



**THE DATASHEET OF  
N0601N-ZK-E1-AY**



# N0601N

N-channel MOSFET

60 V, 100 A, 4.2 mΩ

R07DS0557EJ0200

Rev.2.00

2020.6.10

## Features

- Low on-state resistance :  $R_{DS(on)} = 4.2 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$ )
- Low  $C_{iss}$  :  $C_{iss} = 7730 \text{ pF TYP.}$  ( $V_{DS} = 25 \text{ V}$ ,  $V_{GS} = 0 \text{ V}$ )
- High current :  $I_{D(DC)} = \pm 100 \text{ A}$
- RoHS Compliant
- Quality Grade : Standard
- Applications : For high current switching

## Ordering Information

Part No.	Package	Packing
N0601N-ZK-E1-AY	TO-263, Pb-free <sup>Note1</sup>	800 pcs / Tape and Reel

Note: 1. Pb-free means that this product does not contain lead in the external electrode.

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	60	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 100$	A
Drain Current (pulse) <sup>Note2</sup>	$I_{D(pulse)}$	$\pm 400$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	156	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T2}$	1.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note3</sup>	$I_{AS}$	55	A
Single Avalanche Energy <sup>Note3</sup>	$E_{AS}$	300	mJ

Note: Continuous heavy condition (e.g. high temperature/voltage/current or high variation of temperature) may affect a reliability even if it is within the absolute maximum ratings. Please consider derating condition for appropriate reliability in reference Renesas Semiconductor Reliability Handbook (Recommendation for Handling and Usage of Semiconductor Devices) and individual reliability data.

Notes: 2.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{DD} = 30 \text{ V}$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$ ,  $L = 100 \mu\text{H}$

## Thermal Resistance

Item	Symbol	Max. Value <sup>Note4</sup>	Unit
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.8	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

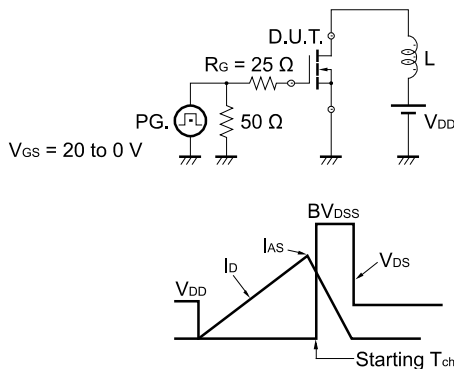
Notes: 4. This data is the designed target maximum value on Renesas's measurement condition. (Not tested)

Electrical Characteristics (T<sub>A</sub> = 25°C)

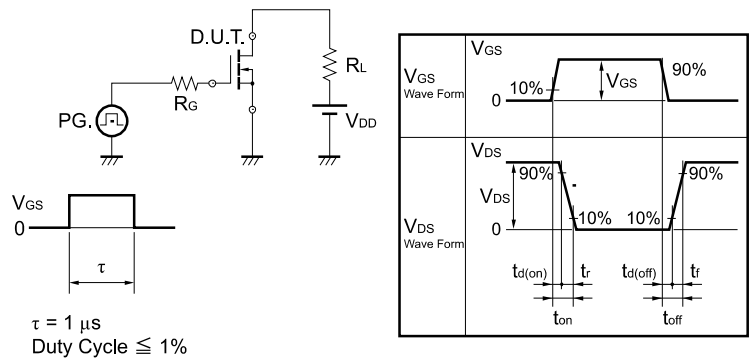
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DSS</sub>			1	μA	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	2.0		4.0	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward Transfer Admittance <sup>Note5</sup>	y <sub>fs</sub>	35			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 50 A
Drain to Source On-state Resistance <sup>Note5</sup>	R <sub>DS(on)</sub>		3.3	4.2	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A
Input Capacitance	C <sub>iss</sub>		7730		pF	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		560		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		290		pF	
Turn-on Delay Time	t <sub>d(on)</sub>		35		ns	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 50 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 0 Ω
Rise Time	t <sub>r</sub>		12		ns	
Turn-off Delay Time	t <sub>d(off)</sub>		76		ns	
Fall Time	t <sub>f</sub>		14		ns	
Total Gate Charge	Q <sub>G</sub>		133		nC	V <sub>DD</sub> = 48 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 100 A
Gate to Source Charge	Q <sub>GS</sub>		38		nC	
Gate to Drain Charge	Q <sub>GD</sub>		38		nC	
Body Diode Forward Voltage <sup>Note5</sup>	V <sub>F(S-D)</sub>			1.5	V	I <sub>F</sub> = 100 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>		44		ns	I <sub>F</sub> = 50 A, V <sub>GS</sub> = 0 V, di/dt = 100 A/μs
Reverse Recovery Charge	Q <sub>rr</sub>		61		nC	

Notes: 5. Pulsed test

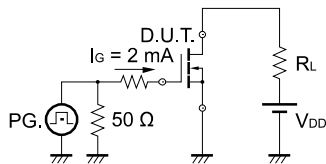
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

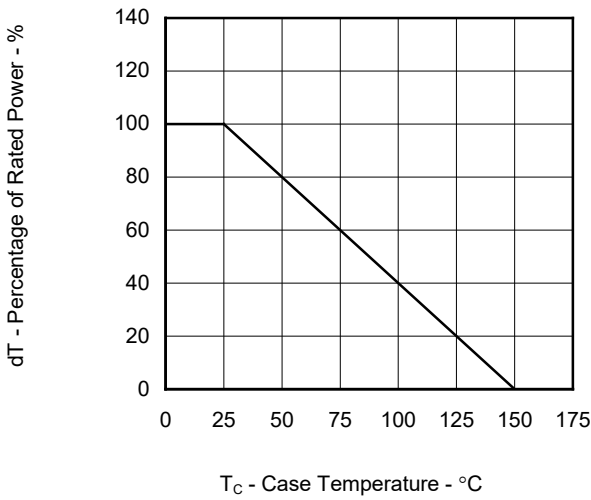


TEST CIRCUIT 3 GATE CHARGE

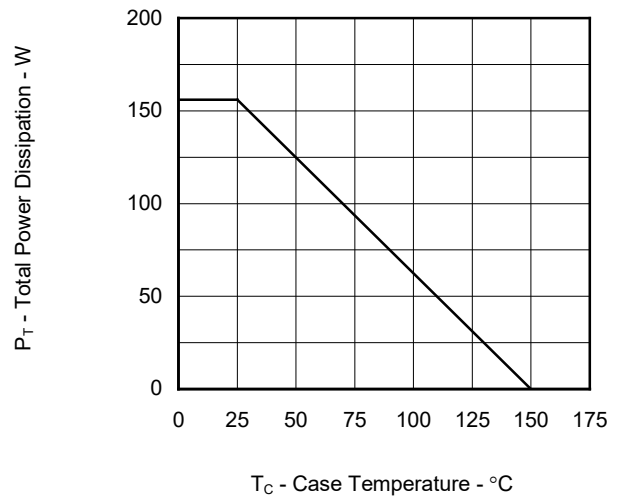


Typical Characteristics <sup>Note6</sup>

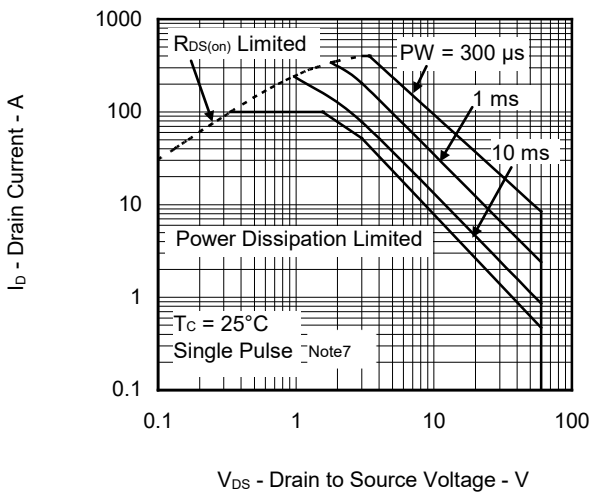
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



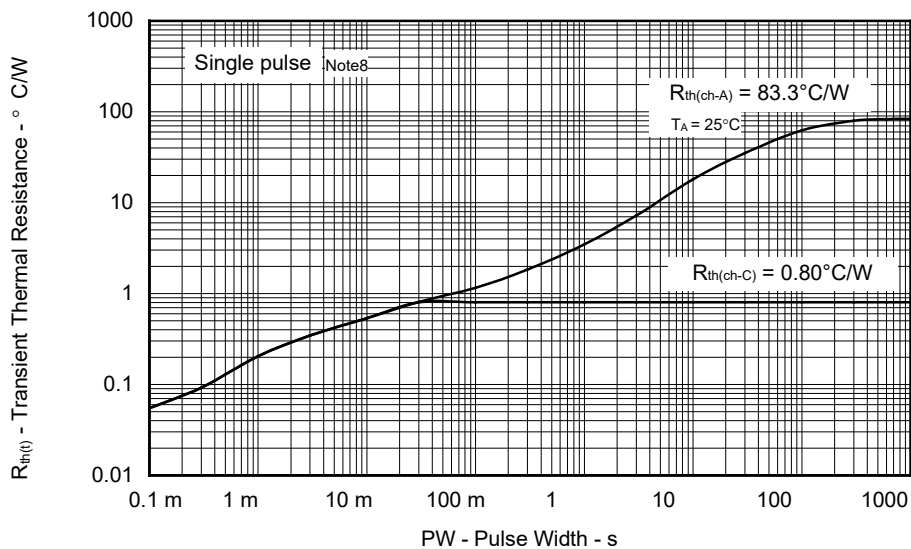
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

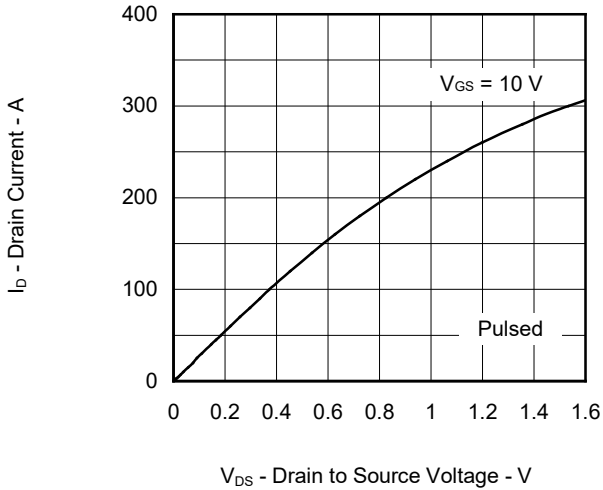


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

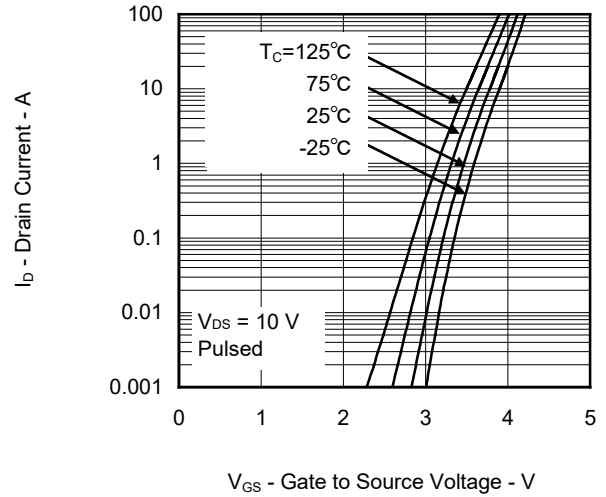


- Notes: 6. Designed target value on Renesas measurement condition. (T<sub>c</sub> = 25°C, unless otherwise specified)  
 7. This data is the designed value on Renesas's measurement condition. Renesas recommends that operating conditions are designed according to a document "Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)".  
 8. This data is the designed target maximum value on Renesas's measurement condition.

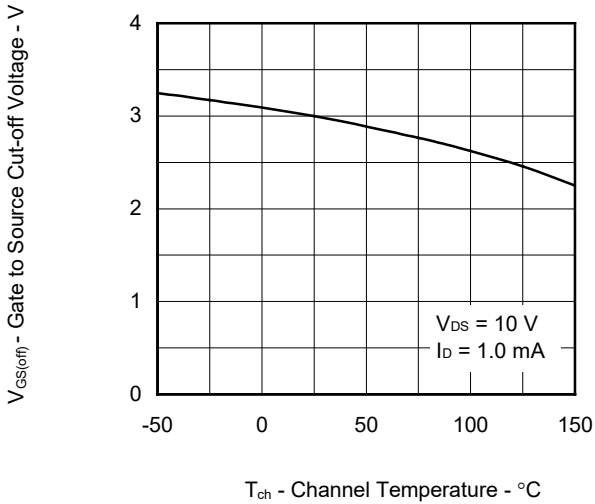
DRAIN CURRENT vs.  
DRAIN TO SOURCE VOLTAGE



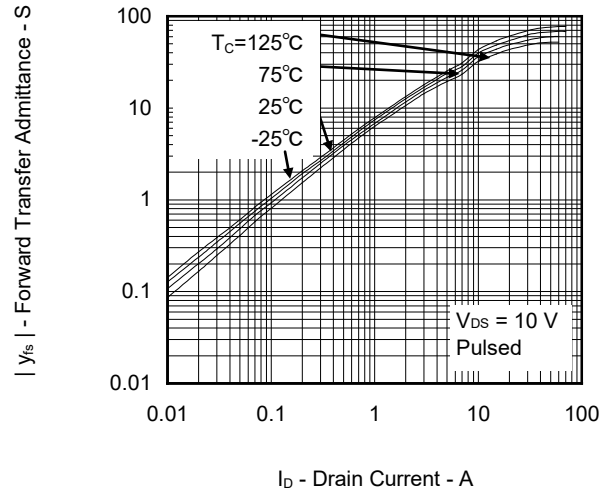
FORWARD TRANSFER  
CHARACTERISTICS



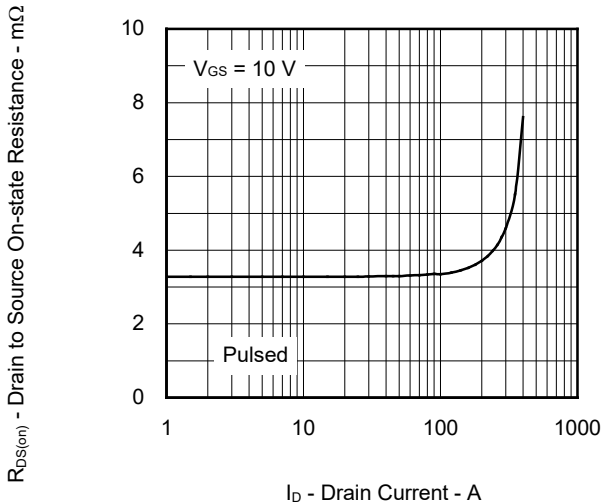
GATE TO SOURCE CUT-OFF VOLTAGE  
vs. CHANNEL TEMPERATURE



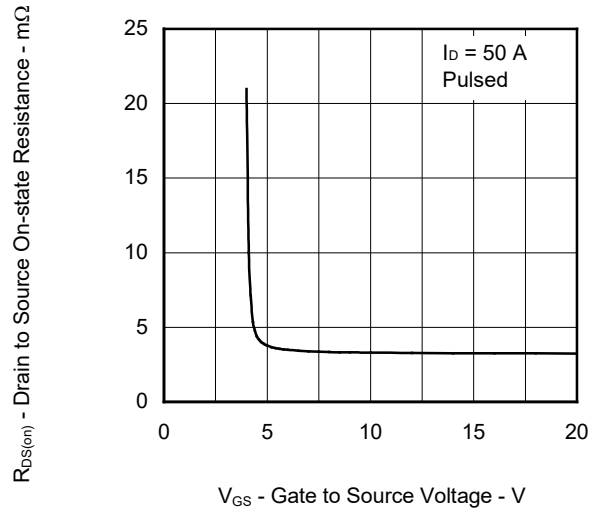
FORWARD TRANSFER ADMITTANCE vs.  
DRAIN CURRENT



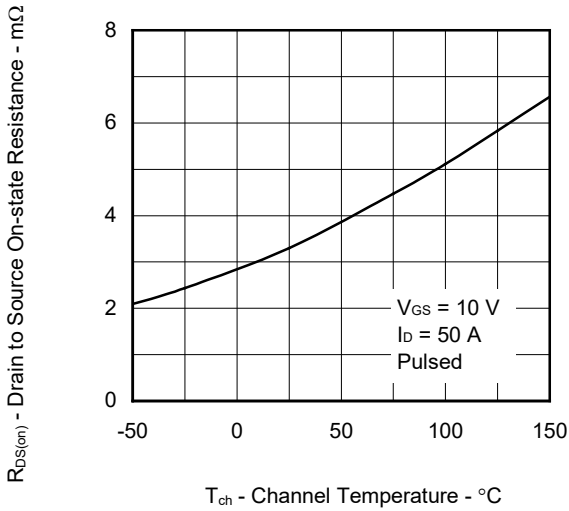
DRAIN TO SOURCE ON-STATE RESISTANCE  
vs. DRAIN CURRENT



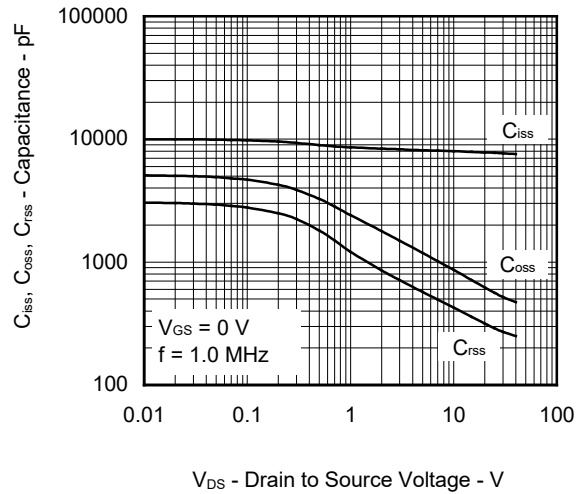
DRAIN TO SOURCE ON-STATE RESISTANCE  
vs. GATE TO SOURCE VOLTAGE



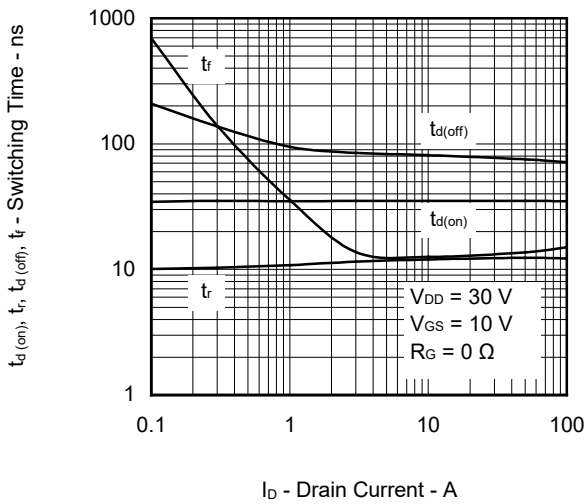
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



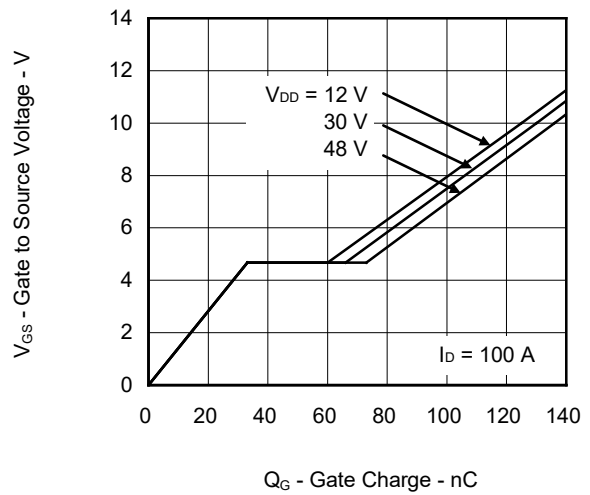
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



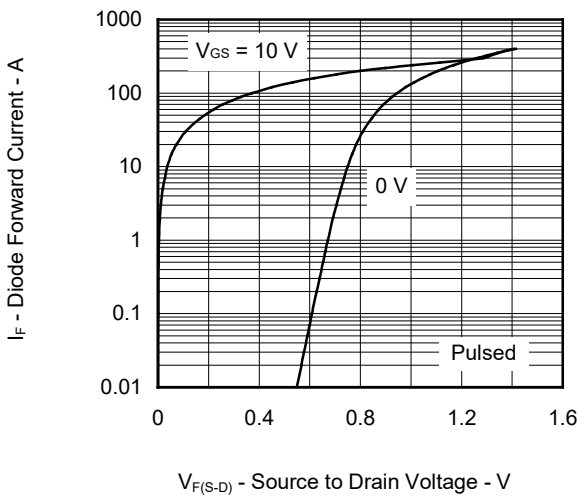
SWITCHING CHARACTERISTICS



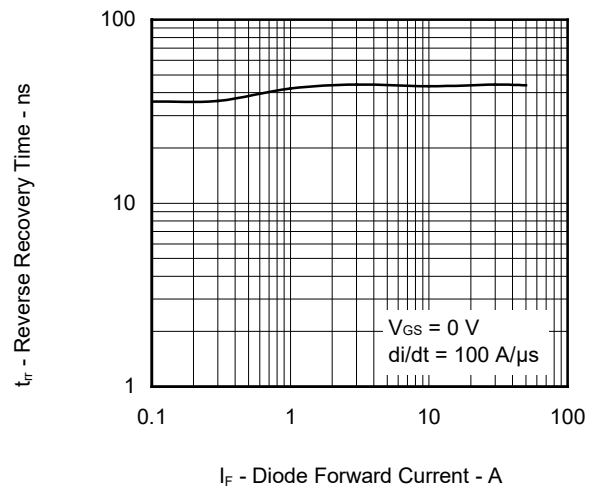
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



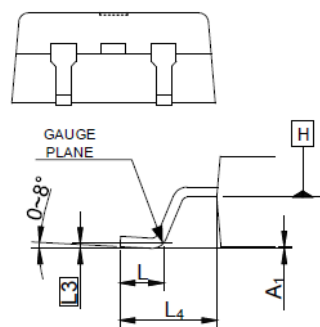
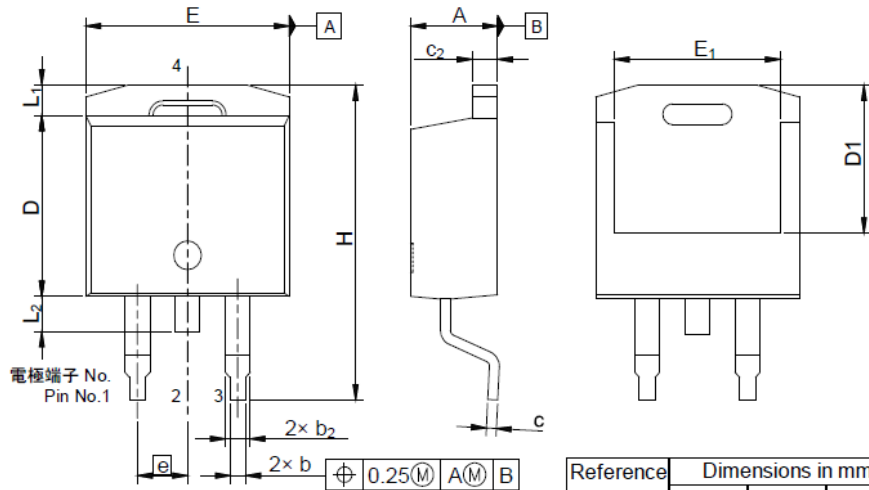
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



Package Drawing (Unit: mm)

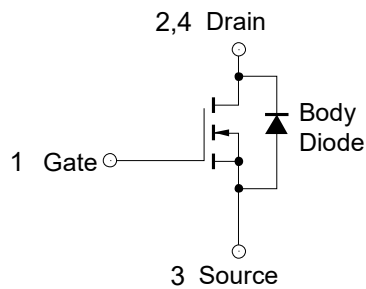
Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-263	—	PRSS0004AS-A	TO-263A	1.4

Unit: mm



Reference Symbol	Dimensions in mm		
	MIN.	NOM.	MAX.
A	4.20	-	4.60
A <sub>1</sub>	0.00	-	0.255
b	0.65	-	0.95
b <sub>2</sub>	1.12	-	1.42
c	0.381	-	0.737
c <sub>2</sub>	1.15	-	1.40
D	8.50	-	9.10
D <sub>1</sub>	6.90	-	7.50
E	10.05	-	10.65
E <sub>1</sub>	8.00	-	8.80
e	2.54 BSC		
H	15.00	-	15.60
L	1.90	-	2.50
L <sub>1</sub>	-	-	1.70
L <sub>2</sub>	-	-	1.78
L <sub>3</sub>	0.25 BSC		
L <sub>4</sub>	4.78	-	5.28

Equivalent Circuit



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9. 不可将瑞萨电子产品和技术用于或者嵌入日本国内或海外相应的法律法规所禁止生产、使用及销售的任何产品或系统中。也不可将瑞萨电子产品或技术用于(1)与大规模杀伤性武器（例如核武器、化学武器、生物武器或运载此类武器的导弹，包括无人机(UAV)）的开发、设计、制造、使用、存储等相关的任何目的；(2)与常规武器的开发、设计、制造或使用相关的任何目的；(3)扰乱国际和平与安全的任何其他目的，并且不可向任何第三方销售、出口、租赁、转让、或让与瑞萨电子产品或技术，无论直接或间接地或者有理由知悉该第三方或任何其他方将从上述活动。用户必须遵守对各方或交易行司法管辖权的任意国家/地区政府所公布和管理的任何适用出口管制法律法规。
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