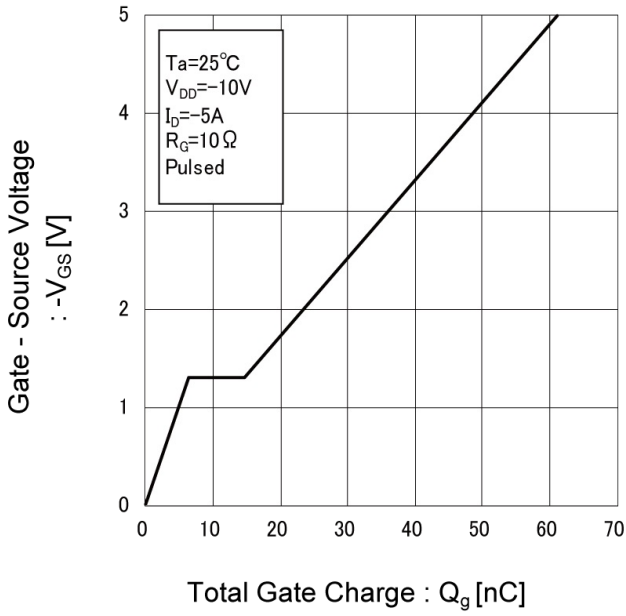
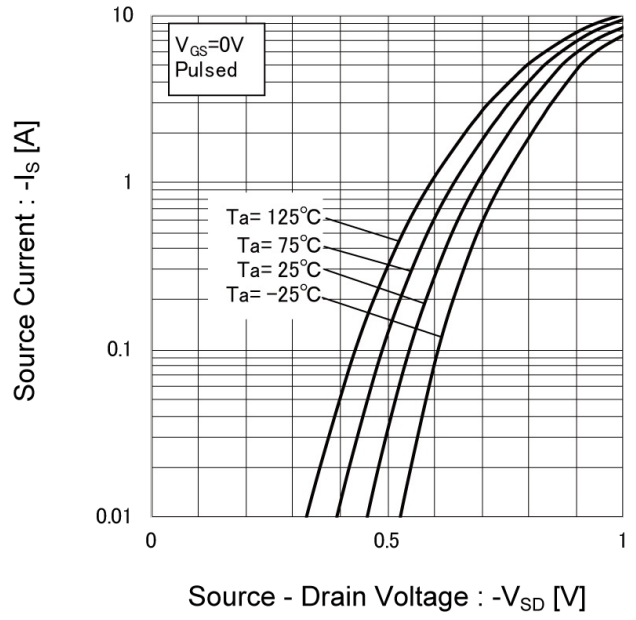


Fig.22 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

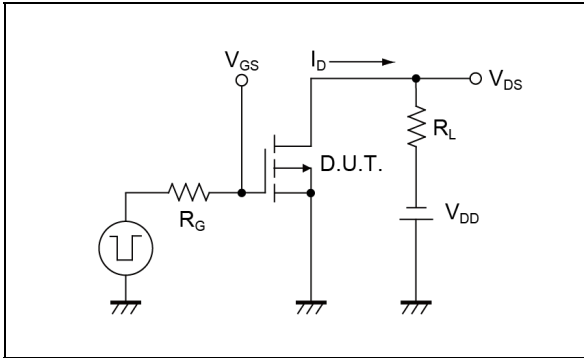


Fig.1-2 Switching Waveforms

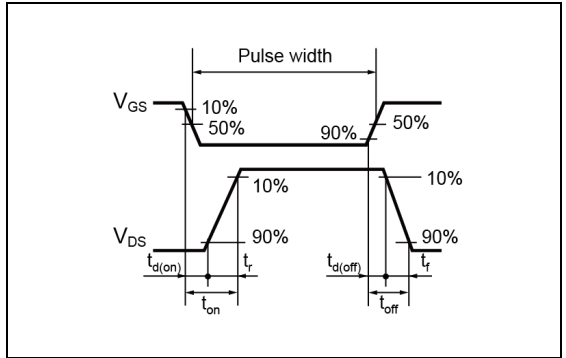


Fig.2-1 Gate Charge Measurement Circuit

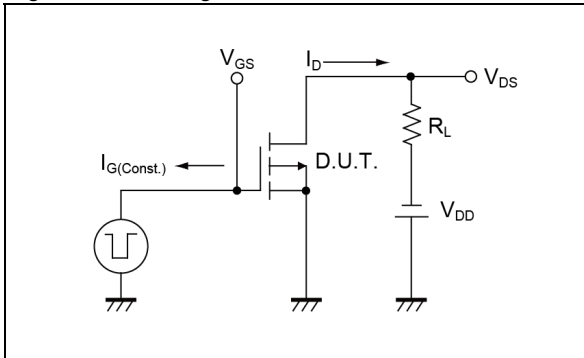
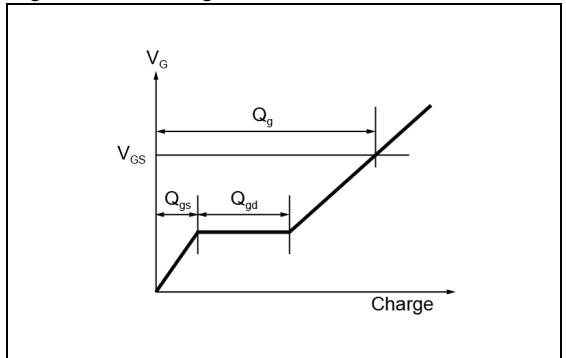


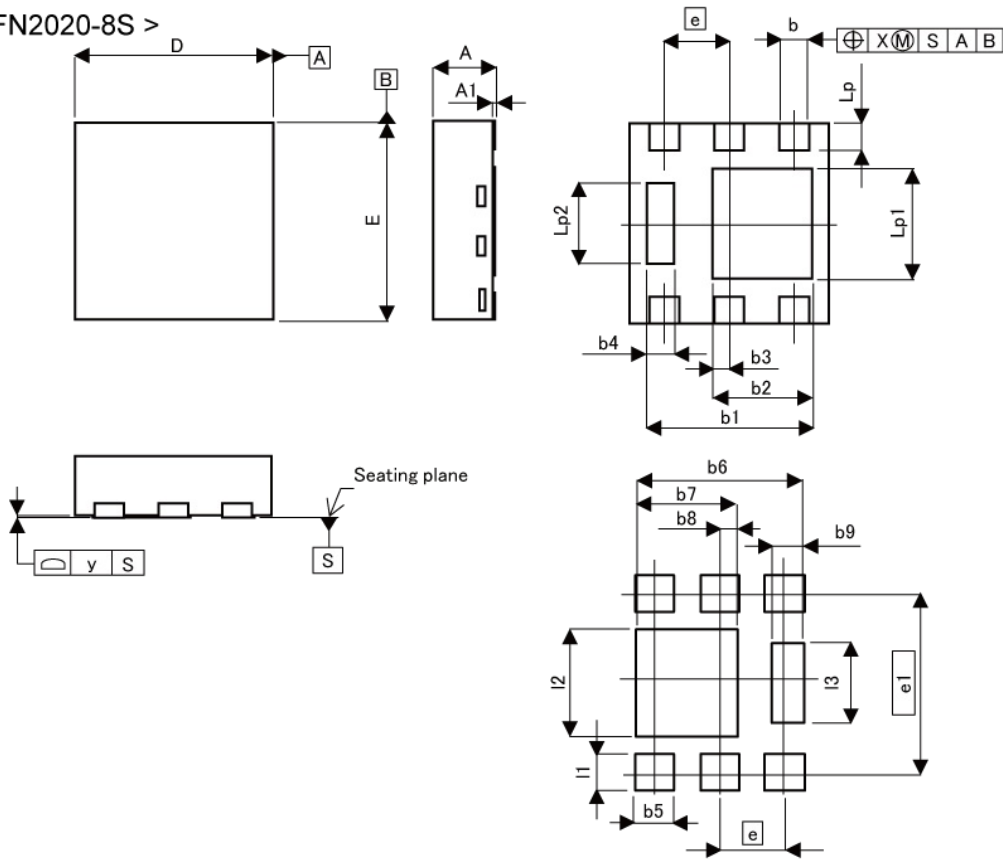
Fig.2-2 Gate Charge Waveform



●Dimensions

HUML2020L8 (Single)

< DFN2020-8S >



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	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