RF4L055GN

Nch 60V 5.5A Power MOSFET

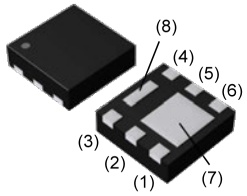
Datasheet

V_{DSS}	60V
$R_{DS(on)}$(Max.)	43mΩ
I_D	±5.5A
P_D	2.0W

●外形図

DFN2020-8S

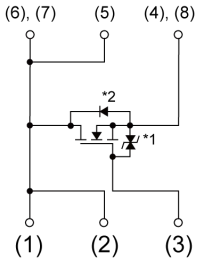
HUML2020L8



●内部回路図

(1) ドレイン
(2) ドレイン
(3) ゲート
(4) ソース
(5) ドレイン
(6) ドレイン
(7) ドレイン
(8) ソース

*1 静電気保護ダイオード
*2 内部ダイオード



●特長

1) 低オン抵抗
2) 小型ハイパワーパッケージ(HUML2020L8)
3) 鉛フリー対応済み、RoHS準拠
4) ハロゲンフリー

●包装仕様

タイプ	包装形態	Embossed Tape
	リールサイズ (mm)	180
	テープ幅 (mm)	8
	基本発注単位(個)	3000
	テーピングコード	TCR
	標印	LA

●用途

スイッチング

●絶対最大定格 (T_a = 25°C、特に指定のない限り)

Parameter	Symbol	Value	Unit
ドレイン・ソース間電圧	V_{DSS}	60	V
ドレイン電流 (直流)	I_D	±5.5	A
ドレイン電流 (パルス)	I_{DP} *1	±22	A
ゲート・ソース間電圧	V_{GSS}	±20	V
アバランシェ電流 (単発)	I_{AS} *2	3.5	A
アバランシェエネルギー (単発)	E_{AS} *2	9.5	mJ
許容損失	P_D *3	2.0	W
ジャンクション温度	T_j	150	℃
保存温度	T_{stg}	-55～+150	℃

●熱抵抗

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
熱抵抗（ジャンクション・外気間）	R_{thJA} *3	-	-	62.5	℃/W

●電気的特性 (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
ドレイン・ソース降伏電圧	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	60	-	-	V
ドレイン・ソース降伏電圧温度係数	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D = 1mA referenced to 25℃	-	60	-	mV/℃
ドレイン遮断電流	I_{DSS}	V_{DS} = 60V, V_{GS} = 0V	-	-	1	μA
ゲート漏れ電流	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	μA
ゲートしきい値電圧	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1mA	1.3	-	2.7	V
ゲートしきい値電圧温度係数	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	I_D = 1mA referenced to 25℃	-	-5.6	-	mV/℃
ドレイン・ソース間オン抵抗	$R_{DS(on)}$ *4	V_{GS} = 10V, I_D = 5.5A	-	31	43	mΩ
		V_{GS} = 4.5V, I_D = 5.5A	-	43	66	
ゲート抵抗	R_G	f=1MHz, open drain	-	1.9	-	Ω
順伝達アドミタンス	$\|Y_{fs}\|$ *4	V_{DS} = 5V, I_D = 5.5A	5.0	-	-	S

*1 Pw ≦ 10μs, Duty cycle ≦ 1%

*2 L ≒ 2mH, V_{DD} = 30V, R_G = 25Ω, 開始温度 T_j = 25℃ 図3-1,3-2参照

*3 銅箔基板実装時 (40×40×0.8mm)

*4 パルス

●電気的特性 (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
入力容量	C_{iss}	V_{GS} = 0V	-	400	-	pF
出力容量	C_{oss}	V_{DS} = 30V	-	80	-	
帰還容量	C_{rss}	f = 1MHz	-	20	-	
ターンオン遅延時間	$t_{d(on)}$ *4	V_{DD} ≃ 30V, V_{GS} = 10V	-	9.2	-	ns
上昇時間	t_r *4	I_D = 2.75A	-	17	-	
ターンオフ遅延時間	$t_{d(off)}$ *4	R_L ≃ 10.9Ω	-	23	-	
下降時間	t_f *4	R_G = 10Ω	-	21	-	

●ゲート電荷量特性 (T_a = 25°C)

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
ゲート総電荷量	Q_g *4	V_{DD} ≃ 30V I_D = 5.5A	V_{GS} = 10V	-	7.8	-	nC
			V_{GS} = 4.5V	-	4.1	-	
ゲート･ソース間電荷量	Q_{gs} *4			-	1.7	-	
ゲート･ドレイン間電荷量	Q_{gd} *4			-	1.5	-	

●内部ダイオード特性 （ソース･ドレイン間）(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
ソース電流（直流）	I_S	T_a = 25℃	-	-	1.67	A
ソース電流（パルス）	I_{SP} *1		-	-	22	A
順方向電圧	V_{SD} *4	V_{GS} = 0V, I_S = 1.67A	-	-	1.2	V

●電気的特性曲線

Fig.1 Power Dissipation Derating Curve

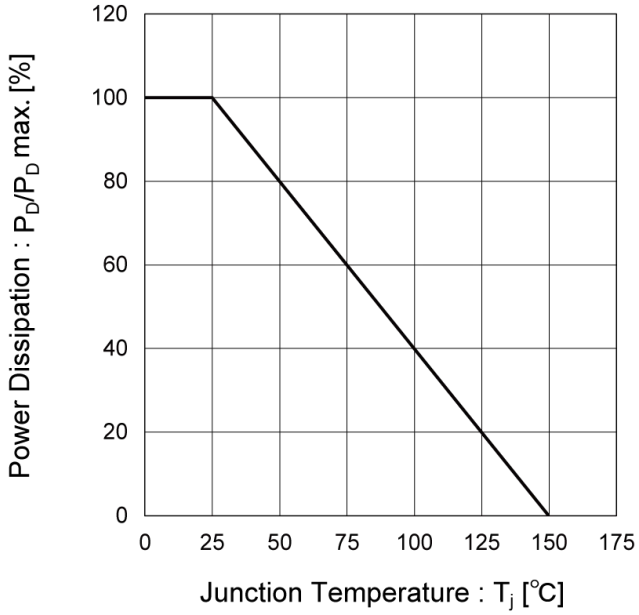


Fig.2 Maximum Safe Operating Area

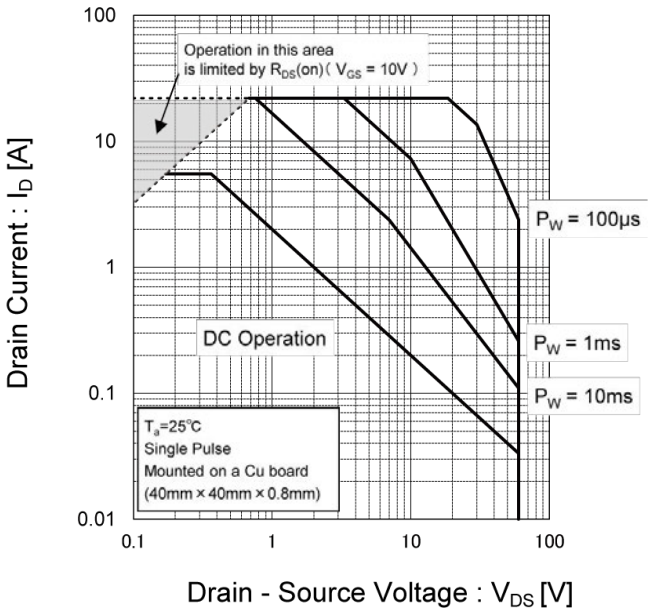


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

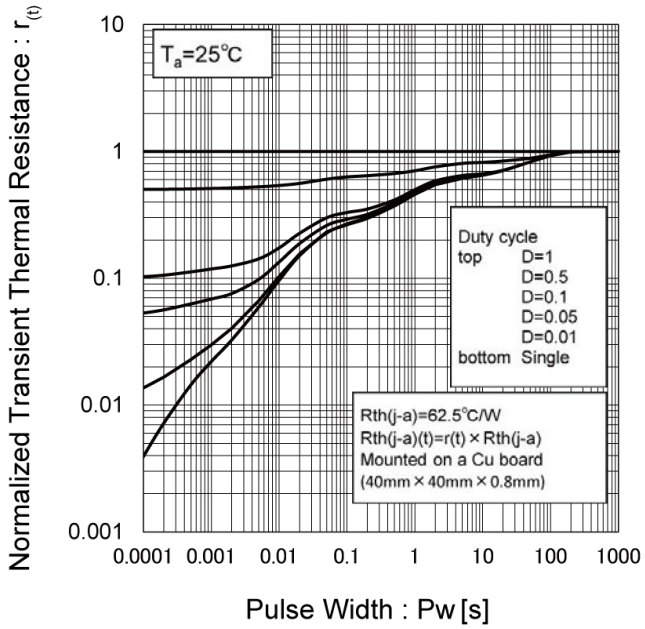
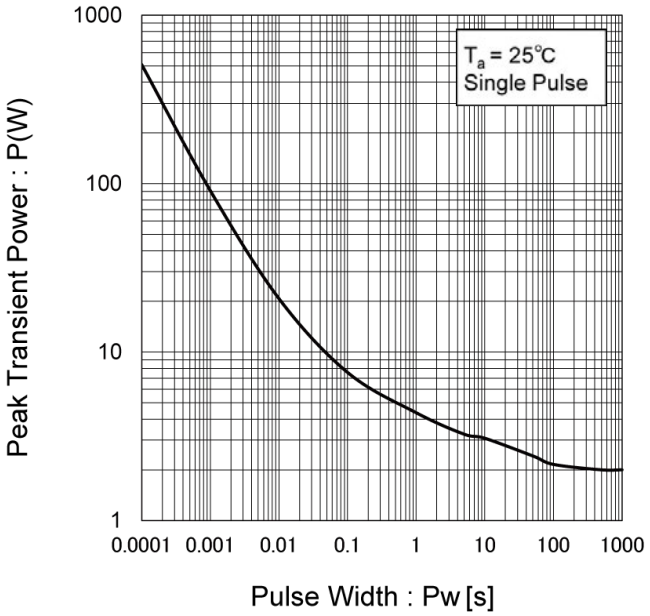


Fig.4 Single Pulse Maximum Power dissipation



●電気的特性曲線

Fig.5 Typical Output Characteristics(I)

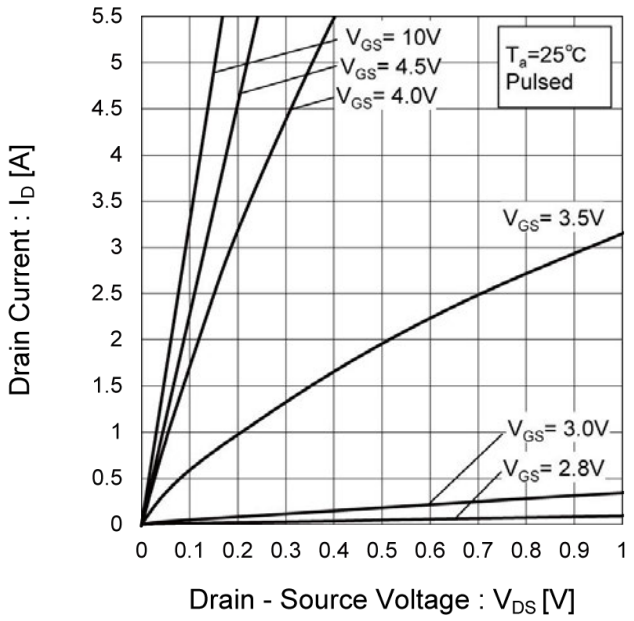


Fig.6 Typical Output Characteristics(II)

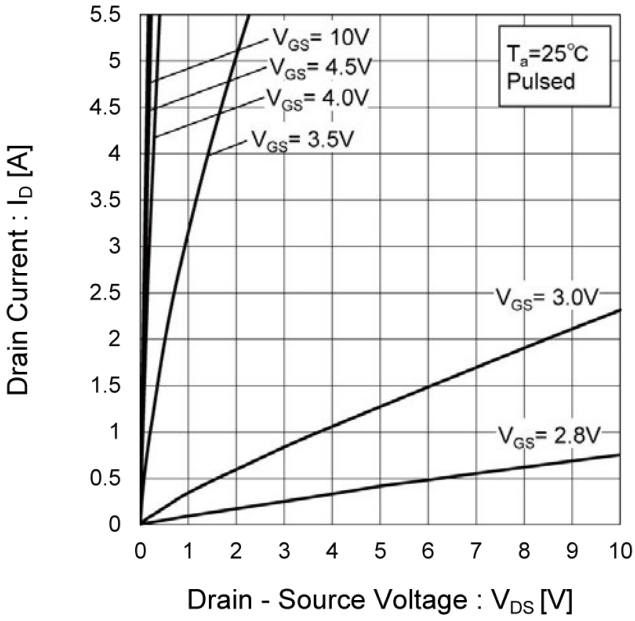


Fig.7 Breakdown Voltage vs. Junction Temperature

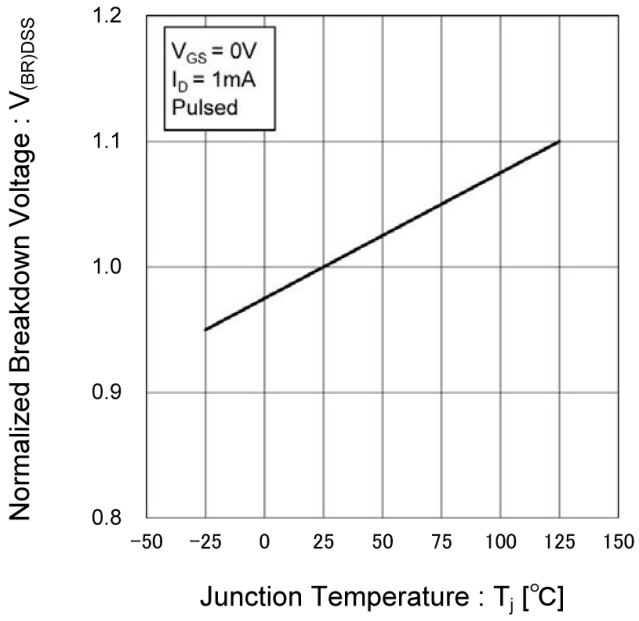
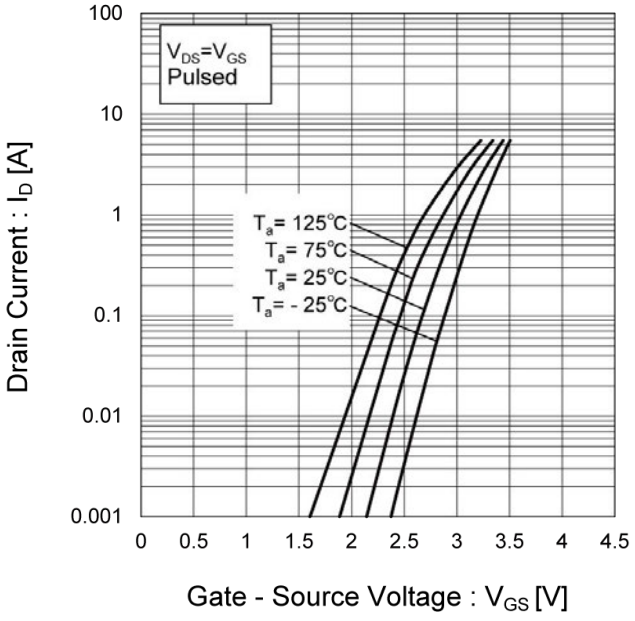


Fig.8 Typical Transfer Characteristics



●電気的特性曲線

Fig.9 Gate Threshold Voltage vs. Junction Temperature

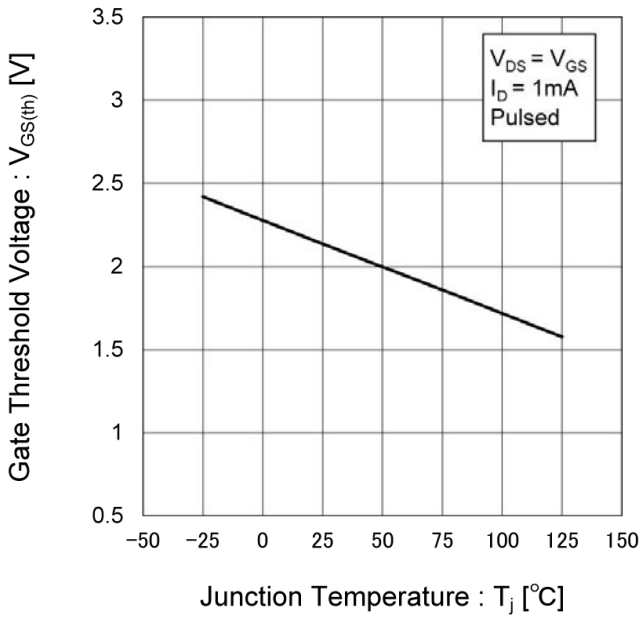


Fig.10 Forward Transfer Admittance vs. Drain Current

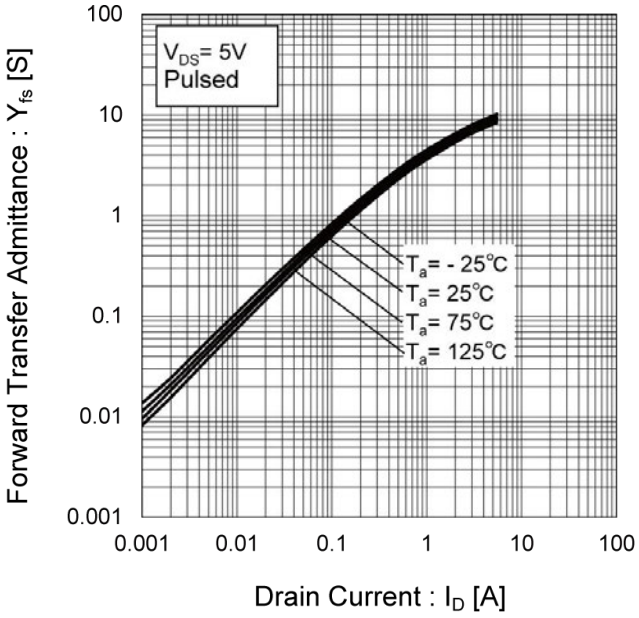


Fig.11 Drain Current Derating Curve

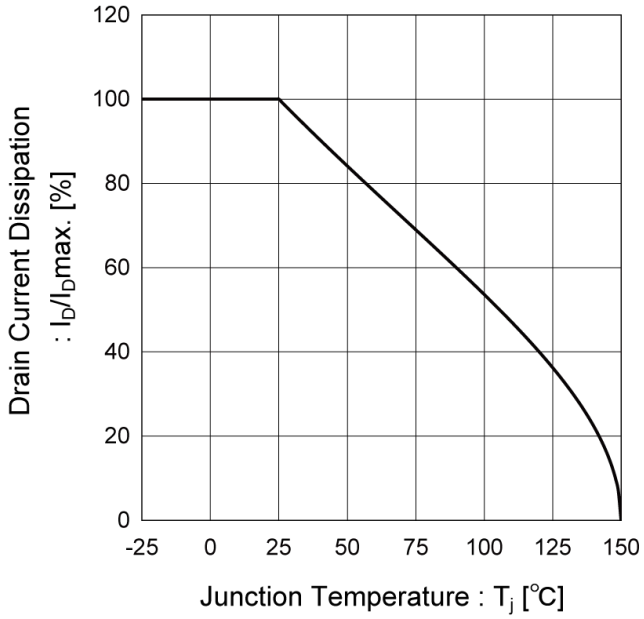
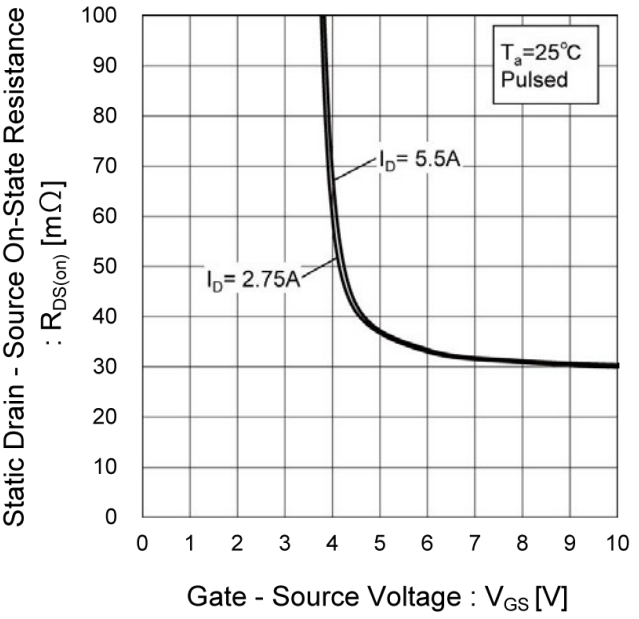


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●電気的特性曲線

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

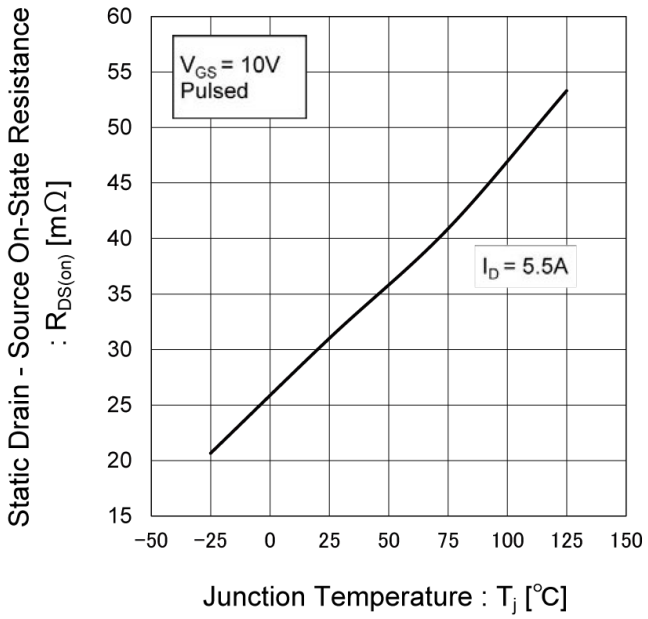


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)

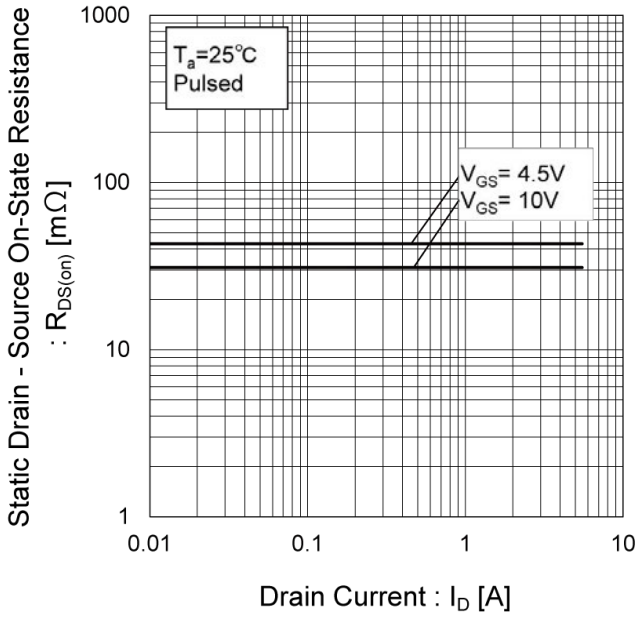


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current (II)

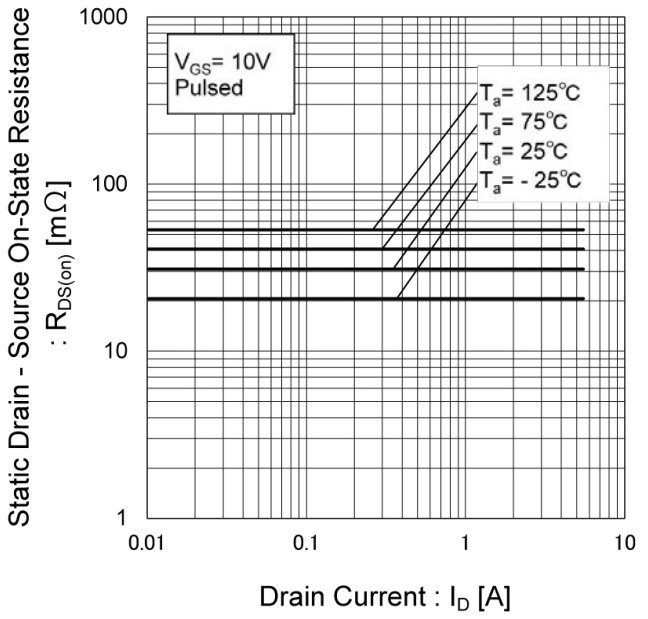
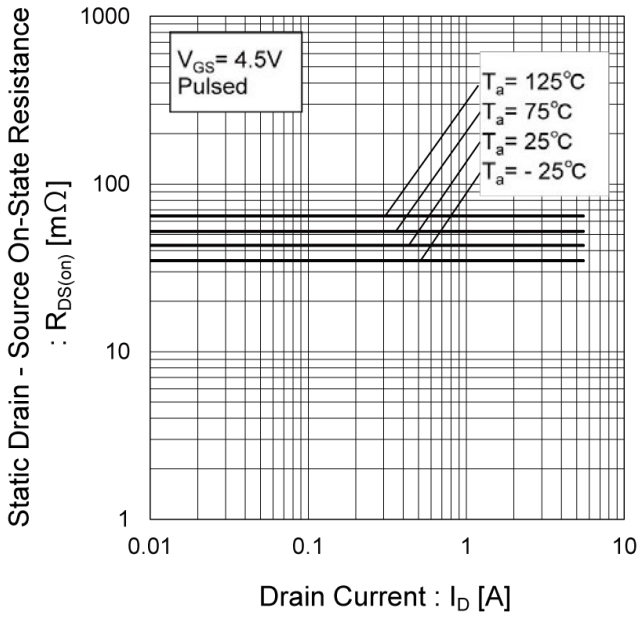


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)



●電気的特性曲線

Fig.17 Typical Capacitance vs. Drain - Source Voltage

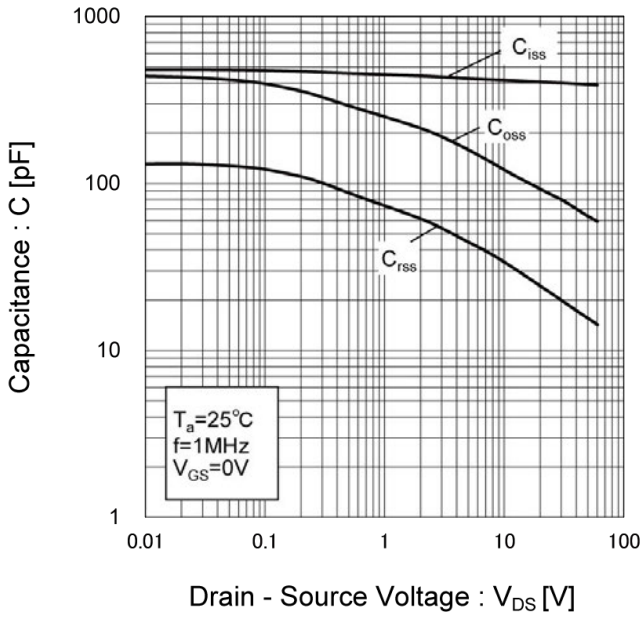


Fig.18 Switching Characteristics

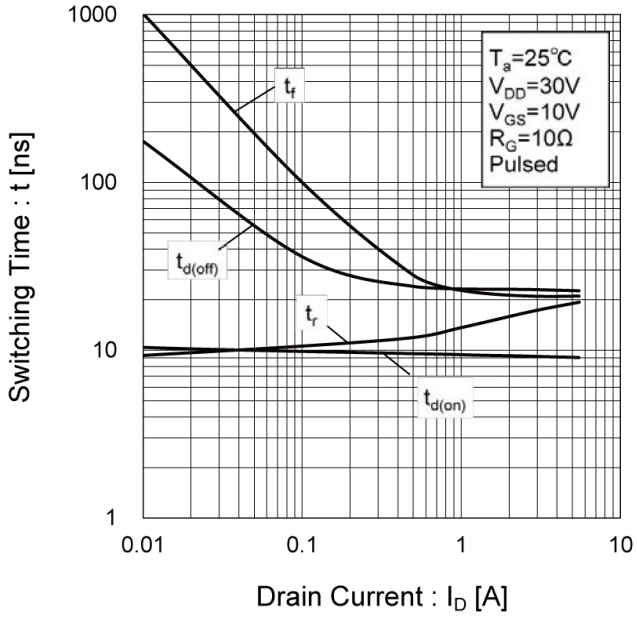


Fig.19 Dynamic Input Characteristics

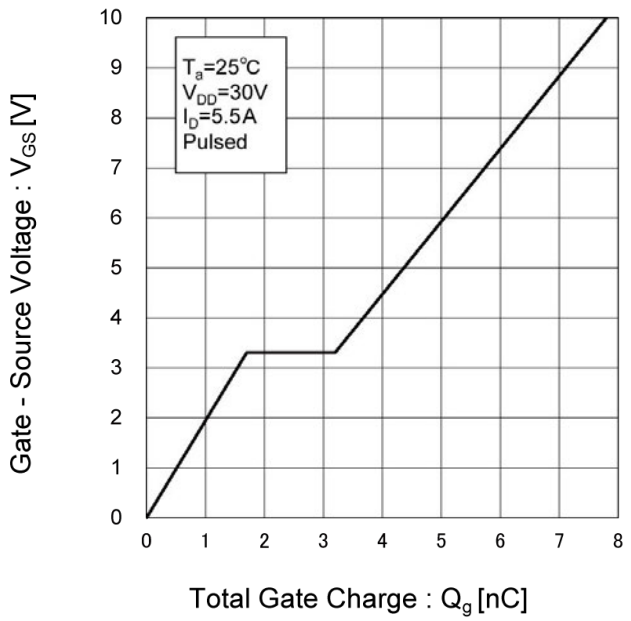
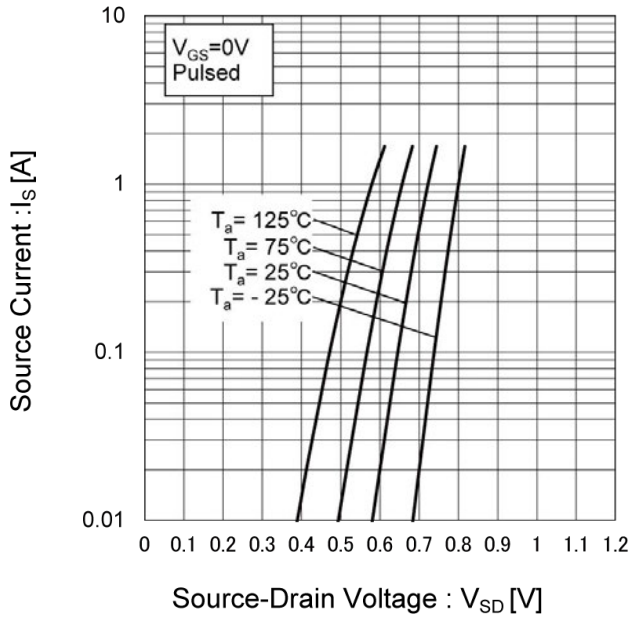


Fig.20 Source Current vs. Source Drain Voltage



●測定回路図

図 1-1 スイッチング時間測定回路

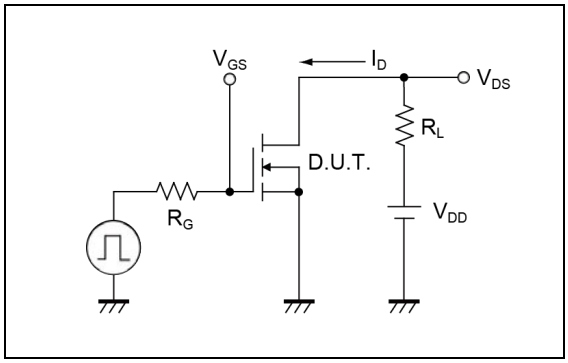


図 1-2 スイッチング波形

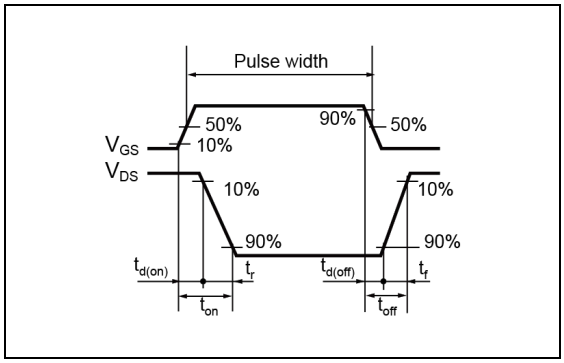


図 2-1 ゲート電荷量測定回路

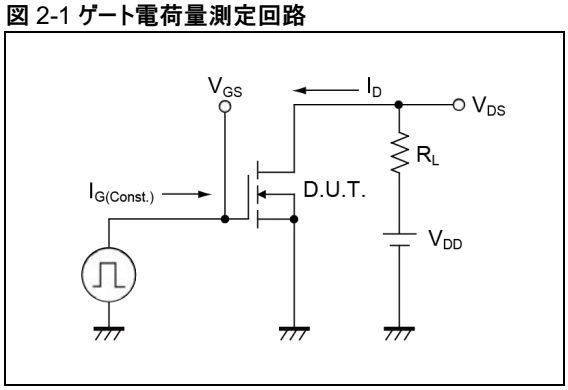


図 2-2 ゲート電荷量波形

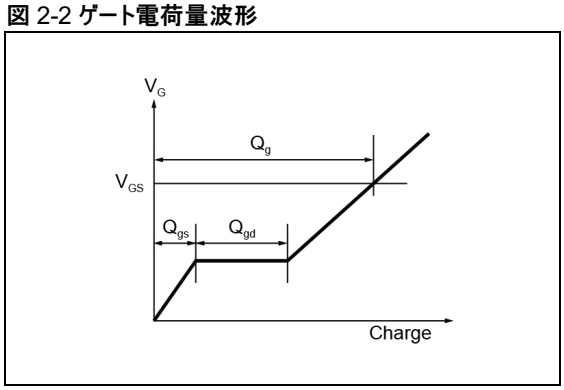


図 3-1 L負荷測定回路

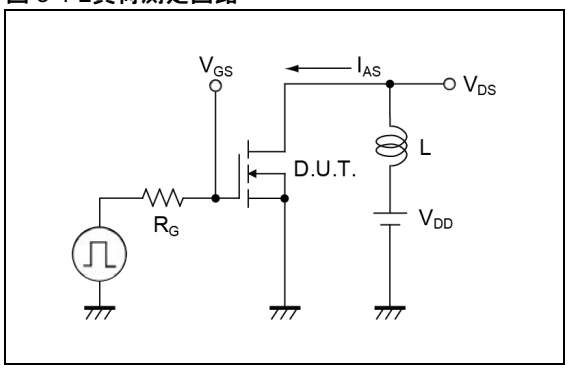
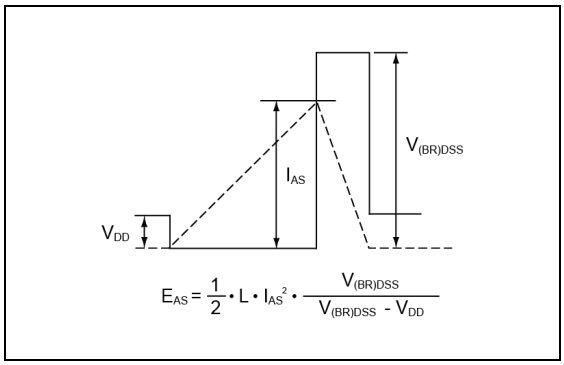


図 3-2 アバランシェ波形



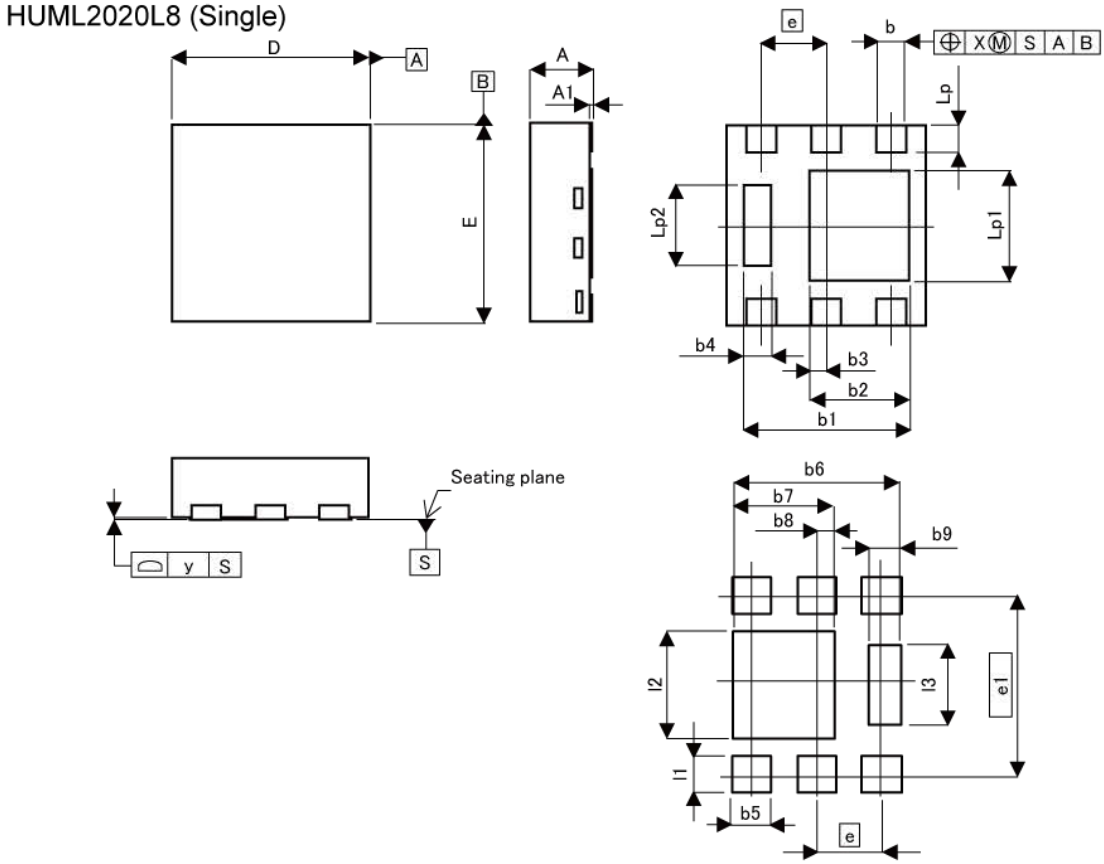
●使用上の注意

本製品は、帯電性の大きな環境では素子の劣化・破壊の恐れがあるので、
取り扱い時には必ず静電対策を講じてください。

●外形寸法図

DFN2020-8S

HUML2020L8 (Single)



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	0.25		0.010	
D	1.90	2.10	0.075	0.083
E	1.90	2.10	0.075	0.083
e	0.60	0.70	0.024	0.028
Lp	0.225	0.325	0.009	0.013
Lp1	1.00	1.20	0.039	0.047
Lp2	0.80		0.031	
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

Notice

Precaution on using ROHM Products

1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   - [b] the temperature or humidity exceeds those recommended by ROHM
   - [c] the Products are exposed to direct sunshine or condensation
   - [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

Precaution Regarding Intellectual Property Rights

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General Precaution

1. Before you use our Products, you are requested to carefully read this document and fully understand its contents. ROHM shall not be in any way responsible or liable for failure, malfunction or accident arising from the use of any ROHM's Products against warning, caution or note contained in this document.

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