RF Aerospace and Defense Solutions

Worldwide leader in RF power—the best choice for defense applications

Featuring New High Power GaN and LDMOS Devices

Worldwide Industry Leader

NXP's RF power transistor products enable the majority of the world's cellular voice and data traffic every day, in the harshest environments on earth, making NXP the world's largest and most deployed supplier of RF power technology.

RF Solutions for Aerospace and Defense

NXP offers diverse technologies such as industry-leading LDMOS, GaN and GaAs on SiC to provide the best technological solution for each customer application.

Dedicated Aerospace and Defense Products Team

This team draws on NXP's wealth of RF technology, design and applications experience to offer optimum RF solutions for defense applications such as radar, communications and electronic warfare.

NXP Advantages

- More than 20 years of RF industry leadership with the largest, most experienced RF engineering team in the world
- NXP owned and operated high-volume manufacturing
- U.S.-based company with U.S. LDMOS fab
- Dedicated, specialized RF packaging R&D team that has produced the industry's highest performance packaging solutions

Benefits of Choosing NXP RF Power for Your Defense Electronics Needs

- Broad line of COTS products repurposed and enabled for optimum performance in aerospace and defense systems, including radar, communications and electronic warfare
- Dedicated team of experts in aerospace and defense systems, applications, marketing and program management who support aerospace and defense customer applications
- Broadest line of RF technologies and products, including LDMOS, GaN and GaAs
- Domestic source of LDMOS and GaN technology
- Security of supply with product longevity guarantee of 10 or 15 years
- ITAR-compliant applications support and secure technical data handling

NXP RF Power Technology Advantages

- Highest RF ruggedness in the industry with > 65:1 sustained VSWR
- Highest gain and efficiency with LDMOS technology
- Widest bandwidth performance
- Broadest lines of packages, including high thermal efficiency over-molded plastic packages and low thermal resistance air cavity ceramic packages

GaN: A New Industry-Leading Product Line

NXP's new best-in-class GaN products offer superior broadband performance, thermal efficiency, innovative packaging, and CW and long pulse performance that defense customers have been asking for.

Contact your dedicated NXP RF aerospace and defense team to request samples or early access to new products.

NXP, the Worldwide Leader in RF Power—the Best Choice for Defense Applications

Questions? A new defense program challenge? A SWaP problem to solve? Contact NXP's dedicated RF aerospace and defense team at **RFMIL@nxp.com** for the best support and to enable your innovative solutions.

RF Aerospace and Defense Power LDMOS Transistors: General Purpose, Radar and Communications

General Purpose Driver ICs

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
MMRF2005NR1	I/O	728–960	3.2 AVG	28	35.9/940	16.5	1.6	TO-270WB-16
MMRF2005GNR1	I/O	728–960	3.2 AVG	28	35.9/940	16.5	1.6	TO-270WBG-16
MMRF2006NT1	I	1805–2170	20 AVG	28	32.6/2140	50	1.9	PQFN 8 × 8
MMRF2004NBR1	I/O	2500–2700	25 AVG	28	28.5/2700	36	1.4	TO-272WB-16
MMRF2007NR1	I/O	136–940	35 AVG	28	32.6/940	42.1	0.6	TO-270WBL-16
MMRF2007GNR1	I/O	136–940	35 AVG	28	32.6/940	42.1	0.6	TO-270WBLG-16

General Purpose Driver Transistors

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
28 Volt LDMOS								
MMRF1014NT1	U	1–2000	4 AVG	28	18/1960	43	8.8	PLD-1.5
MMRF1015NR1	U	450–1500	10 AVG	28	18/960	40	2.85	TO-270-2
MMRF1015GNR1	U	450–1500	10 AVG	28	18/960	40	2.85	TO-270G-2
MMRF1004NR1	I	2110–2170	10 PEP	28	15.5/2170	36	2.3	TO-270-2
MMRF1004GNR1	I	2110–2170	10 PEP	28	15.5/2170	36	2.3	TO-270G-2
MMRF1315NR1	I/O	500–1000	60 CW	28	20.0/960	63	0.77	TO-270-2
MMRF1017NR3	I/O	720–960	80 AVG	28	20.0/960	36.1	0.31	OM-780-2L
50 Volt LDMOS								
MMRF1012NR1	U	10–450	10 CW	50	23.9/220	62	3	TO-270-2
MMRF1304LR5	U	To 2000	25 CW	50	26/512	75	1.4	NI-360-2
MMRF1304NR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270-2
MMRF1304GNR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270G-2
MMRF1305HR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780H-4L

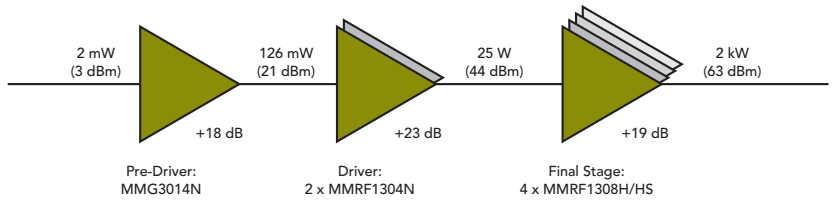
General Purpose Driver Transistors (continued)

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
50 Volt LDMOS								
MMRF1305HSR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780S-4L
MMRF1316NR1	I/O	1.8–600	300 CW	50	25/230	70	0.22	TO-270WB-4
MMRF1318NR1	U	10–600	300 CW	50	22/450	60	0.24	TO-270WB-4

Radar

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
HF, VHF and UHF Radar								
MMRF1012NR1	U	10–450	10 CW	50	23.9/220	62	3	TO-270-2
MMRF1304LR5	U	To 2000	25 CW	50	26/512	75	1.4	NI-360-2
MMRF1304NR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270-2
MMRF1304GNR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270G-2
MMRF1315NR1	I/O	500–1000	60 CW	28	20.0/960	63	0.77	TO-270-2
MMRF1305HR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780H-4L
MMRF1305HSR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780S-4L
MMRF1020-04NR3	I	720–960	100 AVG	48	19.5/920	48.5	0.45	OM-780-4L
MMRF1020-04GNR3	I	720–960	100 AVG	48	19.5/920	48.5	0.45	OM-780G-4L
MMRF1310HR5	U	To 600	300 CW	50	25.0/300	80	0.19	NI-780H-4L
MMRF1310HSR5	U	To 600	300 CW	50	25.0/300	80	0.19	NI-780S-4L
MMRF1316NR1	I/O	1.8–600	300 CW	50	25/230	70	0.22	TO-270WB-4
MMRF1318NR1	U	10–600	300 CW	50	22/450	60	0.24	TO-270WB-4
MMRF1016HR5	U	To 500	600 Peak	50	25/225	59	0.2	NI-1230H-4S
MMRF1308HR5	U	To 600	600 CW	50	24.6/230	75.2	0.12	NI-1230H-4S
MMRF1308HSR5	U	To 600	600 CW	50	24.6/230	75.2	0.12	NI-1230S-4S
MMRF1311H	I	470–860	140 AVG	50	20/810	34	0.16	NI-1230H-4S
MMRF1006HR5	U	10–500	1000 Peak	50	20/450	64	0.03	NI-1230H-4S
MMRF1006HSR5	U	10–500	1000 Peak	50	20/450	64	0.03	NI-1230S-4S
MMRF1306HR5	U	1.8–600	1250 CW	50	22.9/230	74.6	0.15	NI-1230H-4S
MMRF1306HSR5	U	1.8–600	1250 CW	50	22.9/230	74.6	0.15	NI-1230S-4S

VHF Radar Lineup Example



Key Parameters

- Frequency: 2–600 MHz narrowband
- Unmatched for narrow or wideband operation
- Rugged > 65:1 VSWR 50 V LDMOS
- Integrated ESD protection

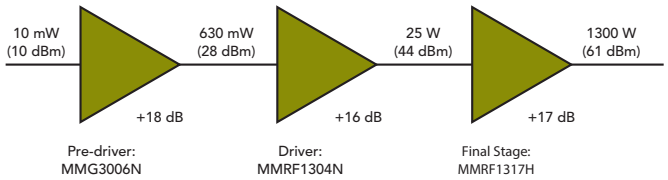
RF Aerospace and Defense Power LDMOS Transistors: General Purpose, Radar and Communications

Radar (continued)

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
L-Band Radar								
MMRF1019NR4	I/O	960–1400	10 Peak	50	25/1090	69	1.6	PLD-1.5
MMRF1304LR5	U	To 2000	25 CW	50	26/512	75	1.4	NI-360-2
MMRF1304NR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270-2
MMRF1304GNR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270G-2
MMRF1305HR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780H-4L
MMRF1305HSR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780S-4L
MMRF1005HR5	I	1300	250 Peak	50	22.7/1300	57	0.07	NI-780H-2L
MMRF1005HSR5	I	1300	250 Peak	50	22.7/1300	57	0.07	NI-780S-2L
MMRF2010NR1	I	1030–1090	250 Peak	50	32.5/1030	59.1	0.15	TO-270WB-14
MMRF2010GNR1	I	1030–1090	250 Peak	50	32.5/1030	59.1	0.15	TO-270WBG-14
MMRF1008HR5	I/O	960–1215	275 Peak	50	20.3/1030	65.5	0.08	NI-780H-2L
MMRF1008HSR5	I/O	960–1215	275 Peak	50	20.3/1030	65.5	0.08	NI-780S-2L
MMRF1011HR5	I/O	1400	330 Peak	50	18/1400	60.5	0.13	NI-780H-2L
MMRF1011HSR5	I/O	1400	330 Peak	50	18/1400	60.5	0.13	NI-780S-2L
MMRF1009HR5	I/O	960–1215	500 Peak	50	19.7/1030	62	0.044	NI-780H-2L
MMRF1009HSR5	I/O	960–1215	500 Peak	50	19.7/1030	62	0.044	NI-780S-2L
MMRF1007HR5	I	965–1215	1000 Peak	50	20/1030	56	0.02	NI-1230H-4S
MMRF1007HSR5	I	965–1215	1000 Peak	50	20/1030	56	0.02	NI-1230S-4S
MMRF1314HR5	I/O	1200–1400	1000 Peak	52	15.5[2]	46.5	0.018	NI-1230H-4S
MMRF1314HSR5	I/O	1200–1400	1000 Peak	52	15.5[2]	46.5	0.018	NI-1230S-4S
MMRF1314GSR5	I/O	1200–1400	1000 Peak	52	15.5[2]	46.5	0.018	NI-1230GS-4L
MMRF1312HR5	I/O	900–1215	1200 Peak[1]	52	17.3[3]	54	0.017	NI-1230H-4S
MMRF1312HSR5	I/O	900–1215	1200 Peak[1]	52	17.3[3]	54	0.017	NI-1230S-4S
MMRF1312GSR5	I/O	900–1215	1200 Peak[1]	52	17.3[3]	54	0.017	NI-1230GS-4L
MMRF1317HR5	I/O	1030–1090	1500 Peak[1]	50	18.9/1030	56	0.019	NI-1230H-4S
MMRF1317HSR5	I/O	1030–1090	1500 Peak[1]	50	18.9/1030	56	0.019	NI-1230S-4S
S-Band Radar								
MMRF5300N*	I	2700–3500	60 Peak	50	17/3500	61.5	-	OM-270-2
MMRF1013HR5	I/O	2700–2900	320 Peak	30	13.3/2900	50.5	0.06	NI-1230H-4S
MMRF1013HSR5	I/O	2700–2900	320 Peak	30	13.3/2900	50.5	0.06	NI-1230S-4S

* Preliminary, [1] P_{out} @ P3dB, [2] 1200-1400 MHz, [3] 960-1215 MHz

Transponder/Secondary Radar Lineup Example



Key Parameters

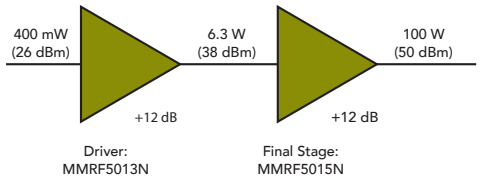
- Frequency: 1030–1090 MHz
- High Power: 1300 W P1dB
- Pulse: Rise and fall time must be short, controlled and equal. Reduced droop of pulse amplitude.

Radio Communications

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
28 Volt GaN								
MMRF5011N*	I	1–3000	12 CW	28	13/2500	40	-	OM-270-8
50 Volt GaN								
MMRF5013N*	I	1–3000	12 CW	50	15/2700	60	-	OM-780-8
MMRF5019N*	I	1-3000	25 CW	50	18/2500	40	-	OM-270-8
MMRF5023N*	I	1-2700	63 CW	50	16/2500	40	-	OM-270-2
MMRF5014HR5	I	1–2700	125 CW	50	16/2500	64.2	0.86	NI-360H-2SB
MMRF5015NR5	I	1–2700	125 CW	50	16/2500	64.2	0.66	OM-270-2
7.5 Volt LDMOS								
MMRF1021NT1	U	136–941	7 CW	7.5	15.2/870	71	1.1	PLD-1.5W
28 Volt LDMOS								
MMRF1024HSR5	I/O	2496–2690	50 AVG	28	14.1 @ 2496	44.6	0.42	NI-1230S-4L2L
MMRF1022HSR5	I/O	2110–2170	63 AVG	28	16.2/2140	51.8	0.33	NI-1230S-4L2L
MMRF1023HSR5	I/O	2300–2400	66 AVG	28	14.9 @ 2300	46.7	0.25	NI-1230S-4L2L
MMRF1315NR1	I/O	500–1000	60 CW	28	20.0/960	63	0.77	TO-270-2
50 Volt LDMOS—1–600 MHz								
MMRF1012NR1	U	10–450	10 CW	50	23.9/220	62	3	TO-270-2
MMRF1304LR5	U	To 2000	25 CW	50	26/512	75	1.4	NI-360-2
MMRF1304NR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270-2
MMRF1304GNR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270G-2
MMRF1305HR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780H-4L
MMRF1305HSR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780S-4L
MMRF1320NR1	U	1.8–600	150 CW	50	26.1/230	70.3	0.21	TO-270WB-4
MMRF1316NR1	I/O	1.8–600	300 CW	50	25.0/230	70	0.22	TO-270WB-4
MMRF1310HR5	U	To 600	300 CW	50	25.0/300	80	0.19	NI-780H-4L
MMRF1318NR1	U	10–600	300 CW	50	22/450	60	0.24	TO-270WB-4
MMRF1310HSR5	U	To 600	300 CW	50	25.0/300	80	0.19	NI-780S-4L
MMRF1016HR5	U	To 500	600 Peak	50	25/225	59	0.2	NI-1230H-4S
MMRF1308HR5	U	To 600	600 CW	50	24.6/230	75.2	0.12	NI-1230H-4S
MMRF1308HSR5	U	To 600	600 CW	50	24.6/230	75.2	0.12	NI-1230S-4S
MMRF1306HR5	U	1.8–600	1250 CW	50	22.9/230	74.6	0.15	NI-1230H-4S
MMRF1306HSR5	U	1.8–600	1250 CW	50	22.9/230	74.6	0.15	NI-1230S-4S

* Preliminary

Radio Communications Lineup Example



Key Parameters

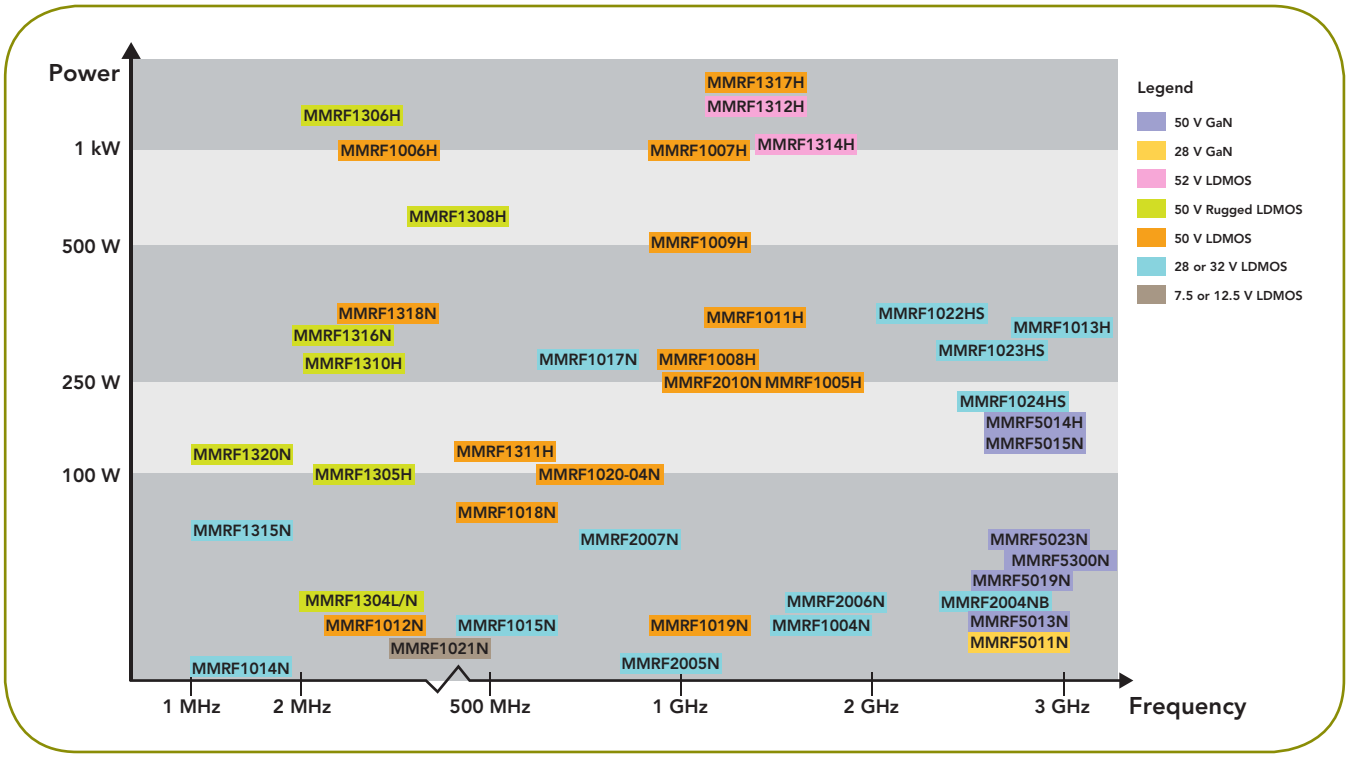
- Frequency: Up to 2500 MHz wideband
- Power: 100 W CW across multi-octave bandwidth, 200 to 2500 MHz
- Thermal Resistance: The OM-270-2 plastic package enables improved thermal resistance.

RF Aerospace and Defense Power LDMOS Transistors: General Purpose, Radar and Communications

Radio Communications (continued)

Product	Frequency Band MHz		P_{out} (Typ) Watts	V_{DD} Volts	Gain (Typ)/Freq dB/MHz	Eff (Typ) %	θ_{JC} °C/W	Packaging
50 Volt LDMOS—450–2000 MHz								
MMRF1304LR5	U	To 2000	25 CW	50	26/512	75	1.4	NI-360-2
MMRF1304NR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270-2
MMRF1304GNR1	U	To 2000	25 CW	50	25.5/512	74.7	1.2	TO-270G-2
MMRF1018NR1	I	470–860	90 CW	50	22.0/860	57	0.79	TO-270WB-4
MMRF1018NBR1	I	470–860	90 CW	50	22.0/860	57	0.79	TO-272WB-4
MMRF1305HR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780H-4L
MMRF1305HSR5	U	To 2000	100 CW	50	27.2/512	70	0.38	NI-780S-4L
MMRF1020-04NR3	I	720–960	100 AVG	48	19.5/920	48.5	0.45	OM-780-4L
MMRF1020-04GNR3	I	720–960	100 AVG	48	19.5/920	48.5	0.45	OM-780G-4L

RF Aerospace and Defense Power Portfolio



Industry-Leading Packaging

- Thermal performance leadership
- Package design
- NXP's JEDEC-registered TO series is the only over-molded plastic package series specifically designed for high-power RF applications
  - Bolt down, clamp down and solder reflow mounting options
  - Low thermal resistance flange material
  - 225°C T_J maximum operating temperature
  - Power dissipation capabilities >1 kW
  - In-package impedance matching
  - Low Au solderable finish for improved reliability
  - Plastic package with a larger contact area for optimal thermal performance
- Manufacturing
  - Automated high-volume assembly and test
  - Multiple manufacturing locations
- Materials
  - RoHS compliant

RF Aerospace and Defense Power Packages

NI-1230H-4S

NI-780S-4L

OM-270-2

NI-1230S-4S

OM-780-4

TO-270WB-4

OM-270-8

Not to scale

Why Choose NXP?

- Best-in-class RF performance
- Industry-leading package designs
- Reliable and repeatable RF performance
- Consistent high quality
- Proven long-term reliability
- High-volume manufacturing capability
- Assured long-term supply
- Comprehensive U.S. and Eurozone sales and design support

Design Support

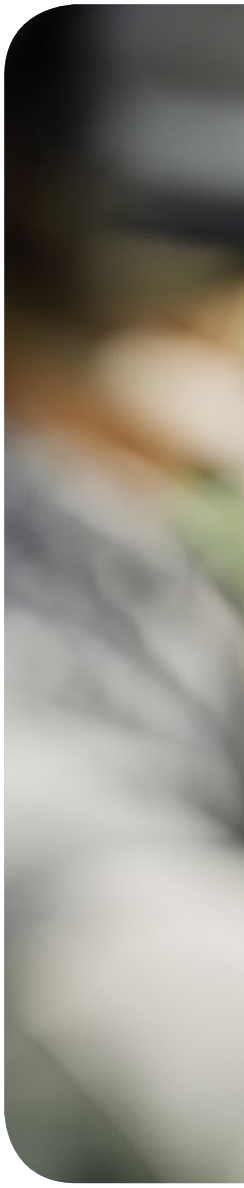
For information on design support for RF aerospace and defense products, visit **www.nxp.com/RFmilitary**.

- Application-specific reference designs
- Test and evaluation fixtures
- Fully validated RF high-power models for Keysight ADS and AWR Microwave Office®
- MTTF calculation programs
- 50 V RF LDMOS white paper
- Packaging and mounting application notes
- Thermal management application notes

Sample/Buy

For ordering and availability, contact your local NXP sales office or NXP authorized distributor.

Notes:



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