Data Sheet

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.

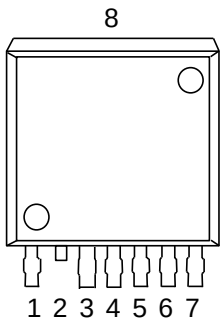
Features

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

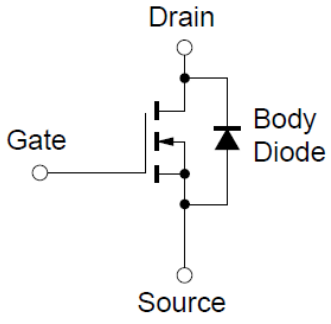
Ordering Information

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_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)	$I_{D(DC)}$	±250	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±1000	A
Total Power Dissipation (T_C = 25 °C)	P_{T1}	348	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
Repetitive Avalanche Current Note2	I_{AR}	74	A
Repetitive Avalanche Energy Note3	E_{AR}	547	mJ

Note 1. $P_W \leq 10\ \mu s$, Duty Cycle ≤ 1%

2. V_{GS} = 20 → 0V , R_G = 25 Ω

3. L = 100μH , V_{DD} = 20V , V_{GS} = 20 → 0V, R_G = 25 Ω

Thermal Resistance

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.43	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	°C/W

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
Drain to Source On-state Resistance	$R_{DS(on)}$ Note4		0.72	0.85	mΩ	V_{GS} = 10 V, I_D = 125 A
Input Capacitance	C_{iss} Note5		12900	19350	pF	V_{DS} = 25 V
Output Capacitance	C_{oss} Note5		1480	2220	pF	V_{GS} = 0 V
Reverse Transfer Capacitance	C_{rss} Note5		680	1220	pF	f = 1 MHz
Turn-on Delay Time	$t_{d(on)}$ Note5		45	90	ns	V_{DD} = 20 V, I_D = 125 A
Rise Time	t_r Note5		20	50	ns	V_{GS} = 10 V
Turn-off Delay Time	$t_{d(off)}$ Note5		148	296	ns	R_G = 0 Ω
Fall Time	t_f Note5		26	65	ns	
Total Gate Charge	Q_G Note5		245	368	nC	V_{DD} = 32 V
Gate to Source Charge	Q_{GS} Note5		56		nC	V_{GS} = 10 V
Gate to Drain Charge	Q_{GD} Note5		77		nC	I_D = 250A
Body Diode Forward Voltage	$V_{F(S-D)}$ Note4		0.9	1.5	V	I_F = 250 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr} Note5		94		ns	I_F = 250 A, V_{GS} = 0 V
Reverse Recovery Charge	Q_{rr} Note5		112		nC	di/dt = 100 A/μs

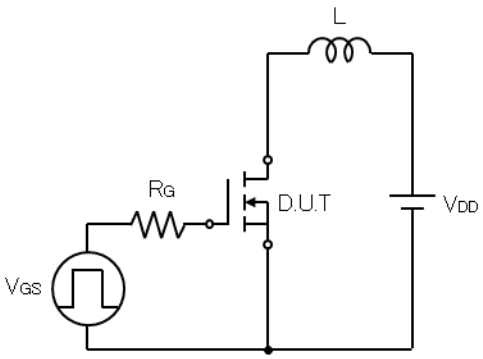
Note 4. Pulse test

Note 5. Refer value

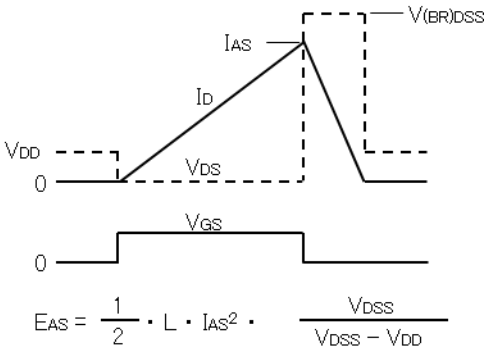
Test Circuit

Avalanche

Test Circuit

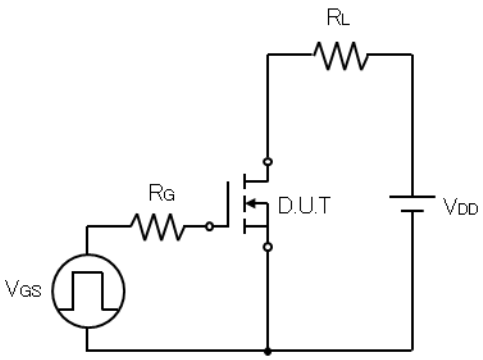


Waveform

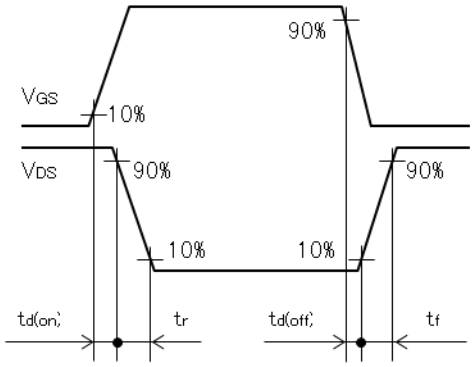


Switching Time

Test Circuit

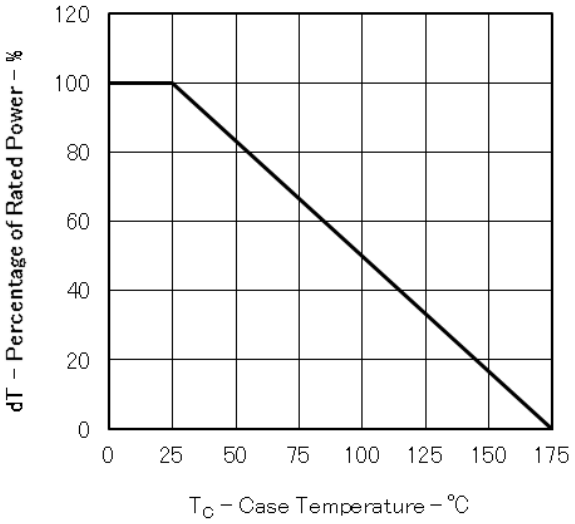


Waveform

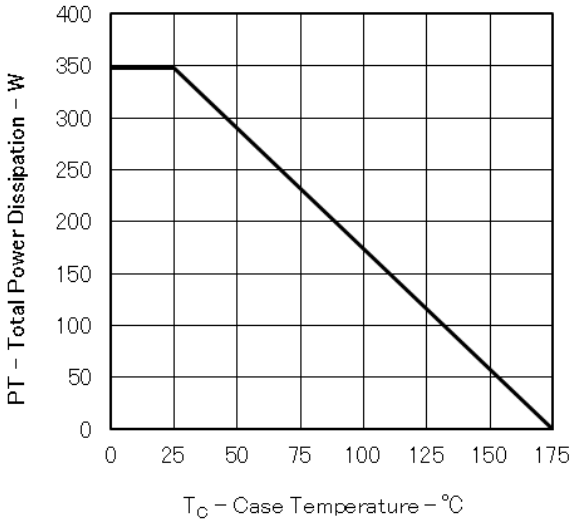


Typical Characteristics (TA = 25°C)

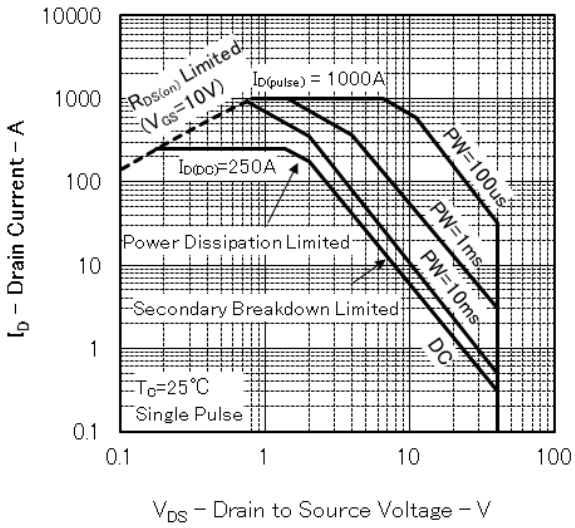
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



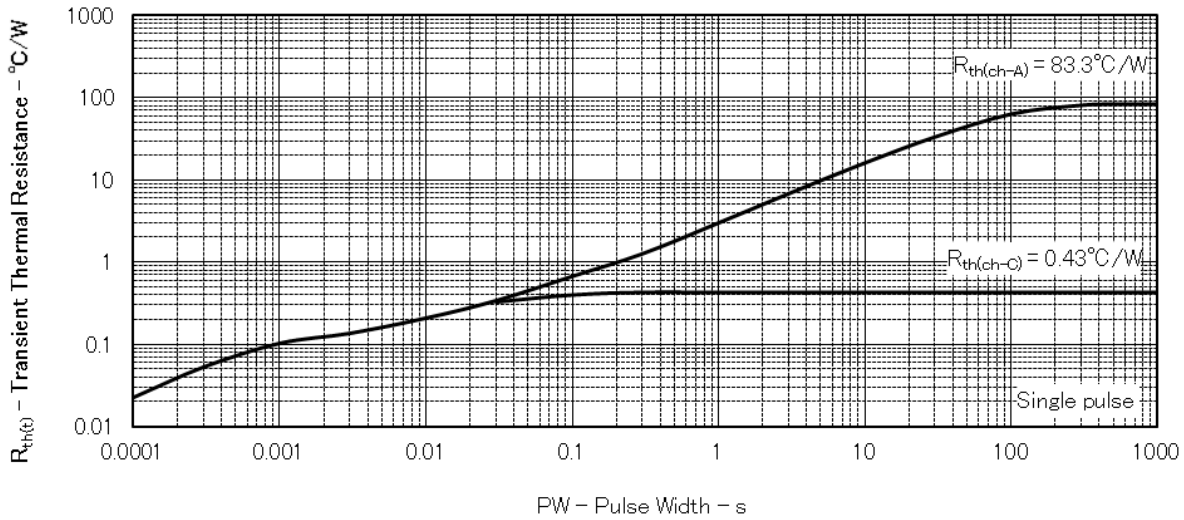
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



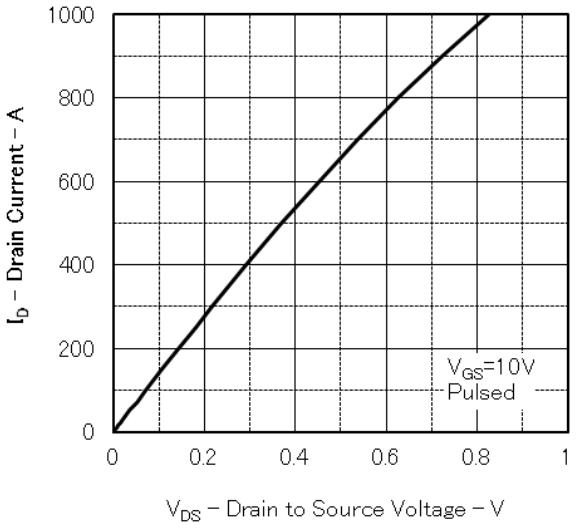
FORWARD BIAS SAFE OPERATING AREA



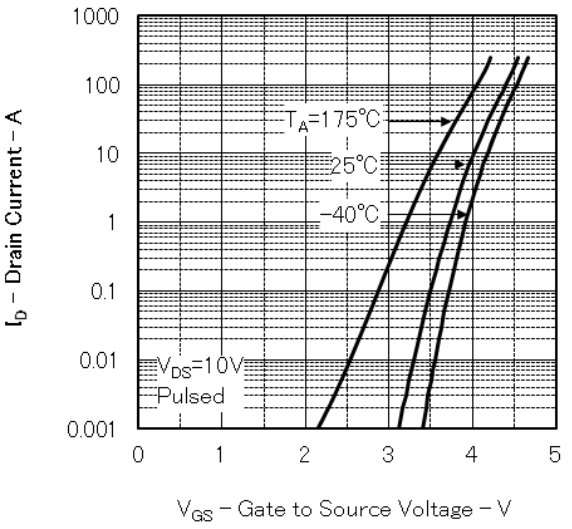
TRANSIENT THREMAL RESISTANCE vs. PULSE WIDTH



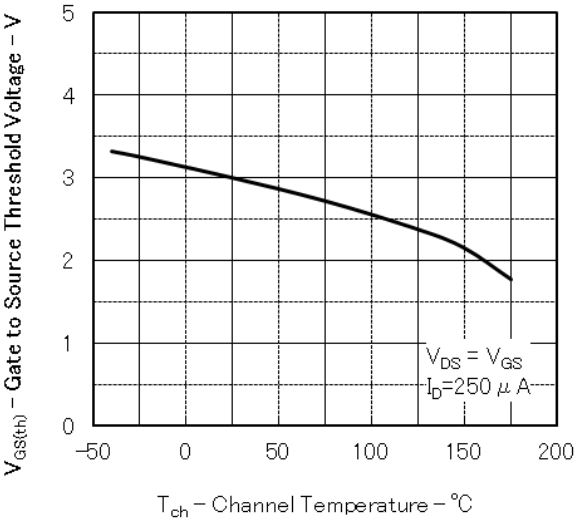
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



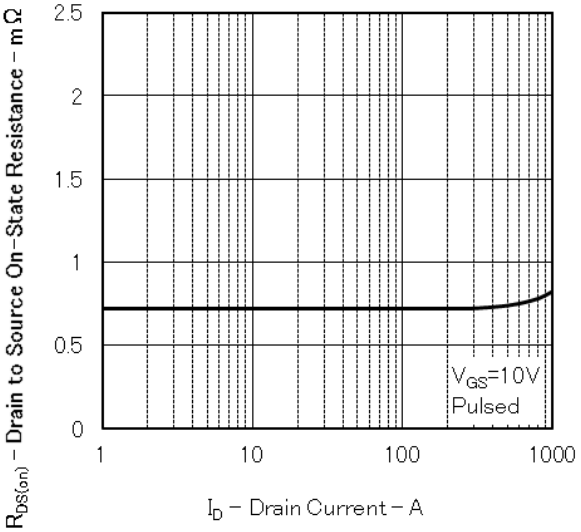
FORWARD TRANSFER CHARACTERISTICS



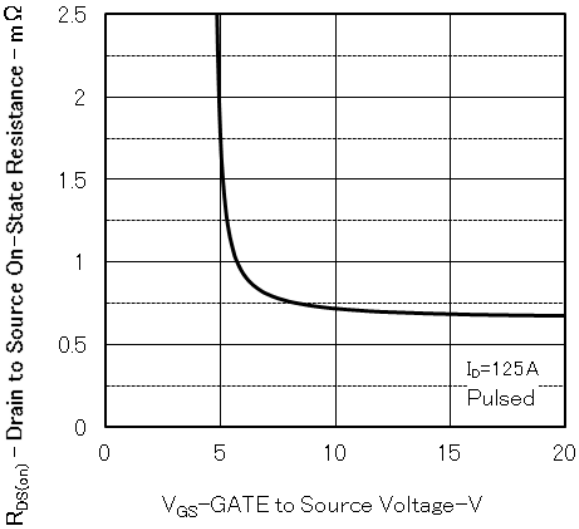
GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



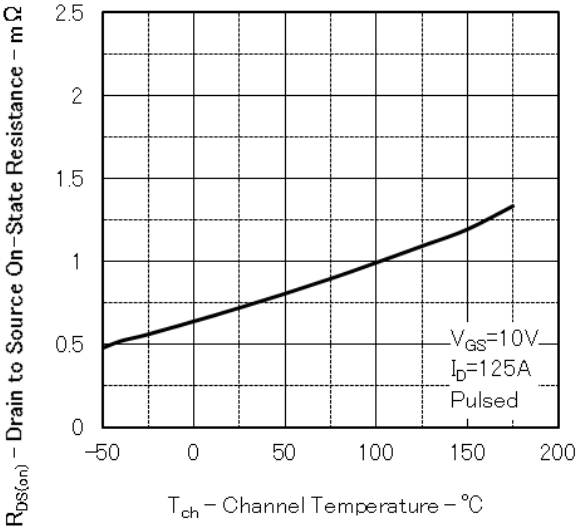
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



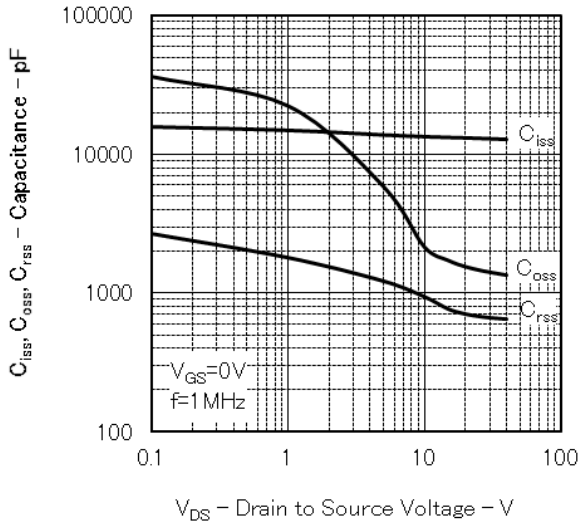
DRAIN TO SOURCE ON-STATERESISTANCE vs.
GATE TO SOURCE VOLTAGE



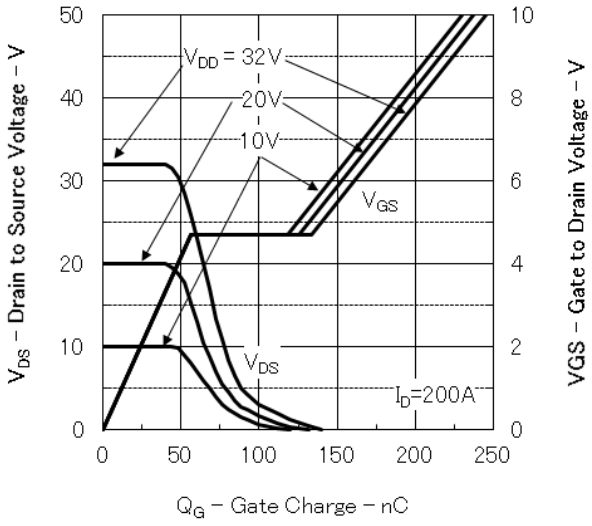
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



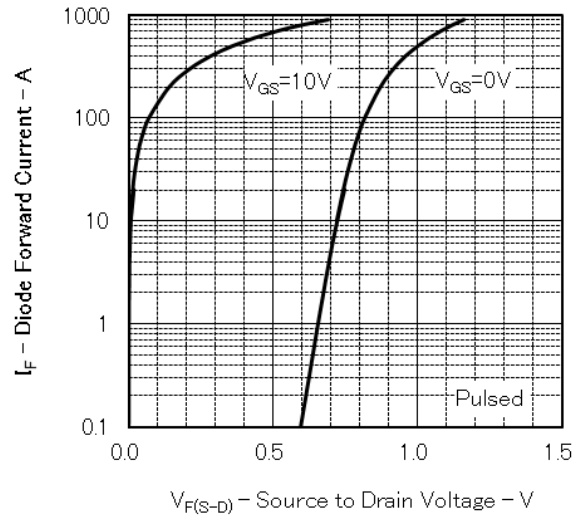
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



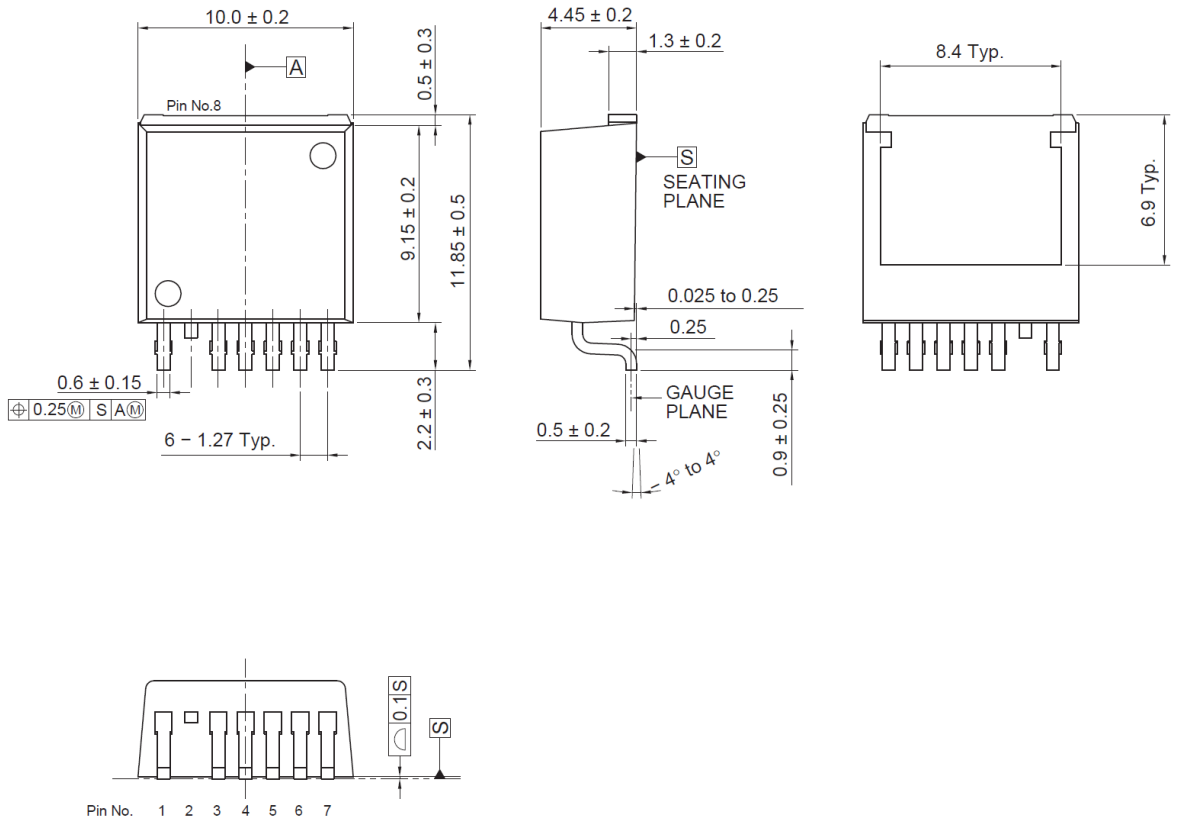
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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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