



MOTOROLA

MC13145

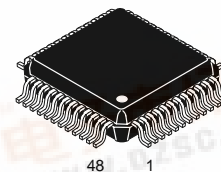
Product Preview

Low Power Integrated Receiver for ISM Band Applications

The MC13145 is a dual conversion integrated RF receiver intended for ISM band applications. It features a Low Noise Amplifier (LNA), two 50 Ω linear Mixers with linearity control, Voltage Controlled Oscillator (VCO), second LO amplifier, divide by 64/65 dual modulus Prescaler, split IF Amplifier and Limiter, RSSI output, Coilless FM/FSK Demodulator and power down control. Together with the transmit chip (MC13146) and the baseband chip (MC33410), a complete 900 MHz cordless phone system can be implemented. This device may be used in applications within 2.0 GHz since its RF bandwidth is greater than 2.4 GHz.

- Low (<1.8 dB @ 900 MHz) Noise Figure LNA with 14 dB Gain
- Externally Programmable Mixer linearity: IIP3 = 10(nom.) to +20 dBm (Mixer1); IIP3 = 10 (nom.) to 20 dBm (Mixer2)
- 50 Ω Mixer Input Impedance and Open Collector Output (Mixer 1 and Mixer 2); 50 Ω Second LO (LO2) Input Impedance
- Low Power 64/65 Dual Modulus Prescaler (MC12053 type)
- Split IF for Improved Filtering and Extended RSSI Range
- Internal 330 Ω Terminations for 10.7 MHz Filters
- Linear Coilless FM/FSK Demodulator with Externally Programmable Bandwidth, Center Frequency and Audio level
- 2.7 V to 6.5 V Operation, Low Current Drain (<30 mA @ 3.0 V) with Power Down Mode (<1.0 μA)
- 2.4 GHz RF, 1.0 GHz IF1 and 50 MHz IF2 Bandwidth

UHF WIDEBAND RECEIVER SUBSYSTEM (LNA, Mixer, VCO, Prescaler, IF Subsystem, Coilless Detector)

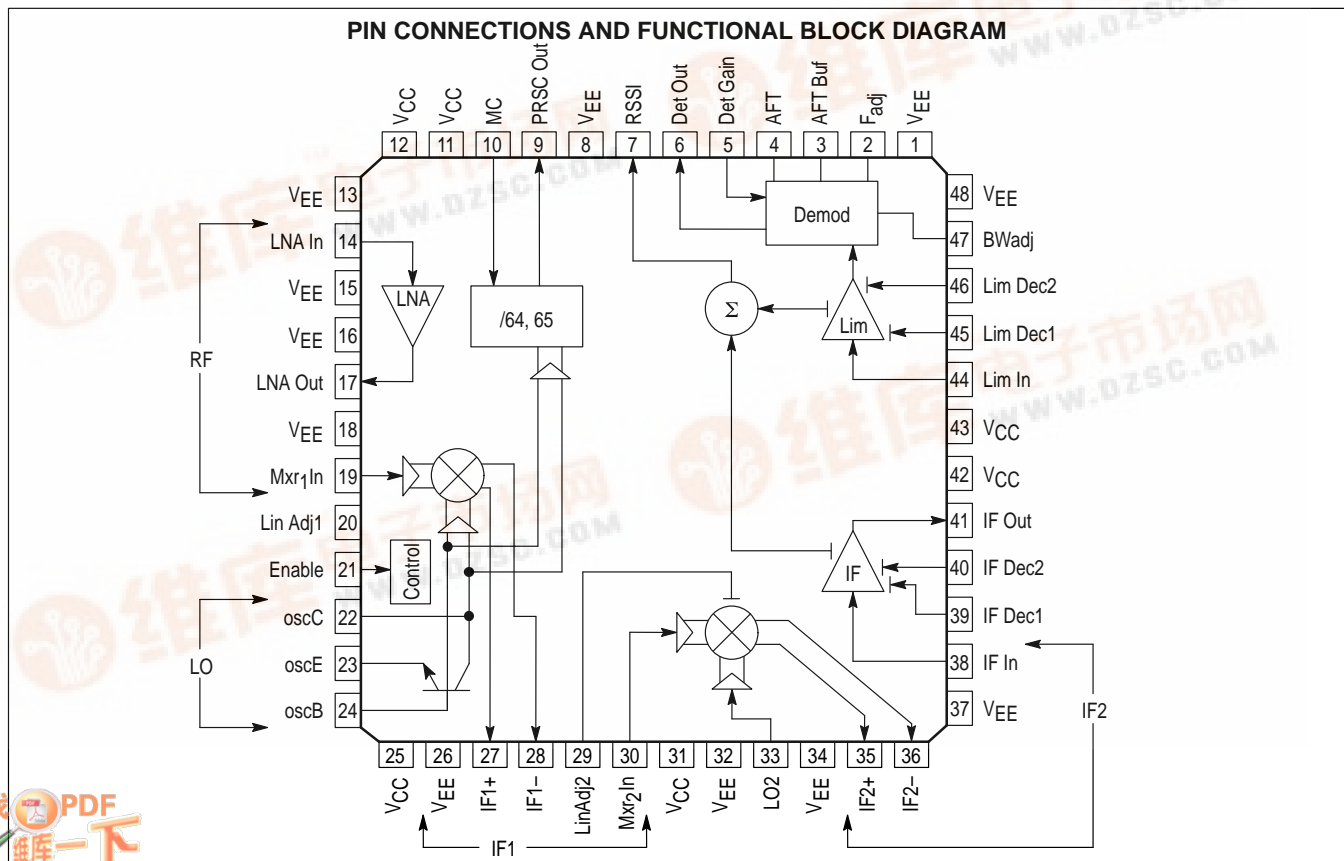


FTA SUFFIX
PLASTIC PACKAGE
CASE 932
(LQFP-48)

ORDERING INFORMATION

Device	Temperature Range	Package
XC13145FTA	-40° to +85°C	LQFP-48

ESD Sensitive — Handle with Care



MC13145

OVERALL RECEIVER SPECIFICATIONS

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC(max)}$	7.0	Vdc
Junction Temperature	$T_J(max)$	150	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

Rating	Symbol	Value	Unit
Power Supply Voltage ($T_A = 25^\circ\text{C}$)	V_{CC} V_{EE}	2.7 to 6.5 0	Vdc
Input Frequency	f_{in}	100 to 2000	MHz
Ambient Temperature Range	T_A	-40 to +85	°C
Maximum Input Signal Level: - with no damage - with minor performance degradation	P_{in}	5.0 -10	dBm

RECEIVER DC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0$ Vdc; No Input Signal, unless otherwise noted)

Characteristics	Symbol	Typical	Unit
Total Supply Current (Enable = V_{CC})	I_{total}	30	mA
Power Down Current (Enable = V_{EE})	I_{total}	<1.0	μA

RECEIVER AC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0$ Vdc; $F_{mod} = 1.0$ kHz; $F_{dev} = \pm 25$ kHz; IF filter bandwidth = 150 kHz, unless otherwise noted)

Characteristics	Symbol	Typical		Unit MHz
		900	1900	
12 dB SINAD Sensitivity (with C-message filter at DetOut)		-115	TBD	dBm
30 dB SINAD Sensitivity (No IF filter distortion within ± 40 kHz)		-100	TBD	dBm
SINAD Variation with IF Offset of ± 40 kHz (No IF filter distortion within ± 40 kHz)		5.0	TBD	dB
RSSI Dynamic Range		80	TBD	dB
Input 1.0 dB Compression Point (Measured at IF output)	P_{in-1dB}	-18	TBD	dBm
Input 3rd Order Intercept Point (Measured at IF output)	IIP3	-8.0	TBD	dBm
Demodulator Output Swing (5.0 k Load)		0.5	0.5	V_{pp}
Demodulator Bandwidth (± 1.0 dB bandwidth)		100	100	kHz
Prescaler Output Level (10 k Ω /8.0 pF load)		0.5	0.5	V_{pp}
Modulus Control Input Level		0.5	0.5	V_{pp}
SNR @ -30 dBm Signal Input (<25 kHz deviation; with C-Message Filter)		50	TBD	dB
Total Harmonic Distortion (<25 kHz deviation; with C-Message Filter)		1.0	TBD	%
Spurious Response SINAD (RF In: -50 dBm)		12	TBD	dB

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INDIVIDUAL BLOCK SPECIFICATIONS

LOW NOISE AMPLIFIER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

Characteristics	Symbol	Typical		Unit MHz
		900	1900	
Amplifier Gain	S21	14	TBD	dB
Noise Figure	NF	1.8	TBD	dB
1.0 dB Gain Compression Point	P_{in-1dB}	-8.0	TBD	dBm
3rd Order Intercept Point	IIP3	-5.0	TBD	dBm
Reverse Isolation	S12	-35	TBD	dB
Input Impedance (with externals)		50	50	Ω
Output Impedance (with externals)		50	50	Ω
Input Match (with externals)	S11	15	TBD	dB
Output Match (with externals)	S22	15	TBD	dB
LO1 to LNA Input Leakage		-45	TBD	dBm

FIRST MIXER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

Characteristics	Symbol	Typical		Unit MHz
		900	1900	
Power Conversion Gain ($P_{in} = -30\text{ dBm}$)	Pgc	0	TBD	dB
Noise Figure	NF	13	TBD	dB
1.0 dB Gain Compression Point	P_{in-1dB}	-1.0	TBD	dBm
3rd Order Intercept Point	IIP3	9.0	TBD	dBm
Input Impedance (single-ended)		50	50	Ω
Output Impedance (differential with externals)		50	50	Ω
Input Match		20	TBD	dB
Output Match (with externals)		20	TBD	dB
RF to IF1 Leakage		-38	TBD	dB
LO to IF1 Leakage		-33	TBD	dBm
LO to RF Leakage		-33	TBD	dBm
Mixer Out to IF in Leakage		-80	TBD	dB

SECOND MIXER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

Characteristics	Symbol	Typical	Unit
Noise Figure	NF	13	dB
1.0 dB Gain Compression Point	P_{in-1dB}	-1.0	dBm
3rd Order Intercept Point	IIP3	9.0	dBm
Input Impedance (single-ended)		50	Ω
Output Impedance (differential with externals)		330	Ω
Input Match		20	dB
Output Match (with externals)		20	dB

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INDIVIDUAL BLOCK SPECIFICATIONS (continued)

LOCAL OSCILLATOR ELECTRICAL CHARACTERISTICS (T_A = 25°C; V_{CC} = 3.0 Vdc, unless otherwise noted)

Characteristics	Symbol	Typical		Unit MHz
		900	1900	
LO Emitter Current (Enable = high)		2.0	TBD	mA
Phase Noise @ 10 kHz Offset		-80	-75	dBc/Hz
Modulation Sideband		-40	TBD	dBc

PRESCALAR ELECTRICAL CHARACTERISTICS (T_A = 25°C; V_{CC} = 3.0 Vdc, unless otherwise noted)

Characteristics	Symbol	Typical		Unit MHz
		900	1900	
Divide Ratio – MC = low – MC = high		65 64	65 64	
Output Impedance		50	50	Ω
Prescaler Output Level (10 kΩ//8pF load)		0.5	0.5	V _{pp}
MC Input Level		0.5	0.5	V _{pp}
MC Current Input (optional)		200	200	μA _{pp}
Prescaler Out to IF Amp and Lim Amp Input Leakage		-85	TBD	dBm

IF AND LIMITING AMPLIFIERS ELECTRICAL CHARACTERISTICS (T_A = 25°C; V_{CC} = 3.0 Vdc, unless otherwise noted)

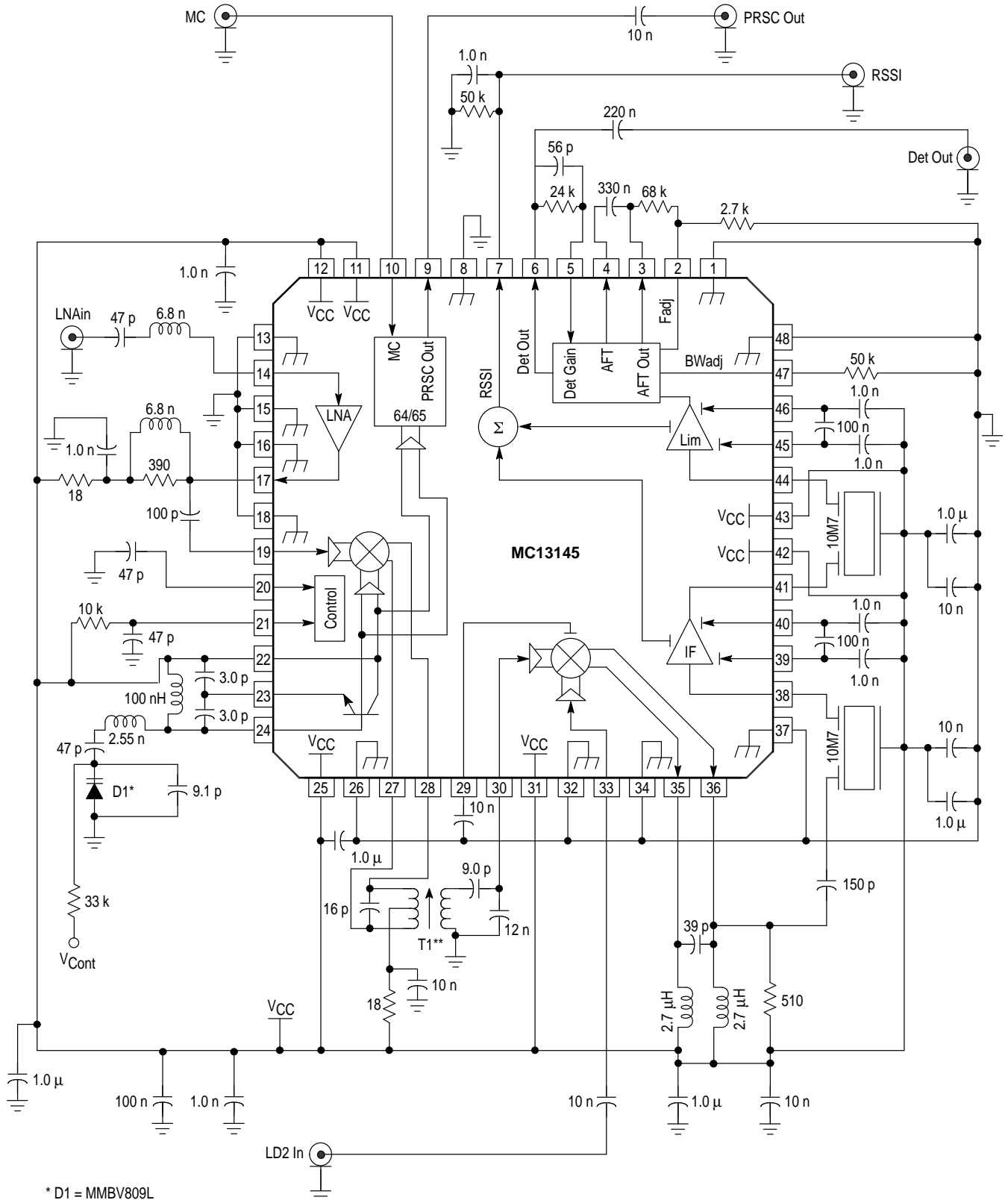
Characteristics	Symbol	Typical	Unit
IF and Lim Amplifier Bandwidth		40	MHz
IF Amplifier Gain		40	dB
IF Amplifier Noise Figure		7.0	dB
IF Input & Output Impedance		330	Ω
IF Amp Input & Output Match		20	dB
Limiting Amplifier Gain		85	dB
Lim Amp Input Impedance		330	Ω
Lim Amp Input Match		15	dB
IF Amp Output to Lim Amp Input Leakage (at 10.7 MHz)		80	dB
RSSI Dynamic Range		80	dB
RSSI Slope		0.5	μA/dB
RSSI Current Range		0 to 40	μA
RSSI Response Time		1.0	μs

COILLESS DEMODULATOR ELECTRICAL CHARACTERISTICS (T_A = 25°C; V_{CC} = 3.0 Vdc, unless otherwise noted)

Characteristics	Symbol	Typical	Unit
Demodulator Output (at 25 kHz deviation)	DetOut	0.5	V _{pp}
Center Frequency		10.7	MHz
Frequency Adjust		<20	MHz
Bandwidth Adjust		100 to 600	kHz
Output Impedance		2000	Ω
Settling Time (assert Enable pin)		TBD	ms

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Figure 1. Application Diagram

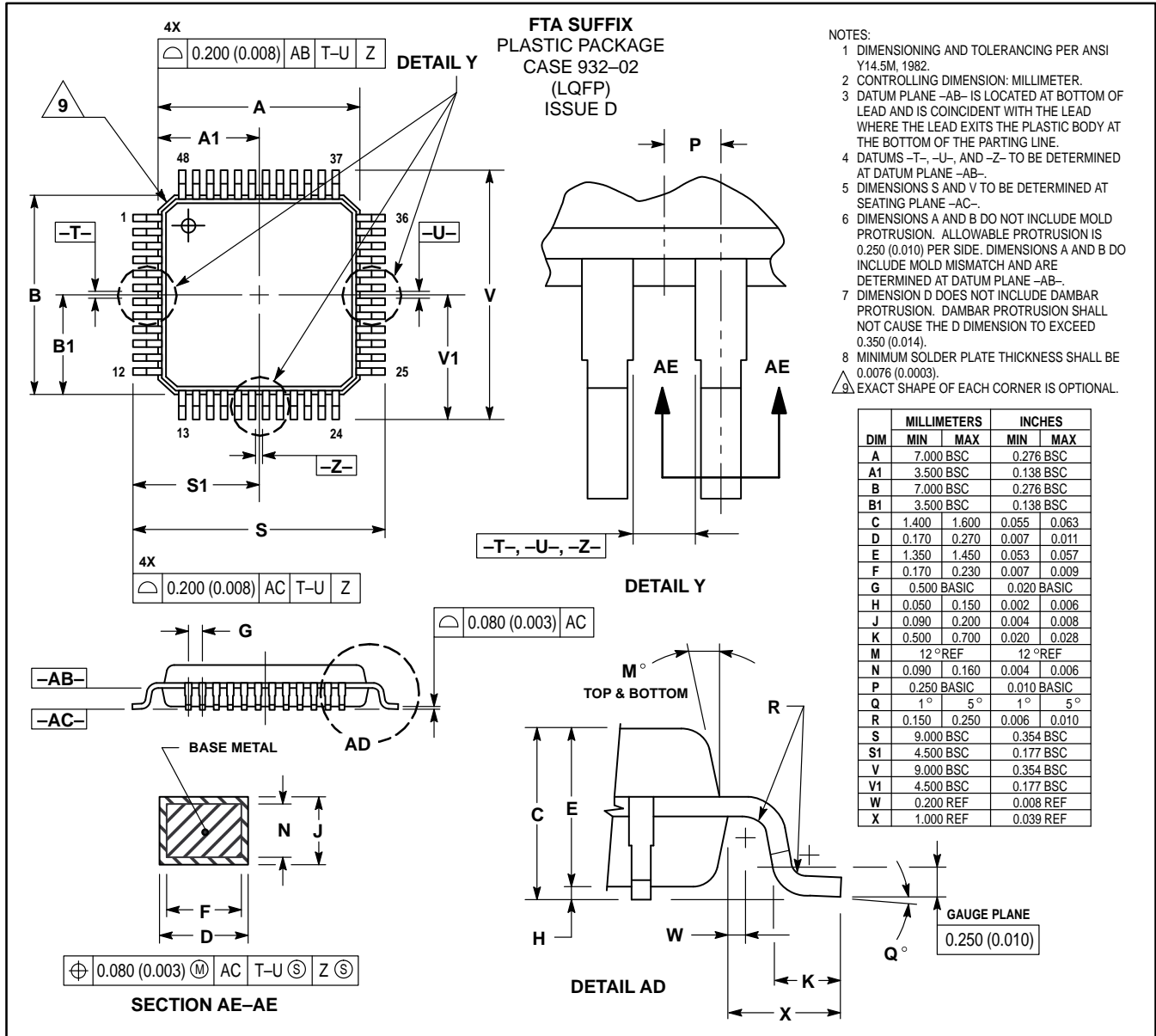


* D1 = MMBV809L

**T1 = Toko Part # 600ENAS-A998EK

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OUTLINE DIMENSIONS



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