MAS9124

150 mA LDO Voltage Regulator IC

- **Low Noise: 20 µVrms**
- **Low Minimum Output Capacitance Requirement: 0.23 µF**
- **Excellent Ripple Rejection: 65 dB**
- **Very Low Dropout: 70 mV**
- **Regulator Enable/Disable Control**
- **Stable with Low-ESR Output Capacitors**

DESCRIPTION

MAS9124 is a low dropout voltage regulator with very low output noise, high PSRR and small output capacitance requirement.

Due to the low noise level of only 20 µVrms, MAS9124 is suitable for sensitive circuits, e.g., in RF applications. In addition to the noise levels, MAS9124 excels in dropout voltage (70 mV typical at 50 mA) and rise time (16 µs typical without bypass capacitor). Also its ripple rejection ability of 65 dB at 10 kHz exceeds that of competition.

The Equivalent Series Resistance (ESR) range of output capacitors that can be used with MAS9124 is very wide. This ESR range from a few mΩ up to a couple of Ohms combined with no minimum output current requirement makes the usage of MAS9124 easier and low in cost.

MAS9124 features an enable/disable pin, which allows device to be turned off or on by pulling control to low or high. In order to save power the device goes into sleep mode when the regulator is disabled.

MAS9124 also includes an auto-discharge function, wherein a shutdown transistor turns on and discharges the output capacitor, when MAS9124 is turned off.

An internal thermal protection circuit prevents the device from overheating. Also the maximum output current is internally limited.

FEATURES

- Low Noise
- Functionally and Pin Compatible with LP2985/LP3985
- Can be used w/o C_{BYPASS}, see p. 3
- Auto-discharge Function
- Internal Thermal Shutdown
- Short Circuit Protection
- Small SOT23-5 or tiny WL-CSP Package
- Several Output Voltage Options Available, see Ordering Information p. 3

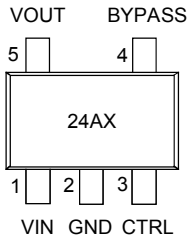
APPLICATIONS

- Mobile Phones
- WLAN Chipsets
- Cordless Phones
- Accessories
- Pagers
- Battery Powered Systems
- Portable Systems
- Radio Control Systems
- Low Voltage Systems

PIN CONFIGURATION

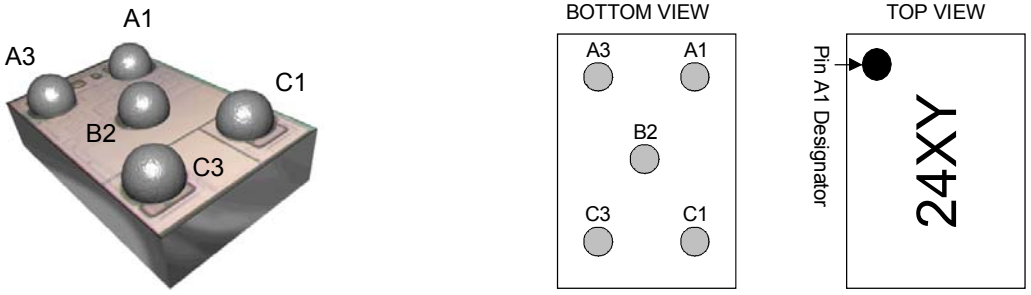
SOT23-5

Top View



For top marking information see ordering information p. 3

WL-CSP



For top marking information see ordering information p. 3

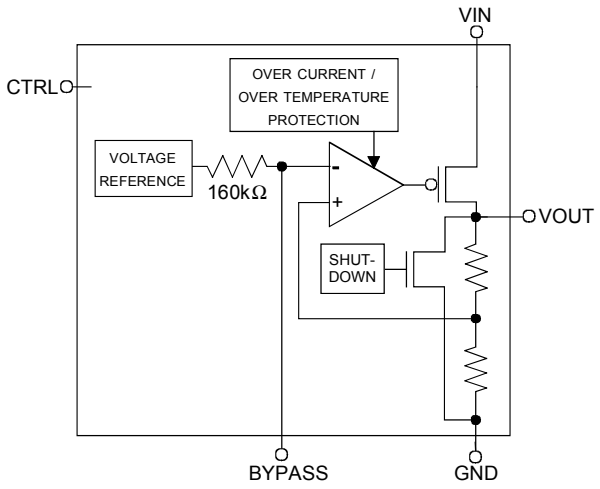
PIN DESCRIPTION

Pin Name	Pin Number in SOT23-5	Pin Number in WL-CSP		Type	Function
		Pin Order 11 Note 1	Pin Order 12 Note 2		
VIN	1	C3	C3	P	Power Supply Voltage
GND	2	B2	A1	G	Ground
CTRL	3	A1	A3	I	Enable/Disable Pin for Regulator
BYPASS	4	A3	B2	I	Pin for Bypass Capacitor
VOUT	5	C1	C1	O	Output

G = Ground, I = Input, O = Output, P = Power

Note 1: WL-CSP Pin Order 11 is pin compatible with LP3985.
Note 2: WL-CSP Pin Order 12 is pin compatible with LP2985.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

All voltages with respect to ground

Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	V_{IN}		-0.3	6	V
Voltage Range for All Pins			-0.3	V_{IN} + 0.3	V
ESD Rating		HBM		2	kV
Junction Temperature	T_{Jmax}			+175 (limited)	°C
Storage Temperature	T_S		-55	+150	°C

Stresses beyond those listed may cause permanent damage to the device. The device may not operate under these conditions, but it will not be destroyed.

RECOMMENDED OPERATING CONDITIONS

All voltages with respect to ground

Parameter	Symbol	Conditions	Min	Max	Unit
Operating Junction Temperature			-40	+125	°C
Operating Ambient Temperature	T_A		-40	+85	°C
Operating Supply Voltage	V_{IN}	$V_{OUT(NOM)}$ < 2.2 V	2.5	5.3	V
		$V_{OUT(NOM)}$ ≥ 2.2 V	$V_{OUT(NOM)}$ + 0.3		
		$V_{OUT(NOM)}$ = 5 V	$V_{OUT(NOM)}$ + 0.3	5.8	

ELECTRICAL CHARACTERISTICS

◆ Thermal Protection

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Threshold High	T_H		145	160	175	°C
Threshold Low	T_L		135	150	165	°C

The hysteresis of 10°C prevents the device from turning on too soon after thermal shut-down.

◆ Control Terminal Specifications

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control Voltage OFF State (Note 1) ON State	V_{CTRL}		 –0.3 1.6		 0.55 V_{IN} + 0.3	V
Control Current	I_{CTRL}	V_{CTRL} = V_{IN} V_{CTRL} = 0 V		5 0	 0.9	µA

If CTRL-pin is not connected, MAS9124 is in OFF state (900 kΩ pull-down resistor to ground).

Note 1: If $V_{OUT(NOM)}$ = 5 V, the device should always be in the ON state.

◆ Voltage Parameters

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Tolerance	V_{OUT}	 I_{OUT} = 0 mA I_{OUT} = 150 mA	 $V_{OUT(NOM)}$ – 0.05 $V_{OUT(NOM)}$ – 0.10		 $V_{OUT(NOM)}$ + 0.05 $V_{OUT(NOM)}$ + 0.05	V
Dropout Voltage	V_{DROP}	 I_{OUT} = 1 mA I_{OUT} = 50 mA I_{OUT} = 150 mA MAS9124A4 (150 mA) MAS9124A5 (150 mA)		 1.7 70 200	 320 800 1100	mV

◆ Current Parameters

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Output Current	I_{OUT}		0		150	mA
Short Circuit Current	I_{MAX}	R_L = 0 Ω	200	450	675	mA
Peak Output Current	I_{PK}	V_{OUT} > 95%* $V_{OUT(NOM)}$		410		mA
Ground Pin Current	I_{GND}	 I_{OUT} = 0 mA I_{OUT} = 10 mA I_{OUT} = 50 mA I_{OUT} = 150 mA		 120 130 160 220	 200 400	µA
Ground Pin Current, Sleep Mode	I_{GND}	V_{CTRL} = 0 V		0.01	5	µA

◆ Power Dissipation

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Junction to Ambient Thermal Resistance	R_{JA}	thermal test board according to JESD51-7 (4 layers), SOT23-5 package		191		°C/W
		mounted on MAS9124 CSP evaluation board, WL-CSP package		210		
Maximum Power Dissipation	P_d	any ambient temperature	$P_{dMAX} = \frac{T_{J(MAX)} - T_A}{R_{JA}}$ Note 1			W

Note 1: $T_{J(MAX)}$ denotes maximum operating junction temperature (+125°C), T_A ambient temperature, and R_{JA} junction-to-air thermal resistance specified above. See also application information p. 8.

◆ Line and Load Regulation

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line Regulation		$V_{OUT(NOM)}$ + 1 V < V_{IN} < 5.3 V, I_{OUT} = 60 mA		0.7		mV
Load Regulation		I_{OUT} = 1 mA to 50 mA I_{OUT} = 1 mA to 150 mA		5 10		mV

◆ Noise and Ripple Rejection

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Noise Voltage	V_{RMS}	300Hz < f < 50kHz C_{BYPASS} = 10 nF w/o C_{BYPASS}		 20 110		µVrms
Noise Density	V_N	I_{OUT} = 50 mA, f = 1 kHz		100		$nV/\sqrt{Hz}$
PSRR		f = 1 kHz f = 10 kHz f = 100 kHz		67 65 48		dB

◆ Dynamic Parameters

T_A = -40°C to +85°C, typical values at T_A = +27°C, V_{IN} = $V_{OUT(NOM)}$ + 1.0 V (or min 3.8 V), I_{OUT} = 1.0 mA, C_{IN} = 1.0 µF, C_L = 1.0 µF, C_{BYPASS} = 10 nF, V_{CTRL} = V_{IN}, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rise Time (10%…90%)		V_{CTRL} = 0 to 2.4 V, I_{OUT} = 30mA C_{BYPASS} = 10 nF w/o C_{BYPASS}		 4 16		 ms µs
Overshoot		V_{CTRL} = 0 to 2.4 V, w/o C_{BYPASS}		3	10	%
Start-up Delay		V_{CTRL} to V_{OUT} , w/o C_{BYPASS} (see figure 1 below)		17		µs

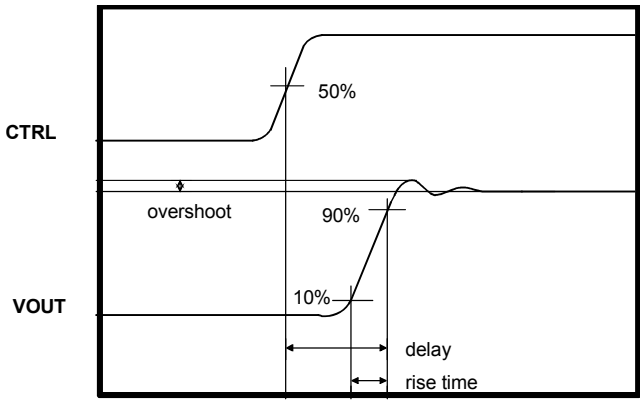
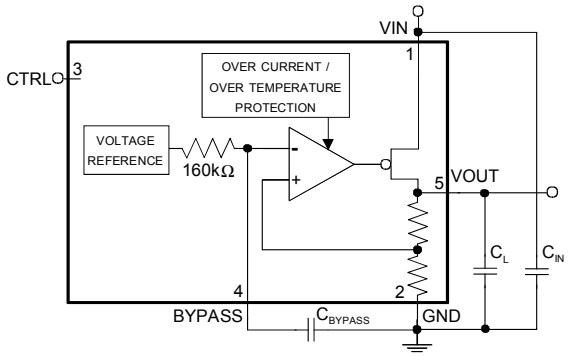


Figure1. Definitions of rise time, overshoot and start-up delay

APPLICATION INFORMATION



Parameter	Symbol	Min	Max	Unit	Note
Output Capacitance	C_L	0.23		µF	1. The selected capacitor has to meet the minimum capacitance requirement in all operating conditions. 2. Ceramic and film capacitors can be used. 3. The value of C_L should be smaller than or equal to the value of C_{IN}.
Effective Series Resistance	ESR	0.01	3	Ohm	1. When within this range, stable with all I_{OUT} = 0 mA…150 mA values.
Bypass Capacitance (Optional: if C_{BYPASS} is not used, noise performance and PSRR decline, but rise time is improved.)	C_{BYPASS}	Typically 0.01		µF	1. Ceramic and film capacitors are best suited. For maximum output voltage accuracy DC leakage current through capacitor should be kept as low as possible. In any case DC leakage current must be below 100 nA.
Input Capacitance	C_{IN}	0.5		µF	1. A big enough input capacitance is needed to prevent possible impedance interactions between the supply and MAS9124. 2. Ceramic, tantalum, and film capacitors can be used. If a tantalum capacitor is used, it should be checked that the surge current rating is sufficient for the application. 3. In the case that the inductance between a **battery** and MAS9124 is very small (< 0.1 µH), a 0.47 µF input capacitor is sufficient. 4. The value of C_{IN} should not be smaller than the value of C_L.
Control Voltage for $V_{OUT(NOM)}$ = 5 V Versions	V_{CTRL}	1.6	V_{IN} + 0.3	V	1. The device should always be in the ON state if $V_{OUT(NOM)}$ = 5 V.

Values given on the table are minimum requirements unless otherwise specified. When selecting capacitors, tolerance and temperature coefficient must be considered to **make sure that the requirement is met in all operating conditions.**

APPLICATION INFORMATION

Auto-Discharge Function
MAS9124 has a shutdown transistor that turns on, when the device is disabled, and discharges the output capacitor.

Calculating Maximum Power Dissipation
Maximum power dissipation of the package may limit output current or input voltage, which can be used, especially with the combination of low output voltage and high input voltage.

The power dissipation can be calculated by using the formula:

$$P_d = (V_{IN} - V_{OUT}) * I_{OUT} + V_{IN} * I_{GND}$$

It shall not exceed the maximum power dissipation, allowed by the package:

$$P_{dMAX} = \frac{T_{JMAX} - T_A}{R_{JA}}$$

where T_{JMAX} is maximum junction temperature (T_{JMAX} = 125°C), T_A is ambient temperature and R_{JA} is junction-to-ambient thermal resistance of the package.

When assumed that:

T_A = +55°C, V_{OUT} = 1.5 V, V_{IN} = 5.0 V and used package is SOT23-5 the equation yields:

$$P_{dMAX} = \frac{125°C - 55°C}{191°C/W} = 0.366\ W$$

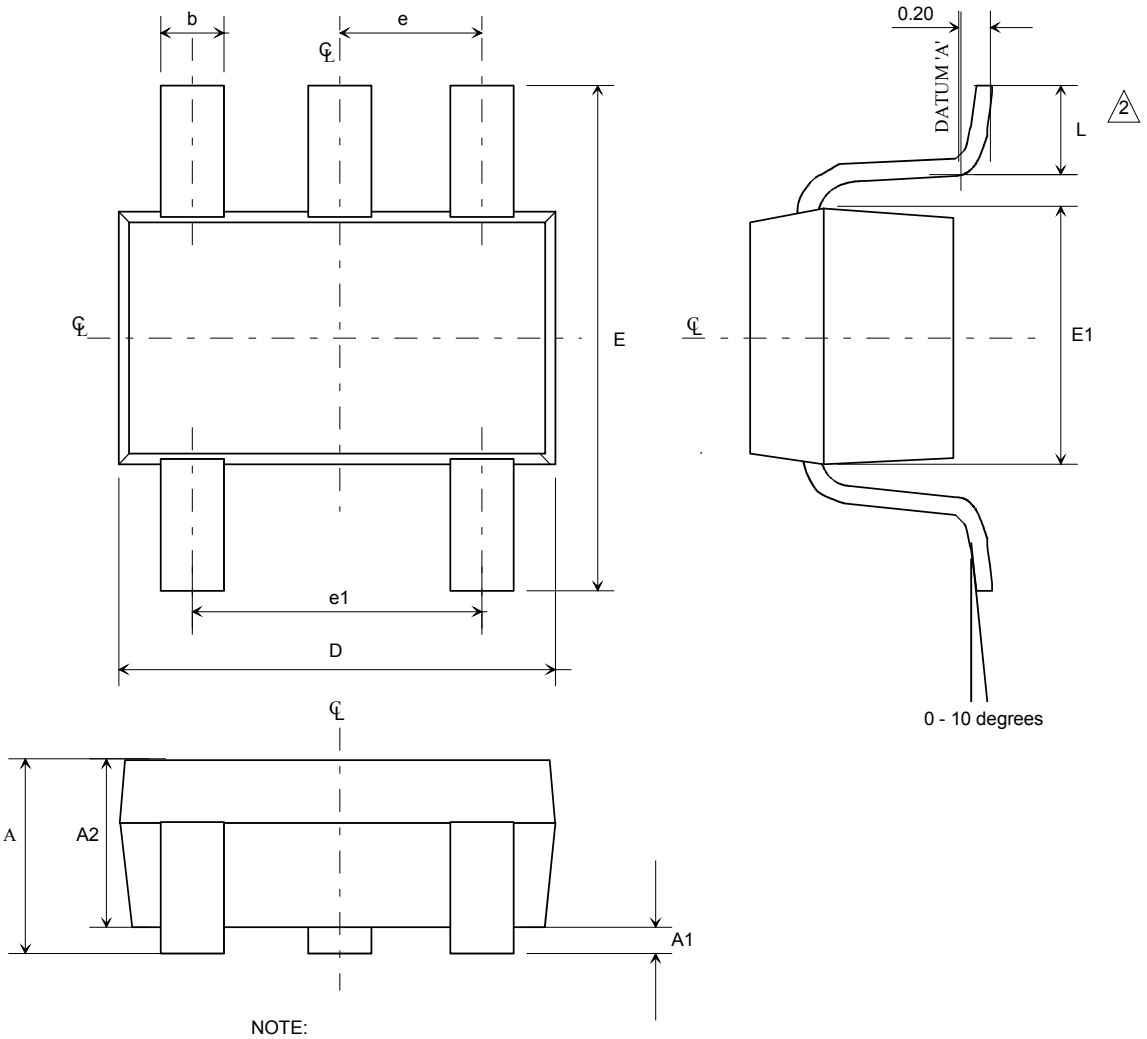
from which can be calculated:

$$I_{OUTMAX} = \frac{P_{dMAX}}{V_{IN} - V_{OUT}} = 105\ mA$$

V_{IN} * I_{GND} is negligible and can be omitted.

Consequently, it can be seen that under these conditions the average output current should not exceed 105 mA.

PACKAGE (SOT23-5) OUTLINE

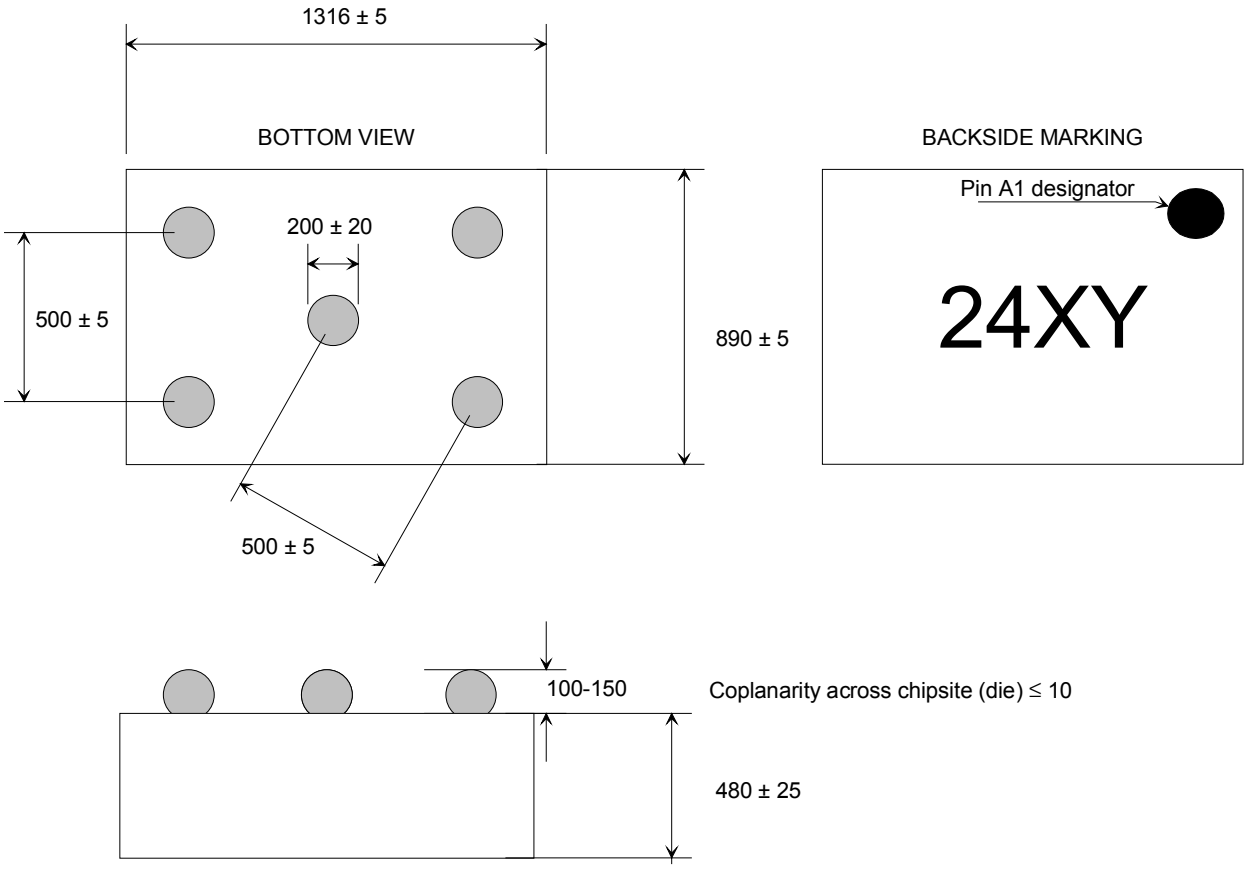


NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS
2. FOOT LENGHT MEASURED AT INTERCEPT POINT BETWEEN DATUM A & LEAD SURFACE.
3. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR
4. PACKAGE OUTLINE INCLUSIVE OF SOLDER PLATING.
5. COMPLY TO EIAJ SC74

Symbol	Min	Max	Unit
A	0.90	1.45	mm
A1	0.00	0.15	mm
A2	0.90	1.30	mm
b	0.25	0.50	mm
C	0.09	0.20	mm
D	2.80	3.10	mm
E	2.60	3.00	mm
E1	1.50	1.75	mm
L	0.35	0.55	mm
e	0.95ref		mm
e1	1.90ref		mm

PACKAGE (WL-CSP) OUTLINE

All dimensions in microns, drawings not to scale.



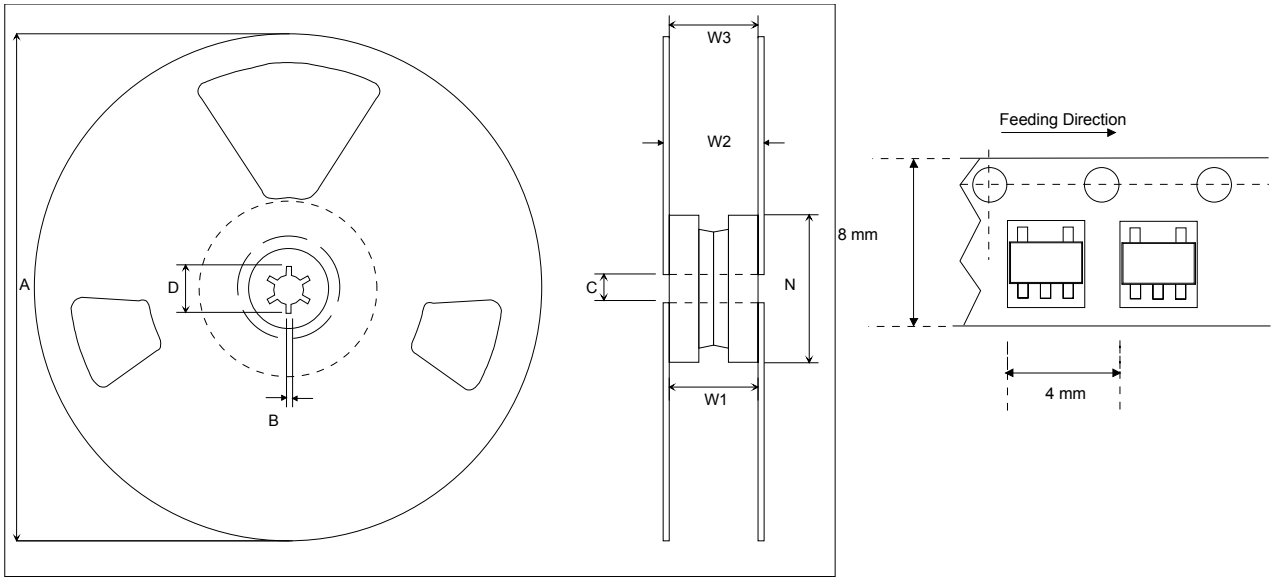
Definitions (see ordering information p. 3):

X = Package option
Y = Output voltage option

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%
WL-CSP Balls	Material Sn 63% Pb 37% (eutectic)

TAPE & REEL SPECIFICATIONS (SOT23-5)



Other Dimensions according to EIA-481 Standard.

3000 Components on Each Reel.

Dimension	Min	Max	Unit
A		178	mm
B	1.5		mm
C	12.80	13.50	mm
D	20.2		mm
N	50		mm
W_1 (measured at hub)	8.4	9.9	mm
W_2 (measured at hub)		14.4	mm
Trailer	160		mm
Leader	390, of which minimum 160 mm of empty carrier tape sealed with cover tape		mm

ORDERING INFORMATION

For Pin Order definition see the pin description on page 2.

Product Code	Product	Top Marking	Package	Pin Order	Comments
MAS9124AST5-T	1.50 V Voltage Regulator IC	24A5	SOT23-5		Tape and Reel
MAS9124A5CA11	1.50 V Voltage Regulator IC	24A5	WL-CSP	11	Tape and Reel
MAS9124A5CA12	1.50 V Voltage Regulator IC	24Z5	WL-CSP	12	Tape and Reel
MAS9124AST4-T	1.80 V Voltage Regulator IC	24A4	SOT23-5		Tape and Reel
MAS9124A4CA11	1.80 V Voltage Regulator IC	24A4	WL-CSP	11	Tape and Reel
MAS9124A4CA12	1.80 V Voltage Regulator IC	24Z4	WL-CSP	12	Tape and Reel
MAS9124ASTA-T	2.30 V Voltage Regulator IC	24AA	SOT23-5		Tape and Reel
MAS9124AACA11	2.30 V Voltage Regulator IC	24AA	WL-CSP	11	Tape and Reel
MAS9124AACA12	2.30 V Voltage Regulator IC	24ZA	WL-CSP	12	Tape and Reel
MAS9124ASTB-T	2.40 V Voltage Regulator IC	24AB	SOT23-5		Tape and Reel
MAS9124ABCA11	2.40 V Voltage Regulator IC	24AB	WL-CSP	11	Tape and Reel
MAS9124ABCA12	2.40 V Voltage Regulator IC	24ZB	WL-CSP	12	Tape and Reel
MAS9124AST3-T	2.50 V Voltage Regulator IC	24A3	SOT23-5		Tape and Reel
MAS9124A3CA11	2.50 V Voltage Regulator IC	24A3	WL-CSP	11	Tape and Reel
MAS9124A3CA12	2.50 V Voltage Regulator IC	24Z3	WL-CSP	12	Tape and Reel
MAS9124ASTC-T	2.60 V Voltage Regulator IC	24AC	SOT23-5		Tape and Reel
MAS9124ACCA11	2.60 V Voltage Regulator IC	24AC	WL-CSP	11	Tape and Reel
MAS9124ACCA12	2.60 V Voltage Regulator IC	24ZC	WL-CSP	12	Tape and Reel
MAS9124AST9-T	2.70 V Voltage Regulator IC	24A9	SOT23-5		Tape and Reel
MAS9124A9CA11	2.70 V Voltage Regulator IC	24A9	WL-CSP	11	Tape and Reel
MAS9124A9CA12	2.70 V Voltage Regulator IC	24Z9	WL-CSP	12	Tape and Reel
MAS9124AST2-T	2.80 V Voltage Regulator IC	24A2	SOT23-5		Tape and Reel
MAS9124A2CA11	2.80 V Voltage Regulator IC	24A2	WL-CSP	11	Tape and Reel
MAS9124A2CA12	2.80 V Voltage Regulator IC	24Z2	WL-CSP	12	Tape and Reel
MAS9124AST8-T	2.86 V Voltage Regulator IC	24A8	SOT23-5		Tape and Reel
MAS9124A8CA11	2.86 V Voltage Regulator IC	24A8	WL-CSP	11	Tape and Reel
MAS9124A8CA12	2.86 V Voltage Regulator IC	24Z8	WL-CSP	12	Tape and Reel
MAS9124AST7-T	2.90 V Voltage Regulator IC	24A7	SOT23-5		Tape and Reel
MAS9124A7CA11	2.90 V Voltage Regulator IC	24A7	WL-CSP	11	Tape and Reel
MAS9124A7CA12	2.90 V Voltage Regulator IC	24Z7	WL-CSP	12	Tape and Reel
MAS9124AST6-T	3.00 V Voltage Regulator IC	24A6	SOT23-5		Tape and Reel
MAS9124A6CA11	3.00 V Voltage Regulator IC	24A6	WL-CSP	11	Tape and Reel
MAS9124A6CA12	3.00 V Voltage Regulator IC	24Z6	WL-CSP	12	Tape and Reel
MAS9124ASTD-T	3.10 V Voltage Regulator IC	24AD	SOT23-5		Tape and Reel
MAS9124ADCA11	3.10 V Voltage Regulator IC	24AD	WL-CSP	11	Tape and Reel
MAS9124ADCA12	3.10 V Voltage Regulator IC	24ZD	WL-CSP	12	Tape and Reel
MAS9124AST1-T	3.30 V Voltage Regulator IC	24A1	SOT23-5		Tape and Reel
MAS9124A1CA11	3.30 V Voltage Regulator IC	24A1	WL-CSP	11	Tape and Reel
MAS9124A1CA12	3.30 V Voltage Regulator IC	24Z1	WL-CSP	12	Tape and Reel
MAS9124ASTF-T	4.00 V Voltage Regulator IC	24AF	SOT23-5		Tape and Reel
MAS9124AFCA11	4.00 V Voltage Regulator IC	24AF	WL-CSP	11	Tape and Reel
MAS9124AFCA12	4.00 V Voltage Regulator IC	24ZF	WL-CSP	12	Tape and Reel

MAS9124ASTG-T	5.00 V Voltage Regulator IC	24AG	SOT23-5		Tape and Reel
MAS9124AGCA11	5.00 V Voltage Regulator IC	24AG	WL-CSP	11	Tape and Reel
MAS9124AGCA12	5.00 V Voltage Regulator IC	24ZG	WL-CSP	12	Tape and Reel

For TSOT-5 package option contact Micro Analog Systems Oy.

For more voltage options contact Micro Analog Systems Oy.

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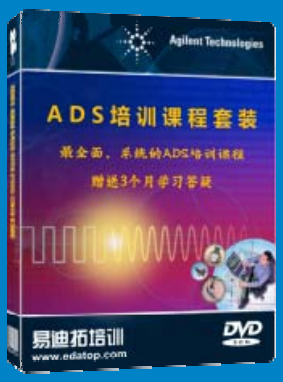
射频工程师养成培训课程套装

该套装精选了射频专业基础培训课程、射频仿真设计培训课程和射频电路测量培训课程三个类别共 30 门视频培训课程和 3 本图书教材；旨在引领学员全面学习一个射频工程师需要熟悉、理解和掌握的专业知识和研发设计能力。通过套装的学习，能够让学员完全达到和胜任一个合格的射频工程师的要求…

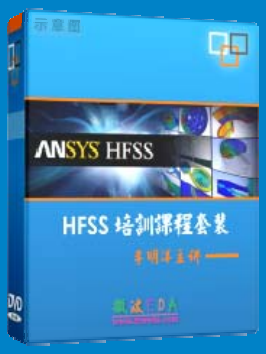
课程网址：http://www.edatop.com/peixun/rfe/110.html

ADS 学习培训课程套装



该套装是迄今国内最全面、最权威的 ADS 培训教程，共包含 10 门 ADS 学习培训课程。课程是由具有多年 ADS 使用经验的微波射频与通信系统设计领域资深专家讲解，并多结合设计实例，由浅入深、详细而又全面地讲解了 ADS 在微波射频电路设计、通信系统设计和电磁仿真设计方面的内容。能让您在最短的时间内学会使用 ADS，迅速提升个人技术能力，把 ADS 真正应用到实际研发工作中去，成为 ADS 设计专家...

课程网址： http://www.edatop.com/peixun/ads/13.html



HFSS 学习培训课程套装

该套课程套装包含了本站全部 HFSS 培训课程，是迄今国内最全面、最专业的 HFSS 培训教程套装，可以帮助您从零开始，全面深入学习 HFSS 的各项功能和在多个方面的工程应用。购买套装，更可超值赠送 3 个月免费学习答疑，随时解答您学习过程中遇到的棘手问题，让您的 HFSS 学习更加轻松顺畅…

课程网址：http://www.edatop.com/peixun/hfss/11.html

CST 学习培训课程套装

该培训套装由易迪拓培训联合微波 EDA 网共同推出，是最全面、系统、专业的 CST 微波工作室培训课程套装，所有课程都由经验丰富的专家授课，视频教学，可以帮助您从零开始，全面系统地学习 CST 微波工作的各项功能及其在微波射频、天线设计等领域的设计应用。且购买该套装，还可超值赠送 3 个月免费学习答疑…

课程网址：http://www.edatop.com/peixun/cst/24.html

HFSS 天线设计培训课程套装

套装包含 6 门视频课程和 1 本图书，课程从基础讲起，内容由浅入深，理论介绍和实际操作讲解相结合，全面系统的讲解了 HFSS 天线设计的全过程。是国内最全面、最专业的 HFSS 天线设计课程，可以帮助您快速学习掌握如何使用 HFSS 设计天线，让天线设计不再难…

课程网址：http://www.edatop.com/peixun/hfss/122.html

13.56MHz NFC/RFID 线圈天线设计培训课程套装

套装包含 4 门视频培训课程，培训将 13.56MHz 线圈天线设计原理和仿真设计实践相结合，全面系统地讲解了 13.56MHz 线圈天线的工作原理、设计方法、设计考量以及使用 HFSS 和 CST 仿真分析线圈天线的具体操作，同时还介绍了 13.56MHz 线圈天线匹配电路的设计和调试。通过该套课程的学习，可以帮助您快速学习掌握 13.56MHz 线圈天线及其匹配电路的原理、设计和调试…

详情浏览：http://www.edatop.com/peixun/antenna/116.html

我们的课程优势：

※ 成立于 2004 年，10 多年丰富的行业经验，

※ 一直致力并专注于微波射频和天线设计工程师的培养，更了解该行业对人才的要求

※ 经验丰富的一线资深工程师讲授，结合实际工程案例，直观、实用、易学

联系我们：

※ 易迪拓培训官网：http://www.edatop.com

※ 微波 EDA 网：http://www.mweda.com

※ 官方淘宝店：http://shop36920890.taobao.com