

# Plastic Packages

***Plastic Packages***



Literature Number: SNOA283

## Plastic Packages

National Semiconductor offers a wide variety of plastic packages for through-hole and surface mount applications. Many of these plastic packages provide cost-effective solutions to achieving greater board density (surface-mount packages) and high performance. Plastic packages are extensively used in commercial applications.

Today National offers molded plastic packages. The primary materials used in a plastic package are a leadframe, die attach material, bond wire, mold compound and a lead finish. In order to provide plastic package solutions which do not sacrifice reliability or functionality, National continues to improve on the materials used, whether focusing on leadframe composition for increased thermal conductivity or low stress mold compound used for large die applications or low moisture absorption mold compounds for improved reliability.

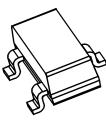
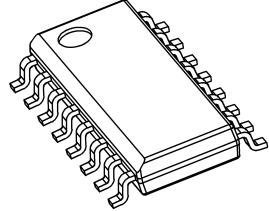
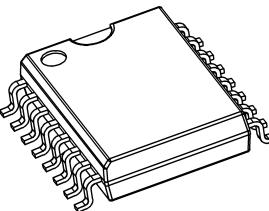
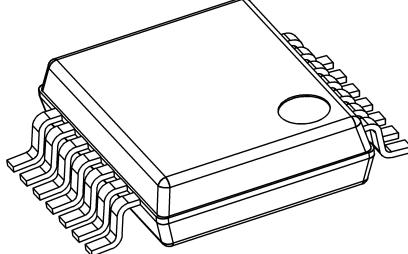
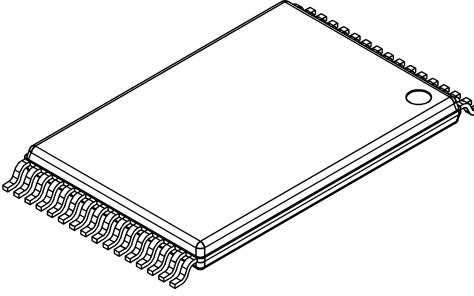
National offers through hole DIP configurations in the molded dual-in-line package (MDIP) style. Other through hole package styles include the plastic pin grid array (PPGA) packages and various plastic TOs.

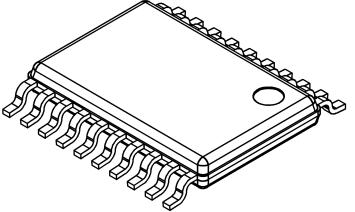
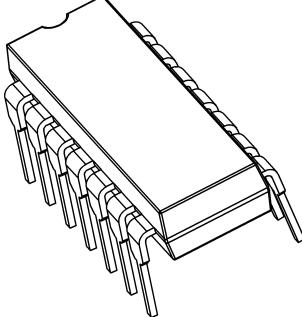
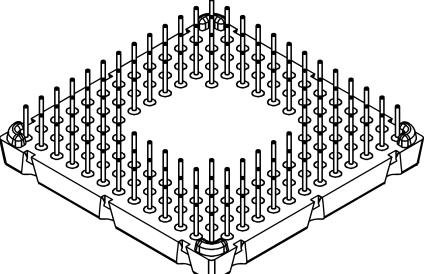
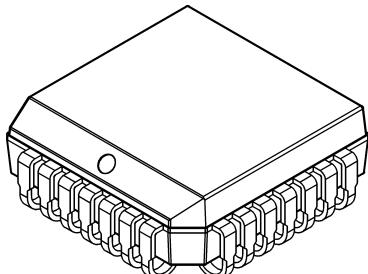
Many plastic surface mount packages are offered by National. Various plastic TO packages are formed for surface mount application (TO-263). Dual-in-line packages such as the small outline package (SOP), the shrink small outline package (SSOP), the thin small outline package (TSOP) and the thin shrink small outline package (TSSOP) are available in lower lead counts. Applications requiring higher density and increased lead count use quad packages such as the plastic leaded chip carrier (PLCC), the plastic quad flatpak (PQFP) and the thin plastic quad pack package(TQFP).

Recent improvements in the surface mount packages include exposed pad thin packages for improved thermal and electrical performance. These packages have the same footprint as the standard thin packages. Other improvements include the introduction of the small body size packages such as the SOT-23, SOT-223 and the SC-70 package outlines.

The following table provides configuration and characteristic data regarding each of the plastic package offered by National.

## Plastic Packages

| Package Configuration   | Package Characteristics   |
|---|---|
| <b>Plastic Small Outline Transistor<br/>(SOT-23)</b><br>           | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li></ul>  |
| <b>Plastic Small Outline Package<br/>(SOP)</b><br>                 | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• EIAJ and JEDEC Package Styles</li><li>• Footprint Compatible with Ceramic Small Outline Package (SOIC)</li></ul> |
| <b>Narrow Body</b><br>   |   |
| <b>Wide Body</b><br>   |   |
| <b>Plastic Shrink Small Outline Package<br/>(SSOP)</b><br>       | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• EIAJ and JEDEC Package Styles</li></ul>  |
| <b>Plastic Thin Small Outline Package, Type I<br/>(TSOP)</b><br> | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• EIAJ Package Style</li></ul>   |

| Package Configuration   | Package Characteristics   |
|---|---|
| <b>Plastic Thin Shrink Small Outline Package (TSSOP)</b><br> | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• EIAJ Package Styles</li></ul>  |
| <b>Molded Dual-In-Line Package (MDIP)</b><br>                | <ul style="list-style-type: none"><li>• Through Hole Package</li><li>• Solder Plate or Solder Dip Lead Finish</li><li>• Molded Package</li><li>• Footprint Compatible with Ceramic Sidebrazed Dual-In-Line Package (SB and Cerdip)</li><li>• Can be Thermally Enhanced</li><li>• Half Lead Package Option</li></ul> |
| <b>Plastic Pin Grid Array (PPGA)</b><br>                    | <ul style="list-style-type: none"><li>• Through Hole Package</li><li>• Solder DIP Lead Finish</li><li>• Molded Package</li><li>• Footprint Compatible CPGA</li></ul>  |
| <b>Plastic Leaded Chip Carrier (PLCC)</b><br>              | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• J-Bend Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• Footprint Compatible with Ceramic Leadless Chip Carrier (LCC) and Ceramic Quad J-Bend (CQJB)</li><li>• Can be Thermally Enhanced</li></ul>  |

## Plastic Packages

| Package Configuration                  | Package Characteristics   |
|--|---|
| <b>Plastic Quad Flatpak<br/>(PQFP)</b> | <ul style="list-style-type: none"><li>• Surface Mount Package</li><li>• Gull Wing Lead Configuration</li><li>• Solder Plate Lead Finish</li><li>• Molded Package</li><li>• Can be Thermally Enhanced</li><li>• High Density Package Application</li></ul> |
| <b>TO-92</b>                           | <ul style="list-style-type: none"><li>• Through Hole Package</li><li>• Solder Plate Lead Finish</li><li>• Molded Plastic Package</li></ul>  |
| <b>TO-202</b>                          | <ul style="list-style-type: none"><li>• Through Hole Package or Chassis Mounting</li><li>• Solder Plate Lead Finish</li><li>• Molded Plastic Package</li></ul>  |
| <b>TO-220</b>                          | <ul style="list-style-type: none"><li>• Through Hole Package or Chassis Mounting</li><li>• Solder Plate Lead Finish</li><li>• Molded Plastic Package</li><li>• Designed with Heat Sink for High Power Applications</li></ul>                              |
| <b>TO-226</b>                          | <ul style="list-style-type: none"><li>• Through Hole Package</li><li>• Solder Plate Lead Finish</li><li>• Molded Plastic Package</li></ul>  |
| <b>TO-237</b>                          | <ul style="list-style-type: none"><li>• Through Hole Package</li><li>• Solder Plate Lead Finish</li><li>• Molded Plastic Package</li></ul>  |

## LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

 **National Semiconductor Corporation**  
Americas  
Tel: 1-800-272-9959  
Fax: 1-800-737-7018  
Email: support@nsc.com  
[www.national.com](http://www.national.com)

**National Semiconductor Europe**  
Fax: +49 (0) 1 80-530 85 86  
Email: europe.support@nsc.com  
Deutsch Tel: +49 (0) 1 80-530 85 85  
English Tel: +49 (0) 1 80-532 78 32  
Français Tel: +49 (0) 1 80-532 93 58  
Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
Tel: 65-2544466  
Fax: 65-2504466  
Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
Tel: 81-3-5639-7560  
Fax: 81-3-5639-7507

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

|                        |  |
|------------------------|--|
| Audio                  | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers             | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters        | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products          | <a href="http://www.dlp.com">www.dlp.com</a>   |
| DSP                    | <a href="http://dsp.ti.com">dsp.ti.com</a>   |
| Clocks and Timers      | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface              | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                  | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt             | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers       | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                   | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Mobile Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity  | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |  |
|-------------------------------|--|
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Transportation and Automotive | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

[TI E2E Community Home Page](#)

[e2e.ti.com](#)

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2011, Texas Instruments Incorporated