Introduction to Texas Instruments Space Enhanced Plastic Products

Introduction

In addition to the large QMLV selection, TI has begun to offer a leading-edge portfolio of plastic devices for Low Earth Orbit (LEO) missions with short mission life, and requirements for small size. This encompasses the emerging term, “New Space”, loosely defined as covering some of the trends in the space community, including the emerging private spaceflight industry and programs that have reduced reliability, lifetime and radiation requirements. There are unique challenges with the space environment such as radiation requirements, thermal cycling and outgassing. TI has addressed this with a new line of rigorously developed products, Space-Enhanced Plastics (SEP).

Space-EP devices offer the following advantages over standard catalog products:

- Controlled baseline with one wafer fab, one assembly site, one material set.
- Optimized material set with die attach, mold compound, leadframe and bond wire all selected to maximize reliability.
- No high tin (>97% Sn) construction including terminations (SnAgCu solderballs and Matte-Sn plating) or internal package components (die bumps or substrate plating).
- No copper bond wire. Product is either flipchip mounted (no bond wire) or uses gold bond wire.
- Additional assembly processing including 100% temperature cycle or 100% single-pass reflow simulation in lieu of temperature cycle.
- Characterization over target temperature range (–55°C to +125°C).
- Parametric testing is standard at both room and high temperatures with guardbands to assure datasheet limits at cold temperature.
- Assembly lot acceptance including x-ray sampling and CSAM sampling.
- Wafer lot acceptance using MIL-PRF-38535 QML Class V as baseline.
- Radiation Lot Acceptance Testing (Group E) to 20krad TID for each wafer lot per MIL-STD-883.
- One time characterization testing to 30-krad TID per MIL-STD-883.
- SEL characterization to 43 MeV-cm2/mg.
- Outgassing qualification for each product per ASTM E-595.
- Qualification to SMC-SO-11.

Space applications require known radiation performance. Not only are TI Space-EP products characterized for total dose and single event radiation performance, but in many cases different wafer fabrication processes or alternate die designs are used to achieve specified levels of radiation tolerance. This is further ensured with a radiation lot acceptance test (RLAT or Group E) performed on each Space-EP wafer lot. An OEM may be tempted to characterize one lot of product and then assume that subsequent material will perform the same. This is not always true. Depending on the process technology, some devices exhibit a significant wafer lot to wafer lot variation and, in some cases, a wafer to wafer variation. Since traceability of Commerical Off The Shelf (COTS) material is only to the wafer lot level, it creates a substantial risk to the OEM.

Texas Instruments Space-EP provides a very cost effective means of mitigating the risks associated with using commercial off-the shelf plastic encapsulated microcircuits. TI’s approach, combining the best of the Enhanced Product methodology and Class V-like wafer processing, ensures a product that meets published specifications in critical space and launch vehicle applications, while providing small size and reduced system cost.

TI is currently offering five SEP devices, and is planning to offer many more in a variety of functions.

- TLV1704-SEP—2.2-V to 36-V, radiation hardened microPower quad comparator in space-enhanced plastic
- IN240-SEP—80-V, low-/high-side, zero-drift, current sense amp with enhanced PWM rejection in space-enhanced plastic
- TL7700-SEP—Voltage supervisor in space-enhanced plastic
- TPS73801-SEP—Radiation-hardened 1-A low-noise fast-transient-response LDO in space-enhanced plastic
- SN55HVD233-SEP—Radiation-hardened 3.3-V CAN transceiver in space-enhanced plastic package with standby mode

For more information on the device roadmap and offerings, please contact your TI representative, or reach out to TI through the E2E™ community or ti.com/sep.

Space-Enhanced Plastic Products

Generic Part Number	Description	Orderable Material	Subfamily	Pin	PKG	PKG Group	ECCN[1]
INA240-SEP	80-V, low-/high-side, zero-drift, current sense amp w/ enhanced PWM rejection in space-enhanced plastic package	INA240PMPWPSEP	Current sense amplifiers	8	PW	TSSOP	EAR99
		INA240PMPWTPSEP		8	PW	TSSOP	EAR99
		V62/18615-01XE		8	PW	TSSOP	EAR99
		V62/18615-01XE-T		8	PW	TSSOP	EAR99
SN55HVD233-SEP	3.3-V CAN transceiver in space-enhanced plastic package with standby mode	SN55HVD233MDPSEP	CAN	8	D	SOIC	EAR99
		SN55HVD233MDTPSEP		8	D	SOIC	EAR99
		V62/18617-01XE		8	D	SOIC	EAR99
		V62/18617-01XE-T		8	D	SOIC	EAR99
SN65C1168E-SEP	Dual differential drivers and receivers with ± 8-kV IEC ESD protection in space-enhanced plastic	SN65C1168EMPWSEP	RS-485/RS-422	16	PW	TSSOP	EAR99
		SN65C1168EMPWTSEP		16	PW	TSSOP	EAR99
TL7700-SEP	Supply-voltage supervisor in space-enhanced plastic package	TL7700CMPWPSEP	Supervisor IC	8	PW	TSSOP	EAR99
		TL7700CMPWTPSEP		8	PW	TSSOP	EAR99
		V62/19602-01XE		8	PW	TSSOP	EAR99
		V62/19602-01XE-T		8	PW	TSSOP	EAR99
TLV1704-SEP	2.2-V to 36-V, microPower quad comparator in space-enhanced plastic package	TLV1704AMPWPSEP	Comparator	14	PW	TSSOP	EAR99
		TLV1704AMPWTPSEP		14	PW	TSSOP	EAR99
		V62/18613-01XE		14	PW	TSSOP	EAR99
		V62/18613-01XE		14	PW	TSSOP	EAR99
TPS73801-SEP	1-A low-noise fast-transient-response LDO in space-enhanced plastic package	TPS73801MDCQPSEP	Linear regulators (LDO)	6	DCQ	SOT-223	EAR99
		TPS73801MDCQTPSEP		6	DCQ	SOT-223	EAR99
		V62/18616-01XE		6	DCQ	SOT-223	EAR99
		V62/18616-01XE-T		6	DCQ	SOT-223	EAR99

*1) ECCN information for products that are EAR99 are shown. For up-to-date ECCN information on any product, please request from: **gtc_eccn-hts-naftateam@list.ti.com**.*

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TI Support

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