Receiver Under Test Theory of Operation

The text below references Motorola schematic 73D43088L01. Relevant sections or this schematic are appended.

The DUT is a 315.0 MHz supperregenerative reciever, designed for onboard automotive security/convenience applications such as remote keyless entry or remote feature activation. It is intended to be powered from an automotive 12VDC source. All decoding functions are handled by a Motorola MC68HC08-family microprocessor clocked at 8MHz.

The receiver circuit consists of the following functional blocks:

Printed Circuit Board (PCB):
A 4-layer FR4 PCB is used.

Antenna:
An E-field antenna.

Front-End Filter:
Composed of C22, L501, C28, C23, L504, and C25. These parts serve two functions:
1. Provide band-pass filtering at around 315MHz
2. Impedance match the Antenna to the Cascode Amplifier

Cascode Amplifier:
Composed of Q500, Q501, R30, C30, R16, R23, R31, C9. This cascode amplifier provides very little gain in the forward direction; it's actual purpose is to limit the amount of noise from the supperregenerative oscillator that gets back to the antenna. C6 takes the output of the cascode and gives it to the superregenerative receiver.

Self-Quenching Superregenerative Receiver:
The actual receiver is formed by Q3 and its surrounding components. The topology used is a self-quenching superregenerative receiver. It is composed of two different oscillators. The first, formed by L502/C8/C10, is designed to ring at the desired RF frequency (315MHz). The RF oscillator will be tuned by adjusting L502 as part of the manufacturing process. The second oscillator, formed by L503/C20/R29/C15, is called the "Quench Oscillator", and is designed to oscillate at a frequency that varies from 700kHz to just over 1MHz.

The greater the amplitude of the recoverd on-frequency RF signal (315MHz), the faster the quench frequency. When no on-frequency RF signal is present, the quench oscillator will run at around 700kHz. When a very strong on-frequency RF signal is present, the quench oscillator will run at around 1MHz. R7 forms the detector: when the quench frequency is low, the average current through R7 is

low. When the quench frequency is high, the average current through R7 is high. This change in average current (and the corresponding change in voltage drop in R7) is put through a low-pass filter made up of R11 and C21, which then is sent to the baseband bit slicer for further processing.

DaimlerChrysler Central Timer Module MY2001
Theory of Operation

The Central Timer Module (CTM) for model year 2001 is designed and manufactured by Motorola for assembly into select DaimlerChrysler vehicles, including the Dodge Durango, Dodge Dakota, and Dodge Ram trucks. These vehicles are intended for sale in the US and Canada. Three models are intended: AN (Chrysler Part Number 1JTH2677EE), DN (Chrysler Part Number 1JTH2681DD), and Base (Chrysler Part Number 1JTB2610BB). The Base model has no Remote Keyless Entry reciever, and so is not included in this discussion.

The MY01 CTM module performs the following vehicle functions:

Courtesy Lamps
Low Beam Head Lamps
Auto Head Lamps
Park Lamps
Battery saver function for head and park lamps
Intermittent wiper control
Door ajar switch status
Chime warning
Remote Keyless Entry operation
Vehicle Theft Alarm (VTA)
Optical Horn
Interior Lamp load shedding
High Beam Head Lamps
Fog Lamps
Head Lamp Day Time Running Lamps
Head Lamp Time Delay
Liftgate/flipper glass status
Power Door locks
Door lock inhibit
Central Locking
Remote Radio Control
Rear Wiper Control

AN (1JTH2677EE) has components populated for all functions, but does not use the Rear Wiper function in operation.

DN (1JTH2681DD) does not use the Cargo Lamp Function, and has the following parts de-populated :
U950 Power FET driver
R560 10K resistor

Key Sub-Circuits and Components (non-Receiver):

Printed Circuit Board (PCB):
   All models use the same 4-layer FR4 PCB.

Regulator:
   Five volts provided by Cherry Semiconductor CS8151 regulator, U100. This part also contains a built-in oscillator that provided timing to wake up the microprocessor around every 40 milliseconds. To conserve current, ability to remove power from certain devices is also provided by two transistor switches.

Processor:
   Motorola 68HC08 series microprocessor U700 clocked by an external resonator at 8MHz. On-board PLL is not used, internal bus speed set at 2MHz.

Digital and Analog Inputs:
   Digital inputs are monitored by the processor through two 74HC165D shift registers, U300 and U301. Several analog inputs are also provided.

J1850 Bus:
   U400 (Philips AU5780) and associated components.

High Side Drivers for Head Lamps:
   A series of power FETS are used to provide headlamp drive: U201, U202, U204, U205 and associated components.

Low Side Drivers for Courtesy, Cargo, Load Shed, and Anti-theft LED functions:
   FETs U950, Q100, Q102, and Darlington Q17 and assoicated components.

Relays and Drive Circuitry for Lock/Unlock functions:
   K800 and K801 provide drive current for the Lock/Unlock motors. They are driven from the microprocessor through Darlington Q18 in the case of the DRV_DOOR function, and through U600 in the case of the Lock/Unlock function.

SPI-controlled Outputs
   Remaining outputs are high-side drive from U600, which is an SPI-bus controlled output driver.

Chime:
   An audible indicator is provided BUZZ800. Waveform shaping is performed in the microprocessor.