

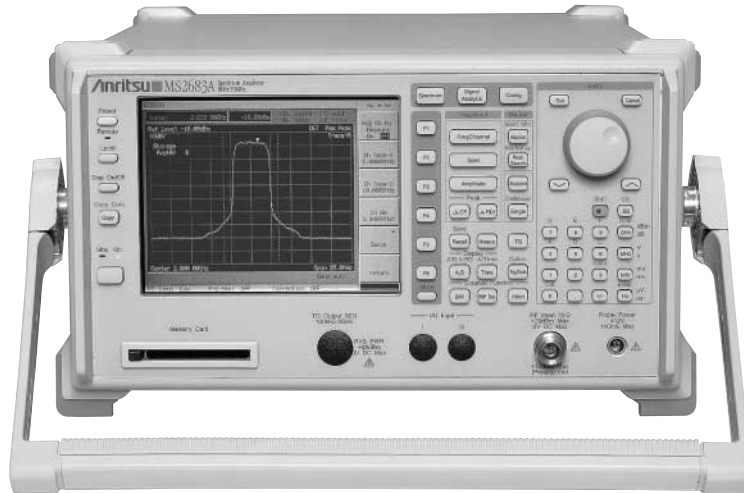
SPECTRUM ANALYZER
MS2681A/2683A

9 kHz to 3/7.8 GHz



For Evaluation of IMT-2000, Bluetooth™, MMAC and Advanced Radio Communication Devices

NEW



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The IMT-2000 (2 GHz band) service for third-generation mobile radio communication has finally started. Bluetooth, or IEEE802.11b (2.4 GHz), has been adopted for close-range radio communication between portable remote terminals and peripheral equipment, and R&D of Wireless LAN, IEEE802.11a, and HyperLAN2 (5 GHz band) for higher speed access have been conducted in various countries. The MS2681A/2683A spectrum analyzer delivers optimum performance over a wide dynamic range (156 dB, typical value), wide resolution bandwidth (20 MHz), to high-speed sweep (refresh rate of 20 times/s), required for evaluating next-generation radio communication systems and devices.

The 2 dB step input attenuator permits setting with low mixer distortion or low noise level inside the analyzer, and a high-speed DSP is equipped as standard. It can be used not only as a spectrum analyzer but also to perform various measurements easily and quickly by installing measurement software.

Features

- Optional measurement software (sold separately) for high-speed modulation analysis (approx. 1.5 sec. in W-CDMA)
- Wide resolution bandwidth (RBW) of 20 MHz for wide bandwidth in the future
- High-speed sweep and data transmission for efficient production
- 2 dB step input attenuator equipped as standard for optimum level signal evaluation
- Narrow resolution bandwidth (1 Hz to 1 kHz, Optional) with FFT (fast Fourier transform)

Specifications

• MS2681A

Specified values are obtained after warming up the equipment for 30 minutes at a constant ambient temperature and then performing calibration. The typical values are given for reference, and are not guaranteed.

Frequency	Frequency range	9 kHz to 3.0 GHz
	Display frequency accuracy	± (Display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz)
	Frequency counter resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz (counts the received frequency at the peak point inside the zone)
	Frequency counter accuracy	± (Display frequency x reference frequency accuracy + 2 Hz x N + 1 LSD) (at S/N 20 dB or more and RBW 3 MHz or less)
	Frequency span	Setting range: 0 Hz, 5 kHz to 3.0 GHz, accuracy: ±1.0% (at data point of 1001)
	Resolution bandwidth (RBW) [3 dB bandwidth]	Setting range: 300 Hz to 3 MHz (1, 3 sequence), 5 MHz, 10 MHz, 20 MHz *Manually settable, or automatically settable according to frequency span Accuracy: ±20% (300 Hz to 10 MHz), ±40% (20 MHz) Selectivity (60 dB: 3 dB): ≤15 : 1
	Video bandwidth (VBW)	1 Hz to 3 MHz (1, 3 sequence), Off *Manually settable, or automatically settable according to RBW
	Signal purity	Noise sideband: ≤-108 dBc/Hz (1 GHz, 10 kHz offset), ≤-120 dBc/Hz (1 GHz, 100 kHz offset)
Reference oscillator	Frequency: 10 MHz Start-up characteristics: ≤5 x 10 ⁻⁸ (after 10 minutes warm-up, with frequency after 24 hours warm-up referenced) Aging rate: ≤2 x 10 ⁻⁸ /day, 1 x 10 ⁻⁷ /year (with frequency after 24 hours of warm-up referenced) Temperature characteristics: ±5 x 10 ⁻⁸ (0 to 50°C, with frequency at 25°C referenced)	

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Amplitude	Level measurement	Measurement range: Average noise level to +30 dB Maximum input level CW average power: +30 dBm (RF ATT: ≥ 10 dB) Peak pulse input: +47 dBm (pulse width: ≤ 1 μ s, duty ratio: $\leq 1\%$, RF ATT: ≥ 30 dB) DC voltage: 0 VDC Average noise level display RBW: 300 Hz, VBW: 1 Hz, RF ATT: 0 dB, in Sample detection mode [Without Option 08] ≤ -124 dBm + f [GHz] dB (1 MHz to 2.5 GHz), ≤ -120 dBm + f [GHz] dB (2.5 to 3.0 GHz) [With Option 08] ≤ -122 dBm + 1.5f [GHz] dB (1 MHz to 2.5 GHz), ≤ -120 dBm + 1.5f [GHz] dB (2.5 to 3.0 GHz) Residual response: ≤ -100 dBm (1 MHz to 3.0 GHz)
	Reference level	Setting range Log scale: -100 to +40 dBm, or equivalent level, Linear scale: 2.24 μ V to 22.4 V Unit Log scale: dBm, dB μ V, dBmV, dB μ V (emf), W, V, dB μ V/m Linear scale: V Reference level accuracy: ± 0.5 dB (-49.9 to 0 dBm), ± 0.75 dB (+0.1 to +30 dBm, -69.9 to -50 dBm), ± 1.5 dB (-80 to -70 dBm) *After calibration, at 50 MHz, span: 1 MHz (when RF ATT, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: ± 0.3 dB (300 Hz to 5 MHz), ± 0.5 dB (10, 20 MHz) *After calibration, with RBW 3 kHz referenced Input attenuator (RF ATT) Setting range: 0 to 62 dB (2 dB step), manually settable, or automatically settable according to reference level Switching uncertainty: ± 0.3 dB (10 to 50 dB), ± 0.5 dB (52 to 62 dB) Input attenuator switching mode: 2, 10 dB step mode
	Frequency response	± 0.6 dB (9 kHz to 3.0 GHz, with 50 Hz referenced, when RF ATT 10 dB, 18° to 28°C) ± 1.0 dB (9 kHz to 3.0 GHz, with 50 Hz referenced, when RF ATT 10 to 62 dB)
	Waveform display	Scale: 10 div (single scale) Log scale: 10, 5, 2, 1 dB/div, Linear scale: 10, 5, 2, 1%/div Linearity (after calibration) Log scale: ± 0.4 dB (0 to -20 dB, RBW: ≤ 1 kHz), ± 1.0 dB (0 to -90 dB, ≤ 1 kHz) Linear scale: 4% of reference level Marker level resolution Log scale: 0.01 dB, linear scale: 0.02%
	Spurious response	2nd harmonic distortion: ≤ -60 dBc (input frequency 10 to 200 MHz, Mixer input: -30 dBm), ≤ -75 dBc (0.2 to 0.85 GHz, Mixer input: -30 dBm), ≤ -70 dBc (0.85 to 1.5 GHz, Mixer input: -30 dBm) Two-signal third-order intermodulation distortion (Frequency difference of two signals: ≥ 50 kHz, Mixer input: -30 dBm): ≤ -70 dBc (10 to 100 MHz), ≤ -85 dBc (0.1 to 3.0 GHz) Image response: ≤ -70 dBc
	1 dB gain compression	≥ 0 dBm (≥ 100 MHz), $\geq +3$ dBm (≥ 500 MHz)
	Maximum dynamic range	1 dB gain compression to average noise level [Without Option 08] ≥ 124 dB - f [GHz] dB, Reference value: 0.1 to 3.0 GHz [With Option 08] ≥ 122 dB - 1.5f [GHz] dB, Reference value: 0.1 to 3.0 GHz
Frequency sweep	Sweep mode	Continuous, single
	Sweep time	Setting range: 10 ms to 1000 s *Manually settable, or automatically settable according to RBW and VBW Set resolution: 5 ms (5 ms to 1 s), Top three digits (≥ 1 s) Accuracy: $\pm 3\%$
	Trigger switch	Free run, triggered
	Trigger source	Wide IF video, external (TTL), external (± 10 V), line
	Gate sweep mode	Off, random sweep mode Setting range Gate delay range: 0 to 65.5 ms (Resolution: 1 μ s), Gate length range: 2 μ s to 65.5 ms (Resolution: 1 μ s), Gate end: Internal/external
	Zone sweep	Sweeps the indicated range in the zone only.
	Tracking sweep	Sweeps following the peak point inside the zone marker (zone sweep also available).
Time sweep	Sweep mode	Continuous, single
	Sweep time	Setting range/resolution: 1 to 50 μ s (1, 2, 5 sequence), 100 μ s to 4.9 ms (100 μ s resolution), 5.0 ms to 1 s (5 ms resolution), 1 to 1000 s (setting of top three digits) Accuracy: $\pm 1\%$
	Trigger switch	Free run, triggered
	Trigger source	Wide IF video, video, external (TTL), external (± 10 V), line
	Trigger delay	Pre-trigger (displays waveform before trigger occurrence point) Setting range: - time span to 0 s Resolution: time span/500 or 100 ns, whichever is larger Post-trigger Setting range: 0 μ s to 65.5 ms Resolution: 100 ns (sweep time: ≤ 4.9 ms), 1 μ s (sweep time: ≥ 5 ms)
Function	Number of data points	Selectable between 501 and 1001
	Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, AVERAGE
	Display functions	TRACE A, TRACE B, TRACE A/BG, TRACE A/TIME Trace calculation: A \rightarrow B, B \rightarrow A, A \leftrightarrow B, A + B \rightarrow A, A - B \rightarrow A, A - B + DL \rightarrow A
	Storage functions	NORMAL, VIEW, MAX HOLD, MIN HOLD, AVERAGE, CUMULATIVE, OVER WRITE

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Function	Marker	Signal search: AUTO TUNE, PEAK → CF, PEAK → REF, SCROLL Zone marker: NORMAL, DELTA Marker functions: MARKER → CF, MARKER → REF, MARKER → CF STEP SIZE ΔMARKER → SPAN, ZONE → SPAN Peak search: PEAK, NEXT PEAK, MIN DIP, NEXT DIP Multi marker: 10 max. (highest 10, harmonics, manually set)
	Measure	Noise power: dBm/Hz, dBm/CH, dBμV/√Hz C/N: dBc/Hz, dBc/CH Occupied bandwidth: power N% method, X-dB down method Adjacent channel leakage power REF: total power/reference level/in-band level method Display: channel designate display: 3 channels x 2, graphic display Average power within burst signal: average power in the designated range of time domain waveform Template comparison (at time sweep): upper limit x 2, lower limit x 2 MASK (at frequency sweep): upper limit x 2, lower limit x 2
	Correction	Frequency response can be corrected arbitrarily up to 150 points
Others	Display	Color TFT-LCD, VGA 17 cm (6.5 type)
	Color	Number of colors: 4096, RGB, each 16-scale settable
	Intensity	Settable in 5 steps (display off included)
	Contents	Scale, waveform data, setting condition, menu, title
	Save/recall	Saves and recalls setting conditions and waveform data to internal memory (max. 12) or memory card
	Hard copy	Displayed data can be hard-copied with the printer via parallel interface (PCL level 3 or lower, or ESC/P-J83, J84 compatible models only)
	GPIOB	Meets IEEE488.2. Controllable with external controller (except for power switch) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
	Parallel interface	Centronics-compatible, outputs print data to printer, D-sub 25 pin connector (jack) Data line exclusive for output: 8, Control line: 4 (BUSY, DTSB, ERROR, PE)
	PC card interface	Saves and recalls setting condition and waveform data, ATA flash card accessible (3.3 V/5 V), Connector: Type I or Type II of PC card
Input/output connector	RS-232C	Controllable with external controller (except for power switch) Baud rate: 1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 56 k, 115 kbps
	Input/output connector	Input connector: N-J, 50 Ω nominal value Impedance: VSWR ≤1.5 Typical (RF ATT ≥10 dB) Video output: outputs analog RGB, D-sub 15-pin connector (jack) IF output: BNC connector, 50 Ω nominal value, 66/10.69 MHz, Level: -10 dBm Typical, (frequency 50 MHz, display scale upper edge, 50 Ω terminated) Broadband IF output: BNC connector, 50 Ω nominal value, 60.69/66 MHz Gain: 0 dB Typical (50 MHz, RF ATT: 0 dB, for RF input level) Video output (Y): BNC connector Level: 0 V to 0.5 V ± 0.1 V Typical (log scale), 0 V to 0.4 V ± 0.1 V Typical (linear scale), (50 MHz, from upper edge to lower edge at 10 dB/div or 10%/div, 75 Ω terminated) Buffered Output: BNC connector, Level: 2 to 5 V (p-p) (200 Ω terminated) Sweep Output (X): BNC connector, Level: 0 to 10 V ± 0.1 V (≥100 kΩ termination, from the left edge to the right edge of the display scale, single band sweep) Sweep Status Output (Z): BNC connector, Level: TTL (low level at sweep) Probe source: 4-pole connector, +12 V, -12 V, ±10% each, 110 mA max. each. Trig/Gate input: BNC connector, level: ±10 V (0.1 V resolution), or TTL level External reference input: BNC connector, Frequency: 10 MHz ±10 Hz, 13 MHz ±13 Hz, level: ≥0 dBm
	Dimensions and mass	320 (W) x 177 (H) x 411 (D) mm (handle, leg, front cover, fan cover excluded), ≤16 kg (nominal value)
	Power	100 to 120/200 to 240 VAC (-15%/+10%, 250 V max., wide range input) 47.5 Hz to 63 Hz, ≤400 VA
	Ambient temperature and humidity	0° to 50°C, RH ≤85% (no condensation allowed)
	Storage temperature range	-20° to 60°C
	EMC	EN61326: 1997/A1: 1998 (Class A), EN61000-3-2: 1995/A2: 1998 (Class A), EN61326: 1997/A1: 1998 (Annex A)
	LVD	EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution degree 2)

• **MS2683A**

Specified values are obtained after warming up the equipment for 30 minutes at a constant ambient temperature and then performing calibration. The typical values are given for reference, and are not guaranteed.

Frequency	Frequency range	9 kHz to 7.8 GHz
	Frequency band	Band 0: 9 kHz to 3.2 GHz, Band 1-L: 1.6 to 3.2 GHz (Option 03), Band 1: 3.15 to 6.3 GHz, Band 1+: 6.2 to 7.8 GHz
	Pre-selector range	3.15 to 7.8 GHz, 1.6 to 7.8 GHz (Option 03)
	Display frequency accuracy	± (Display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz)
	Frequency counter resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz (counts the received frequency at the peak point inside the zone)
	Frequency counter accuracy	± (Display frequency x reference frequency accuracy + 2 Hz + 1 LSD) *At S/N 20 dB or more and RBW 3 MHz or less
	Frequency span	Setting range: 0 Hz, 5 kHz to 7.8 GHz, accuracy: ±1.0% (at data point of 1001)
	Resolution bandwidth (RBW) [3 dB bandwidth]	Setting range: 300 Hz to 3 MHz (1, 3 sequence), 5 MHz, 10 MHz, 20 MHz *Manually settable, or automatically settable according to frequency span Accuracy: ±20% (300 Hz to 10 MHz), ±40% (20 MHz) Selectivity (60 dB: 3 dB): ≤ 15 : 1
	Video bandwidth (VBW)	1 Hz to 3 MHz (1, 3 sequence), Off *Manually settable, or automatically settable according to RBW

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Frequency	Signal purity	Noise sideband: ≤ -108 dBc/Hz (1 GHz, 10 kHz offset), ≤ -120 dBc/Hz (1 GHz, 100 kHz offset)
	Reference oscillator	Frequency: 10 MHz Start-up characteristics: $\leq 5 \times 10^{-8}$ (after 10 minutes warm-up, with frequency after 24 hours warm-up referenced) Aging rate: $\leq 2 \times 10^{-8}$ /day, 1×10^{-7} /year (with frequency after 24 hours of warm-up referenced) Temperature characteristics: $\pm 5 \times 10^{-8}$ (0° to 50°C, with frequency at 25°C referenced)
Amplitude	Level measurement	Measurement range: Average noise level to +30 dB Maximum input level CW average power: +30 dBm (RF ATT: ≥ 10 dB) Peak pulse input: +47 dBm (pulse width: ≤ 1 μ s, duty ratio: $\leq 1\%$, RF ATT: ≥ 30 dB) DC voltage: 0 VDC Average noise level display RBW: 300 Hz, VBW: 1 Hz, RF ATT 0 dB, in Sample detection mode [Without Option 08] ≤ -124 dBm + f [GHz] dB (1 MHz to 2.5 GHz, band 0), ≤ -120 dBm + f [GHz] dB (2.5 to 3.2 GHz, band 0), ≤ -122 dBm + 0.5f [GHz] dB (3.15 to 7.8 GHz, band 1) [With Option 08] ≤ -122 dBm + 1.5f [GHz] dB (1 MHz to 2.5 GHz, band 0), ≤ -120 dBm + 1.5f [GHz] dB (2.5 to 3.2 GHz, band 0), ≤ -122 dBm + 0.5f [GHz] dB (3.15 to 7.8 GHz, band 1) Residual response: ≤ -100 dBm (1 MHz to 3.2 GHz, band 0), ≤ -90 dBm (3.15 to 7.8 GHz, band 1)
	Reference level	Setting range Log scale: -100 to +40 dBm, or equivalent level, Linear scale: 2.24 μ V to 22.4 V Unit Log scale: dBm, dB μ V, dBmV, dB μ V (emf), W, V, dB μ V/m Linear scale: V Reference level accuracy: ± 0.5 dB (-49.9 to 0 dBm), ± 0.75 dB (+0.1 to +30 dBm, -69.9 to -50 dBm), ± 1.5 dB (-80 to -70 dBm) *After calibration, at 50 MHz, span: 1 MHz (when RF ATT, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: ± 0.3 dB (300 Hz to 5 MHz), ± 0.5 dB (10, 20 MHz) *After calibration, with RBW 3 kHz referenced Input attenuator (RF ATT) Setting range: 0 dB to 62 dB (2 dB step), manually settable, or automatically settable according to reference level Switching uncertainty: ± 0.3 dB (10 to 50 dB), ± 0.5 dB (52 to 62 dB) *After calibration, with 50 MHz, RF ATT 10 dB referenced Input attenuator switching mode: 2, 10 dB step mode
	Frequency response	± 0.6 dB (9 kHz to 3.2 GHz, band 0), ± 1.0 dB (3.15 to 7.8 GHz, band 1) ± 1.0 dB (Option 03, 1.6 to 7.8 GHz, band 1) *With 50 MHz referenced (when RF ATT 10 dB, 18° to 28°C) ± 1.0 dB (9 kHz to 3.2 GHz, band 0), ± 2.0 dB (3.15 to 7.8 GHz, band 1) ± 2.0 dB (1.6 to 7.8 GHz, band 1) *With 50 MHz referenced (when RF ATT 10 to 62 dB) After pre-selector tuning for band 1.
	Waveform display	Scale: 10 div (single scale) Log scale: 10, 5, 2, 1 dB/div, Linear scale: 10, 5, 2, 1%/div Linearity (after calibration) Log scale: ± 0.4 dB (0 to -20 dB, RBW ≤ 1 kHz), 1.0 dB (0 to -90 dB, ≤ 1 kHz) Linear scale: 4% of reference level Marker level resolution Log scale: 0.01 dB, linear scale: 0.02%
	Spurious response	2nd harmonic distortion: ≤ -60 dBc (input frequency 10 to 200 MHz), ≤ -75 dBc (0.2 to 0.85 GHz, band 0), ≤ -70 dBc (0.85 to 1.6 GHz, band 0) *Mixer input: -30 dBm ≤ 90 dBc (1.6 to 3.9 GHz, band 1), ≤ -90 dBc (Option 03, 0.8 to 3.9 GHz, band 1) *Mixer input: -10 dBm Two-signal third-order intermodulation distortion: ≤ -70 dBc (10 to 100 MHz), ≤ -85 dBc (0.1 to 7.8 GHz) *Frequency difference of two signals: ≥ 50 kHz, Mixer input: -30 dBm Image response: ≤ -70 dBc
	1 dB gain compression	≥ 0 dBm (≥ 100 MHz), $\geq +3$ dBm (≥ 500 MHz, band 1), ≥ 0 dBm (≥ 3.15 GHz, band 1), ≥ 0 dBm (Option 03: ≥ 1.6 GHz, band 1)
	Maximum dynamic range	1 dB gain compression to average noise level [Without Option 08] ≥ 124 dB - f [GHz] dB, Reference value: 0.1 to 3.2 GHz, band 0 ≥ 122 dB - 0.5f [GHz] dB, Reference value: 3.15 to 7.8 GHz, band 1 [With Option 08] ≥ 122 dB - 1.5f [GHz] dB, Reference value: 0.1 to 3.2 GHz, band 0 ≥ 122 dB - 0.5f [GHz] dB, Reference value: 3.15 to 7.8 GHz, band 1
Frequency sweep	Sweep mode	Continuous, single
	Sweep time	Setting range: 10 ms to 1000 s *Manually settable, or automatically settable according to RBW and VBW Set resolution: 5 ms (5 ms to 1 s), Top three digits (≥ 1 s) Accuracy: $\pm 3\%$
	Trigger switch	Free run, triggered
	Trigger source	Wide IF video, external (TTL), external (± 10 V), line
Time sweep	Gate sweep mode	Off, random sweep mode Setting range Gate delay range: 0 to 65.5 ms (Resolution: 1 μ s), Gate length range: 2 μ s to 65.5 ms (Resolution: 1 μ s), Gate end: Internal/external
	Sweep mode	Continuous, single
	Sweep time	Setting range/resolution: 1 to 50 μ s (1, 2, 5 sequence), 100 μ s to 4.9 ms (100 μ s resolution) 5.0 ms to 1 s (5 ms resolution), 1 to 1000 s (setting of top three digits) Accuracy: $\pm 1\%$
	Trigger switch	Free run, triggered

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Time sweep	Trigger source	Wide IF video, video, external (TTL), external (± 10 V), line
	Trigger delay	Pre-trigger (displays waveform before trigger occurrence point) Setting range: - time span to 0 s Resolution: time span/500 or 100 ns, whichever is larger Post-trigger Setting range: 0 μ s to 65.5 ms Resolution: 100 ns (sweep time: ≤ 4.9 ms), 1 μ s (sweep time: ≤ 5 ms)
Functions	Number of data points	Selectable between 501 and 1001
	Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, AVERAGE
	Display functions	TRACE A, TRACE B, TRACE A/BG, TRACE A/TIME Trace calculation: A \rightarrow B, B \rightarrow A, A \leftrightarrow B, A + B \rightarrow A, A - B \rightarrow A, A - B + DL \rightarrow A
	Storage functions	NORMAL, VIEW, MAX HOLD, MIN HOLD, AVERAGE, CUMULATIVE, OVER WRITE
	Marker	Signal search: AUTO TUNE, PEAK \rightarrow CF, PEAK \rightarrow REF, SCROLL Zone marker: NORMAL, DELTA Marker functions: MARKER \rightarrow CF, MARKER \rightarrow REF, MARKER \rightarrow CF STEP SIZE Δ MARKER \rightarrow SPAN, ZONE \rightarrow SPAN Peak search: PEAK, NEXT PEAK, MIN DIP, NEXT DIP Multi marker: 10 max. (highest 10, harmonics, manually set)
	Measure	Noise power: dBm/Hz, dBm/CH, dB μ V/ \sqrt Hz C/N: dBc/Hz, dBc/CH Occupied bandwidth: power N% method, X-dB down method Adjacent channel leakage power REF: total power/reference level/in-band level method Display: channel designate display: 3 channels x 2, graphic display Average power within burst signal: average power in the designated range of time domain waveform Template comparison (at time sweep): upper limit x 2, lower limit x 2 MASK (at frequency sweep): upper limit x 2, lower limit x 2
Correction	Frequency response can be corrected arbitrarily up to 150 points	
Others	Display	Color TFT LCD, VGA 17 cm (6.5 type)
	Color	Number of colors: 4096, RGB, each 16-scale settable
	Intensity	Settable in 5 steps (display off included)
	Contents	Scale, waveform data, setting condition, menu, title
	Save/recall	Saves and recalls setting conditions and waveform data to internal memory (max. 12) or memory card
	Hard copy	Displayed data can be hard-copied with the printer via parallel interface (PCL level 3 or lower, or ESC/P-J83, J84 compatible models only)
	GPIB	Meets IEEE488.2. Controllable with external controller (except for power switch) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
	Parallel interface	Centronics-compatible, outputs print data to printer, D-sub 25 pin connector (jack) Data line exclusive for output: 8, Control line: 4 (BUSY, DTSB, ERROR, PE)
	PC card interface	Saves and recalls setting condition and waveform data, ATA flash card accessible (3.3/5 V), Connector: Type I or Type II of PC card
	RS-232C	Controllable with external controller (except for power switch) Baud rate: 1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 56 k, 115 kbps
Input/output connector	Input connector: N-J, 50 Ω nominal value Impedance: VSWR ≤ 1.5 Typical (RF ATT: ≥ 10 dB) Video output: outputs analog RGB, D-sub 15-pin connector (jack) IF output: BNC connector, 50 Ω nominal value, 66/10.69 MHz, Level: -10 dBm Typical, (frequency 50 MHz, display scale upper edge, 50 Ω terminated) Broadband IF output: BNC connector, 50 Ω nominal value, 60.69/66 MHz Gain: 0 dB Typical (50 MHz, RF ATT: 0 dB, for RF input level) Video output (Y): BNC connector Level: 0 to 0.5 V \pm 0.1 V Typical (log scale), 0 to 0.4 V \pm 0.1 V Typical (linear scale), (50 MHz, from upper edge to lower edge at 10 dB/div or 10%/div, 75 Ω terminated) Buffered Output: BNC connector, Level: 2 to 5 V (p-p) (200 Ω terminated) Sweep Output (X): BNC connector, Level: 0 to 10 V \pm 0.1 V (≥ 100 k Ω termination, from the left edge to the right edge of the display scale, single band sweep) Sweep Status Output (Z): BNC connector, Level: TTL (low level at sweep) Probe source: 4-pole connector, +12 V, -12 V, $\pm 10\%$ each, 110 mA max. each. Trig/Gate input: BNC connector, level: ± 10 V (0.1 V resolution), or TTL level External reference input: BNC connector, Frequency: 10 MHz ± 10 Hz, 13 MHz ± 13 Hz, level: ≥ 0 dBm	
Dimensions and mass	320 (W) x 177 (H) x 411 (D) mm (handle, leg, front cover, fan cover excluded), ≤ 16 kg (nominal value)	
Power	100 to 120/200 to 240 VAC (-15%/+10%, 250 V max., wide range input) 47.5 to 63 Hz, ≤ 400 VA	
Ambient temperature and humidity	0 to 50°C, RH $\leq 85\%$ (no condensation allowed)	
Storage temperature range	-20° to 60°C	
EMC	EN61326: 1997/A1: 1998 (Class A), EN61000-3-2: 1995/A2: 1998 (Class A), EN61326: 1997/A1: 1998 (Annex A)	
LVD	EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution degree 2)	

• MS2681A Options

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq 5 \times 10^{-8}$ (≤ 7 minutes, 25°C, Typical value)
Aging rate	$\leq \pm 5 \times 10^{-10}$ /day (With the frequency at 24 hours after the power is turned on referenced)
Temperature characteristics	$\leq \pm 5 \times 10^{-10}$ (With the frequency at 0 to 50°C and 25°C referenced)

Option 02: Narrow resolution bandwidths (FFT)

Resolution bandwidth	Setting range: 1 Hz to 1 kHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW = 30, 300 Hz), $\pm 10\%$ Typical (RBW = 1, 3, 10, 100, 1 kHz) RBW selectivity (60 dB: 3 dB): $\leq 5:1$ RBW switching uncertainty: ± 0.5 dB
Span setting	Minimum setting span: 100 Hz
Average noise level display	When RBW is 1 Hz and RF ATT is 0 dB [Without Option 08] ≤ -148.3 dBm + f [GHz] dB Typical (1 MHz to 2.5 GHz), ≤ -146.3 dBm + f [GHz] dB Typical (2.5 to 3.0 GHz) [With Option 08] ≤ -146.3 dBm + 1.5f [GHz] dB Typical (1 MHz to 2.5 GHz), ≤ -144.3 dBm + 1.5f [GHz] dB Typical (2.5 to 3.0 GHz)

Option 04: Digital resolution bandwidth

Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW: ≥ 100 Hz), $\pm 10\%$ NOMINAL (RBW: ≤ 30 Hz) Bandwidth selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW ≥ 100 Hz), $\leq 5:1$ NOMINAL (RBW: ≤ 30 Hz) RBW switching uncertainty: 0.5 dB
Span setting	Minimum span setting: 1 kHz
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level	When RBW is 10 Hz and RF ATT is 0dB [Without Option 08] ≤ -136.5 dBm + f [GHz] dB NOMINAL (1 MHz to 2.5 GHz), ≤ -132.5 dBm + f [GHz] dB NOMINAL (2.5 to 3.0 GHz) [With Option 08] ≤ -134.5 dBm + 1.5 x f [GHz] dB Typical (1 MHz to 2.5 GHz), ≤ -130.5 dBm + 1.5 x f [GHz] dB Typical (2.5 to 3.0 GHz)

Option 08: Pre-amplifier*1

Frequency range	100 kHz to 3 GHz
Gain	20 dB Typical
Noise figure	6.5 dB Typical (input frequency ≤ 2 GHz), 12 dB Typical (input frequency > 2 GHz)
Level measurement range	Average noise level display to +10 dBm
Max. input level	CW average power: +10 dBm
Reference level	Setting range Log scale: -120 to +10 dBm, or equivalent, Linear scale: 2.24 μ V to 707 mV Reference level accuracy: ± 0.9 dB (-69.9 to +10 dBm), ± 1.5 dB (-90 to -70 dBm) *After calibration, with 50 MHz referenced, 1 MHz span (RF ATT, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: ± 0.5 dB (300 Hz to 5 MHz), ± 0.75 dB (10 MHz, 20 MHz) RF ATT switching uncertainty: ± 0.5 dB (10 to 50 dB), ± 0.75 dB (52 to 62 dB) *With 50 MHz and RF ATT 10 dB referenced
Average noise level display	-137 dBm + 2.0 x f [GHz]dB (1 MHz to 3.0 GHz) *When RBW is 300 Hz, VBW is 1 Hz, RF ATT is 0 dB, and detection mode is set to SAMPLE
Frequency response	± 2.0 dB (100 kHz to 3.0 GHz) *With 50 MHz referenced, when RF ATT is 10 dB to 50 dB, and temperature is 18° to 28°C
Linearity of waveform display	Log scale (after calibration): ± 0.5 dB (0 to -20 dB, RBW ≤ 1 kHz), ± 1.0 dB (0 to -60 dB, RBW ≤ 1 kHz), ± 1.5 dB (0 to -75 dB, RBW ≤ 1 kHz) Linear scale (after calibration): $\pm 5\%$ (relative to reference level)
Spurious response	≤ -70 dBc (10 MHz to 3 GHz) *Frequency difference of two signals ≥ 50 kHz, At pre-amplifier input level of -55 dBm*2
1 dB gain compression	≥ -35 dBm (input frequency ≥ 100 MHz) *At pre-amplifier input level

*1 : Overall specification with pre-amplifier ON (Noise figure and gain are single performance of pre-amplifier.)

*2 : Pre-amplifier input level is shown by the following equation: Pre-amplifier input level = RF input level – RF ATT setting level

Option 09: Ethernet interface

Function	Control with external controller (except for power switch)
Connector	10base-T

Option 17: I/Q balanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity <100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) In-phase voltage range: ± 2.5 V (at input terminal)

Option 18: I/Q unbalanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity <100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) Changeable between DC connection and AC connection

• MS2683A Options

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq 5 \times 10^{-8}$ (≤ 7 minutes, 25°C, Typical value)
Aging rate	$\leq \pm 5 \times 10^{-10}$ /day (With the frequency at 24 hours after the power is turned on referenced)
Temperature characteristics	$\leq \pm 5 \times 10^{-10}$ /day (With the frequency at 0° to 50°C and 25°C referenced)

Option 02: Narrow resolution bandwidths (FFT)

Resolution bandwidth	Setting range: 1 Hz to 1 kHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW = 30, 300 Hz), $\pm 10\%$ Typical (RBW = 1, 3, 10, 100, 1 kHz) RBW selectivity (60 dB: 3 dB): $\leq 5:1$ RBW switching uncertainty: ± 0.5 dB
Span setting	Minimum setting span: 100 Hz
Average noise level display	When RBW is 1 Hz and RF ATT is 0 dB [Without Option 08] ≤ -146.5 dBm + f [GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -142.5 dBm + f [GHz] dB Typical (2.5 to 3.2 GHz, band 0) ≤ -144.5 dBm + 0.5f [GHz] dB Typical (3.15 to 7.8 GHz, band 1) [With Option 08] ≤ -144.5 dBm + 1.5f [GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -140.5 dBm + 1.5f [GHz] dB Typical (2.5 to 3.2 GHz, band 1) ≤ -138.5 dBm + 0.5f [GHz] dB Typical (3.15 to 7.8 GHz, band 1)

Option 03: Extension of pre-selector lower limit to 1.6 GHz

Function	Extends the lowest frequency of pre-selector from 3.15 to 1.6 GHz
Frequency band	0 band: 9 kHz to 3.2 GHz, 1-L band: 1.6 to 3.2 GHz, 1- band: 3.15 to 6.3 GHz, 1+ band: 6.2 to 7.8 GHz
Pre-selector range	1.6 to 7.8 GHz (band: 1-L, 1-, 1+)
Average noise level	≤ -122 dBm + 0.5f [GHz] dB (1.6 to 7.8 GHz, band 1, RBW: 300 Hz, VBW: 1 Hz, RF ATT: 0 dB)
Residual response	≤ -90 dBm (1.6 to 7.8 GHz, band 1, RF ATT: 0 dB, input terminated at 50 Ω)
Frequency response	± 1.0 dB (with 1.6 to 7.8 GHz, band 1, and 50 MHz referenced, when RF ATT is 10 dB and temperature is 18° to 28°C) ± 2.0 dB (1.6 to 7.8 GHz, band 1, RF ATT: 10 dB to 62 dB) *After pre-selector tuning for band 1
2nd harmonic distortion	≤ -90 dBc (0.8 to 3.9 GHz, band 1, mixer input: -10 dBm)
1 dB gain compression	≥ 0 dBm (1.6 to 7.8 GHz, band 1)
Maximum dynamic range	≥ -122 dB + 0.5f [GHz] dB (1.6 to 7.8 GHz, band 1)

Option 46: Auto power recovery

Function	Disables the power switch on the front panel and automatically restores power after power failure. ON/OFF operation can be performed using the standby switch on the rear panel. *Power switch on the front panel of this unit does not have a latching function. Therefore, if power is interrupted in the ON status, the standby status is kept even after power is restored.
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Option 47: Rack mount (IEC)

Function	Mounts the rack mount for IEC standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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Option 48: Rack mount (JIS)

Function	Mounts the rack mount for JIS standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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Option 04: Digital resolution bandwidth

Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW: ≥ 100 Hz), $\pm 10\%$ NOMINAL (RBW: ≥ 30 Hz) Bandwidth selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW: ≥ 100 Hz), $\leq 5:1$ NOMINAL (RBW: ≤ 30 Hz) RBW switching uncertainty: 0.5 dB
Span setting	Minimum span setting: 1 kHz
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level	When RBW is 10 Hz and RF ATT is 0 dB [Without Option 08] ≤ -136.5 dBm + f [GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -132.5 dBm + f [GHz] dB Typical (2.5 to 3.2 GHz, band 0) ≤ -134.5 dBm + 0.5f [GHz] dB Typical (3.15 to 7.8 GHz, band 1) [With Option 08] ≤ -134.5 dBm + 1.5 x f [GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -130.5 dBm + 1.5 x f [GHz] dB Typical (2.5 to 3.2 GHz, band 0) ≤ -134.5 dBm + 0.5 x f [GHz] dB Typical (3.15 to 7.8 GHz, band 1)

Option 08: Pre-amplifier*1

Frequency range	100 kHz to 3 GHz
Gain	20 dB Typical
Noise figure	6.5 dB Typical (input frequency ≤ 2 GHz), 12 dB Typical (input frequency > 2 GHz)
Level measurement range	Average noise level display to +10 dBm
Max. input level	CW average power: +10 dBm
Reference level	Setting range Log scale: -120 to +10 dBm, or equivalent, Linear scale: 2.24 μ V to 707 mV Reference level accuracy: ± 0.9 dB (-69.9 to +10 dBm), ± 1.5 dB (-90 to -70 dBm) *After calibration, with 50 MHz referenced, 1 MHz span (RF, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: ± 0.5 dB (300 Hz to 5 MHz), ± 0.75 dB (10 MHz, 20 MHz) RF ATT switching uncertainty: ± 0.5 dB (10 to 50 dB), ± 0.75 dB (52 to 62 dB) *With 50 MHz referenced, when RF ATT is 10 dB
Average noise level display	-137 dBm + 2.0 x f [GHz] dB (1 MHz to 2.5 GHz, band 0) *When RBW is 300 Hz, VBW is 1 Hz, RF ATT is 0 dB, and detection mode set to SAMPLE
Frequency response	± 2.0 dB (100 kHz to 3.0 GHz) *With 50 MHz referenced, when RF ATT is 10 dB to 50 dB, and temperature is 18° to 28°C
Linearity of waveform display	Log scale (after calibration): ± 0.5 dB (0 to -20 dB, RBW: ≤ 1 kHz), ± 1.0 dB (0 to -60 dB, RBW: ≤ 1 kHz), ± 1.5 dB (0 to -75 dB, RBW: ≤ 1 kHz) Linear scale (after calibration): $\pm 5\%$ (relative to reference level)
Spurious response	≤ -70 dBc (10 MHz to 3 GHz) *Frequency difference of two signals ≥ 50 kHz, At pre-amplifier input level of -55 dBm*2
1 dB gain compression	≥ -35 dBm (input frequency ≥ 100 MHz) *At pre-amplifier input level

*1 : Overall specification with pre-amplifier ON (Noise figure and gain are single performance of pre-amplifier.)

*2 : Pre-amplifier input level is shown by the following equation: Pre-amplifier input level = RF input level – RF ATT setting level

Option 09: Ethernet interface

Function	Exercises control with external controller (except for power switch)
Connector	10base-T

Option 17: I/Q balanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity < 100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) In-phase voltage range: ± 2.5 V (at input terminal)

Option 18: I/Q unbalanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity < 100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) Changeable between DC connection and AC connection

Option 34: 4 GHz LO output

Frequency	Frequency: 4 GHz Frequency accuracy: $\pm (4 \text{ GHz} \times \text{reference frequency accuracy}) \pm 1 \text{ Hz}$
Output level	-10 dBm Typical
Spurious	≤ -40 dBc Typical

Option 46: Auto power recovery

Function	Disables the power switch on the front panel and automatically restores power after power failure. ON/OFF operation can be performed using the standby switch on the rear panel. *Power switch on the front panel of this unit does not have a latching function. Therefore, if power is interrupted in the ON status, the standby status is kept even after power is restored.
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Option 47: Rack mount (IEC)

Function	Mounts the rack mount for IEC standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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Option 48: Rack mount (JIS)

Function	Mounts the rack mount for JIS standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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• **MX268101A/268301A W-CDMA Measurement Software**

The following specifications are guaranteed after execution of internal level optimization of MS2683A (automatically executed by pressing the key).

Model	MX268101A	MX268301A	
Modulation/frequency measurement	Frequency measurement range	50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with Option 08)	
	Measurement level range	-60 to +30 dBm (average power, when pre-amplifier is OFF) -80 to +10 dBm (average power, when pre-amplifier is ON ^{*1})	
	Carrier frequency accuracy	Input level: ≥ -30 dBm (when pre-amplifier is OFF), ≥ -40 dBm (when pre-amplifier is ON ^{*1}), at code channel 1CH \pm (reference crystal oscillator accuracy +10 Hz)	
	Modulation accuracy	Residual vector error Input level: ≥ -30 dBm (when pre-amplifier is OFF), ≥ -40 dBm (when pre-amplifier is ON ^{*1}), at code channel 1CH, <2.0% (rms)	
	Origin point offset accuracy	Input: level ≥ -30 dBm (when pre-amplifier is OFF), ≥ -40 dBm (when pre-amplifier is ON ^{*1}), at code channel 1CH only, ± 0.5 dB for the signal of origin point offset of -30 dBc	
	Waveform display	Indicates the following for 1CH to multi-CH input signals Constellation display, Vector error vs. chip number display, Phase error vs. chip number display, Amplitude error vs. chip number display	
Code domain analysis	Frequency measurement range	50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with Option 08)	
	Measurement level range	-60 to +30 dBm (average power, when pre-amplifier is OFF) -80 to +10 dBm (average power, when pre-amplifier is ON ^{*1})	
	Code domain power accuracy	Input level: ≥ -10 dBm (when pre-amplifier is OFF), ≥ -20 dBm (when pre-amplifier is ON ^{*1}) ± 0.1 dB (code power: ≥ -10 dBc), ± 0.3 dB (code power: ≥ -25 dBc)	
	Code domain error	Input level: ≥ -10 dBm (when pre-amplifier is OFF), ≥ -20 dBm (when pre-amplifier is ON ^{*1}), diffusion coefficient: 512 (down link), 256 (up link) Residual error: <-50 dB, Accuracy: ± 0.5 dB (for error -30 dBc)	
	Display function	Code domain power, code domain error display Corresponding spread factor: 4 to 256 (up link), 4 to 512 (down link), With spread factor automatic detection function I/Q is separately displayed at up link.	
Amplitude measurement	Frequency range	50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with Option 08)	
	Measurement level range	-60 to +30 dBm (average power, when pre-amplifier is OFF) -80 to +10 dBm (average power, when pre-amplifier is ON ^{*1})	
	Transmitted power measurement	After execution of level calibration Measurement range: -20 to +30 dBm (average power, when pre-amplifier is OFF) -20 to +10 dBm (average power, when pre-amplifier is ON ^{*1}) Accuracy: ± 2.0 dB Typical	
	Power measurement linearity	Input level: ≥ -10 dBm (when pre-amplifier is OFF), ≥ -20 dBm (when pre-amplifier is ON ^{*1}), ± 0.2 dB (0 to 40 dB) without changing reference level setting after range optimization	
	Filter select function	Power when passing RRC ($\alpha = 0.22$) filter can be measured.	
	Transmitted power control measurement function	Relative power per slot is displayed. Equipped with pass/fail judging function.	
Occupied bandwidth	Frequency range	50 MHz to 3 GHz	
	Measurement level range	-60 to +30 dBm (average power, when pre-amplifier is OFF) -80 to +10 dBm (average power, when pre-amplifier is ON ^{*1})	
	Measurement method	Sweep method: After measuring the signal with the sweep type spectrum analyzer, performs calculation and displays the result. FFT method: After analyzing the signal with FFT, performs calculation and displays the result.	
Adjacent channel leakage power measurement	Frequency range	50 MHz to 3 GHz, 50 MHz to 2.3 GHz (with Option 08)	
	Input level range	-10 to +30 dBm (average power): when pre-amplifier is OFF	
	Measurement method	Sweep method (all): After measuring the signal with the sweep type spectrum analyzer, performs calculation and displays the result. Sweep method (separate): After measuring adjacent channel and the channel next to the adjacent channel with the sweep type spectrum analyzer, performs calculation and displays the result. Filter method: Measures power at adjacent channel and at the channel next to the adjacent channel after it passes the built-in receive filter (RRC: $\alpha = 0.22$) and displays the value.	
	Measurement range	Input level: ≥ 0 dBm, filter method, in broad dynamic range mode At code channel 1CH 5 MHz offset: ≥ 55 dBc, 10 MHz offset: ≥ 62 dBc At multiple code channel 16CH (only with Option 8) 5 MHz offset: ≥ 50 dBc, 10 MHz offset: ≥ 60 dBc Input level: ≥ -10 dBm, filter method, in broad dynamic range mode At code channel 1CH 5 MHz offset: 55 dBc Typical, 10 MHz offset: 62 dBc Typical At multiple code channel 16CH 5 MHz offset: 50 dBc Typical, 10 MHz offset: 60 dBc Typical	

Continued on next page

Model		MX268101A	MX268301A
Spurious measurement	Frequency measurement range	9 kHz to 3.0 GHz, except for the range within carrier frequency ± 50 MHz	9 kHz to 7.8 GHz, except for the range within carrier frequency ± 50 MHz
	Input level range (transmitted power)	0 to +30 dBm (average power): when pre-amplifier is OFF	
	Measurement method	<p>Sweep method: After sweeping the designated frequency range with the spectrum analyzer, detects the peak value and displays it. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE.</p> <p>Spot method: After measuring the designated frequency in time domain of the spectrum analyzer, displays the average value. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE.</p> <p>Search method: After sweeping the designated frequency range with the spectrum analyzer and detecting the peak value, measures the frequency in time domain, and displays the average value. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE.</p>	
	Measurement range *2	Carrier frequency: 1800 to 2200 MHz (Exceptions are the following spurious frequencies.) ≥ 79 dB Typical (RBW: 1 kHz, 9 kHz to 150 kHz) ≥ 79 dB Typical (RBW: 10 kHz, 150 kHz to 30 MHz) ≥ 79 dB Typical (RBW: 100 kHz, 30 MHz to 1 GHz) $\geq 76 - f$ [GHz] dB Typical (RBW: 1 MHz, 1 to 3.0 GHz)	Carrier frequency: 1800 to 2200 MHz (Exceptions are the following spurious frequencies.) ≥ 79 dB Typical (RBW: 1 kHz, 9 kHz to 150 kHz, band 0) ≥ 79 dB Typical (RBW: 10 kHz, 150 kHz to 30 MHz, band 0) ≥ 79 dB Typical (RBW: 100 kHz, 30 MHz to 1 GHz, band 0) $\geq 76 - f$ [GHz] dB Typical (RBW: 1 MHz, 1 GHz to 3.15 GHz, band 0) ≥ 76 dB Typical (RBW: 1 MHz, 3.15 GHz to 7.8 GHz, band 1) ≥ 76 dB Typical (RBW: 1 MHz, 1.6 GHz to 7.8 GHz, band 1, with Option 03)
Spectrum emission	-	Mask measurement: After measuring the signal with sweep type spectrum analyzer, assessment of template is made and displayed. Demodulation measurement: Outputs maximum of 10 frames of data after back-diffusion for designated code channel.	
Electrical performance (I/Q input)	Input method	With Option 17 or 18, selectable between balanced and unbalanced	
	Input impedance	Selectable between 1 M Ω (parallel capacity <100 pF) and 50 Ω	
	Input level range	Balanced input Differential voltage range: 0.1 to 1 Vp-p (at input terminal) In-phase voltage range: ± 2.5 V (at input terminal) Unbalanced input: 0.1 to 1 Vp-p (at input terminal), changeable between DC connection and AC connection	
	Measurement item	Modulation accuracy, code domain power, amplitude, occupied bandwidth (FFT method), IQ level Modulation accuracy Input level: ≥ 0.1 V (rms) Residual vector difference: <2% (rms), DC connection	
I/Q level	Level measurement: Measures input voltage (rms value and p-p value) of I and Q and displays them. I/Q phase difference: When CW signal is input to each input terminal of I and Q, measures the phase difference between I phase signal and Q phase signal and displays it.		

*1: Pre-amplifier ON is settable when Option 08 is installed.

*2: When the carrier frequency is in the range from 2030.354 to 2200 MHz, the following spurious frequency is generated.
 f (spurious) = f (input) - 2030.345 MHz

• MX268102A/268302A GSM Measurement Software

The following specifications are guaranteed after execution of internal level optimization of MS2683A (automatically executed by pressing the key).

Model		MX268102A	MX268302A
Modulation/frequency measurement	Frequency measurement range	50 MHz to 2.7 GHz	
	Measurement level range	-40 to +30 dBm (average power within burst signal, when pre-amplifier is OFF) -60 to +10 dBm (average power within burst signal, when pre-amplifier is ON*1)	
	Carrier frequency accuracy	Input level (average power within burst signal): ≥ -30 dBm (when pre-amplifier is OFF), ≥ -40 dBm (when pre-amplifier is ON*1) \pm (reference crystal oscillator accuracy + 10 Hz)	
	Modulation accuracy	Input level (average power within burst signal): ≥ -30 dBm (when pre-amplifier is OFF), ≥ -40 dBm (when pre-amplifier is ON*1) Residual phase error (GMSK modulation): <0.5 degree (rms), <2.0 degree (peak), <1.0% (rms) Waveform display: Trellis display (at GMSK modulation), Eye pattern display, EVM vs. bit number display (at 8PSK modulation), Phase error vs. bit number display, Amplitude error vs. bit number display, I/Q diagram display	

Continued on next page

Model	MX268102A	MX268302A	
Amplitude measurement	Frequency range	50 MHz to 2.7 GHz	
	Measurement level range	-40 to +30 dBm (average power within burst signal, when pre-amplifier is OFF) -60 to +10 dBm (average power within burst signal, when pre-amplifier is ON*)	
	Transmitted power measurement	After execution of level calibration Measurement range: -10 to +30 dBm (average power within burst signal, when pre-amplifier is OFF) -10 to +10 dBm (average power within burst signal, when pre-amplifier is ON*) Accuracy: ±2.0 dB typical	
	Power measurement linearity	Input level (average power within burst signal): ≥-10 dBm (when pre-amplifier is OFF), ≥-20 dBm (when pre-amplifier is ON*), without changing reference level setting after range optimization ±0.2 dB (0 to -30 dB)	
	Power measurement when carrier is OFF	Input level (average power within burst signal): ≥-10 dBm (when pre-amplifier is OFF), ≥-20 dBm (when pre-amplifier is ON*) Normal mode measurement range: ≥60 dB (compared with average power within burst signal) Broad dynamic range: Average power within burst signal: compared with 10 mV Mode measurement range: ≥80 dB Note that the measurement limit is determined depending on the average noise level: ≤-70 dBm (50 MHz to 2.7 GHz).	
	Rise/fall characteristics	Waveform is displayed in synchronization with the data of measured signal. Specified line can be displayed (measured in 1 MHz bandwidth), equipped with pass/fail judging function	
Output RF spectrum measurement	Frequency range	100 MHz to 2.7 GHz	
	Input level range	-10 to +30 dBm (average power within burst signal, when pre-amplifier is OFF) -20 to +10 dBm (average power within burst signal, when pre-amplifier is ON*)	
	Modulation measurement range (spectrum due to modulation)	At CW signal input ≥60 dB (≥200 kHz offset) ≥68 dB (≥250 kHz offset) * < 1.8 MHz offset is RBW: 30 kHz, ≥ 1.8 MHz offset is RBW: 100 kHz	
	Transient section measurement range (Switching transient)	At CW signal input, ≥63 dB (≥400 kHz offset)	
Spurious measurement	Frequency measurement range	100 kHz to 3.0 GHz, except for the range within carrier frequency ±50 MHz	100 kHz to 7.8 GHz, except for the range within carrier frequency ±50 MHz
	Input level range (transmitted power)	0 to +30 dBm (average power of burst signal): when pre-amplifier is OFF	
	Measurement method	Sweep method: After sweeping the designated frequency range with the spectrum analyzer, detects the peak value and displays it. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE. Spot method: After measuring the designated frequency in time domain of the spectrum analyzer, displays the average value. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE. Search method: After sweeping the designated frequency range with the spectrum analyzer and detecting the peak value, measures the frequency in time domain, and displays the average value. Calculates the ratio with the transmitted power value, which is the power ratio, and displays it. Detection mode should be AVERAGE.	
	Measurement range	Carrier frequency: 800 MHz to 1 GHz and 1.8 to 2 GHz ≥72 dB Typical (RBW: 10 kHz, 100 kHz to 50 MHz) ≥72 dB Typical (RBW: 100 kHz, 50 kHz to 500 MHz) ≥66 - f [GHz] dB Typical (RBW: 3 MHz, 500 MHz to 3 GHz, except for harmonic frequency)	Carrier frequency: 800 MHz to 1 GHz and 1.8 to 2 GHz ≥72 dB Typical (RBW: 10 kHz, 100 kHz to 150 MHz, band 0) ≥72 dB Typical (RBW: 100 kHz, 50 to 500 MHz, band 0) ≥66 - f [GHz] dB Typical (RBW: 3 MHz, 500 MHz to 3.15 GHz, band 0, except for harmonic frequency) ≥66 dB Typical (RBW: 3 MHz, 3.15 to 7.8 GHz, band 1) ≥66 dB Typical (RBW: 3 MHz, 1.6 to 7.8 GHz, band 1, with Option 03)
Electrical performance (I/Q input)	Input method	With Option 17 or 18, selectable between balanced and unbalanced	
	Input impedance	Selectable between 1 MΩ (parallel capacity <100 pF) and 50 Ω	
	Input level range	Balanced input Differential voltage range: 0.1 to 1 Vp-p (at input terminal) In-phase voltage range: ±2.5 V (at input terminal) Unbalanced input: 0.1 to 1 Vp-p (at input terminal, changeable between DC connection and AC connection)	
	Measurement item	Modulation accuracy, amplitude, IQ level Modulation accuracy Input level: ≥0.1 V (rms), at ambient temperature 18° to 28°C Residual vector error: <0.5 degree (rms), DC connection	
	Residual EVM	<1.0% (rms), DC connection	
	I/Q level	Level measurement: Measures input voltage (rms value and p-p value) of I and Q, and displays them. I/Q phase difference: When CW signal is input to each input terminal of I and Q, measures the phase difference between I phase signal and Q phase signal and displays it.	

*1: Pre-amplifier ON is settable when Option 08 is installed.

Ordering information

Please specify model/order number, name and quantity when ordering.

Model/Order No.	Name
MS2681A	Main frame Spectrum Analyzer
MS2683A	Spectrum Analyzer
	Standard accessories
	Power cord, 2.6 m: 1 pc
J0996B	RS-232C cable: 1 pc
JT32MA3-NT1	PC-ATA card (32 MB): 1 pc
F0014	Fuse, 6.3 A: 1 pc
MX268001A	File Transfer Utility: 1 pc
W1754AE	MS2681A/2683A/2687A operation manual: 1 copy
	Options
MS2681A-01	Precision frequency reference (aging rate: 5×10^{-10} /day)
MS2681A-02	Narrow resolution bandwidths (FFT)
MS2681A-04	Digital resolution bandwidth
MS2681A-08	Pre-amplifier
MS2681A-09	Ethernet interface
MS2681A-17	I/Q balanced input
MS2681A-18	I/Q unbalanced input
MS2681A-46	Auto power recovery
MS2681A-47	Rack mount (IEC) without handles
MS2681A-48	Rack mount (JIS) without handles
MS2683A-01	Precision frequency reference (aging rate: 5×10^{-10} /day)
MS2683A-02	Narrow resolution bandwidths (FFT)
MS2683A-03	Extension of pre-selector lower limit to 1.6 GHz
MS2683A-04	Digital resolution bandwidth
MS2683A-08	Pre-amplifier
MS2683A-09	Ethernet interface
MS2683A-17	I/Q balanced input
MS2683A-18	I/Q unbalanced input
MS2683A-34	4 GHz LO output
MS2683A-46	Auto power recovery
MS2683A-47	Rack mount (IEC) without handles
MS2683A-48	Rack mount (JIS) without handles
	Measurement software
MX268101A	W-CDMA Measurement Software
MX268102A	GSM Measurement Software
MX268301A	W-CDMA Measurement Software
MX268302A	GSM Measurement Software
	Application parts
J0576D	Coaxial cord (N-P, 5D-2W, N-P), 2 m
J0127C	Coaxial cord (BNC-P, RG-58A/U, BNC-P), 0.5 m
J0127A	Coaxial cord (BNC-P, RG-58A/U, BNC-P), 1 m
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
J1047	Ethernet cross cable
MA1612A	Four-port Junction Pad (5 MHz to 3000 MHz)
MA1621A	$50 \Omega \rightarrow 75 \Omega$ Impedance Transformer (75Ω , 9 kHz to 3 GHz, ± 100 V, NC-type)
MP614B	$50 \leftrightarrow 70 \Omega$ Impedance Converter (50 to 1200 MHz, 1.5 dB or lower)
J0395	Fixed attenuator for high-power (30 dB, 30 W, DC to 8 GHz)
B0472	Fixed attenuator for high-power (30 dB, 100 W, DC to 18 GHz)
B0452A	Hard carrying case (with casters)
B0452B	Hard carrying case (without casters)
B0488	Rear panel protective pad
W1888AW	Assembling guide drawing for rear protective pad (supplied with B0488 as standard)
B0481B	Carrybone
B0479	Soft carrying case (rucksack type)
	Warranty
MS2681A-90	Extended three year warranty service
MS2681A-91	Extended five year warranty service
MS2683A-90	Extended three year warranty service
MS2683A-91	Extended five year warranty service