

# RBA250N04AHPF-4UA01

40V – 250A – N-channel Power MOS FET

Application : Automotive

R07DS1362EJ0300

Rev.3.00

Jul. 08, 2020

## Description

The RBA250N04AHPF-4UA01 is N-channel MOS Field Effect Transistor designed for high current switching applications.

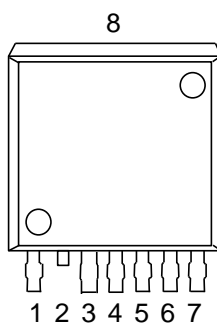
## Features

- Super low on-state resistance  
 $R_{DS(on)} = 0.85 \text{ m}\Omega \text{ MAX. ( } V_{GS} = 10 \text{ V, } I_D = 125\text{A )}$
- Low input capacitance  
 $C_{iss} = 12900\text{pF TYP. ( } V_{DS} = 25 \text{ V )}$
- Designed for automotive application and AEC-Q101 qualified
- Pb-free (This product does not contain Pb in the external electrode)

## Ordering Information

Part No.	Quantity	Shipping container
RBA250N04AHPF-4UA01#GB0	800pcs/reel	Taping

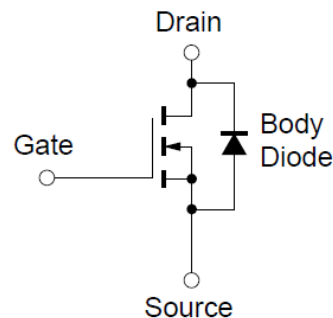
## Outline



1. Gate
2. Drain
- 3, 4, 5, 6, 7. Source
8. Drain (Fin)

TO-263-7pin-SHL\* (MP-25ZU)

\* Short Head & Lead



Equivalent circuit

**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

## Absolute Maximum Ratings

(T<sub>A</sub>=25°C)

Item	Symbol	Ratings	Unit
Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	40	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±20	V
Drain Current (DC) (T <sub>C</sub> = 25 °C)	I <sub>D(DC)</sub>	±250	A
Drain Current (pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±1000	A
Total Power Dissipation (T <sub>C</sub> = 25 °C)	P <sub>T1</sub>	348	W
Total Power Dissipation (T <sub>A</sub> = 25 °C)	P <sub>T2</sub>	1.8	W
Channel Temperature	T <sub>ch</sub>	175	°C
Storage Temperature	T <sub>stg</sub>	-55 to 175	°C
Repetitive Avalanche Current <sup>Note2</sup>	I <sub>AR</sub>	74	A
Repetitive Avalanche Energy <sup>Note3</sup>	E <sub>AR</sub>	547	mJ

Note 1. P<sub>W</sub> ≤ 10 μs, Duty Cycle ≤ 1%2. V<sub>GS</sub> = 20 → 0V, R<sub>G</sub> = 25 Ω3. L = 100μH, V<sub>DD</sub> = 20V, V<sub>GS</sub> = 20 → 0V, R<sub>G</sub> = 25 Ω

## Thermal Resistance

Channel to Case Thermal Resistance	R <sub>th(ch-C)</sub>	0.43	°C/W
Channel to Ambient Thermal Resistance	R <sub>th(ch-A)</sub>	83.3	°C/W

## 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> = 40 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 Threshold Voltage	V <sub>GS(th)</sub>	2.0	3.0	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA
Drain to Source On-state Resistance	R <sub>DS(on)</sub> <sup>Note4</sup>		0.72	0.85	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 125 A
Input Capacitance	C <sub>iss</sub> <sup>Note5</sup>		12900	19350	pF	V <sub>DS</sub> = 25 V V <sub>GS</sub> = 0 V f = 1 MHz
Output Capacitance	C <sub>oss</sub> <sup>Note5</sup>		1480	2220	pF	
Reverse Transfer Capacitance	C <sub>rss</sub> <sup>Note5</sup>		680	1220	pF	
Turn-on Delay Time	t <sub>d(on)</sub> <sup>Note5</sup>		45	90	ns	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 125 A V <sub>GS</sub> = 10 V
Rise Time	t <sub>r</sub> <sup>Note5</sup>		20	50	ns	
Turn-off Delay Time	t <sub>d(off)</sub> <sup>Note5</sup>		148	296	ns	R <sub>G</sub> = 0 Ω
Fall Time	t <sub>f</sub> <sup>Note5</sup>		26	65	ns	
Total Gate Charge	Q <sub>G</sub> <sup>Note5</sup>		245	368	nC	V <sub>DD</sub> = 32 V V <sub>GS</sub> = 10 V I <sub>D</sub> = 250A
Gate to Source Charge	Q <sub>GS</sub> <sup>Note5</sup>		56		nC	
Gate to Drain Charge	Q <sub>GD</sub> <sup>Note5</sup>		77		nC	
Body Diode Forward Voltage	V <sub>F(S-D)</sub> <sup>Note4</sup>		0.9	1.5	V	I <sub>F</sub> = 250 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub> <sup>Note5</sup>		94		ns	I <sub>F</sub> = 250 A, V <sub>GS</sub> = 0 V
Reverse Recovery Charge	Q <sub>rr</sub> <sup>Note5</sup>		112		nC	di/dt = 100 A/μs

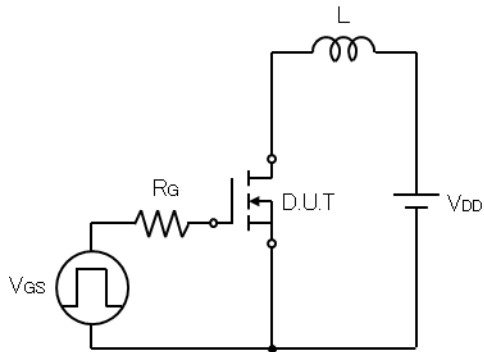
Note 4. Pulse test

Note 5. Refer value

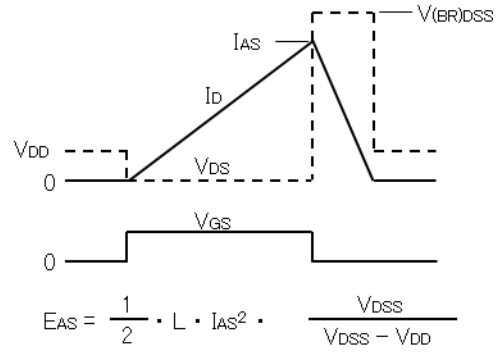
Test Circuit

Avalanche

Test Circuit

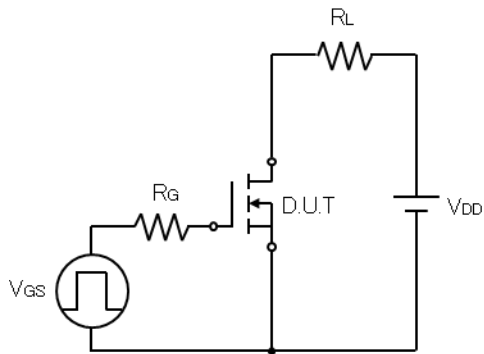


Waveform

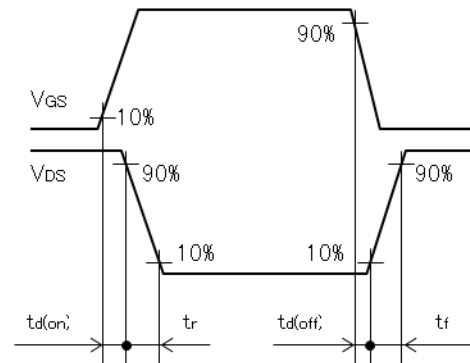


Switching Time

Test Circuit

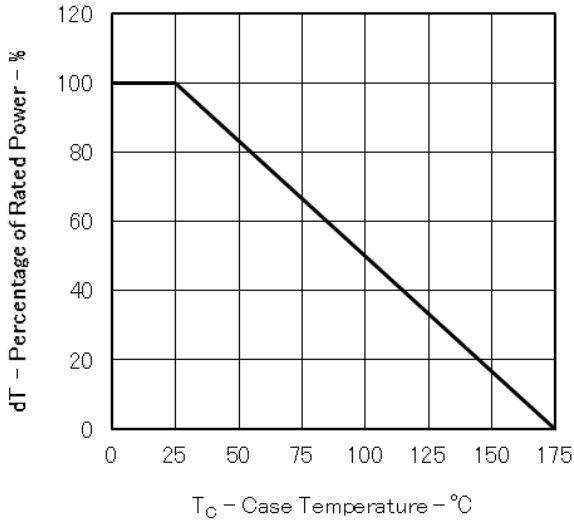


Waveform

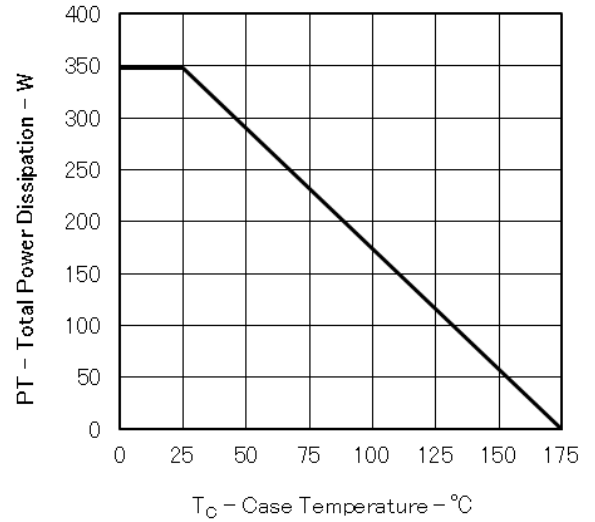


Typical Characteristics (TA = 25°C)

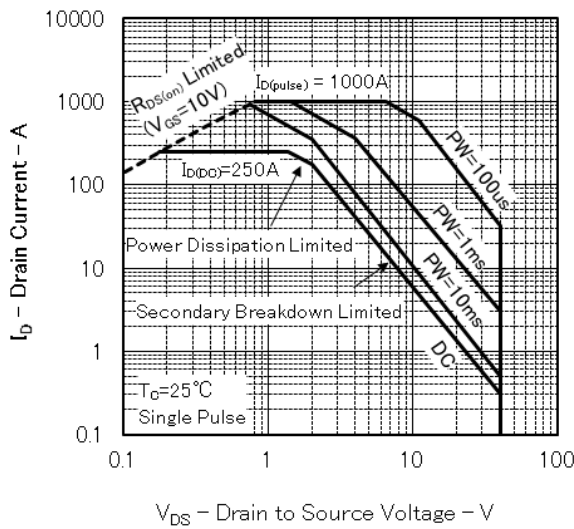
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



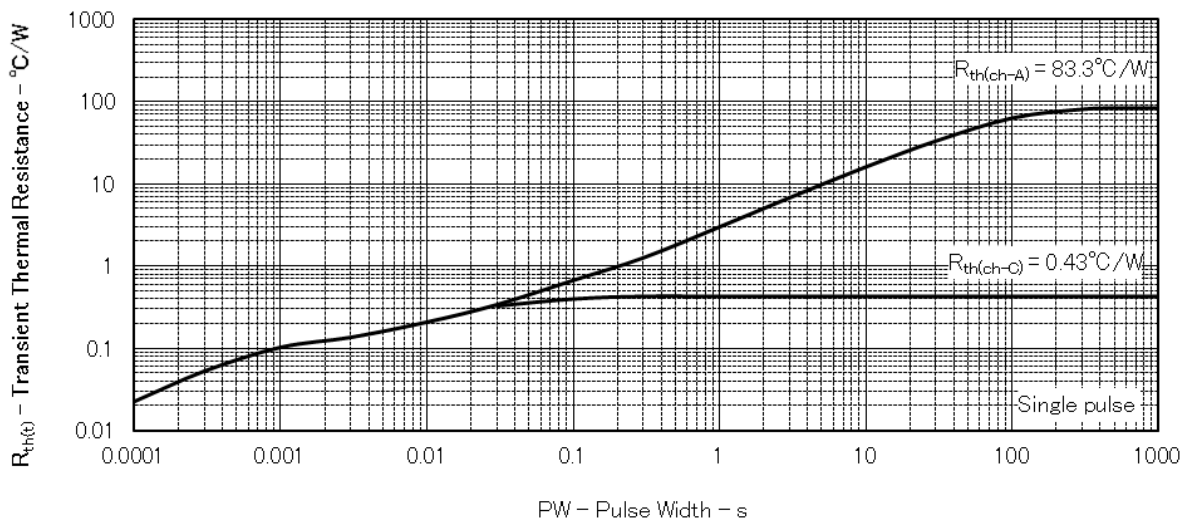
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



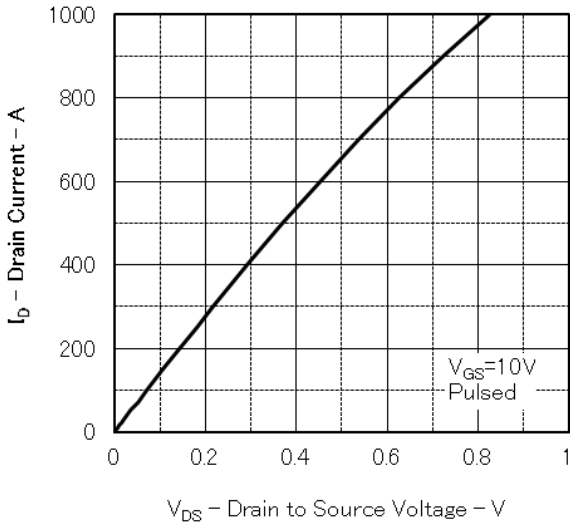
FORWARD BIAS SAFE OPERATING AREA



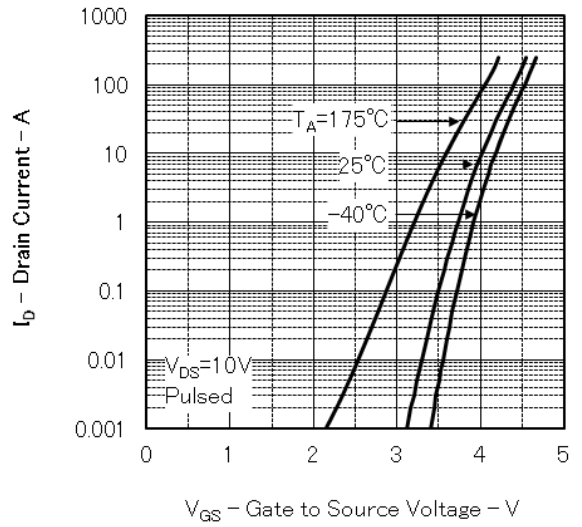
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



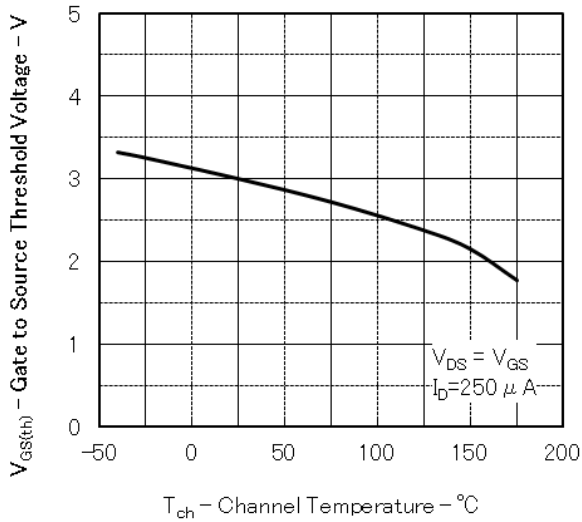
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



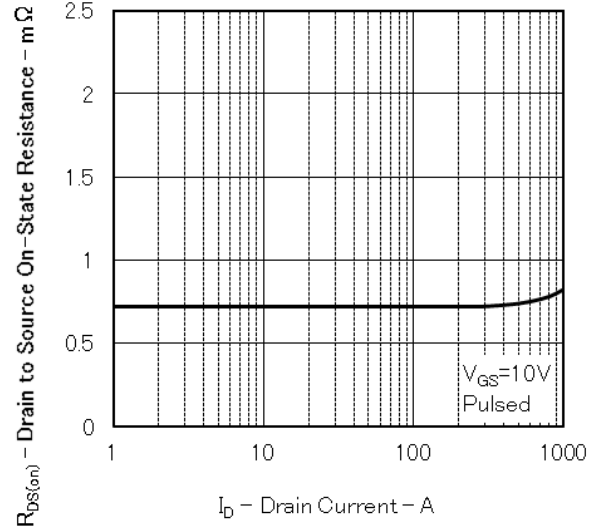
FORWARD TRANSFER CHARACTERISTICS



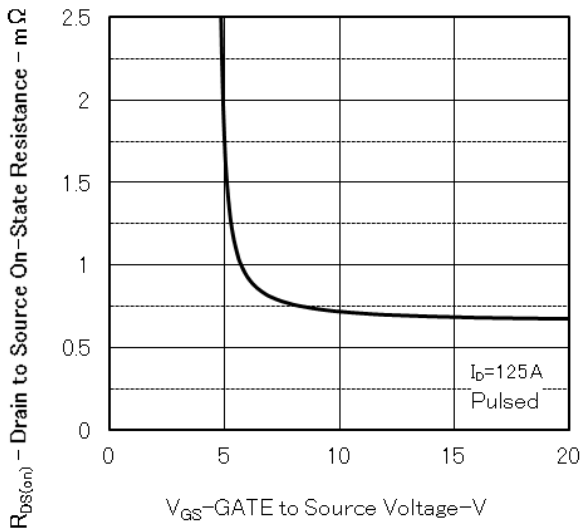
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



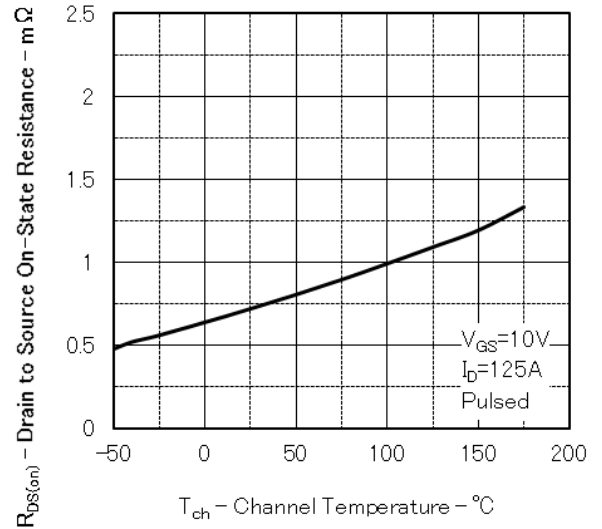
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



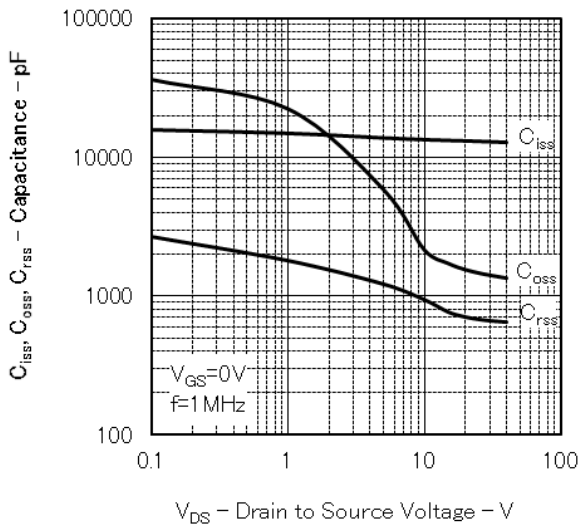
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



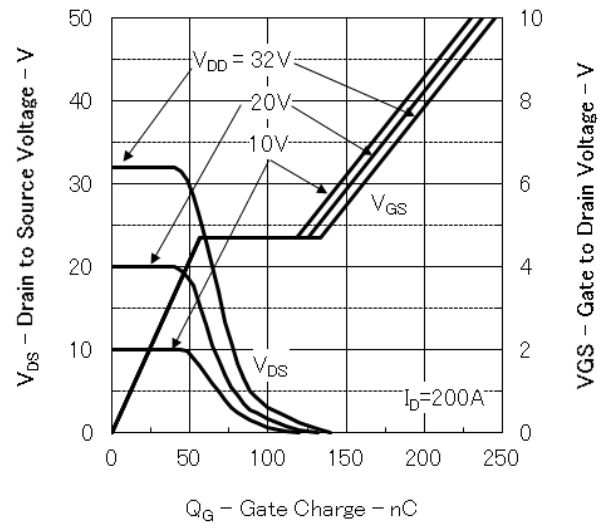
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



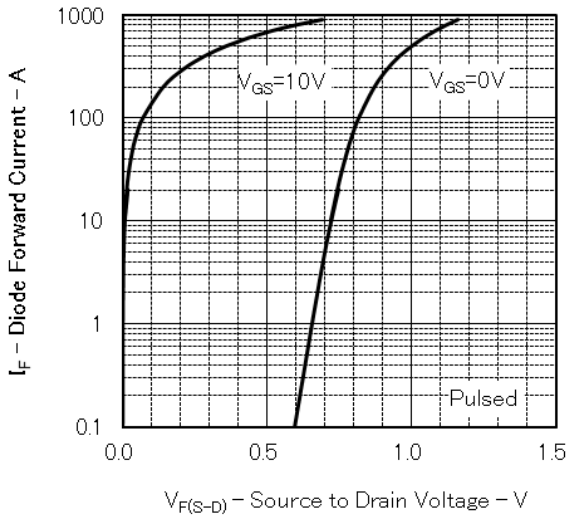
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



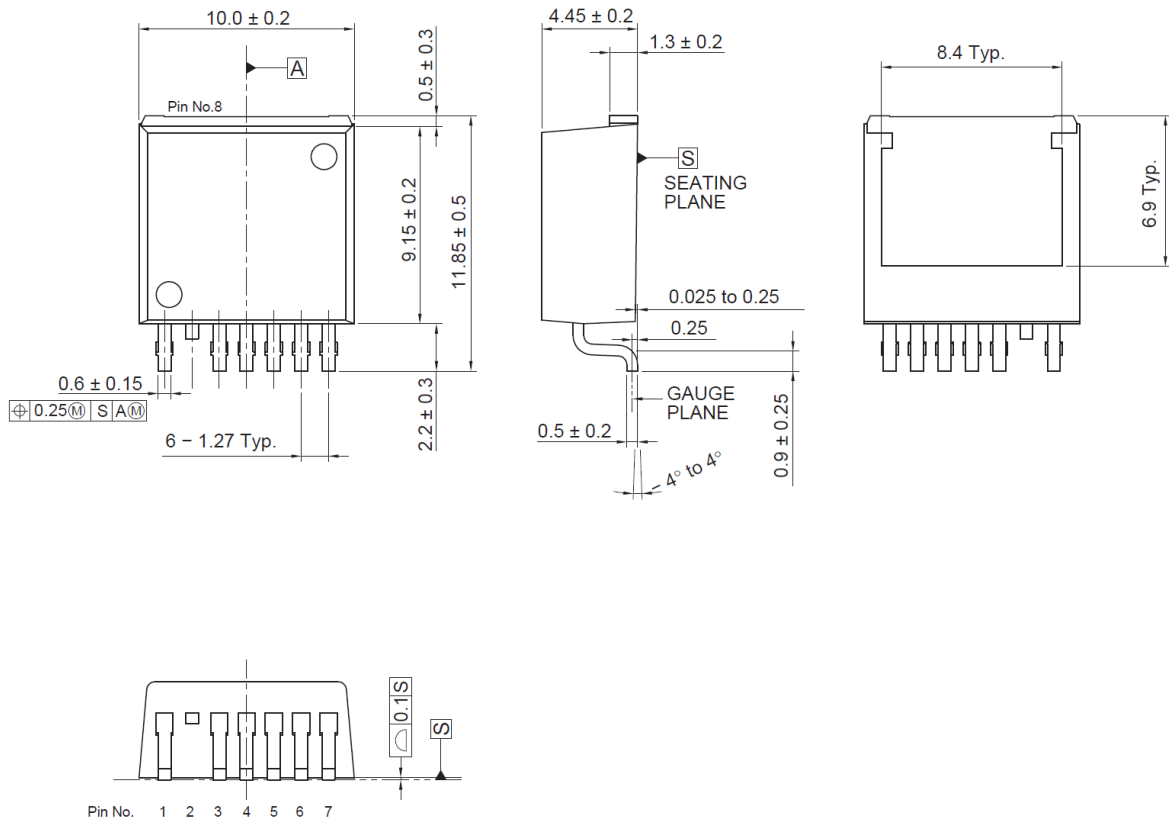
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



### Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]	Package Name
—	PRSS0008DC-A	—	1.39	MP-25ZU

Unit: mm



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