

N0412N

N-channel MOSFET

40 V, 100 A, 3.7 mΩ

R07DS0554EJ0200

Rev.2.00

2020.6.10

Features

- Low on-state resistance : $R_{DS(on)} = 3.7 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$)
- Low C_{iss} : $C_{iss} = 5550 \text{ pF TYP.}$ ($V_{DS} = 25 \text{ V}$, $V_{GS} = 0 \text{ V}$)
- 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
N0412N-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 ($T_A = 25^\circ\text{C}$)

Item	Symbol	Ratings	Unit
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 100	A
Drain Current (pulse) ^{Note2}	$I_{D(pulse)}$	± 400	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	119	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 ^{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. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

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

Thermal Resistance

Item	Symbol	Max. Value ^{Note4}	Unit
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.05	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

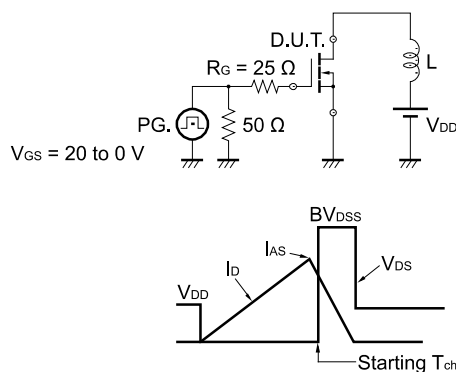
Notes: 4. This data is the designed target maximum value on Renesas's measurement condition. (Not tested)

Electrical Characteristics ($T_A = 25^\circ\text{C}$)

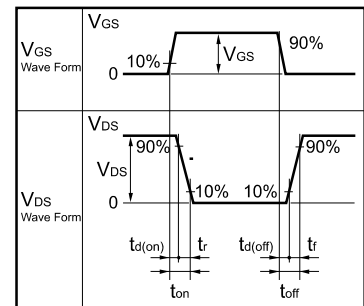
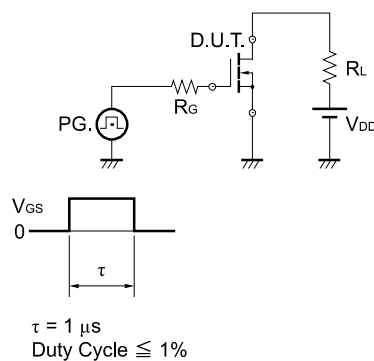
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$
Gate Leakage Current	I_{GSS}			± 100	nA	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$
Gate to Source Cut-off Voltage	$V_{GS(off)}$	2.0		4.0	V	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$
Forward Transfer Admittance ^{Note5}	$ y_{fs} $	26			S	$V_{DS} = 10\text{ V}$, $I_D = 50\text{ A}$
Drain to Source On-state Resistance ^{Note5}	$R_{DS(on)}$		2.7	3.7	$\text{m}\Omega$	$V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$
Input Capacitance	C_{iss}		5550		pF	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$
Output Capacitance	C_{oss}		580		pF	
Reverse Transfer Capacitance	C_{rss}		320		pF	
Turn-on Delay Time	$t_{d(on)}$		29.0		ns	$V_{DD} = 20\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 0\ \Omega$
Rise Time	t_r		15.0		ns	
Turn-off Delay Time	$t_{d(off)}$		64.0		ns	
Fall Time	t_f		13.0		ns	
Total Gate Charge	Q_G		100		nC	$V_{DD} = 32\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 100\text{ A}$
Gate to Source Charge	Q_{GS}		26		nC	
Gate to Drain Charge	Q_{GD}		32		nC	
Body Diode Forward Voltage ^{Note5}	$V_{F(S-D)}$			1.5	V	$I_F = 100\text{ A}$, $V_{GS} = 0\text{ V}$
Reverse Recovery Time	t_{rr}		40		ns	$I_F = 50\text{ A}$, $V_{GS} = 0\text{ V}$, $di/dt = 100\text{ A}/\mu\text{s}$
Reverse Recovery Charge	Q_{rr}		44		nC	

Notes: 5. Pulsed test

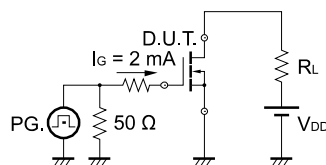
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

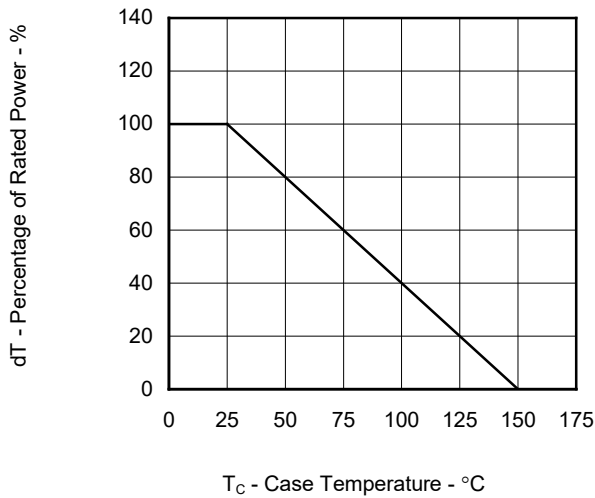


TEST CIRCUIT 3 GATE CHARGE

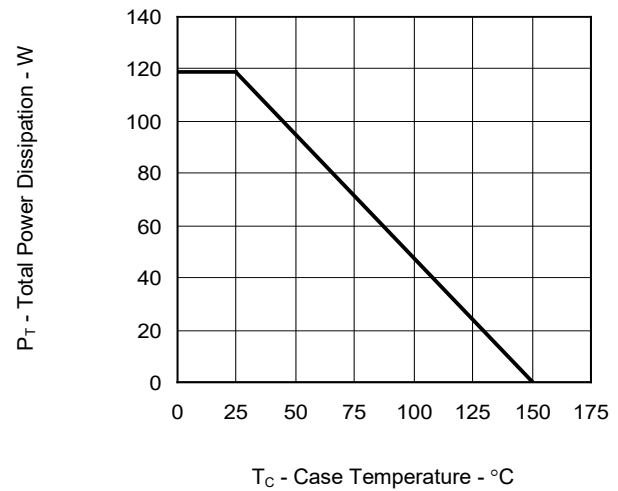


Typical Characteristics Note6

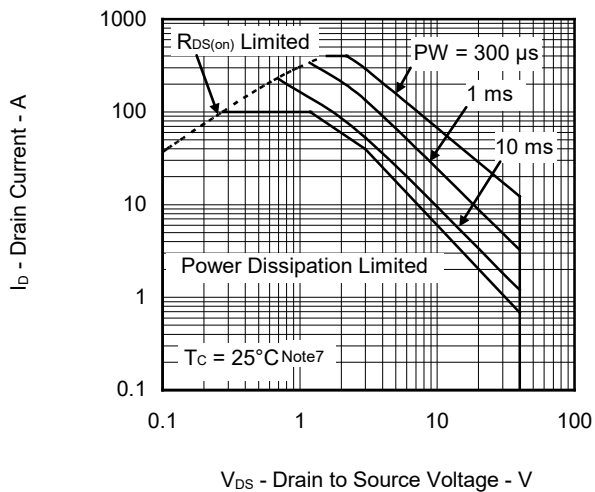
DERATING FACTOR OF FORWARD BIAS
SAFE OPERATING AREA



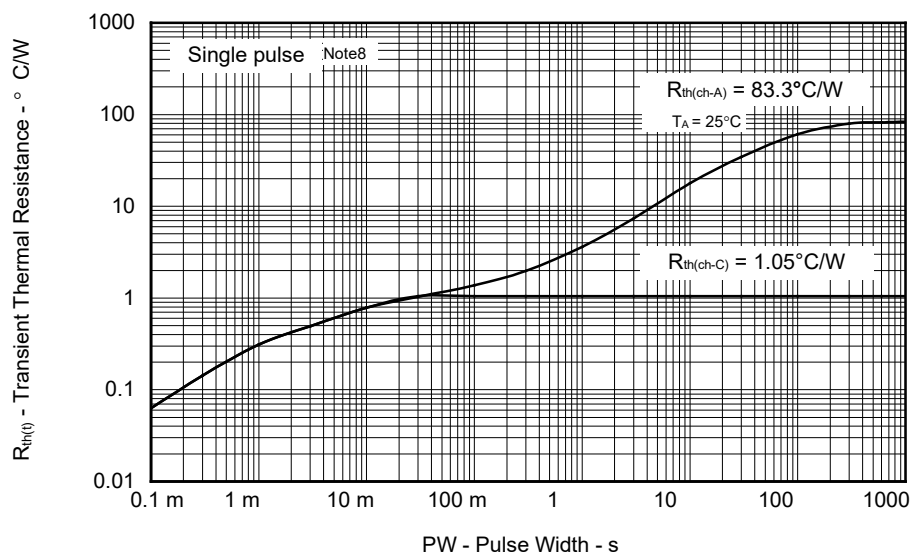
TOTAL POWER DISSIPATION vs.
CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA



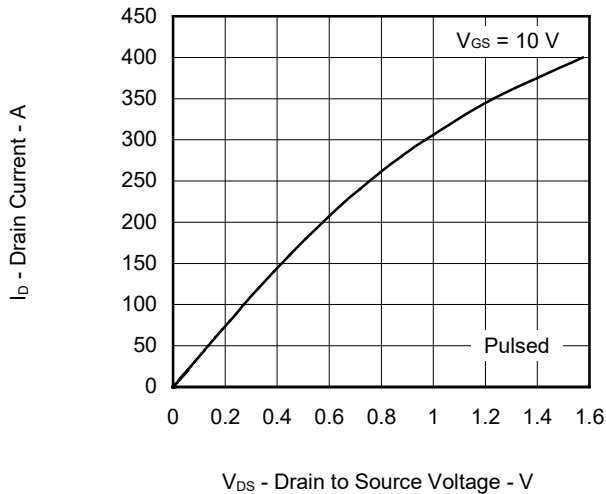
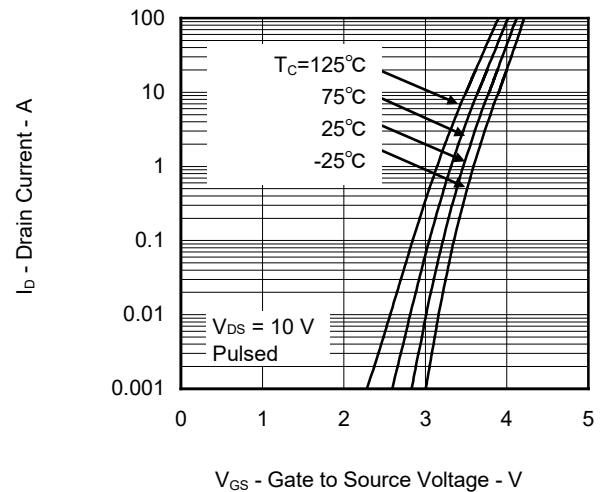
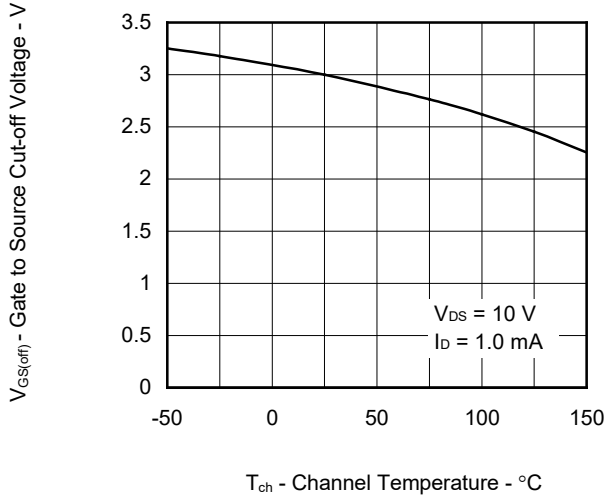
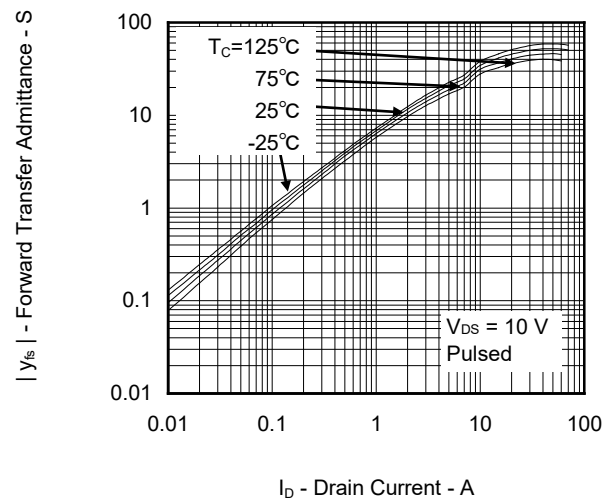
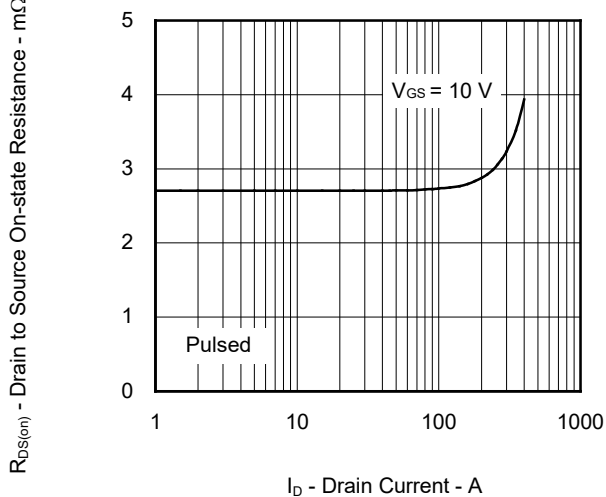
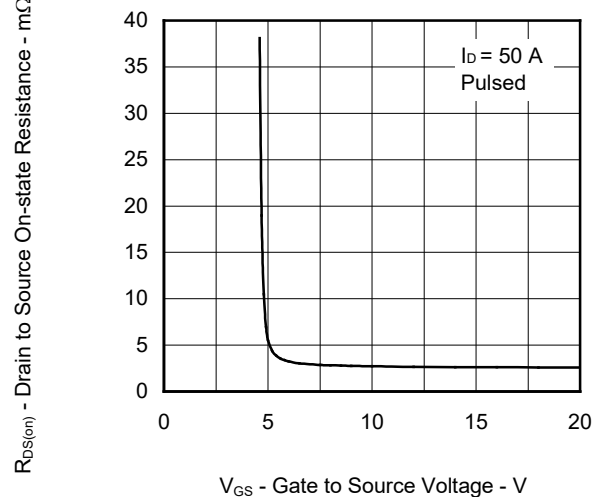
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

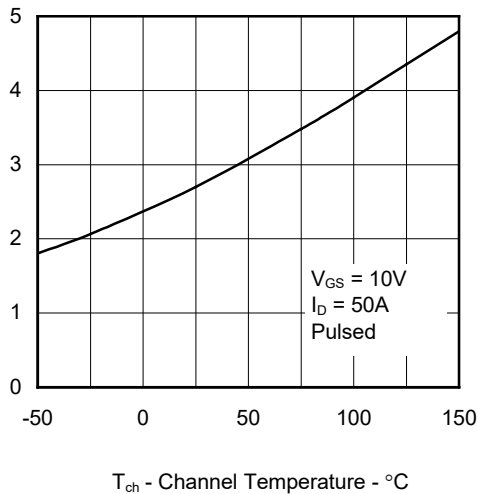
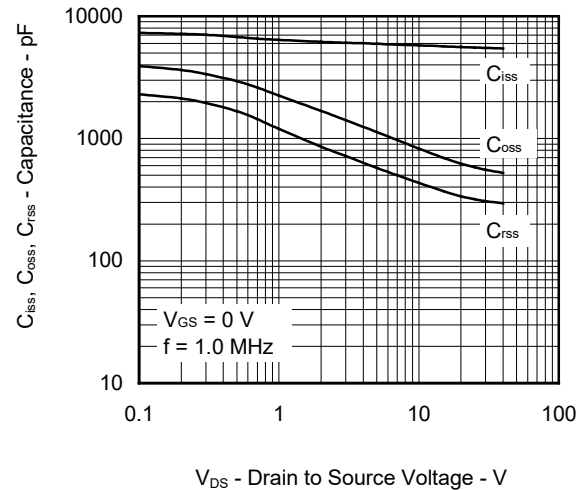


Notes: 6. Designed target value on Renesas measurement condition. ($T_C = 25^\circ\text{C}$, unless otherwise specified)

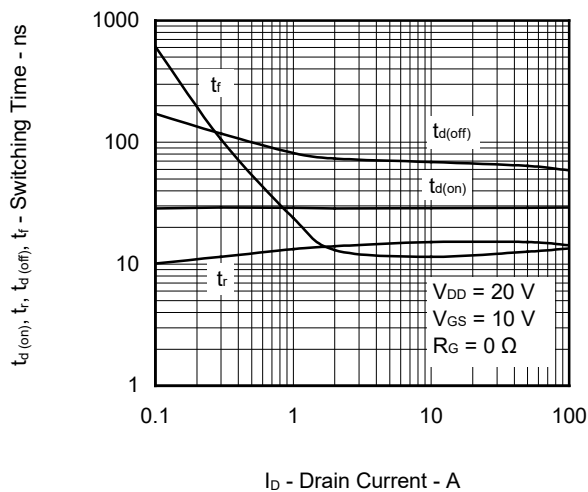
7. This data is the designed value on Renesas's measurement condition. Renesas recommends that operating conditions are designed according to a document "Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)".

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

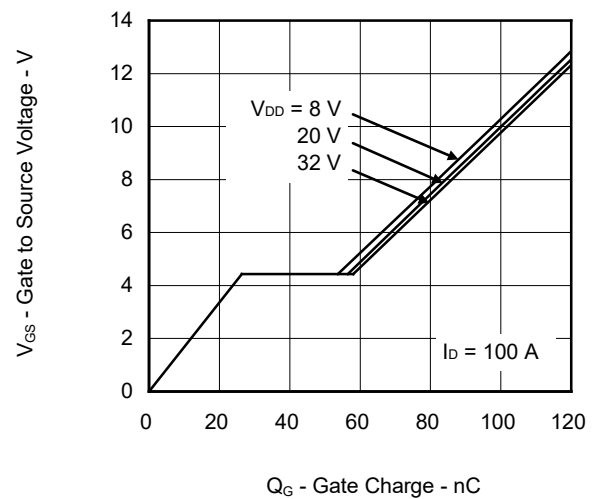
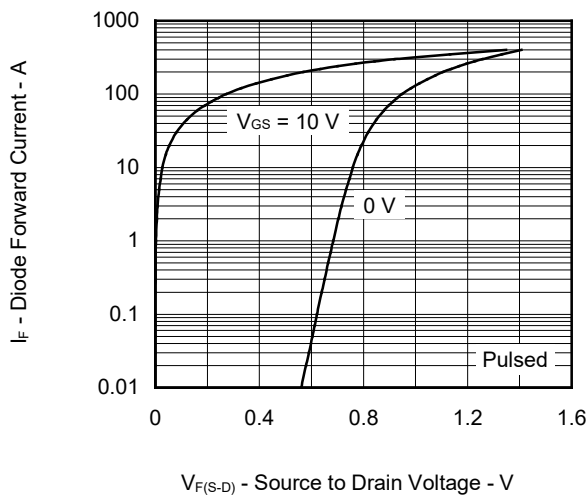
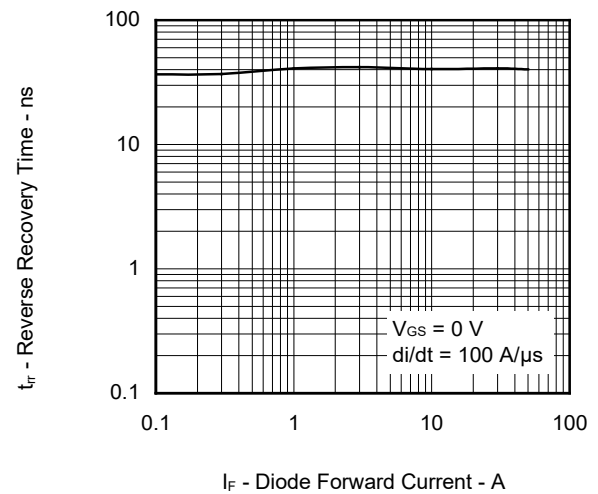
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGEFORWARD TRANSFER
CHARACTERISTICSGATE TO SOURCE CUT-OFF VOLTAGE
vs. CHANNEL TEMPERATUREFORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE
vs. GATE TO SOURCE VOLTAGE

$R_{DS(on)}$ - Drain to Source On-state Resistance - m Ω DRAIN TO SOURCE ON-STATE RESISTANCE
vs. CHANNEL TEMPERATURECAPACITANCE vs. DRAIN TO
SOURCE VOLTAGE

SWITCHING CHARACTERISTICS



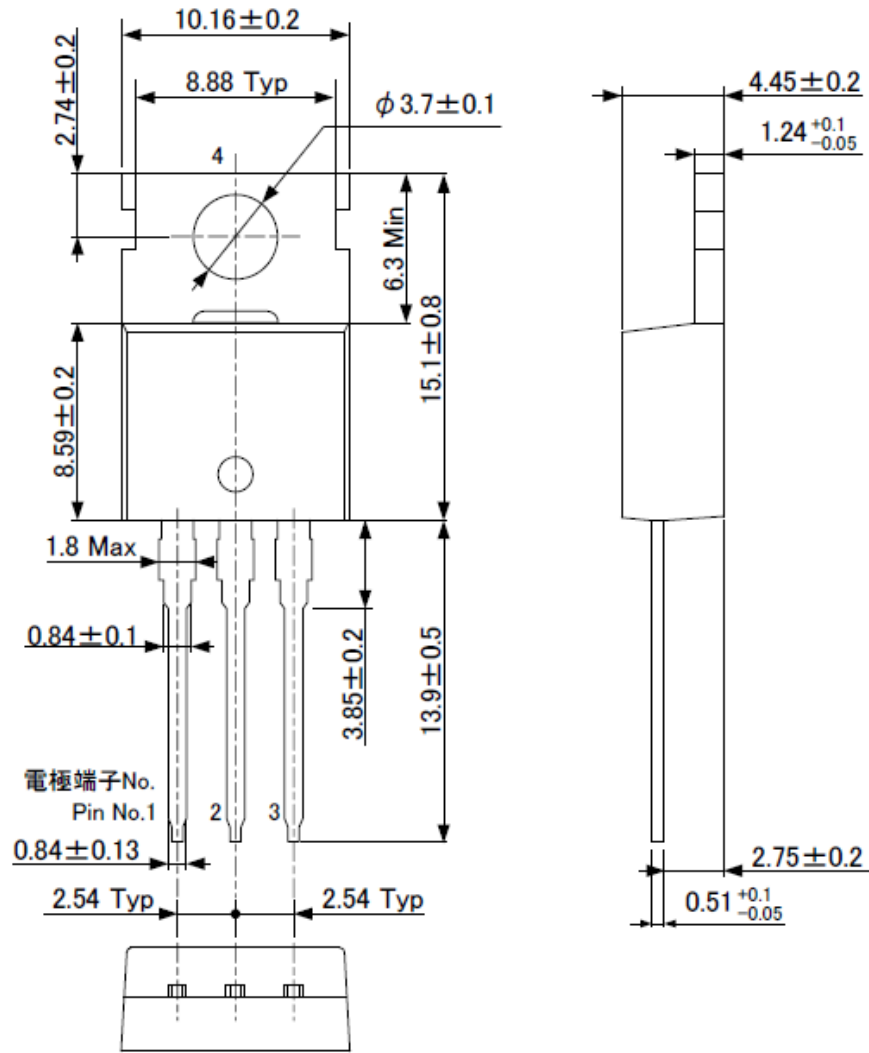
DYNAMIC INPUT CHARACTERISTICS

SOURCE TO DRAIN DIODE FORWARD
VOLTAGEREVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT

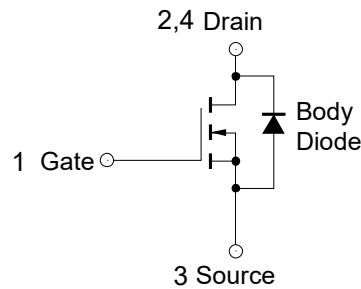
Package Drawing (Unit: mm)

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

Unit: mm



Equivalent Circuit



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