

**MITSUBISHI**

**High Frequency MOSFET devices**

**Lead Free Status & Roadmap**

**June, 2004**

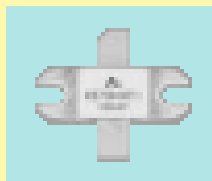
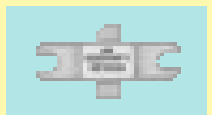




**Mitsubishi Electric Co.**  
**High Frequency & Optical Device Works**

**Miyoshi Electronics Co.**  
**Electronic Devices Div.**

# SiRF Pb Free Road Map For New MOS Products

Issues	2003	2004				2005			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>For Discrete MOS FETs</b>									
Material Investigation									
Solder For Die Bonding	→	Completed							
Finished Plating	→	Completed							
Outer Lead (Electrode)	→	Completed							
Investigation of Productability and Usability		→							
Confirm Reliability			→						
In-Line Production						→	→	→	→
<b>For RF Module</b>									
Material Investigation									
Pb Free Status of Chip Devices.	→	Completed							
Solder for Attaching Chip Devices on the Surface of the Dielectric Substrate.		→							
Solder for Attaching Dielectric Substrate (Al <sub>2</sub> O <sub>3</sub> ) and Heat Sink (Fin or Flange)		→							
Possibility Investigation of the Module Structure and Process		→							
Process Change Confirmation. Trial and Test			→						
Confirm Reliability						→			
In-Line Production							→	→	→


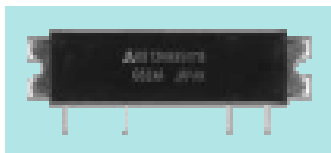
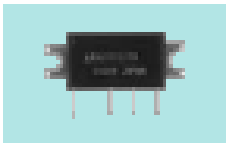
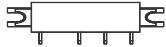
## Pb Free Plan For Discrete RF MOS FETs

Outline	Structure	Type Examples	Current	Pb Free	Remark
	Ceramic PKG with Fin T31S T40S	<i>RD70HVF1</i> <i>RD60HUF1</i> <i>RD45HMF1</i> <i>RD70HHF1</i> <i>RD100HHF1</i>	<b>Ni+Au</b>	<b>Ni+Au</b>	Note 1
		<i>RD30HVF1</i> <i>RD30HUF1</i> <i>RD20HMF1</i>	<b>Ni+Au</b>	<b>Ni+Au</b>	Note 1
	Ceramic SMD PKG	<i>2SK2974</i> <i>2SK2975</i>	<b>Ni+Au</b>	<b>Ni+Au</b>	Note 1
	Plastic Molded SMD SLP	<i>RD07MVS1</i> <i>RD02MUS1</i>	<b>Ni+Au</b>	<b>Ni+Au</b>	Note 1
	TO-220 Similar Plastic Molded PKG	<i>RD15HVF1</i> <i>RD16HHF1</i> <i>RD06HHF1</i>	<b>PbSn</b>	<b>SnAg or SnBi</b>	
	SC-62(SOT-89) Molded PKG	<i>RD00HVS1</i> <i>RD01MUS1</i>	<b>PbSn</b>	<b>SnBi</b>	Note 2

Note 1: Lead Free from start of production

Note 2: Using PbSnAg Solder For Die Bonding. PbSnAg which is High Melting Temp. Solder Including 85% Pb. This kind of Solder is a exception from the RoHS Restriction.

## Pb Free Plan For RF Modules

Outline	Structure	PKG#	Type Examples	Part	Current	Pb Free
	H/P Module PKG L	H2S H2RS	<i>RA13H, RA30H RA45H, RA60H RA35H, RA20H Series</i>	Lead Finish :	<b>Sn Plating</b>	<b>Sn Plating</b>
				Chip Attach :	<b>PbSnAg</b>	<b>SnAgCu</b>
				Substrate Attach :	<b>InPbAg</b>	Under Consideration
	H/P Module PKG M	H11S	<i>RA13H8891MB RA06H8285M</i>	Lead Finish :	<b>Sn Plating</b>	<b>Sn Plating</b>
				Chip Attach :	<b>PbSnAg</b>	<b>SnAgCu</b>
				Substrate Attach :	<b>InPbAg</b>	Under Consideration
	Handy Module PKG	H46S	<i>RA03M, RA07M RA07N, RA07H Series</i>	Lead Finish :	<b>Sn Plating</b>	<b>Sn Plating</b>
				Chip Attach :	<b>PbSnAg</b>	<b>SnAgCu</b>
				Substrate Attach :	<b>PbSnAg</b>	Under Consideration
	Handy Module PKG SMD	H46 SMD	<i>RA07M1317MS RA07M4047MS RA07M4452MS</i>	Lead Finish :	<b>PbSnAg</b>	<b>SnAg or SnBi or Sn</b>
				Chip Attach :	<b>PbSnAg</b>	<b>SnAgCu</b>
				Substrate Attach :	<b>PbSnAg</b>	Under Consideration

**Note: High Melting Temperature Solder Including 85% Pb is an exception from the RoHS Restriction.  
Therefore this kind of solder will be used after year 2005.**

## Pb Free Recommendation

### Recommended Reflow Temperature Profile

