N0439N

N-channel MOSFET
40 V, 90 A, 3.3 mΩ

R07DS1065EJ0200
Rev.2.00
2020.6.10

Features

- Low on-state resistance : $R_{DS(on)}$ = 3.3 mΩ MAX. (V_{GS} = 10 V, I_D = 45 A)
- Low C_{iss} : C_{iss} = 3900 pF TYP. (V_{DS} = 25 V, V_{GS} = 0 V)
- High current : $I_{D(DC)}$ = ±90 A
- RoHS Compliant
- Quality Grade : Standard
- Applications : For high current switching

Ordering Information

Part No.	Package	Packing
N0439N-S19-AY	TO-220AB, 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}	40	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	± 20	V
Drain Current (DC) (T_C = 25 °C)	$I_{D(DC)}$	± 90	A
Drain Current (pulse) Note2	$I_{D(pulse)}$	± 360	A
Total Power Dissipation (T_C = 25 °C)	P_{T1}	147	W
Total Power Dissipation (T_A = 25 °C)	P_{T2}	1.8	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	-55 to 175	°C
Single Avalanche Current Note3	I_{AS}	37	A
Single Avalanche Energy Note3	E_{AS}	136	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. T_C=25°C, Pw ≤ 10 μs, Duty Cycle ≤ 1%

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

Thermal Resistance

Item	Symbol	Max. Value Note4	Unit
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.02	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	°C/W

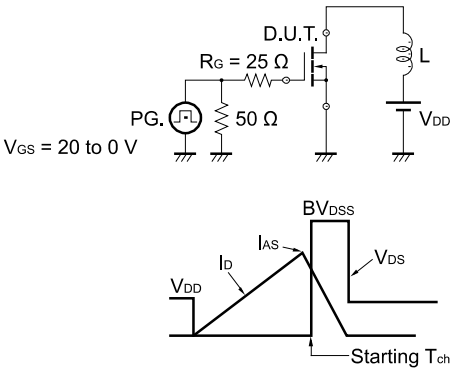
Notes: 4. This data is the designed target maximum value on Renesas's measurement condition. (Not tested)

Electrical Characteristics (T_A = 25°C)

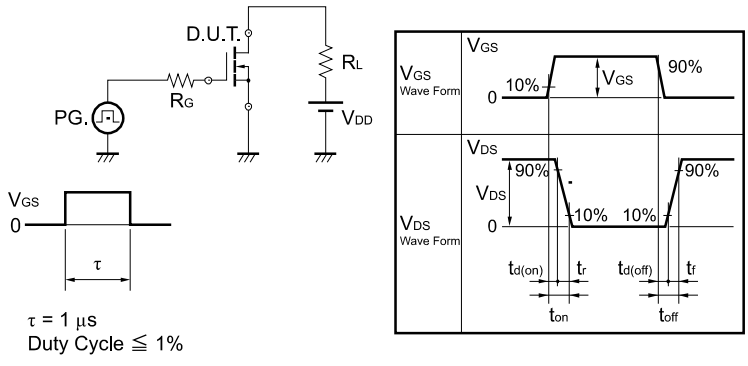
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	V_{DS} = 40 V, V_{GS} = 0 V
Gate Leakage Current	I_{GSS}			±100	nA	V_{GS} = ±20 V, V_{DS} = 0 V
Gate to Source Threshold Voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	V_{DS} = V_{GS}, I_D = 250 μA
Forward Transfer Admittance Note5	$\|y_{fs}\|$	30			S	V_{DS} = 5 V, I_D = 45 A
Drain to Source On-state Resistance Note5	$R_{DS(on)}$		2.75	3.30	mΩ	V_{GS} = 10 V, I_D = 45 A
Input Capacitance	C_{iss}		3900		pF	V_{DS} = 25 V,
Output Capacitance	C_{oss}		530		pF	V_{GS} = 0 V,
Reverse Transfer Capacitance	C_{rss}		200		pF	f = 1 MHz
Turn-on Delay Time	$t_{d(on)}$		25		ns	V_{DD} = 20 V, I_D = 45 A,
Rise Time	t_r		12		ns	V_{GS} = 10 V,
Turn-off Delay Time	$t_{d(off)}$		65		ns	R_G = 0 Ω
Fall Time	t_f		8		ns	
Total Gate Charge	Q_G		68		nC	V_{DD} = 32 V,
Gate to Source Charge	Q_{GS}		18		nC	V_{GS} = 10 V,
Gate to Drain Charge	Q_{GD}		18		nC	I_D = 90 A
Body Diode Forward Voltage Note5	$V_{F(S-D)}$			1.5	V	I_F = 90 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}		47		ns	I_F = 90 A, V_{GS} = 0 V,
Reverse Recovery Charge	Q_{rr}		68		nC	di/dt = 100 A/μs

Notes: 5. Pulsed test

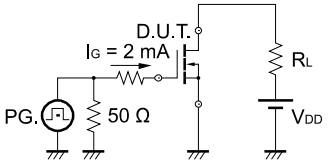
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

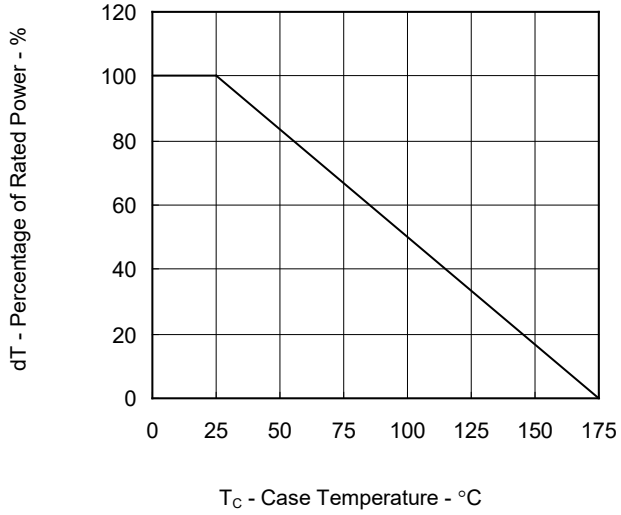


TEST CIRCUIT 3 GATE CHARGE

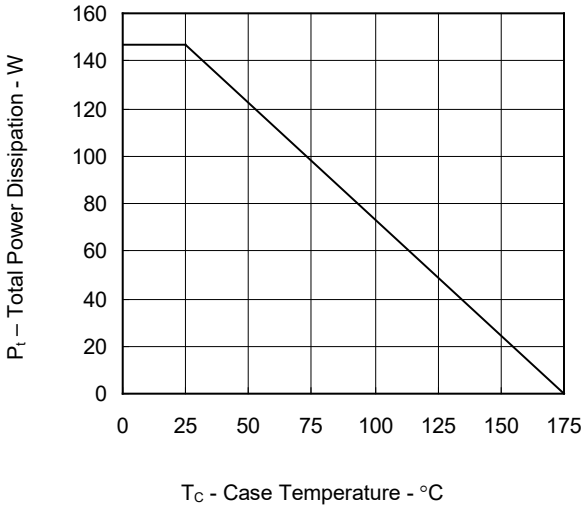


Typical Characteristics Note6

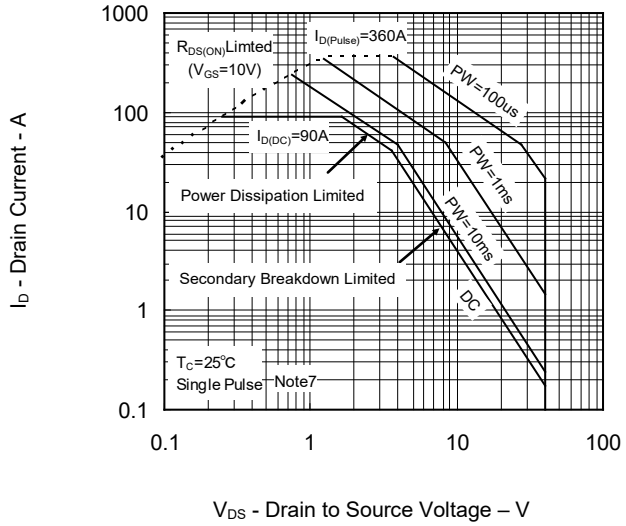
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



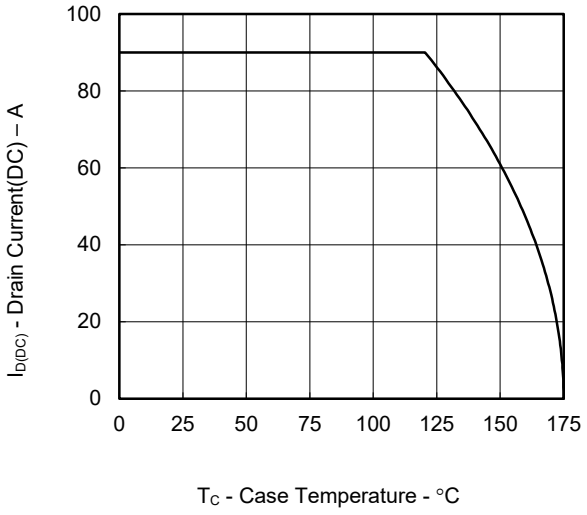
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



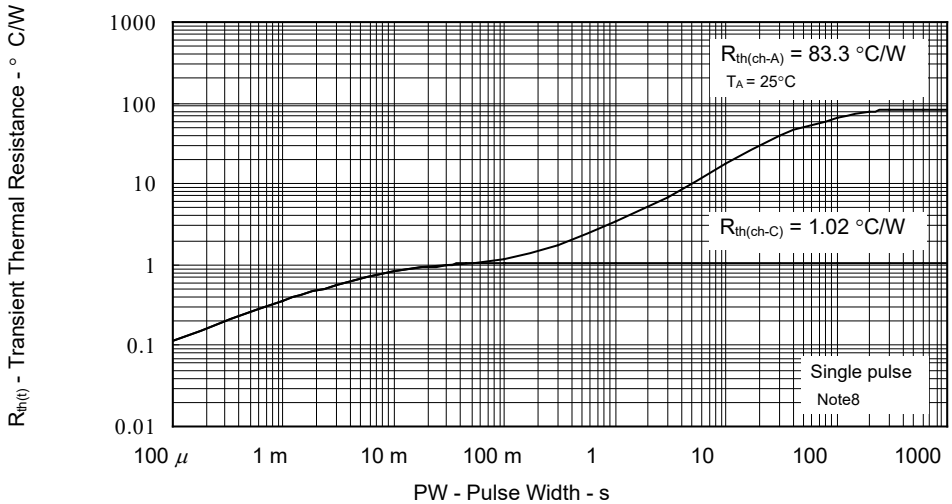
FORWARD BIAS SAFE OPERATING AREA



DRAIN CURRENT(DC) vs. CASE TEMPERATURE



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

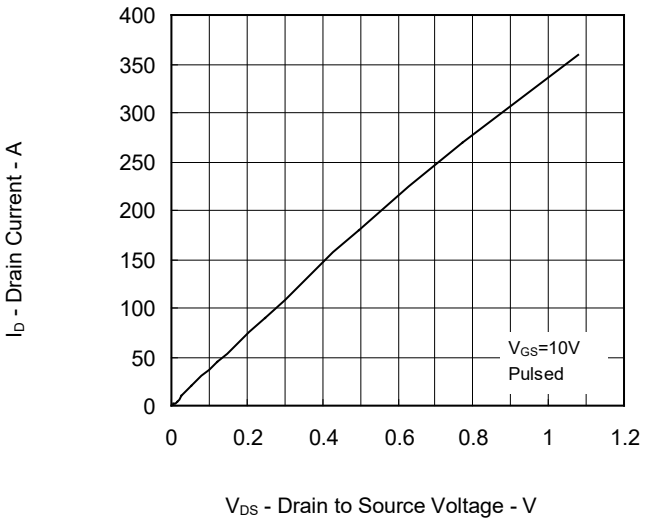


Notes: 6. Designed target value on Renesas measurement condition. (T_C = 25°C, unless otherwise specified)

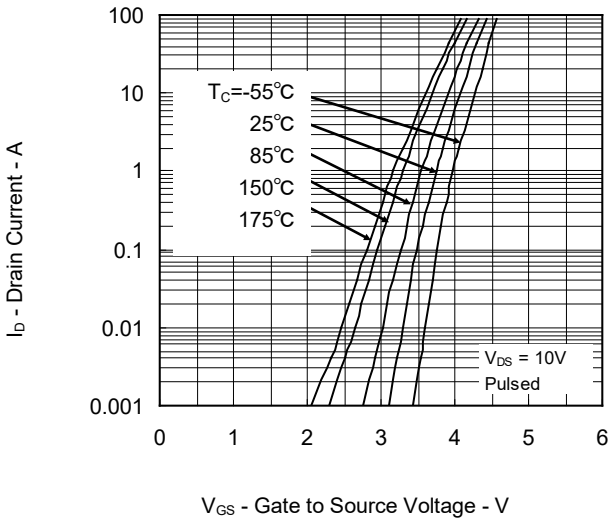
7. This data is the designed value on Renesas's measurement condition. Renesas recommends that operating conditions are designed according to a document "Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)".

8. This data is the designed target maximum value on Renesas's measurement condition.

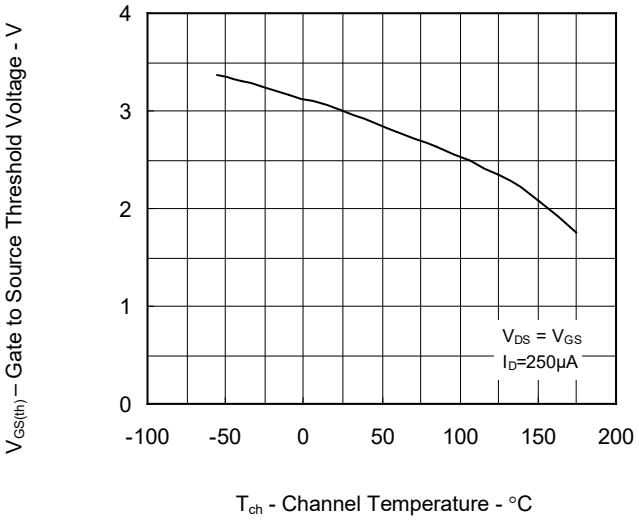
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



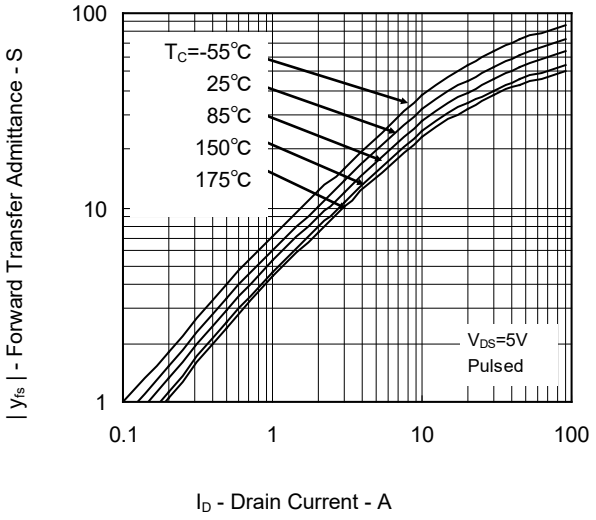
FORWARD TRANSFER
CHARACTERISTICS



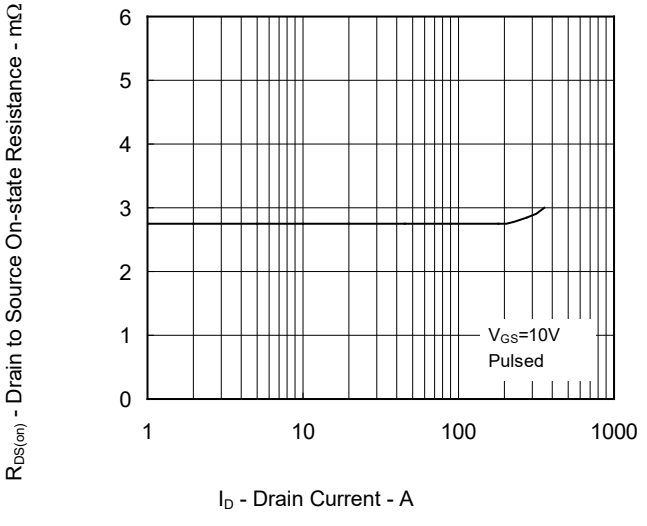
GATE TO SOURCE THRESHOLD VOLTAGE
vs. CHANNEL TEMPERATURE



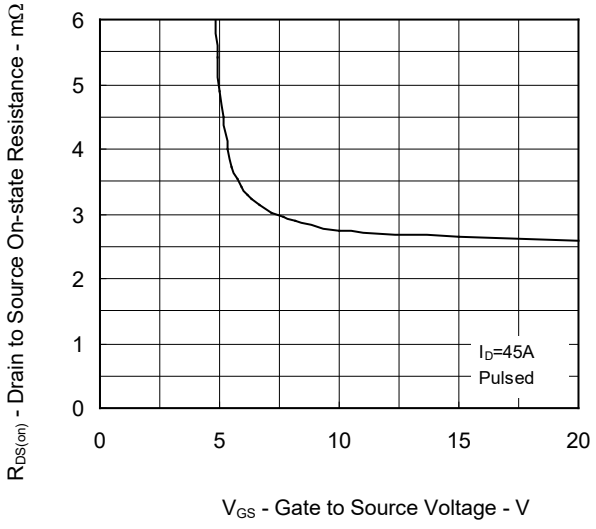
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



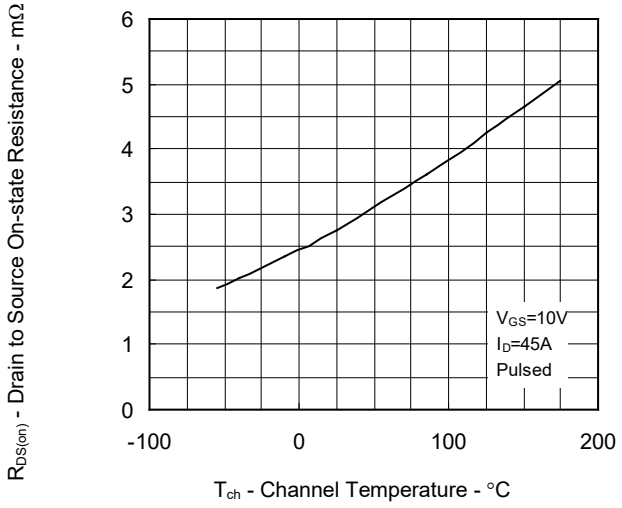
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



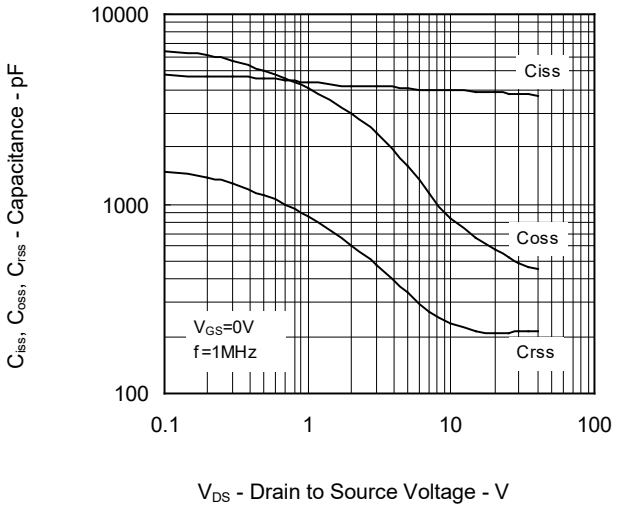
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. GATE TO SOURCE VOLTAGE



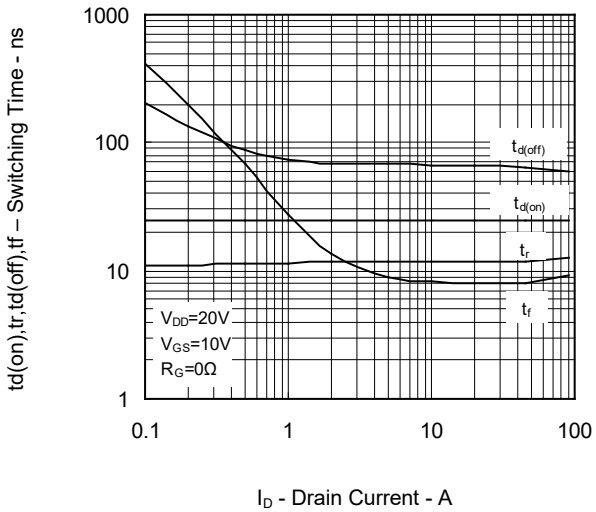
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



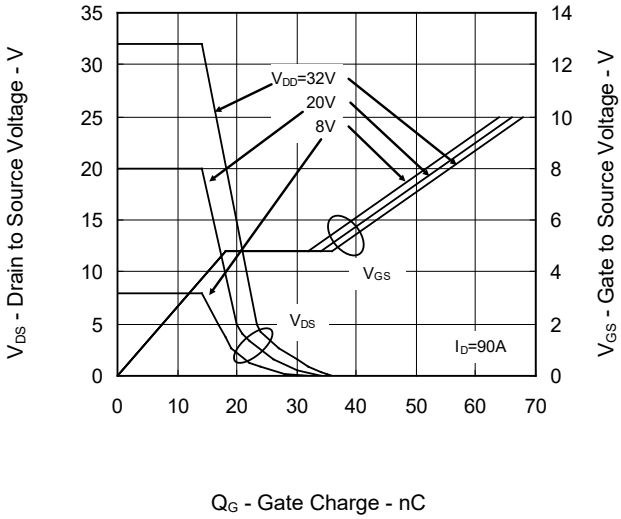
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



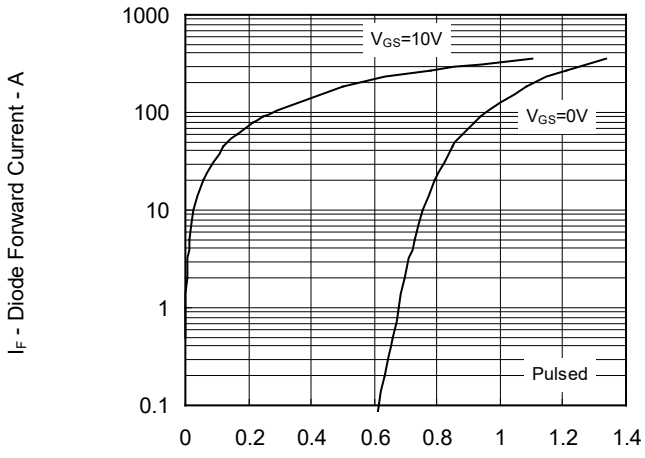
SWITCHING CHARACTERISTICS



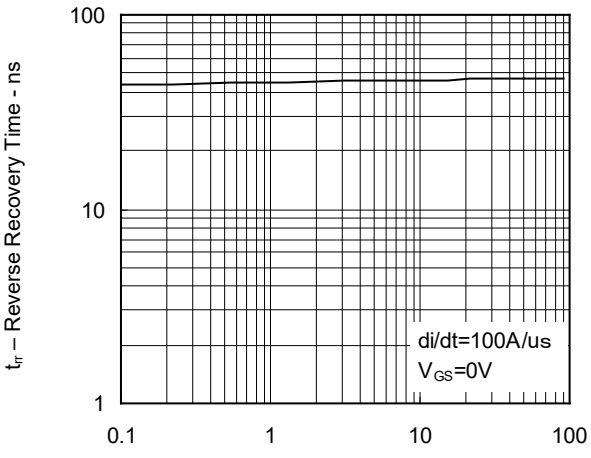
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



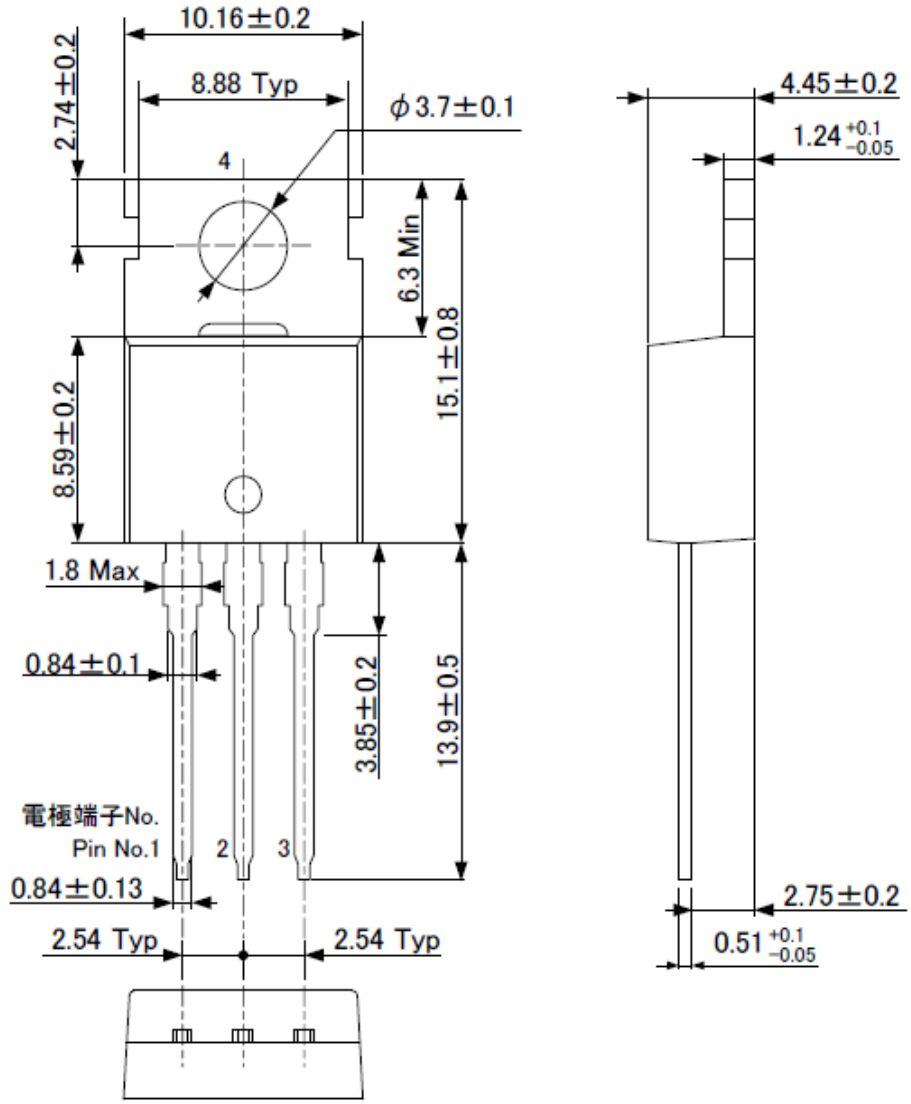
REVERSE RECOVERY TIME vs. DRAIN CURRENT



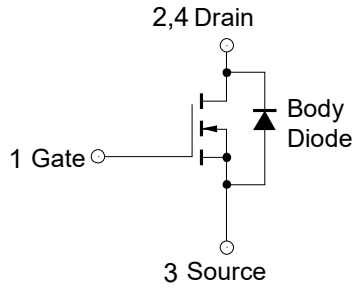
Package Drawings (Unit: mm)

JEDEC Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-220AB	PRSS0004AU-A	TO-220ABB	2.1

Unit: mm



Equivalent Circuit / Pin Assignment



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(Rev.4.0-1 November 2017)

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