

MAS9142

This is preliminary information on a new product under development. Micro Analog Systems reserves the right to make any changes without notice.

Preliminary

Power Amplifier Controller (PAC) and Low Dropout Voltage (LDO) Regulator

- Temperature Compensation of Sensor Signal
- Bias Current Source for Detector Diodes
- Applicable for a Wide Range of Power Amplifiers
- Low Noise LDO Regulator included

DESCRIPTION

MAS9142 is designed for use in GSM900 and DCS1800 systems, in particular with Hitachi PF08103B power amplifier module. Other PA modules can be used with the MAS9142 with external compensation elements to maintain the stability of the PA control loop. The MAS9142 incorporates the power detector biasing

components, RC-filtering for power ramping signal, operational amplifier with AC feedback and a low dropout (LDO) voltage regulator with output voltage 2.8 V and maximum load current of 50 mA for generating supply voltage for VCO/Modulator in the radio channel of a mobile phone.

FEATURES

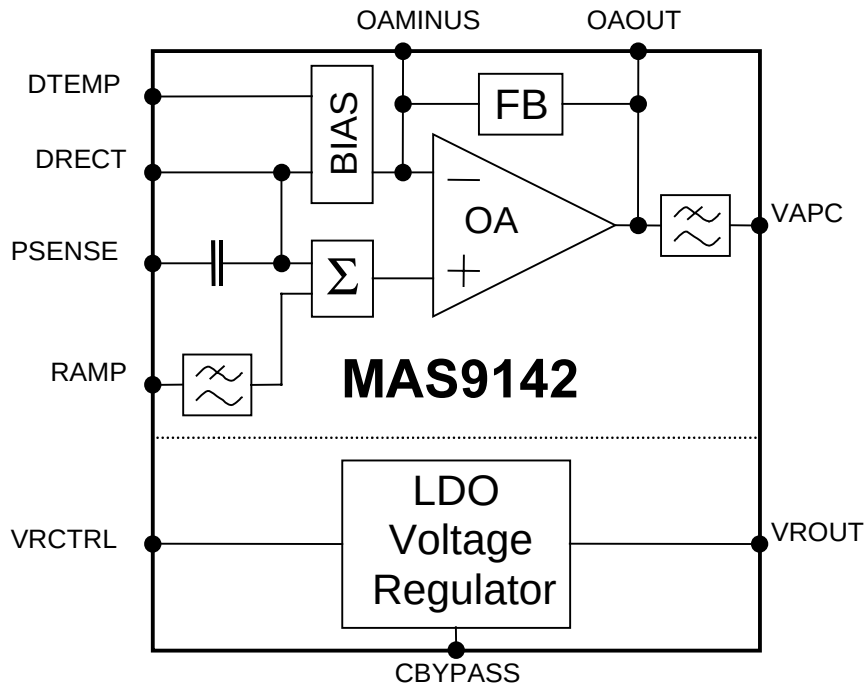
- Two functional blocks: Power Amplifier Controller and LDO Voltage Regulator
- Low current consumption
- Temperature compensated biasing for external-detection Schottky diodes
- Both PAC loop and LDO voltage regulator have temperature-controlled power-down feature
- LDO voltage regulator with short circuit current protection
- Excellent ripple rejection in regulator

APPLICATION

- Dual Band Cellular Phone
- PCMCIA GSM/DCS data communications

NOT AVAILABLE IN THE U.S.A. AND CANADA

BLOCK DIAGRAM



PIN CONFIGURATION

Pin No	Pin name	Function
1	OAMINUS	OA Inverting Input (for Optional External Feedback Components)
2	DTEMP	Schottky Diode for Temperature Compensation
3	DIRECT	Rectifier Schottky Diode
4	PSENSE	Power Measurement Input (from Directional Coupler)
5	VSS1	Ground for Power Amplifier Controller
6	RAMP	GSM Power Ramping Signal Input
7	CBYPASS	Voltage Regulator Reference Voltage Bypass Capacitor
8	VRCTRL *1	Voltage Regulator Enable
9	VSS2	Ground for Voltage Regulator
10	VDD2	Supply for Voltage Regulator
12	VROUT	Voltage Regulator Output
13	VAPC	Automatic Power Control Output Voltage (to PA)
14	TXEN *1	Transmit Enable
15	VDD1	Supply for Power Amplifier Controller
16	OAOUT	OA Output (for Optional External Feedback Components)

NOTE 1: Digital control pads, Active-High, CMOS-compatible voltage levels.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	V_{DD}		-0.3	6.5	V
Storage Temperature	T_S		-55	+125	°C
ESD Rating		Human Body Model, HBM		2	kV
Operating Temperature	T_{OP}		-30	+85	°C

RECOMMENDED OPERATION CONDITIONS

(test conditions)						
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		3.0	3.5	6.0	V
Supply Current	I_{DD}	Operating				
Operating Temperature	T_A		-10		+55	°C
Operating Frequency	F_{OP}		780		1920	MHz

ELECTRICAL CHARACTERISTICS

Regulator

For typical values $T_A = 27^\circ\text{C}$, for min/max values $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, unless otherwise noted

◆ Thermal Protection

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Threshold High	T_H		150	160	170	°C
Threshold Low	T_L		140	150	160	°C

A hysteresis of 10°C prevents oscillation in case of thermal shutdown. After the regulator temperature has dropped by this value, it will turn on again automatically.

◆ Regulator Control Pin Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage ON-state OFF-state	VR_{CTRL}		0 2.0		V_{CC} 0.3	V

◆ Current Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Regulator Output Current	I_{OUT}	Listed maximum output currents are peak values. Maximum power dissipation should be used to determine the maximum total DC current.	0		50	mA
Current Limit	I_{MAX}			150		mA

◆ Power Dissipation

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Power Dissipation	P_d	$V_{CC} = 5.3 \text{ V}, T_A = 85 \text{ }^\circ\text{C}$			285	mW
Power Dissipation	P_d	$V_{CC} = 5.3 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$			700	mW

◆ Voltage Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Regulator Dropout Voltage	V_{DROP}	$I_{OUT} = 40 \text{ mA}$ for Typical V_{DROP} $I_{OUT} = \text{Max}$ for Max V_{DROP}		0.11	0.17	V

◆ External Capacitors

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Capacitor for Regulator	C_{OUT}		1			μF
Effective Series Resistance	ESR		0.05	1	3	Ω
Bypass Capacitor	C_{BYPASS}			100		nF

◆ Load Regulation

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Load Regulation		$V_{CC} = 3.6 \text{ V}, I_{OUT}$ from 0.5 mA to Max			0.5	$\frac{\text{mV}}{\text{mA}}$

◆ Line Regulation

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line Regulation		$I_{OUT} = \text{Max}, V_{CC}$ from 5.3 V to 3.6 V		0.15	1.2	mV

◆ Ripple Rejection

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Ripple Rejection		$f = 1 \text{ kHz}$ $f = 10 \text{ kHz}$ $f = 100 \text{ kHz}$	60 42 26	74 54 38		dB

◆ Noise

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Noise Voltage	V_{NO}	$100 \text{ Hz} < f < 100 \text{ kHz},$ $C_{BYPASS} = 100 \text{ nF}$ $C_{OUT} = 1 \mu\text{F}$		21	30	μVrms

◆ Dynamic Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rise Time (From V_{RCTRL} to V_{OUT} 90%)		$C_{OUT} = 1 \mu\text{F}$			70	μs
Overshoot		$C_{OUT} = 1 \mu\text{F}$		1	8	%
Settling Time (from V_{OUT} 90% to max $\pm 0.1\%$ fluctuation)		$C = 1 \mu\text{F}$			70	μs

Power Amplifier Controller

◆ Power Amplifier Controller Pin Parameters

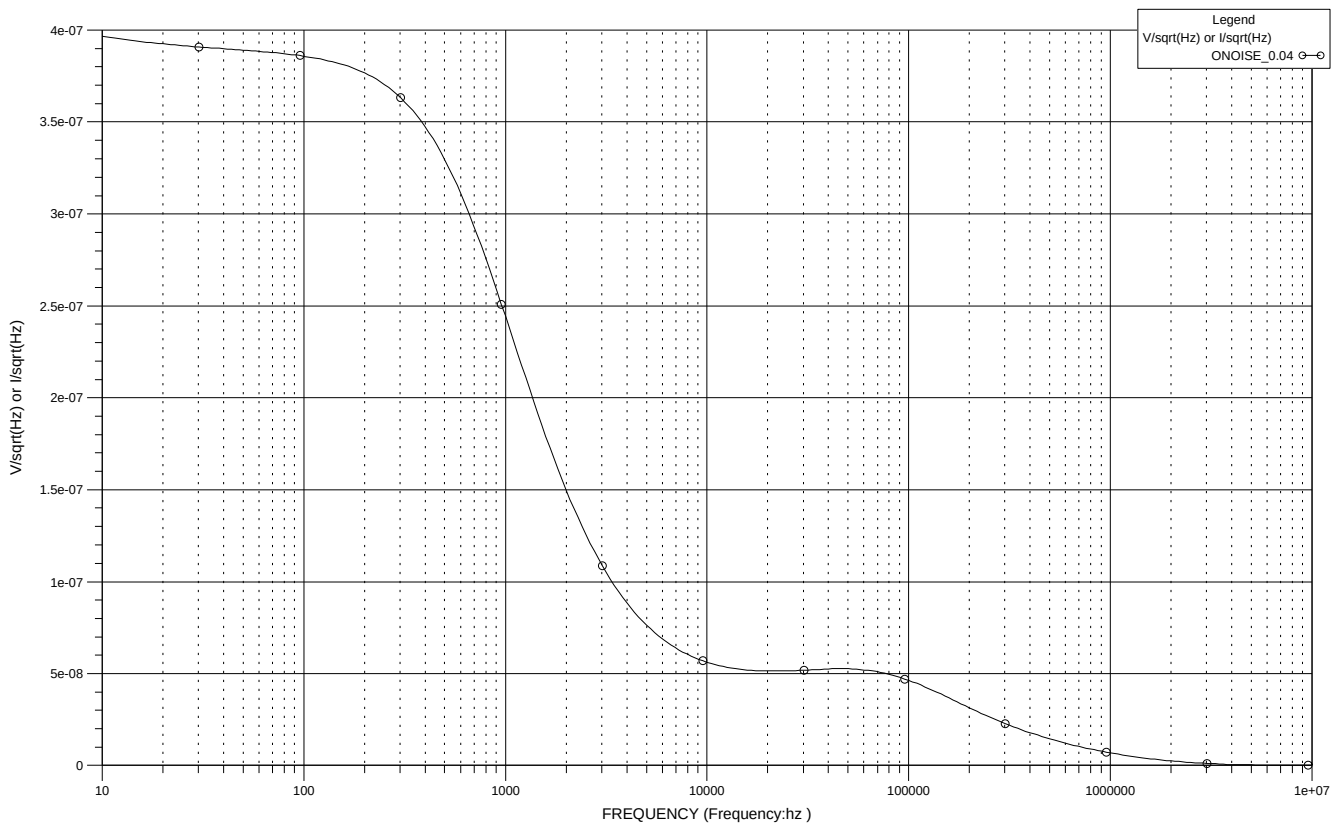
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage ON-state OFF-state	VR _{CTRL}		0 2.0		V _{CC} 0.3	V

Common

◆ Current Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent Currents		VR _{CTRL} =OFF; TXEN=OFF			2	nA
		VR _{CTRL} =OFF; TXEN=ON			2	mA
		VR _{CTRL} =ON; TXEN=OFF			300	uA
		VR _{CTRL} =ON; TXEN=ON			2.3	mA

OUTPUT NOISE PERFORMANCE FOR REGULATOR



V_{IN} = 3.6 V, I_{OUT} = 40 mA, C_{BYPASS} = 10 nF, T_J = 27 °C

FUNCTIONS

Power Amplifier Controller (PAC)

The PAC is an operational amplifier (OA) with AC feedback and some RC-filtering components. PAC also includes the biasing circuit for the dual Schottky diodes used in RF rectifier. In the design, the Siemens BAT62 Schottky diode package was assumed. The DC feedback is provided by the means of the rest of the PAC loop: the Power Amplifier, the Directional Coupler and the

Power Detector (Rectifier). See also Fig 2.

Low-Dropout Voltage Regulator (LDOVR)

The LDOVR is a high-performance, low-dropout voltage regulator including short circuit current and temperature protection. The circuit also contains necessary reference voltage and current generators, so minimum number of external components is required.

TEST CIRCUIT

t.b.d.

APPLICATION INFORMATION

The application circuit diagram is shown in Fig 2. The following comments apply to the schematic:

1. The VSS1 (ground for PAC) and VSS2 (ground for regulator) must be connected together.
2. There are no external biasing components needed for the RF rectifier, they are on the chip.
3. When the external RF decoupling capacitor C_{RFD} from the directional coupler (not shown) is used PSENSE pin must be left unconnected.

When the integrated RF decoupling capacitor is used, the output of directional coupler goes directly to the PSENSE pin and connection between directional coupler and DIRECT pin is not connected.

4. Stabilizing capacitor C_{FB} between the OAMINUS and OAOUT pins is optional.

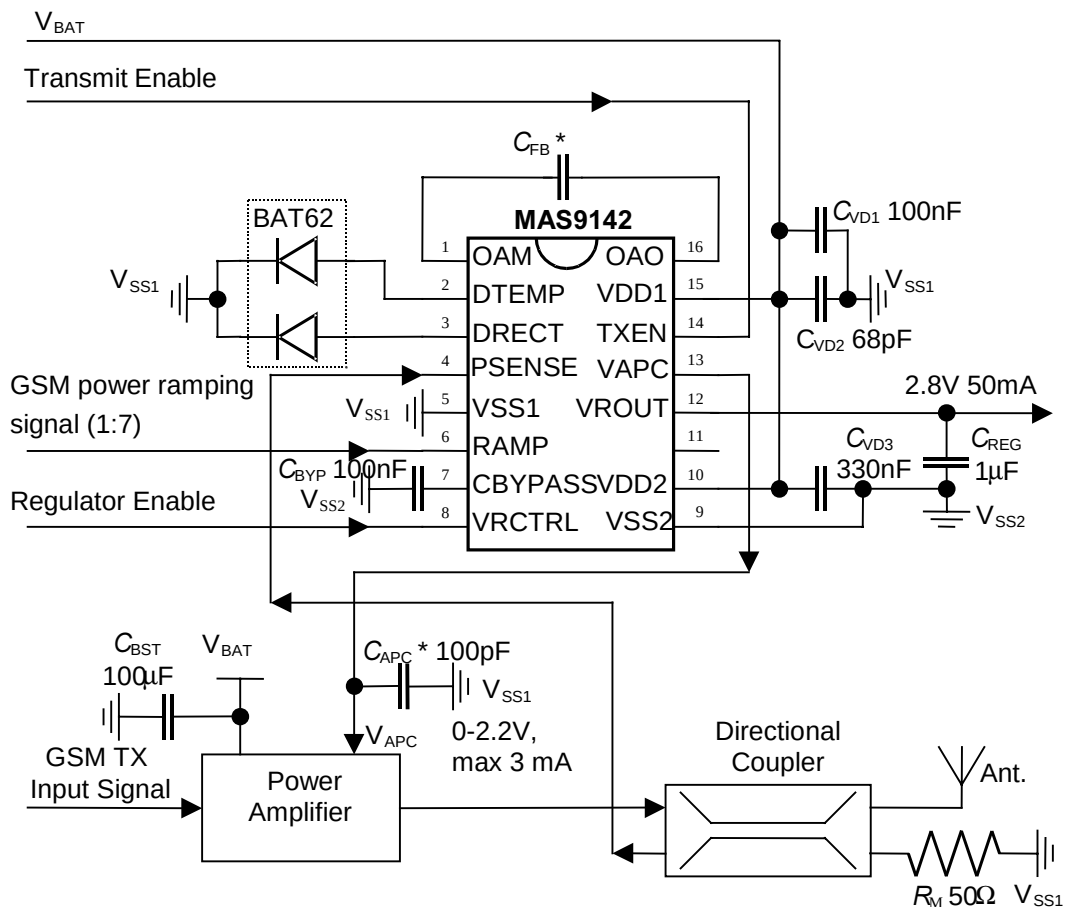
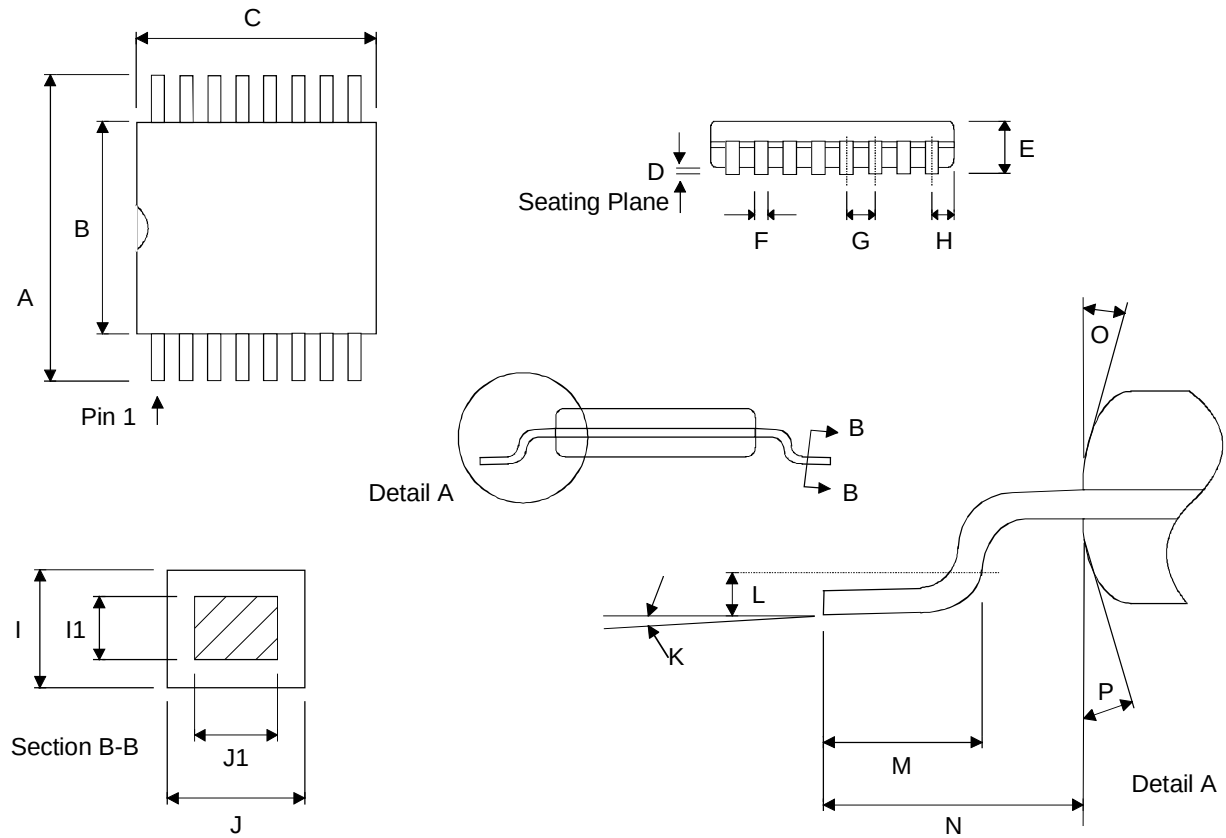


Fig. 2

PACKAGE (TSSOP16) OUTLINES



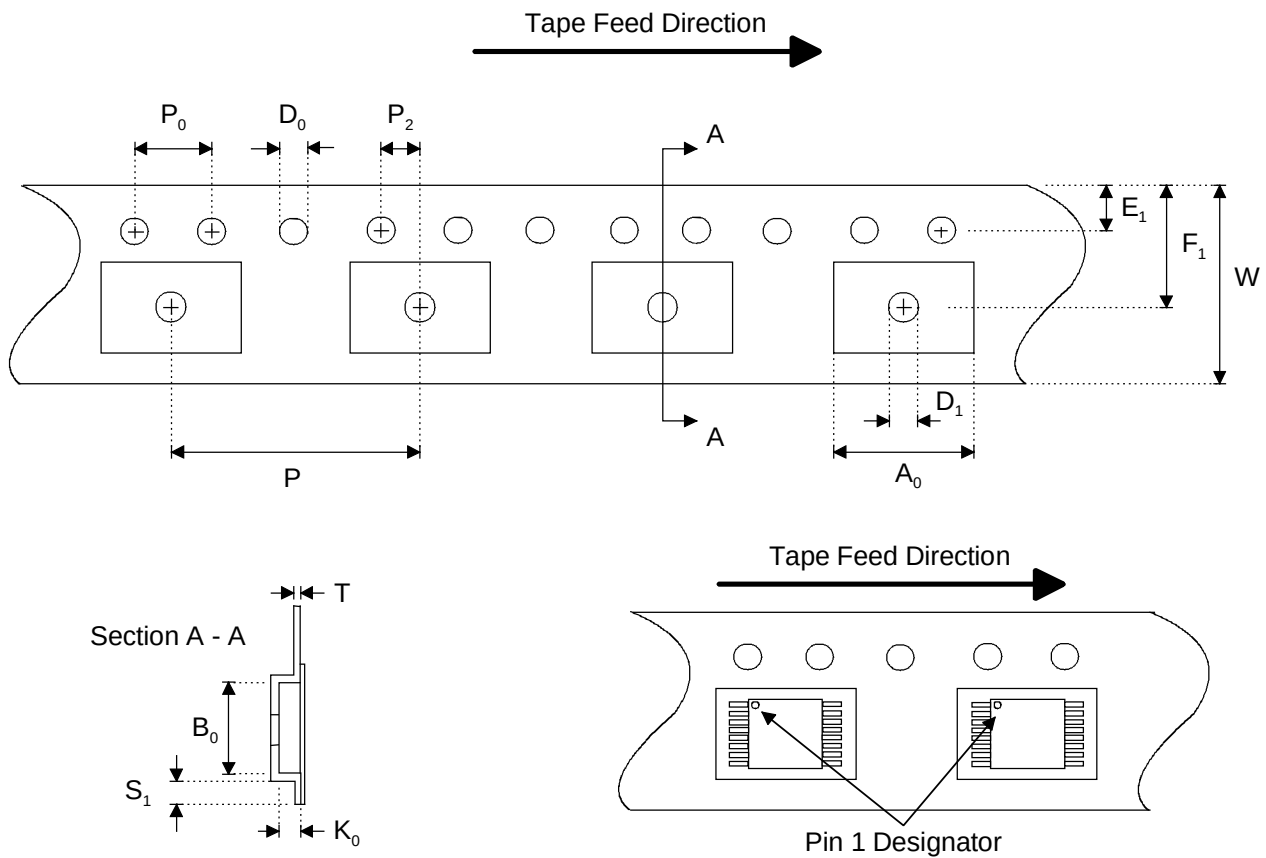
Dimension	Min	Max	Unit
A	6.40 BSC		mm
B	4.30	4.50	mm
C	4.90	5.10	mm
D	0.05	0.15	mm
E		1.10	mm
F	0.19	0.30	mm
G	0.65 BSC		mm
H	0.18	0.28	mm
I	0.09	0.20	mm
I1	0.09	0.16	mm
J	0.19	0.30	mm
J1	0.19	0.25	mm
K	0°	8°	
L	0.24	0.26	mm
M	0.50	0.75	mm
(The length of a terminal for soldering to a substrate)			
N	1.00 REF		mm
O	12°		
P	12°		

Dimensions do not include mold flash, protrusions, or gate burrs.
All dimensions are in accordance with JEDEC standard MO-153.

SOLDERING INFORMATION

Resistance to Soldering Heat	According to RSH test IEC 68-2-58/20 2*220°C
Maximum Reflow Temperature	235°C
Maximum Number of Reflow Cycles	2
Seating Plane Co-planarity	max 0.08 mm
Lead Finish	Solder plate 7.62 - 25.4 µm, material Sn 85% Pb 15%

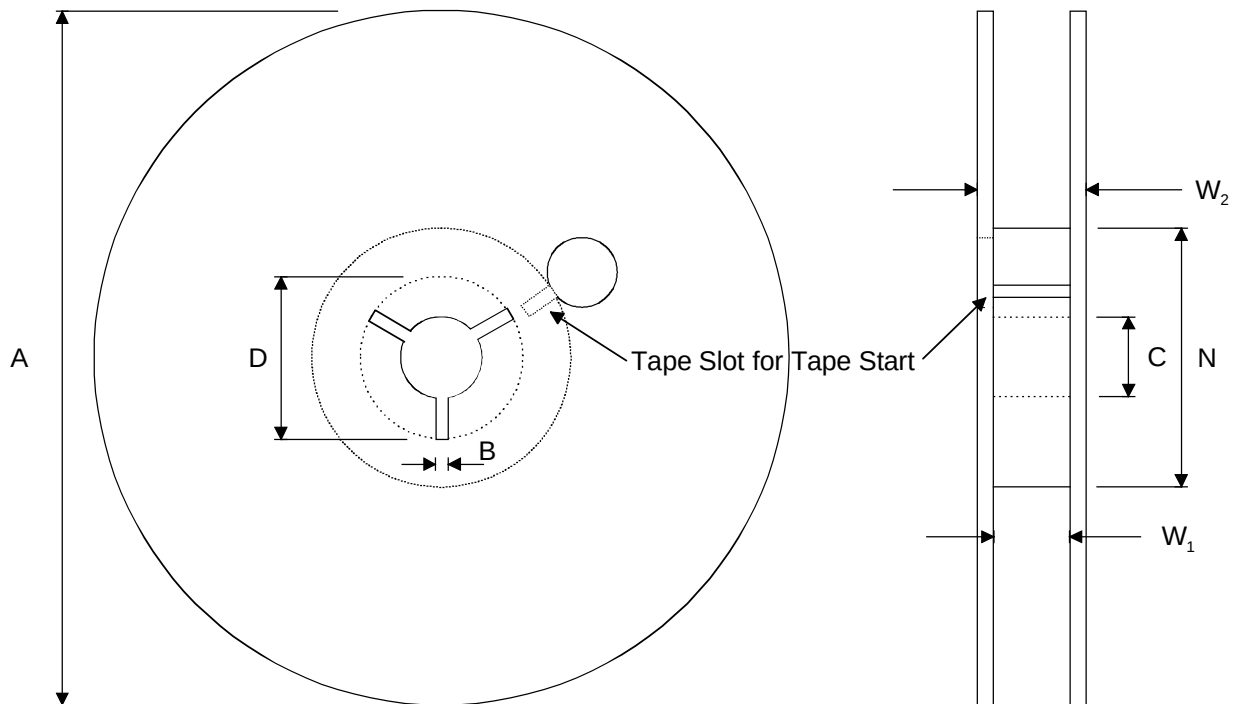
EMBOSED TAPE SPECIFICATIONS



Dimension	Min	Max	Unit
A ₀	6.50	6.70	mm
B ₀	5.20	5.40	mm
D ₀	1.50 +0.10 / -0.00		mm
D ₁	1.50		mm
E ₁	1.65	1.85	mm
F ₁	7.20	7.30	mm
K ₀	1.20	1.40	mm
P	11.90	12.10	mm
P ₀	4.0		mm
P ₂	1.95	2.05	mm
S ₁	0.6		mm
T	0.25	0.35	mm
W	11.70	12.30	mm

All dimensions are in accordance with EIA-481 Standard.

REEL SPECIFICATIONS

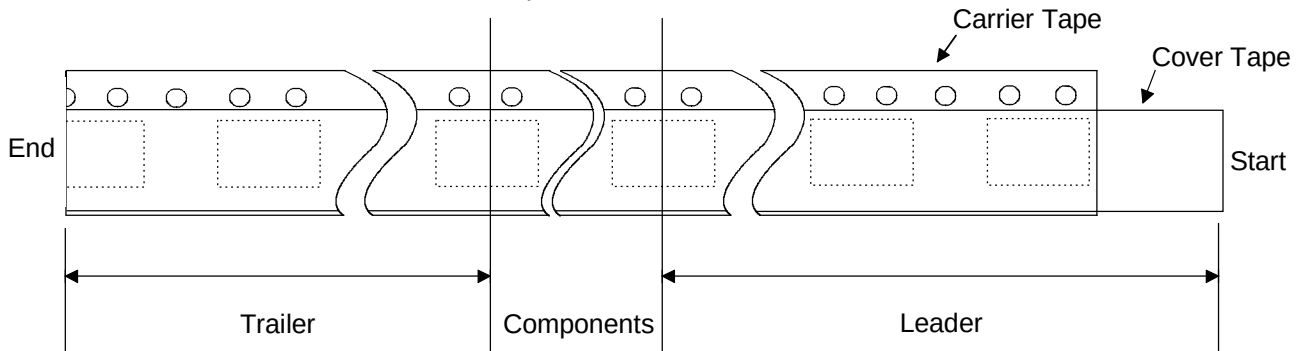


2000 Components on Each Reel

Reel Material: Conductive, Plastic Antistatic or Static Dissipative

Carrier Tape Material: Conductive

Cover Tape Material: Static Dissipative



Dimension	Min	Max	Unit
A		330	mm
B	1.5		mm
C	12.80	13.50	mm
D	20.2		mm
N	50		mm
W ₁ (measured at hub)	12.4	14.4	mm
W ₂ (measured at hub)		18.4	mm
Trailer	160		mm
Leader	390, of which minimum 160mm of empty carrier tape sealed with cover tape		mm
Weight		1500	g

ORDERING INFORMATION

Product Code	Product	Package	Comments
MAS9142AUA1-T	PAC & 2.8 V LDO Regulator	TSSOP16	with LDO regulator/Tape & Reel

LOCAL DISTRIBUTOR

MICRO ANALOG SYSTEMS OY CONTACTS

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