**Texas Instruments**

LM3290 Product Brief

1 Features

- V_{OUT_RANGE}
  - V_{OUT_ET} = 0.6 V to 4.5 V
  - V_{OUT_APT} = 0.4 V to 3.81 V (or V_{IN} – 200 mV)
- **DC Boost For ET Operation:**
  - Boost Input Voltage Range: 2.5 V to 5 V
  - High-Efficiency (90% typical) with Internal Synchronous Rectification
  - Boost Bypass Function with Low Resistance (150 mΩ typ.)
  - 2.7-MHz PWM Switching Frequency
- **Buck DC-DC for APT and ET Operation:**
  - High Operating Frequency for Small External Inductor and Capacitors
  - V_{OUT_RANGE} = 0.4 V to 3.81 V (or V_{IN} – 200 mV)
  - High-Efficiency (95% typical) with Internal Synchronous Rectification
  - Low-Power PFM Mode
- **LM3291 Control:**
  - Automatic Control of LM3291 in ET Mode
- **RFFE Control Interface:**
  - 1.8-V MIPI® RFFE 1.1-Compatible Digital Control Interface
  - 26-MHz Write Capability
  - 13-MHz Read Capability
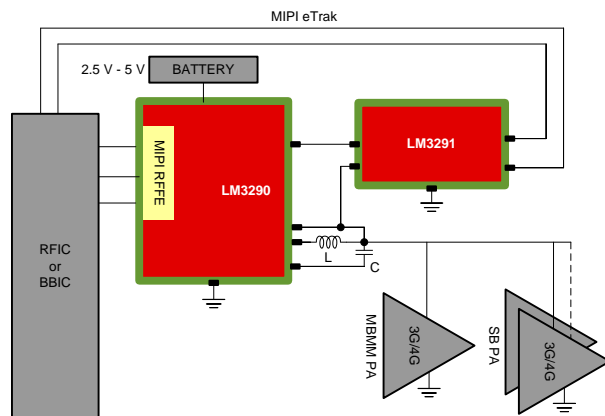
2 Description

The LM3290, with its companion IC LM3291, is an RF envelope supply modulator (EM) with integrated DC-DC boost converter optimized for Envelope Tracking (ET) RF power amplifiers (PAs). The device enables maximum transmit output power independent of the input battery voltage (battery as low as 2.5 V) and is controlled by the MIPI® RFFE 1.1.

The LM3290 operates in two active modes:

Active Mode 1: For low TX output power, LM3290 may operate in Average Power Tracking (APT) mode, providing a static, but programmable, output voltage to supply the PA. At light load and in APT mode, the LM3290 enters into Pulse Frequency Mode (PFM) operation automatically and operates with reduced switching frequency. In PFM mode, the quiescent current is reduced, which extends the battery life.

Active Mode 2: In ET mode, the LM3290 with LM3291 efficiently provides a dynamic, high-bandwidth supply voltage for the PA to maximize total EM + PA efficiency. The envelope modulator follows the envelope reference input signal delivered by the RFIC to the LM3291 via a differential analog input. The output is a single-ended power supply signal to the PA.

The LM3290 and LM3291 support 3G, as well as LTE operation up to 20-MHz signal bandwidth.

The LM3290 controls the LM3291 companion-IC through direct control signals, and no additional controls are needed from the system. Shutdown, standby, and idle modes turn the EM off and reduce battery current consumption.

For the full datasheet, samples, or the EVM hardware and software please contact a TI representative at ET@list.ti.com.

Device Information [1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LM3290	DSBGA (30)	2.432 mm x 2.808 mm

(1) For all available packages, see the orderable addendum at the end of the datasheet.

3 Revision History

4 Device and Documentation Support

4.1 Trademarks

MIPI is a registered trademark of Mobile Industry Processor Interface Alliance.
All other trademarks are the property of their respective owners.

4.2 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

4.3 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms and definitions.

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM3290TME/NOPB	NRND	DSBGA	YFQ	30	250	RoHS & Green	SNAGCU	Level-1-260C-UNLIM	-30 to 85	3290	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

Reel Diameter

Reel Width (W1)

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

Sprocket Holes

User Direction of Feed

Pocket Quadrants

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM3290TME/NOPB	DSBGA	YFQ	30	250	178.0	8.4	2.67	2.95	0.76	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM3290TME/NOPB	DSBGA	YFQ	30	250	208.0	191.0	35.0

IMPORTANT NOTICE AND DISCLAIMER