RBK04U04GNS

40V - 35A N-Channel Power MOSFET
Applications: Li-ion battery management system

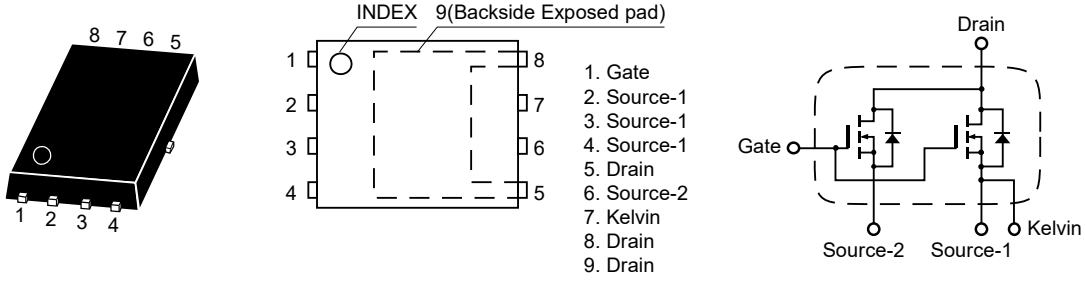
R07DS1507EJ0100
Rev.1.00
Mar.14.2022

Features

- Low on-state resistance
  $R_{DS(on)}$ = 1.2 mΩ typ. (at V_{GS} = 10 V, I_D = 18 A)
- Current Sensing
- Surface mount package
- Quality grade: Standard

Outline

RENESAS Package code: PTSN0008DB-A
(Package name: HSON-8pin)



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

Absolute Maximum Ratings

(Ta = 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) Notes2	$I_{D(DC)}$	35	A
Drain current (Pulse) Notes1, 2	$I_{D(pulse)}$	320	A
Body diode forward current Notes2	I_F	35	A
Single avalanche current Notes3	I_{AS}	45	A
Single avalanche energy Notes3	E_{AS}	202	mJ
Total power dissipation (T_C = 25 °C)	P_{T1}	83	W
Channel temperature	T_{ch}	150	°C
Storage temperature	T_{stg}	–55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. This data is on Renesas's measurement condition.
3. Starting T_{ch} = 25 °C, V_{DD} = 20 V, R_G = 25 Ω, V_{GS} = 10 to 0 V, L = 100 μH

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.

Thermal Resistance Characteristics

Item	Symbol	Max. Value Notes4	Unit
Thermal resistance (Junction to case) (Tc = 25 °C)	$R_{th(j-c)}$	1.5	°C/W
Thermal resistance (Junction to ambient)	$R_{th(j-a)}$	35 Notes6 / 136 Notes5	°C/W

Notes: 4. Designed target maximum value on Renesas measurement condition. (Not tested)
5. Mounted on FR4 board of 40mm x 40mm x 1.6mm^t, 1 oz Cu with 4% Cu area.
6. Mounted on FR4 board of 50mm x 100mm x 1.0mm^t, 1 oz Cu. (Reference data)

Electrical Characteristics

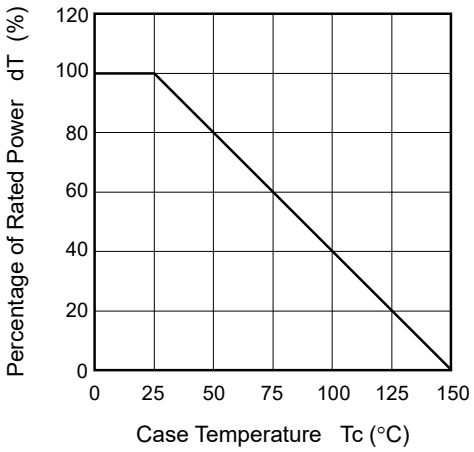
(Ta = 25°C)

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
Zero leakage current	I_{GSS}	—	—	±100	nA	V_{GS} = ±20 V, V_{DS} = 0 V
Gate cutoff voltage	$V_{GS(off)}$	2.0	—	4.0	V	V_{DS} = 10 V, I_D = 1 mA
Drain to source on-state resistance Notes7	$R_{DS(on)}$	—	1.2	1.5	mΩ	V_{GS} = 10 V, I_D = 18 A
Input capacitance	C_{iss}	—	6900	—	pF	V_{DS} = 10 V
Output capacitance	C_{oss}	—	1100	—	pF	V_{GS} = 0 V
Reverse transfer capacitance	C_{rss}	—	650	—	pF	f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	37	—	ns	I_D = 35 A
Rise time	t_r	—	34	—	ns	V_{DD} = 20 V
Turn-off delay time	$t_{d(off)}$	—	116	—	ns	V_{GS} = 10 V
Fall time	t_f	—	42	—	ns	R_G = 5 Ω
Total gate charge	Q_G	—	111	—	nC	I_D = 35 A
Gate to source charge	Q_{GS}	—	28	—	nC	V_{DD} = 32 V
Gate to drain charge	Q_{GD}	—	31	—	nC	V_{GS} = 10 V
Body diode forward voltage Notes7	$V_{F(S-D)}$	—	0.79	1.5	V	I_F = 35 A, V_{GS} = 0 V
Reverse recovery time	t_{rr}	—	61	—	ns	I_F = 35 A, V_{GS} = 0 V
Reverse recovery charge	Q_{rr}	—	71	—	nC	di/dt = 100 A/μs
Current sensing ratio Notes8	I_{ratio}	—	10000	—	-	V_{GS} = 10 V, I_D = 18 A

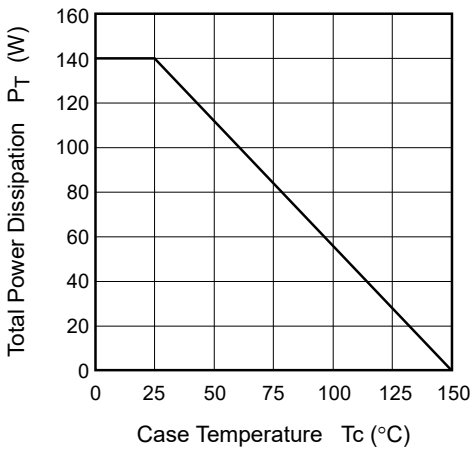
Notes: 7. Pulse test
8. Designed target value on Renesas measurement condition. (Not tested)

Main Characteristics

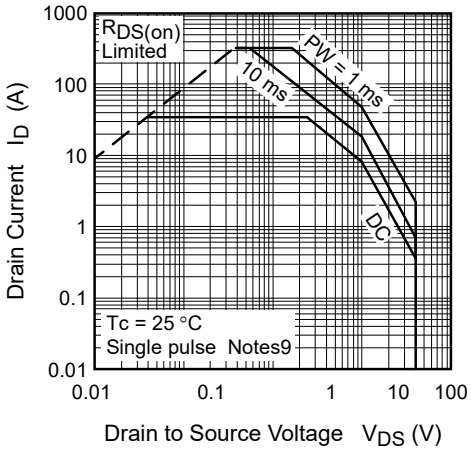
Dreating Factor of Forward Base Safe Operating Area



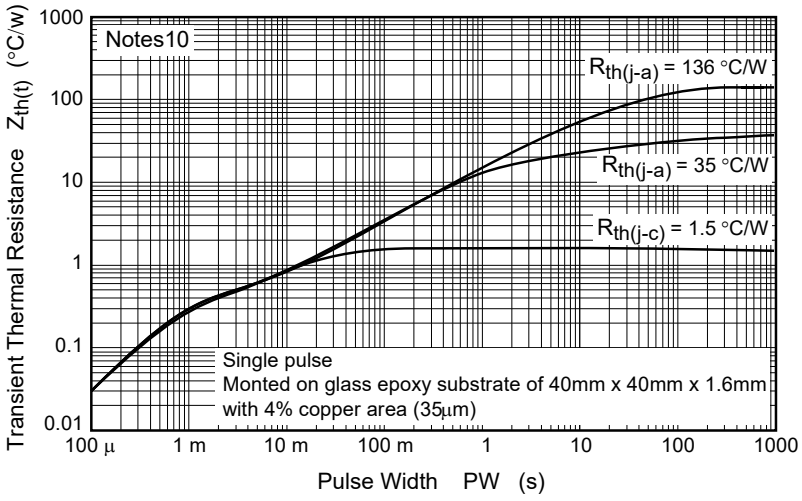
Total Power Dissipation vs. Case Temperature



Forward Bias Safe Operating Area



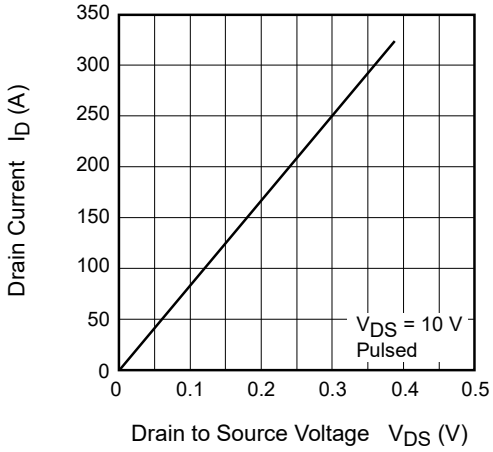
Transient Thermal Resistance vs. Pulse Width



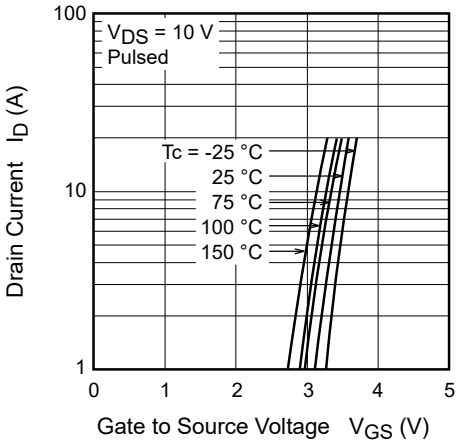
Notes: 9. Designed target value on Renesas measurement condition. (Not tested)
Renesas recommends that operating conditions are designed according to a document “Power MOS FET・IGBT Attention of Handling Semiconductor Devices”.

10. Designed target value on Renesas measurement condition. (Not tested)

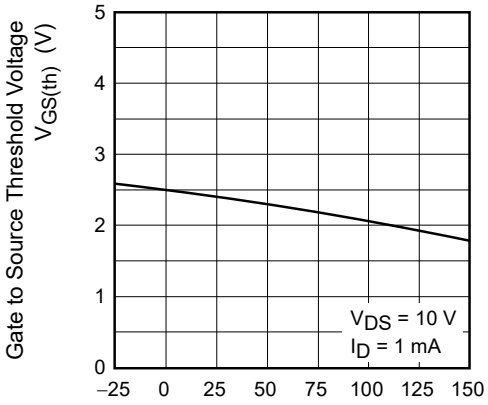
Drain Current vs.
Drain to Source Voltage



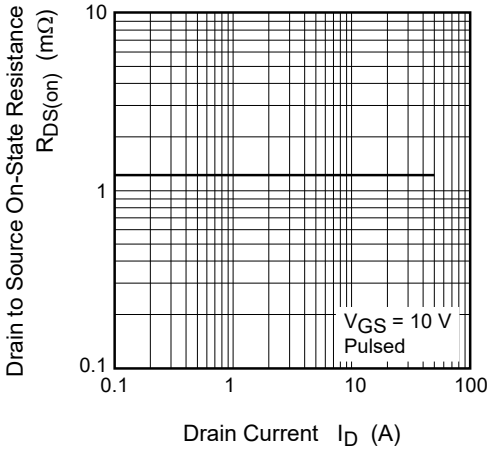
Forward Transfer Characteristics



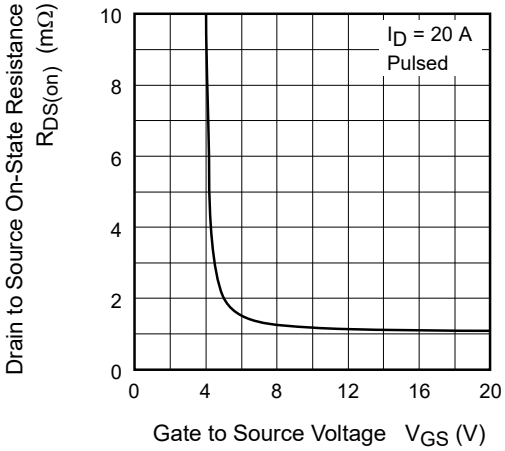
Gate to Source Threshold Voltage
vs. Channel Temperature



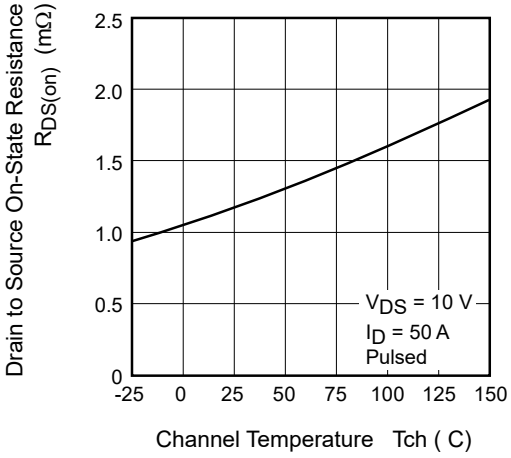
Drain to Source On-State Resistance
vs. Drain current



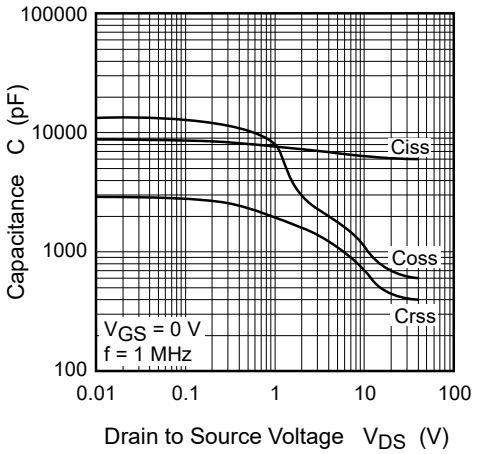
Drain to Source On-State Resistance
vs. Gate to Source Voltage



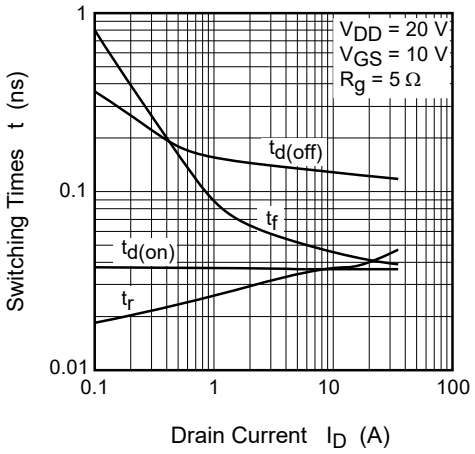
Drain to Source On-State Resistance vs. Channel Temperature



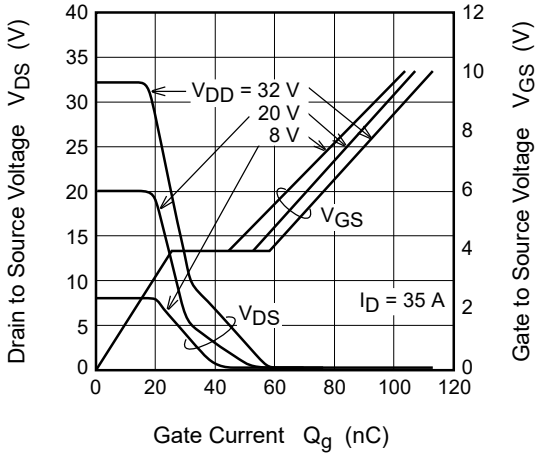
Capacitance vs. Drain to Source Voltage



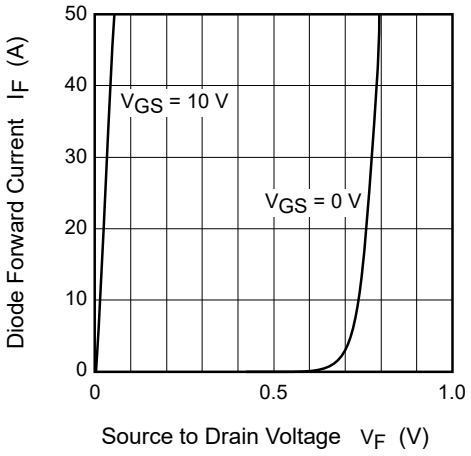
Switching Characteristics



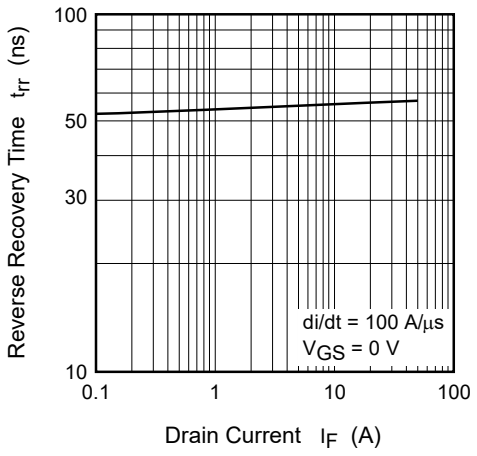
Dynamic Input/Output Characteristics



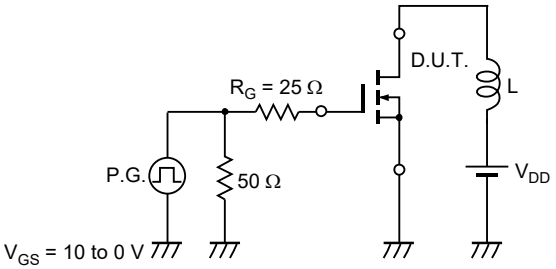
Source to Drain Diode Forward Voltage



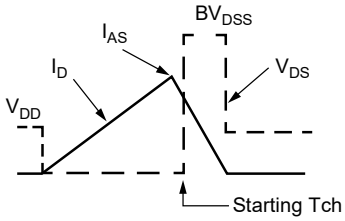
Reverse Recovery Time vs. Drain Current



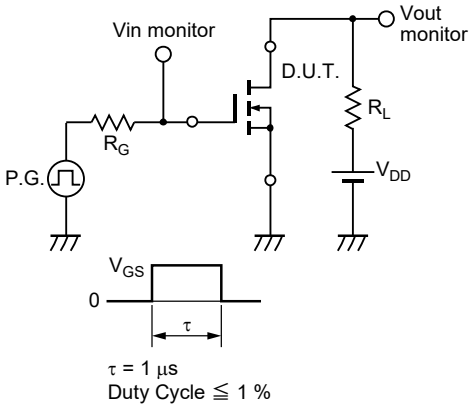
Avalanche Test Circuit



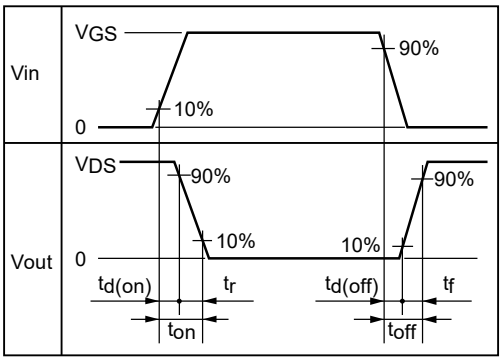
Avalanche Waveform



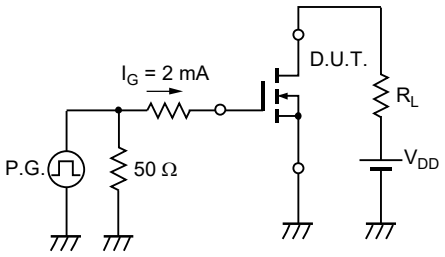
Switching Time Test Circuit



Waveform



Gate Charge Test Circuit

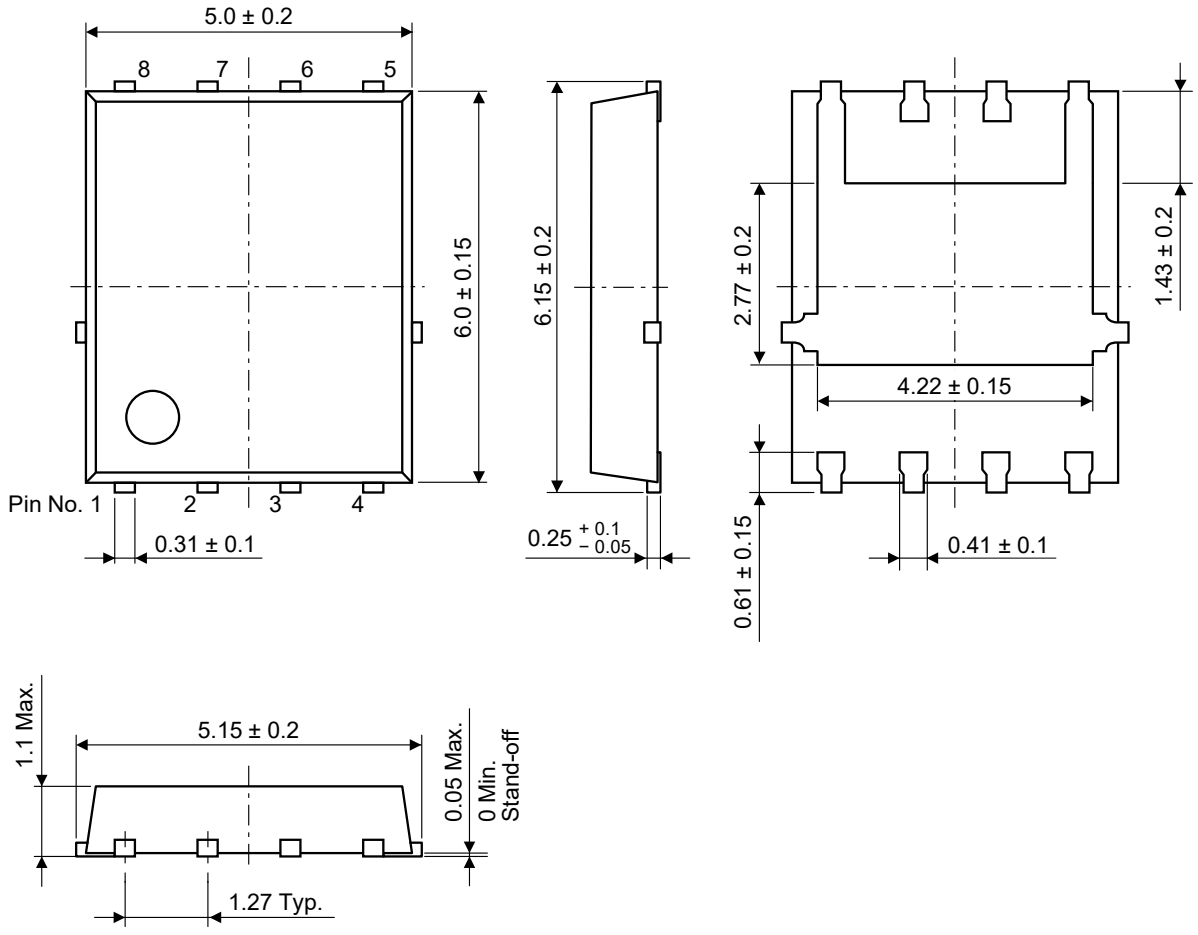


Package Dimensions

HSON-8pin

JEDEC Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
—	PTSN0008DB-A	—	0.12

Unit: mm



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RBK04U04GNS-0000#HBH	3000 pcs	Taping (Reel)

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(Rev. 5.0-1 October 2020)

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