



# MAX5860

## Scalable High-Density Downstream Cable QAM Modulator

**Very Low Power, Fully Integrated, Symbols-to-QAM RF Solution:  
45mW/QAM in 12mm x 17mm BGA**



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### ***Description***

The MAX5860 is an integrated, high-density, downstream cable QAM modulator, digital upconverter (DUC) and RF digital-to-analog converter (RF-DAC). The device performs QAM mapping, pulse shaping and digital RF upconversion of forward-error-correction (FEC) encoded data with full agility and drives a single RF-port using a 14-bit 4.6Gsp/s DAC. The device digitally synthesizes RF signals with up to 128 DOCSIS-compliant 6MHz QAM channels (or up to 96 8MHz QAM channels). The device has scalable QAM capacity and provides high-density QAM modulation with very low power dissipation (45mW/QAM typical) in a compact 12mm x 17mm footprint.

The device accepts FEC-encoded CMOS data (symbols) on up to four 10-bit input ports that accept up to 32 time-interleaved digital data streams each. Each channel features an individually configurable QAM mapper, RRC filter, and arbitrary rate resampler (ARR). The device performs pulse shaping, resampling, interpolation and quadrature modulation of input data, supporting all data rates defined in DOCSIS 3.0 and DVB-C. A cascade of interpolation filters, complex modulators, and channel combiners allow modulation of the signal to any frequency from 47MHz to 1006MHz. Integrated direct digital frequency synthesizers allow positioning of the QAM channels with a resolution of 125Hz. The interpolation filters and resamplers provide linear phase and excellent gain flatness. Output data from the last modulator is fed to a digital-predistortion (DPD) block that can be used to correct distortion in the device's integrated RF-DAC and output amplifiers external to the device.

## Key Features

- Integrated Downstream Cable QAM Modulator
  - High-Density: Scalable Up to 128 QAM Channels
    - Factory Preset for 32, 48, 64, 96, or 128 QAM Channels
    - Soft-Key Field-Upgradeable in Steps of 8 QAMs\*
  - 14-Bit 4.6Gsps RF-DAC
  - DOCSIS 3.0 DRFI Compliant
- Highly Flexible and Configurable
  - RRC Filters Support ITU-T J.83 Annex A, B, and C
  - 1MHz to 8MHz Channel Bandwidth
  - Full Carrier Agility within Each of Four 192MHz Blocks Block Agility within 950MHz Output Bandwidth
  - Reconfigurable Without Service Interruption
  - Input Symbol Rate: 1Msym/s to 7.14Msym/s Independently Set for Each Channel
  - Integrated QAM Mapper (16/32/64/128/256-QAM) Supports All ITU-T J.83-Defined Constellations
  - Four CMOS Input Ports Support Up to 1024-QAM
- Additional Features Ease RF Design
  - Programmable Digital Predistortion
  - High DAC Output Power 9dBm (CW) Eliminates Pre-amp
- Low Power, Compact Solution
  - 5.7W at 128 (6MHz) QAMs,  $f_s = 4.6\text{Gsps}$
  - 12mm x 17mm, 280-Ball FCBGA

## Applications/Uses

- Edge QAM, CMTS, CCAP, IP-QAM
- Multi-Dweller Unit Mini-Headends
- Remote PHY, Coax Media Converters

• Device	Fab Process	Technology	Sample size	Rejects	FIT at 25°C	FIT at 55°C
MAX5860DUXH+CQC*	Contact reliability engineer for information					
MAX5860LUXH+*	Contact reliability engineer for information					
MAX5860FUXH+*	Contact reliability engineer for information					
MAX5860LUXH+W*	Contact reliability engineer for information					

• Device	Fab Process	Technology	Sample size	Rejects	FIT at 25°C	FIT at 55°C
MAX5860PUXH+W*						Contact reliability engineer for information
MAX5860AUXH+*						Contact reliability engineer for information
MAX5860EVKIT#*						Contact reliability engineer for information
MAX5860BUXH+W*						Contact reliability engineer for information
MAX5860PUXH+*						Contact reliability engineer for information
MAX5860BUXH+*						Contact reliability engineer for information
MAX5860PUXH+CKD*						Contact reliability engineer for information
MAX5860FUXH+W*						Contact reliability engineer for information
MAX5860PUXH+CPS*						Contact reliability engineer for information
MAX5860HUXH+*						Contact reliability engineer for information
MAX5860HUXH+CNS*						Contact reliability engineer for information
MAX5860DUXH+*						Contact reliability engineer for information
MAX5860BUXH+CEF*						Contact reliability engineer for information

Note : The failure rates are summarized by technology and mapped to the associated material part numbers. The failure rates are highly dependent on the number of units tested.