Data Sheet

Central Semiconductor Corp.™

145 Adams Avenue, Hauppauge, NY 11788 USA
Tel: (631) 435-1110 • Fax: (631) 435-1824

Manufacturers of World Class Discrete Semiconductors

2N5770

NPN SILICON RF TRANSISTOR

JEDEC TO-92 CASE (EBC)

DESCRIPTION

The CENTRAL SEMICONDUCTOR 2N5770 type is a NPN Silicon Epitaxial Planar Transistors designed for high frequency amplifier and oscillator applications.

MAXIMUM RATINGS ($T_A = 25^oC$)

	SYMBOL		UNITS
Collector-Base Voltage	V_{CBO}	30	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	50	mA
Power Dissipation	P_D	625	mW
Operating and Storage Junction Temperature	T_J, T_{stg}	-65 to +150	^oC
Thermal Resistance	Θ_{JA}	200	$^oC/W$

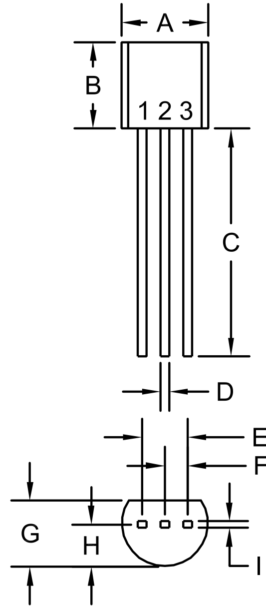
ELECTRICAL CHARACTERISTICS ($T_C = 25^oC$ unless otherwise noted)

SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS
I_{CBO}	$V_{CB} = 15V$		10	nA
I_{CBO}	$V_{CB} = 15V$, $T_A = 150^oC$		1.0	μA
BV_{CBO}	$I_C = 1.0\mu A$	30		V
BV_{CEO}	$I_C = 3.0mA$	15		V
BV_{EBO}	$I_E = 10\mu A$	3.0		V
$V_{CE(SAT)}$	$I_C = 10mA$, $I_B = 1.0mA$		0.4	V
$V_{BE(SAT)}$	$I_C = 10mA$, $I_B = 1.0mA$		1.0	V
h_{FE}	$V_{CE} = 1.0V$, $I_C = 3.0mA$	20		
h_{FE}	$V_{CE} = 1.0V$, $I_C = 8.0mA$	50	200	
f_T	$V_{CE} = 10V$, $I_C = 8.0mA$, $f = 100MHz$	900		MHz
C_{ob}	$V_{CB} = 10V$, $I_E = 0$, $f = 1.0MHz$		1.7	pF
C_{ib}	$V_{EB} = 0.5V$, $I_C = 0$, $f = 1.0MHz$		2.0	pF
G_{pe}	$V_{CB} = 12V$, $I_C = 6.0mA$, $f = 200MHz$	15		dB
P_O	$V_{CB} = 15V$, $I_C = 8.0mA$, $f = 500MHz$	30		mW
η	$V_{CB} = 15V$, $I_C = 8.0mA$, $f = 500MHz$	25		%
NF	$V_{CE} = 6.0V$, $I_C = 1.0mA$, $R_G = 400\Omega$, $f = 60MHz$		6.0	dB

Datasheet.Directory

Package Details - TO-92

Mechanical Drawing



R1

DIMENSIONS				
	INCHES		MILLIMETERS	
SYMBOL	MIN	MAX	MIN	MAX
A (DIA)	0.175	0.205	4.45	5.21
B	0.170	0.210	4.32	5.33
C	0.500	-	12.70	-
D	0.016	0.022	0.41	0.56
E	0.100		2.54	
F	0.050		1.27	
G	0.125	0.165	3.18	4.19
H	0.080	0.105	2.03	2.67
I	0.015		0.38	

TO-92 (REV: R1)

LEAD CODE:

*** SCR**
1) ANODE
2) GATE
3) CATHODE

or

1) CATHODE
2) GATE
3) ANODE

*** FET**
1) DRAIN
2) SOURCE
3) GATE

1) DRAIN
2) GATE
3) SOURCE

or

1) GATE
2) SOURCE
3) DRAIN

1) SOURCE
2) DRAIN
3) GATE

PUT
1) ANODE
2) GATE
3) CATHODE

TRIAC
1) MT1
2) GATE
3) MT2

*** TRANSISTOR**
1) EMITTER
2) BASE
3) COLLECTOR

1) EMITTER
2) COLLECTOR
3) BASE

or

1) COLLECTOR
2) BASE
3) EMITTER

1) BASE
2) EMITTER
3) COLLECTOR

* Note: See individual device datasheet for pinout information

Packing Code: D
D = White corrugated box with black conductive coating (surface resistivity of <10^5 ohms per square).

Standard Packing Quantity: 2.5K

Also available in the following lead form options
TO-92-SF, TO-92-ST, TO-92-ST1, TO-92-18F, TO-92-18R

Central™
Semiconductor Corp.
www.centralsemi.com

R0 (21-June 2004)

Package Details - TO-92 TR

Tape and Reel Specifications

1.0. Purpose:

This specification defines the tape and reel packaging requirements for TO-92 devices. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 Requirements:

2.1 Tape and Reel Requirements: Devices to be taped and reeled in accordance with Figures 2 and 3.
2.2 Style Type: A suffix is added to part number to indicate Style Type. Example: CS92B TRE (CS92B taped and reeled in accordance with STYLE E). Note: STYLE E is preferred.
2.3 Packaging Base: Devices to be taped 2000 pieces per reel.

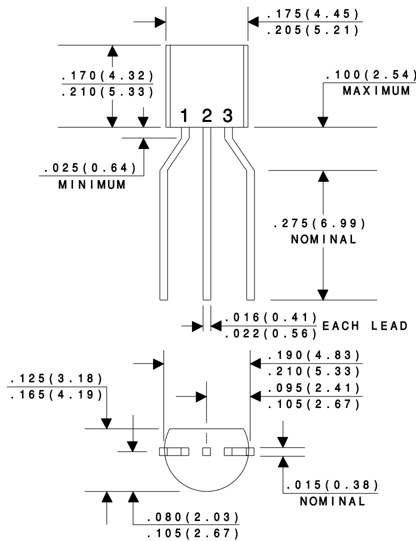


FIGURE 1. PHYSICAL DIMENSIONS
ALL DIMENSIONS IN INCHES (mm).

Package Details - TO-92 TR

Tape and Reel Specifications
(Continued)

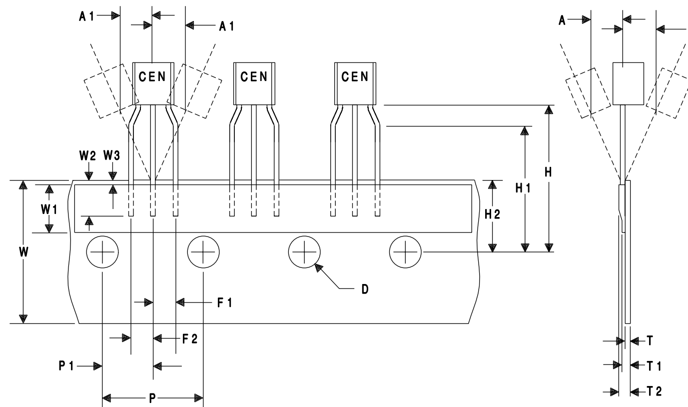


FIGURE 2. TAPING SPECIFICATIONS

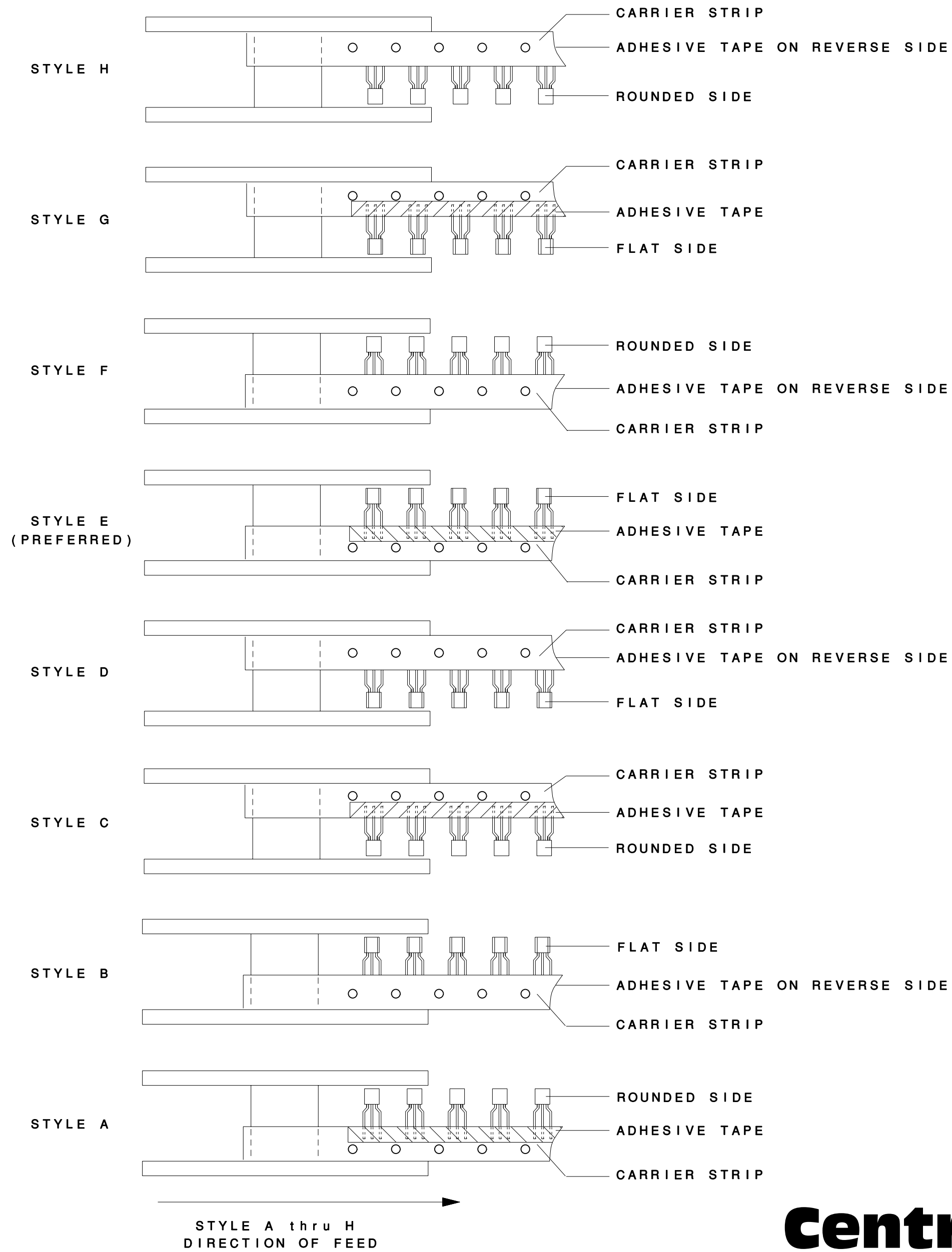
SYMBOL	DESCRIPTION	INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	FRONT TO REAR DEFLECTION	---	0.039	---	1.0	1
A1	LEFT TO RIGHT DEFLECTION	---	0.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.8	4.2	
F1	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
F2	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
H	FEED HOLE TO BOTTOM OF COMPONENT	0.75	0.79	19.0	20.0	
H1	HEIGHT OF SEATING PLANE	0.61	0.65	15.5	16.5	2
H2	HEIGHT OF FEED HOLE LOCATION	0.33	0.37	8.5	9.5	7,8
P	FEED HOLE PITCH	0.49	0.51	12.5	12.9	3
P1	CENTER OF SEATING PLANE LOCATION	0.23	0.26	5.95	6.75	
T	CARRIER TAPE THICKNESS	0.015	0.027	0.38	0.68	4
T1	OVERALL TAPE THICKNESS	0.020	0.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	0.057	---	1.44	4
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.0	7.0	5
W2	LEAD ENCLOSURE	0.18	---	4.5	---	
W3	ADHESIVE TAPE POSITION	---	0.020	---	0.5	5

NOTES:
1) MAXIMUM ALIGNMENT DEVIATION BETWEEN LEADS NOT TO BE GREATER THAN 0.2mm.
2) AS ILLUSTRATED, THE CLEARANCE TO THE LEAD STANDOFF FORM SHALL BE DEFINED TO THE POINT OF RADIUS FOR THE STANDOFF FORM.
3) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
4) OVERALL TAPED PACKAGE THICKNESS, INCLUDING COMPONENT LEADS AND TAPE SPLICES SHALL NOT EXCEED 1.44mm.
5) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
6) NO MORE THAN 0.1% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
7) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
8) NO MORE THAN 10 SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET FEED HOLES.

Package Details - TO-92 TR

Tape and Reel Specifications
(Continued)

FIGURE3. TAPING STYLE



Package Details - TO-92 AP

Ammopack

Specifications

1.0. PURPOSE:

This specification defines the TO-92 Ammopack requirements. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 REQUIREMENTS:

2.1 Tape Requirements: Devices to be taped in accordance with Figure 2.
2.2 Style Type: STYLE M (PREFERRED) or STYLE P (See Figures 3 and 4).
2.3 Ordering Info: Add suffix to part number to indicate Style Type .
Suffix APM For STYLE M (Equivalent to reel pack STYLE E).
Example: CS92B APM (CS92B SCR, Ammopack STYLE M).
or
Suffix APP For STYLE P (Equivalent to reel pack STYLE A).
Example: CS92B APP (CS92B SCR, Ammopack STYLE P).
2.4 Packaging Base: Devices to be taped 2000 pieces per Ammopack.

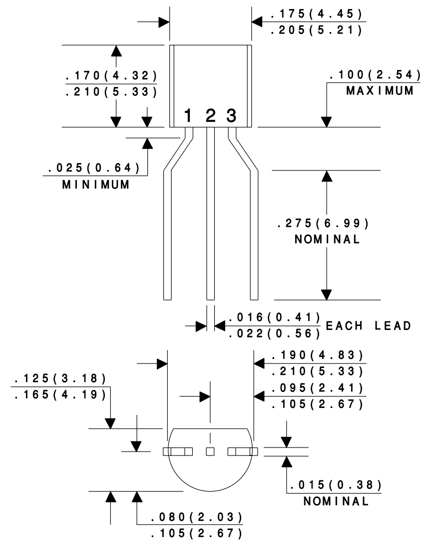


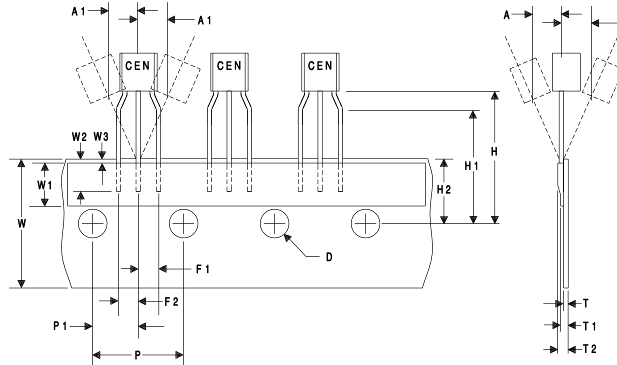
FIGURE 1. PHYSICAL DIMENSIONS
All Dimensions in Inches (mm)

Package Details - TO-92 AP

TO-92 Ammopack

Specifications
(Continued)

FIGURE 2. (TAPING SPECIFICATIONS)



SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	0.039	---	1.0	1
A1	LEFT TO RIGHT DEFLECTION	---	0.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.8	4.2	
F1	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
F2	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
H	FEED HOLE TO BOTTOM OF COMPONENT	0.75	0.79	19.0	20.0	
H1	HEIGHT OF SEATING PLANE	0.61	0.65	15.5	16.5	2
H2	HEIGHT OF FEED HOLE LOCATION	0.33	0.37	8.5	9.5	7,8
P	FEED HOLE PITCH	0.49	0.51	12.5	12.9	3
P1	CENTER OF SEATING PLANE LOCATION	0.23	0.26	5.95	6.75	
T	CARRIER TAPE THICKNESS	0.015	0.027	0.38	0.68	4
T1	OVERALL TAPE THICKNESS	0.020	0.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	0.057	---	1.44	4
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.0	7.0	5
W2	LEAD ENCLOSURE	0.18	---	4.5	---	
W3	ADHESIVE TAPE POSITION	---	0.020	---	0.5	5

NOTES:
1) MAXIMUM ALIGNMENT DEVIATION BETWEEN LEADS NOT TO BE GREATER THAN 0.2mm.
2) AS ILLUSTRATED, THE CLEARANCE TO THE LEAD STANDOFF FORM SHALL BE DEFINED TO THE POINT OF RADIUS FOR THE STANDOFF FORM.
3) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
4) OVERALL TAPED PACKAGE THICKNESS, INCLUDING COMPONENT LEADS AND TAPE SPLICES SHALL NOT EXCEED 1.44mm.
5) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
6) NO MORE THAN 0.1% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
7) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
8) NO MORE THAN 10 SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET FEED HOLES.

Central™
Semiconductor Corp.
www.centralsemi.com

Package Details - TO-92 AP

Ammopack

Specifications (Continued)

FIGURE 3. STYLE M (PREFERRED)

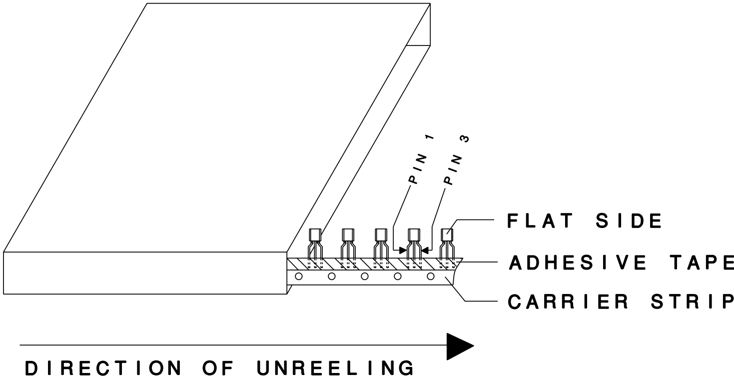
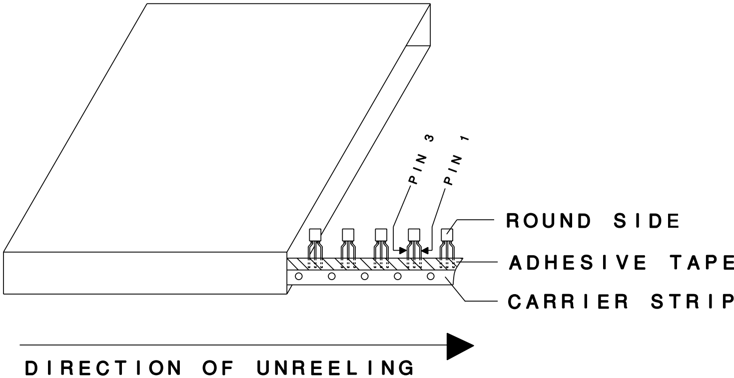


FIGURE 4. STYLE P

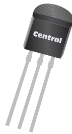


Note: The box is accessible from either side depending upon whether PIN 1 or PIN 3 is required at the leading edge.

Material Composition Specification

TO-92 (Eutectic Die Attach)

Pb (lead)-free plating**



Device average mass . . . . 206 mg
Fluctuation margin . . . . +/-10%

Component	Material	Material (%wt)	Material (mg)	Substance	CAS No.	Substance (%wt)	Substance (mg)	Substance (ppm)
active device	doped Si	0.034%	0.07	Si	7440-21-3	0.034%	0.07	340
bond wire	gold	0.016%	0.032	Au	7440-57-5	0.016%	0.032	155
leadframe	Cu alloy w/ silver plating	44.824%	92.338	Cu	7440-50-8	44.641%	91.96	446,408
				Fe	7439-89-6	0.045%	0.092	447
				P	7723-14-0	0.016%	0.032	155
				Ag	7440-22-4	0.123%	0.254	1,233
encapsulation*	EMC	52.286%	107.71	silica	7631-86-9	40.694%	83.83	406,942
				epoxy resin	29690-82-2	5.267%	10.85	52,670
				phenol resin	9003-35-4	4.748%	9.78	47,476
				carbon black	1333-86-4	0.149%	0.306	1,485
				Sb_2O_3	1309-64-4	1.146%	2.36	11,456
				TBBA	79-94-7	0.283%	0.584	2,835
	EMC GREEN	52.286%	107.71	silica	7631-86-9	38.816%	79.96	388,155
				epoxy resin	29690-82-2	5.024%	10.35	50,243
				phenol resin	9003-35-4	4.529%	9.33	45,291
				carbon black	1333-86-4	0.568%	1.17	5,680
				metal hydroxide	1309-42-8	3.35%	6.9	33,495
plating**	tin lead process	2.84%	5.85	Sn	7440-31-5	2.282%	4.7	22,816
				Pb	7439-92-1	0.558%	1.15	5,583
	100% matte tin	2.84%	5.85	Sn	7440-31-5	2.84%	5.85	28,398

*EMC GREEN molding compound is Halogen Free.
**Specify Lead-Free when ordering 100% tin (Pb-free) plating.

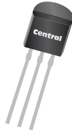
Disclaimer
The information provided in this Material Composition data sheet is, to the best of our knowledge, correct. However, there is no guarantee to completeness or accuracy, as some information is derived from data sources outside the company.

R2 (25-October 2010)

Material Composition Specification

TO-92 (Solder Die Attach)

Pb (lead)-free plating**



Device average mass. . . . . 206 mg

Fluctuation margin. . . . . +/-10%

Component	Material	Material (%wt)	Material (mg)	Substance	CAS No.	Substance (%wt)	Substance (mg)	Substance (ppm)
active device	doped Si	0.035%	0.07	Si	7440-21-3	0.035%	0.073	354
bond wire	gold	0.016%	0.032	Au	7440-57-5	0.016%	0.032	155
leadframe	Cu alloy w/ silver plating	44.82%	92.34	Cu	7440-50-8	44.64%	91.96	446,408
				Fe	7439-89-6	0.045%	0.092	447
				P	7723-14-0	0.016%	0.032	155
				Ag	7440-22-4	0.123%	0.254	1,233
die attach	silver epoxy	0.121%	0.25	Pb	7439-92-1	0.113%	0.232	1,126
				Sn	7440-31-5	0.006%	0.012	58
				Ag	7440-22-4	0.003%	0.006	29
encapsulation*	EMC	52.16%	107.46	silica	7631-86-9	40.6%	83.64	406,019
				epoxy resin	29690-82-2	5.25%	10.82	52,524
				phenol resin	9003-35-4	4.74%	9.76	47,379
				carbon black	1333-86-4	0.148%	0.305	1,481
				Sb_2O_3	1309-64-4	1.14%	2.35	11,408
				TBBA	79-94-7	0.283%	0.582	2,825
	EMC GREEN	52.16%	107.46	silica	7631-86-9	38.72%	79.77	387,233
				epoxy resin	29690-82-2	5.015%	10.33	50,146
				phenol resin	9003-35-4	4.519%	9.31	45,194
				carbon black	1333-86-4	0.567%	1.167	5,665
				metal hydroxide	1309-42-8	3.34%	6.88	33,398
plating**	tin lead process	2.84%	5.85	Sn	7440-31-5	2.282%	4.7	22,816
				Pb	7439-92-1	0.558%	1.15	5,583
	100% matte tin	2.84%	5.85	Sn	7440-31-5	2.84%	5.85	28,398

*EMC GREEN molding compound is Halogen Free.
**Specify Lead-Free when ordering 100% tin (Pb-free) plating.

Disclaimer
The information provided in this Material Composition data sheet is, to the best of our knowledge, correct. However, there is no guarantee to completeness or accuracy, as some information is derived from data sources outside the company.

R2 (25-October 2010)

GO
Advanced Search
Registered user login

Products »
Samples »
What's New »
Engineering »
Corporate Info »
Contact Us »
Literature »
In the Press »
Trade Shows »
Career Opportunites »
Home »

ENGINEERING

Central Semiconductor's RoHS compliance

RoHS:
The European Union has adopted Directive 2002/95/EC - the Restriction of Hazardous Substances (RoHS) in electrical and electronic equipment. This legislation bans the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) in electrical and electronic devices after July 1, 2006 with certain exemptions.

Central's Policy:
Central Semiconductor is doing its part to help improve the environment by reducing and removing any substances that are considered harmful to the environment. Central has put procedures in place to comply with legislation pertaining to environmental concerns. Central has implemented procedures to comply with RoHS banned substances.

Table 1 lists the allowable limits for banned substances.

Table 1

Substance	Maximum Limit (ppm)
Cadmium (Cd)	100
Lead (Pb)	1000 (1) (2)
Mercury (Hg)	1000
Hexavalent Chromium (Cr^{6+})	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl Ethers (PBDE)	1000

(1) Applicable to products with Pb-free lead finish only.
(2) Maximum limit does not apply to applications for which exemptions have been granted by the RoHS directive.

Central's current products do not contain any of the following banned substances: Mercury, Cadmium, hexavalent chromium, polybrominated biphenyls (PBB), or polybrominated diphenyl ethers (PBDE). Nearly all of Central's products are currently available with lead free exterior finishes, in the form of 99.9% matte tin plating. Presently most of Central's products are available in both Lead free (99.9% Tin), and Tin/Lead finishes.

Special Notations

1. Tin Whisker Mitigation Methods:
   Central's Pb free plating meets the following criteria:

   a. External plating composition is 99.9% Matte Tin (Sn) minimum.
   b. External plating thickness is 315 micro-inches (8µm) minimum.
   c. External plating grain size is 40 micro-inches (1µm) minimum.
   d. External plating carbon content is 0.1% maximum.
   e. Devices do not have a Nickel (Ni) barrier underlayer.
   f. Some case types include a post plating anneal bake.

2. Central's Pb free devices are RoHS compliant.
3. Central's Pb free devices are compatible with both tin/lead and lead free solder processes.
4. Central's Pb free devices can withstand a MAX temperature of 260°C for 30 seconds maximum.
   Click here for Central's typical reflow & wave soldering temperature profile.
5. Central's Pb free surface mount devices have a Moisture Sensitivity Level (MSL) of 1. (per JEDEC J-STD-020D)
6. Central's Pb free devices are not a change in form, fit or function.
7. Central's Pb free devices are controlled by an internal lot tracking system.
8. In order to receive Pb free devices please add a suffix of "Lead Free" to the part number when ordering. (Example: CMPD2004S TR LEAD FREE)
9. Devices ordered as Pb free are certified to contain less than 1000ppm Pb content on the terminal plating and will be labeled with Central's Lead Free/RoHS Compliant Logo.
   Sample Label

10. Devices with tin/lead plating are still available for certain customer's requirements. Please contact Central's sales department for additional detail.

Central Semiconductor's REACH compliance

The European Union's REACH (**R**egistration, **E**valuation, **A**uthorization, and restriction of **Ch**emicals) regulation applies to chemical substances manufactured in or imported to the EU in quantities of 1 tonne or more per year. It applies to chemical substances on their own, in preparations, or in articles (manufactured goods). The goal of REACH is to improve the protection of human health and the environment through better and earlier identification of chemical substances.

Central's Policy:
Central's devices are in compliance with article 57 of Regulation (EC) No. 1907/2006 (the REACH Regulation). They do not contain, nor are they manufactured with, any of the currently identified SVHCs (Substances of Very High Concern). They do not contain any substances meant for intentional release.

Click here for a PDF version of this statement.

For additional information please **contact** the Central sales department at (631) 435-1110.

---

145 Adams Avenue
Hauppauge, NY 11788 USA
TEL (631) 435-1110
FAX (631) 435-1824