N0603N

N-channel MOSFET
60 V, 100 A, 4.6 mΩ

R07DS0559EJ0200
Rev.2.00
2020.06.10

Features

- Low on-state resistance : $R_{DS(on)}$ = 4.6 mΩ MAX. (V_{GS} = 10 V, I_D = 50 A)
- Low C_{iss} : C_{iss} = 7730 pF TYP. (V_{DS} = 25 V, V_{GS} = 0 V)
- High current : $I_{D(DC)}$ = ±100 A
- RoHS Compliant
- Quality Grade : Standard
- Applications : For high current switching

Ordering Information

Part No.	Package	Packing
N0603N-S23-AY	TO-262, Pb-free Note1	50 pcs / Magazine (Tube)

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

Absolute Maximum Ratings (T_A = 25°C)

Item	Symbol	Ratings	Unit
Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	60	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±100	A
Drain Current (pulse) Note2	$I_{D(pulse)}$	±400	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	156	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	−55 to +150	°C
Single Avalanche Current Note3	I_{AS}	55	A
Single Avalanche Energy Note3	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 ≤ 10 μs, Duty Cycle ≤ 1%

3. Starting T_{ch} = 25°C, R_G = 25 Ω, V_{DD} = 30 V, V_{GS} = 20 → 0 V, L = 100 μH

Thermal Resistance

Item	Symbol	Max. Value Note4	Unit
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.80	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	°C/W

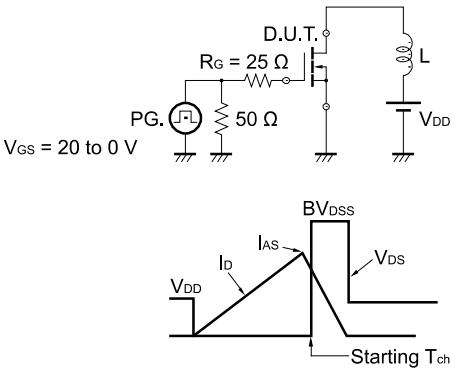
Notes: 4. This data is the designed target maximum value on Renesas's measurement condition. (Not tested)

Electrical Characteristics (T_A = 25°C)

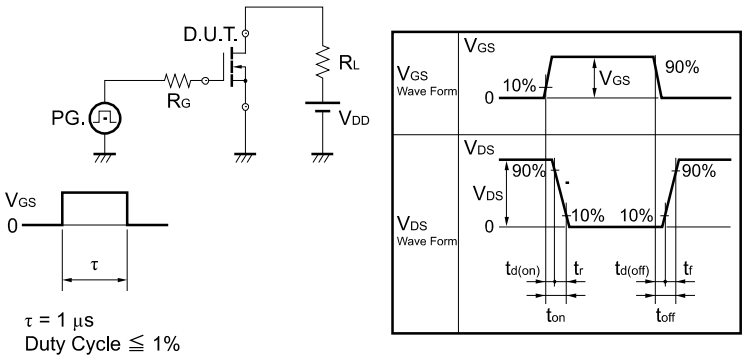
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	V_{DS} = 60 V, V_{GS} = 0 V
Gate Leakage Current	I_{GSS}			±100	nA	V_{GS} = ±20 V, V_{DS} = 0 V
Gate to Source Cut-off Voltage	$V_{GS(off)}$	2.0		4.0	V	V_{DS} = 10 V, I_D = 1 mA
Forward Transfer Admittance Note5	$\|y_{fs}\|$	35			S	V_{DS} = 10 V, I_D = 50 A
Drain to Source On-state Resistance Note5	$R_{DS(on)}$		3.7	4.6	mΩ	V_{GS} = 10 V, I_D = 50 A
Input Capacitance	C_{iss}		7730		pF	V_{DS} = 25 V,
Output Capacitance	C_{oss}		560		pF	V_{GS} = 0 V,
Reverse Transfer Capacitance	C_{rss}		290		pF	f = 1 MHz
Turn-on Delay Time	$t_{d(on)}$		35		ns	V_{DD} = 30 V, I_D = 50 A,
Rise Time	t_r		12		ns	V_{GS} = 10 V,
Turn-off Delay Time	$t_{d(off)}$		76		ns	R_G = 0 Ω
Fall Time	t_f		14		ns	
Total Gate Charge	Q_G		133		nC	V_{DD} = 48 V,
Gate to Source Charge	Q_{GS}		38		nC	V_{GS} = 10 V,
Gate to Drain Charge	Q_{GD}		38		nC	I_D = 100 A
Body Diode Forward Voltage Note5	$V_{F(S-D)}$			1.5	V	I_F = 100 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}		44		ns	I_F = 50 A, V_{GS} = 0 V,
Reverse Recovery Charge	Q_{rr}		61		nC	di/dt = 100 A/μs

Notes: 5. Pulsed test

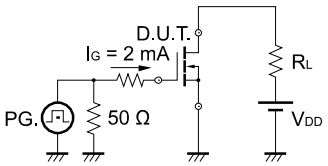
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

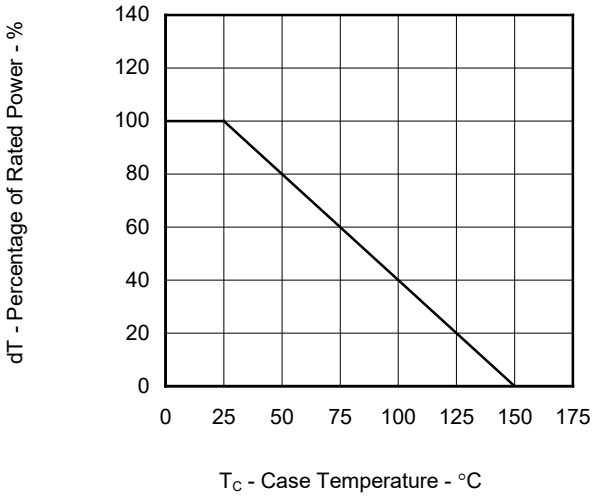


TEST CIRCUIT 3 GATE CHARGE

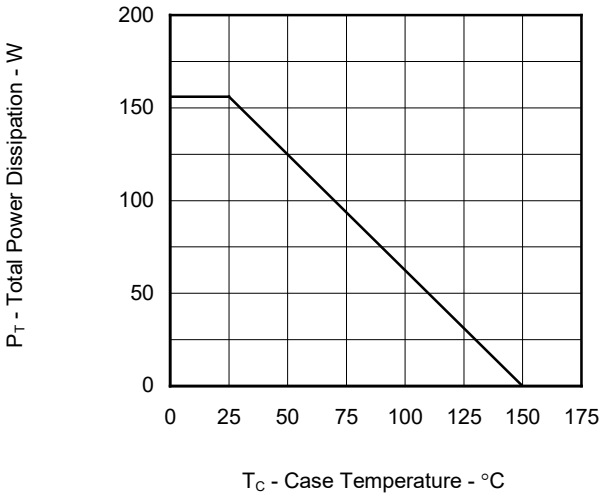


Typical Characteristics Note6

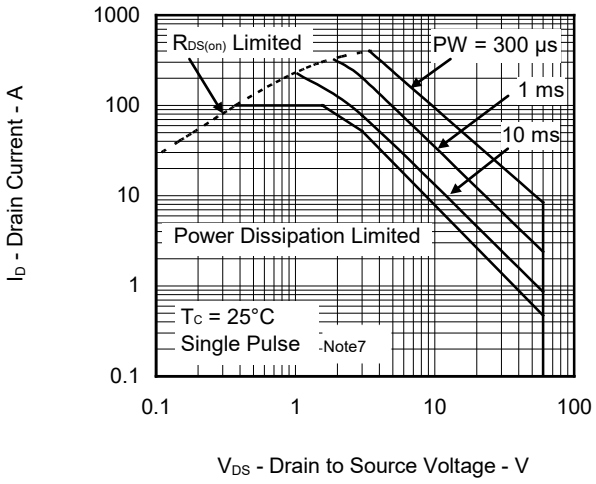
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



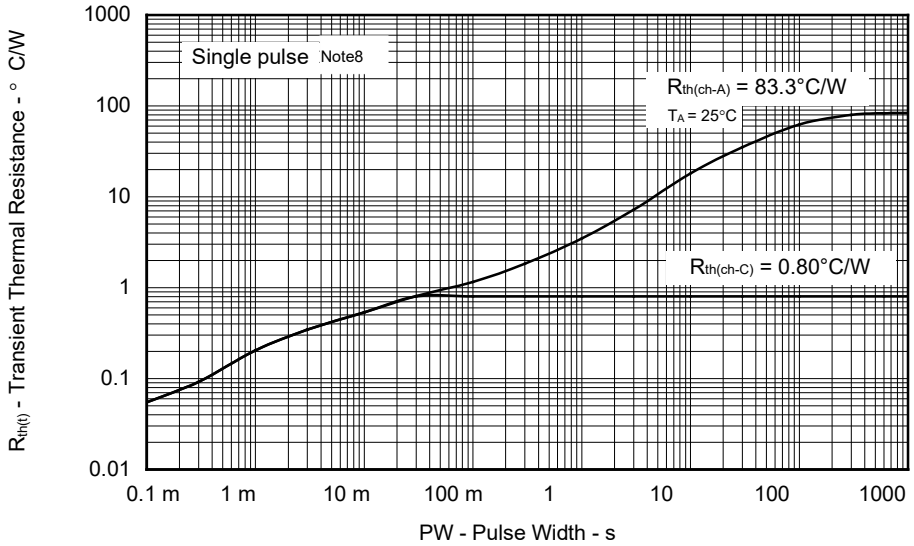
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

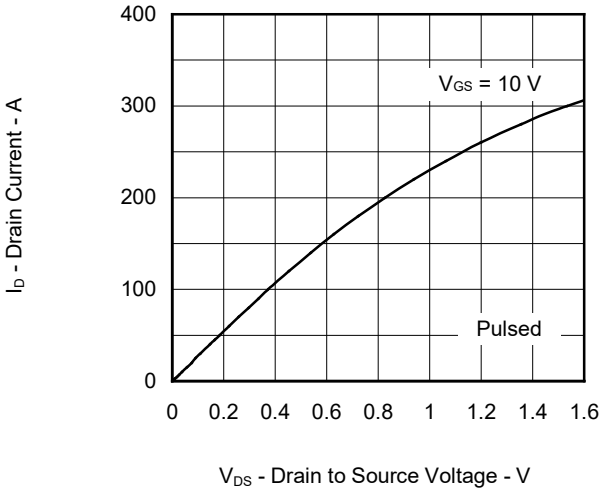


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

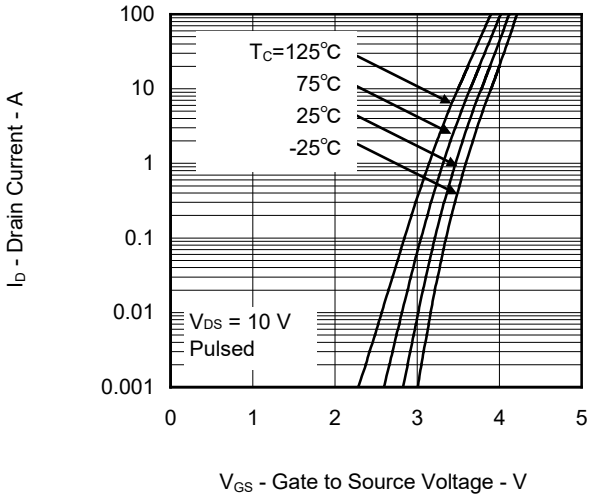


Notes: 6. Designed target value on Renesas measurement condition. (T_C = 25°C, unless otherwise specified)
7. This data is the designed value on Renesas's measurement condition. Renesas recommends that operating conditions are designed according to a document "Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)".
8. This data is the designed target maximum value on Renesas's measurement condition.

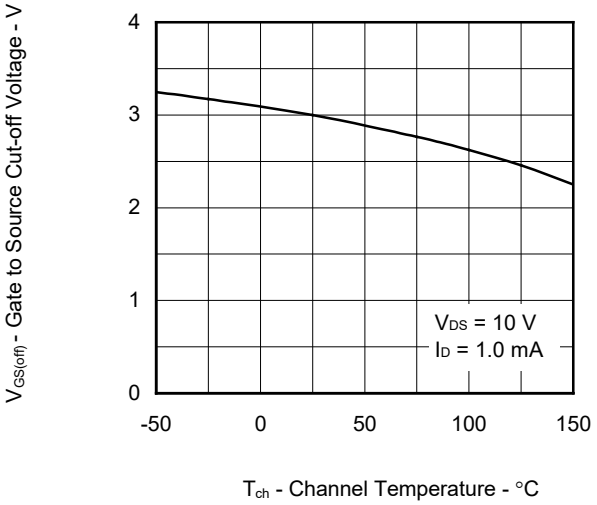
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



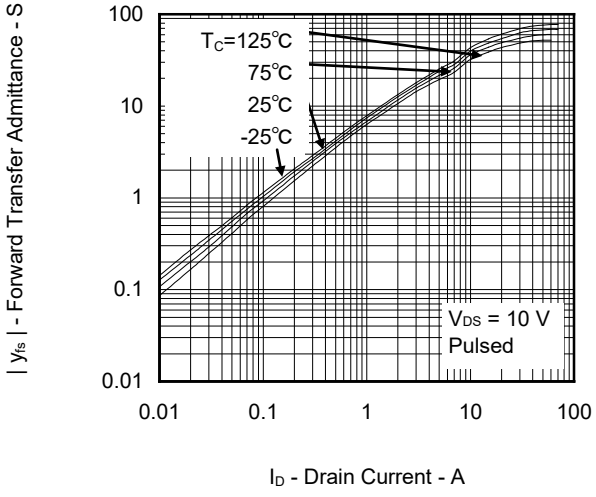
FORWARD TRANSFER
CHARACTERISTICS



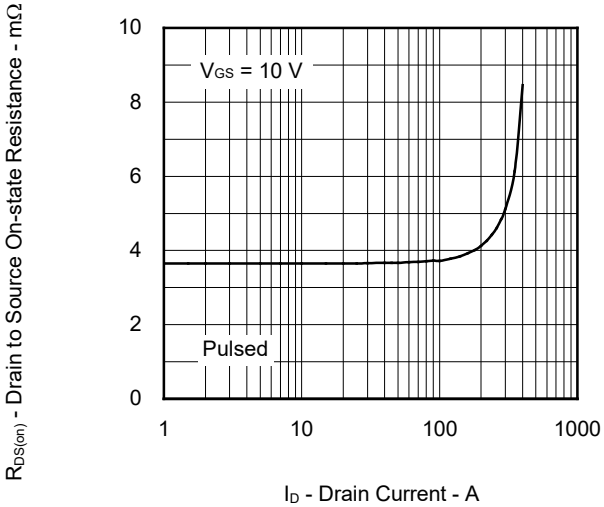
GATE TO SOURCE CUT-OFF VOLTAGE
vs. CHANNEL TEMPERATURE



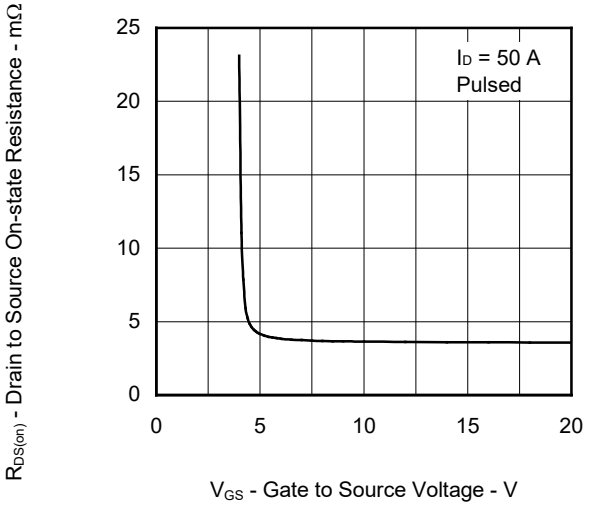
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



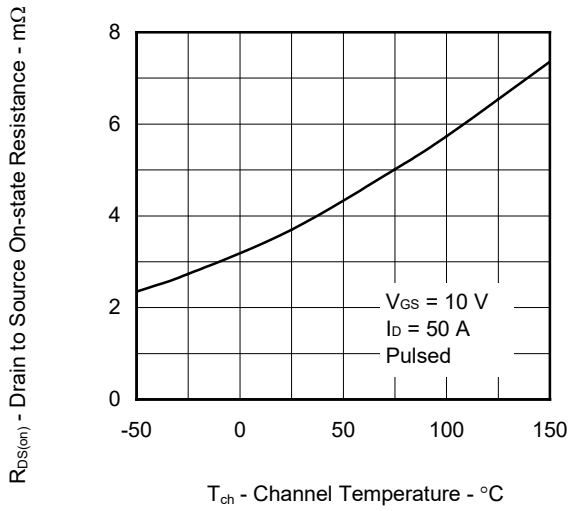
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



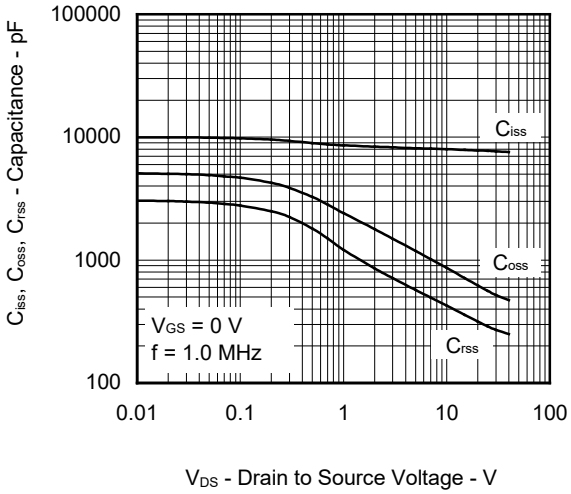
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. GATE TO SOURCE VOLTAGE



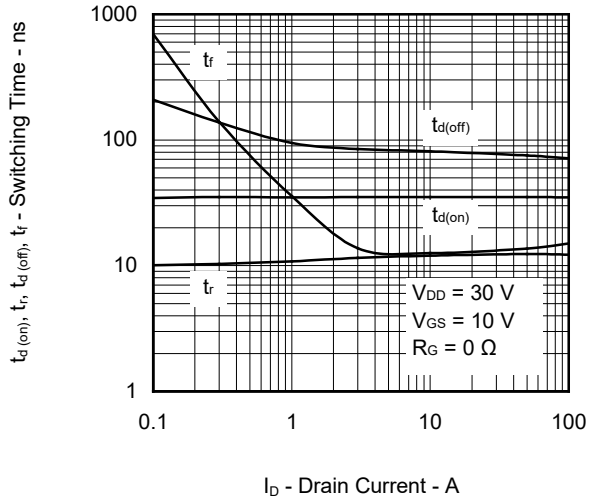
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



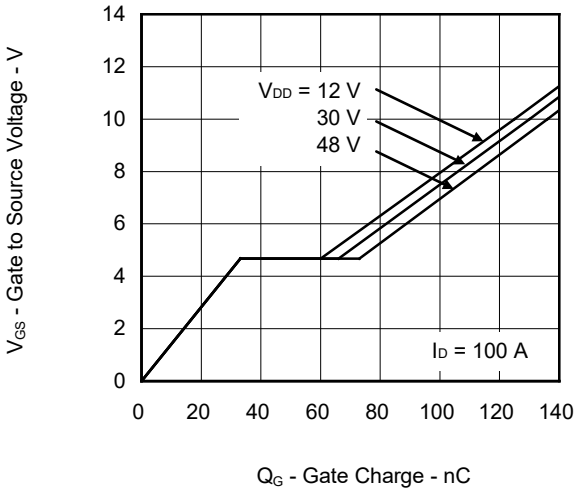
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



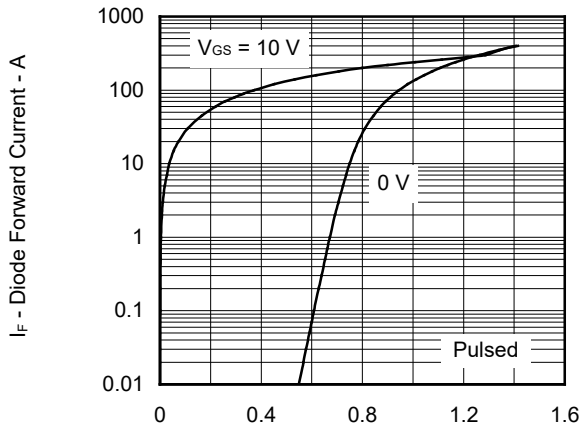
SWITCHING CHARACTERISTICS



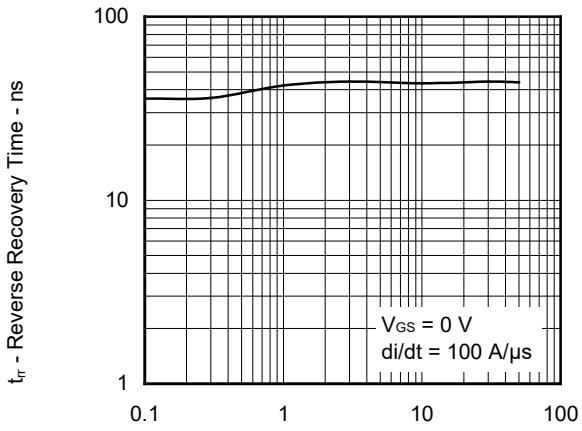
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



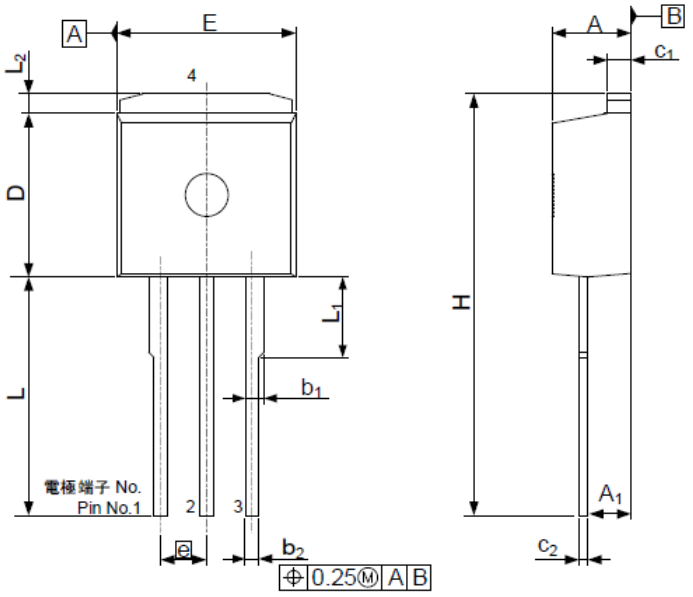
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

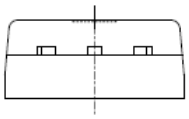


Package Drawing (Unit: mm)

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-262	—	PRSS0004AR-A	TO-262A	1.4

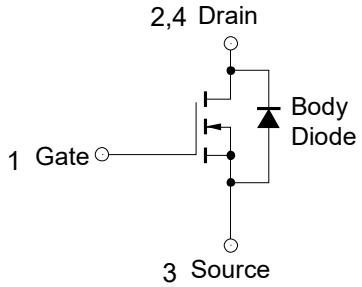
Unit: mm





Reference Symbol	Dimensions in mm		
	MIN.	NOM.	MAX.
A	4.20	4.40	4.60
A_1	2.05	2.40	2.75
b_1	0.635	1.05	1.40
b_2	0.64	0.75	0.88
c_1	1.14	1.30	1.40
c_2	0.33	0.50	0.60
D	8.50	9.25	9.65
E	9.65	10.00	10.37
e		2.54 BSC	
H	—	23.85	—
L	12.90	13.50	14.10
L_1	—	4.55	4.80
L_2	—	1.10	1.727

Equivalent Circuit



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6. 使用瑞萨电子产品时，请参阅最新产品信息（数据表、使用说明书、应用指南、可靠性手册中的“半导体元件处理和使用一般注意事项”等），并确保使用条件在瑞萨电子指定的最大额定值、电源工作电压范围、散热特性、安装条件等范围内使用。对于在上述指定范围之外使用瑞萨电子产品而产生的任何故障、失效或事故，瑞萨电子概不承担任何责任。
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8. 关于环境保护方面的详细内容，例如每种瑞萨电子产品的环境兼容性等，请与瑞萨电子的营业部门联系。用户负责仔细并充分查阅对管制物质的使用或含量进行管理的所有适用法律法规（包括但不限于《欧盟RoHS指令》），并在使用瑞萨电子产品时遵守所有适用法律法规。对于因用户未遵守相应法律法规而导致的损害或损失，瑞萨电子概不承担任何责任。
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、生物武器或运送此等武器的导弹，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，无论直接或间接知悉或者有理由知悉该第三方或任何其他方将从事上述活动。用户必须遵守对各方或交易行使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。
10. 瑞萨电子产品的买方或分销商，或者分销、处置产品、或以其他方式向第三方出售或转让产品的任何其他方有责任事先向所述第三方通知本文档规定的内容和条件。
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12. 如果对本文档所记载的信息或瑞萨电子产品有任何疑问，请向瑞萨电子的营业部门咨询。

（注1） 瑞萨电子：在本文档中指瑞萨电子株式会社及其控股子公司。
（注2） 瑞萨电子产品：指瑞萨电子开发或生产的任何产品。

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