

Automotive Semiconductor Device Standardization – Part 2

Background

Recent supply chain crises, such as the global semiconductor shortages of the early 2020s, have underscored the automotive industry's vulnerability to disruptions in the availability of critical components. Legacy semiconductor technologies have become increasingly fragmented, with a wide array of part numbers, package types, and specifications tailored to individual original equipment manufacturers (OEMs) and tier suppliers. This diversity, while historically functional, has complicated procurement and limited the scalability of production among semiconductor suppliers in multiple facilities. To address these issues, a consortium of leading automotive OEMs has developed this white paper to outline potential standardization of a select subset of legacy semiconductor technologies, with the primary intent of enhancing supply chain resilience and the secondary goal of reducing costs across the industry.

This document establishes a collaborative framework for standardizing key categories of legacy semiconductors by specifying a streamlined set of allowable packages, pinouts, and technical requirements. Standardization enables semiconductor manufacturers to focus investments on increasing production capacity to limited SKUs, rather than supporting a broad range of individualized part numbers. This approach strengthens supply chain resilience by improving component availability and predictability, while also yielding cost reductions to the whole supply chain through economies of scale.

The OEMs authoring this white paper invite all automotive manufacturers and tier suppliers to adopt this standardized list of legacy semiconductors, amplifying the impact industry-wide resiliency, scalability and efficiency. Convergence on common sets of components can streamline design reduce exposure to supply disruptions and promote cost efficiency. Detailed information on allowable packages, pinouts, and technical specifications for each semiconductor category is presented in the sections below.

This paper does not constitute an agreement or invitation to agree to use or decline the utilization of any specific supplier(s) or technology(ies). The information set forth below is an attempt to promote efficiency on a broad industry basis. Of course, all OEMs and suppliers are always encouraged to innovate and iterate designs where they feel other designs may offer cost, quality, or other efficiencies unique to their individual needs.

Aligned Devices

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AEC Qualification Requirement Summary

Component Category	AEC-Q Standard	Classification Description
BJT	AEC-Q101	Discrete Semiconductor
Diode	AEC-Q101	Discrete Semiconductor
MOSFET	AEC-Q101	Discrete Semiconductor
LDO	AEC-Q100	Integrated Circuit (IC)
Operational Amplifier	AEC-Q100	Integrated Circuit (IC)
CAN Transceiver	AEC-Q100	Integrated Circuit (IC)
LIN Transceiver	AEC-Q100	Integrated Circuit (IC)

BJT

Device Requirement:

- All BJT shall comply with AEC-Q101

Packages Allowed:

- DFN1010-3
- DFN1110-3
- DFN2020-3
- LFPAK56
- SOT-23
- SOT-223
- SOT-323
- SOT-363

Diode

Device Requirements:

- All Zener, Schottky, and TVS diodes shall comply with AEC-Q101
- All diodes used for ESD protection shall comply with IEC 61000-4-2, and ISO 10605 standards
- All 2-pin diodes shall have the cathode side clearly marked with a visual indicator to aid in automated optical inspection (AOI) during assembly; anode side marking is not allowed



*shaded bar = cathode marking

Packages Allowed:

- 2 Pin
 - SOD-123
 - SOD-123F
 - SOD-123W
 - SOD-128
 - SOD-323HP (2-SMD Flat Lead)
 - SC-70 (SOT-323)
 - SC-76 (SOD-323)
 - SC-90 (SOD-323F)
 - SC-79 (SOD-523)
 - DO-214AC (SMA)
 - DO-214AA (SMB)
 - DO-214AB (SMC)
 - DO-221AC (SMA Flat Leads)
 - DO-221AA (SMB Flat Leads)
 - SOD-882 (DFN1006-2)
 - 2-XDFN (DFN1006D-2)
- 3 Pin
 - TO-236-3 (SC-59, SOT-23-3)
 - TO-243AA
 - 3-XDFN
 - SC-101 (SOT-883, DFN1006-3)
 - 3-PowerUDFN
 - TO-227 (3-PowerDFN)
 - DFN1110D-3
- 4 Pin
 - TO-261-4 (TO-261AA)
 - TO-253-4 (TO-253AA, SOD-143)
- 5 Pin
 - 5-TSSOP (SC-70-5, SOT-353)
 - SOT-23-5 Thin (TSOT-23-5)

MOSFET

Device Requirement:

- All MOSFET shall comply with AEC-Q101

Packages Allowed:

- DFN1010 (1.0mm x 1.0mm)
- DFN1110 (1.1mm x 1.0mm)
- DFN5 (5mm x 6mm)
- mTOLG (8mm x 8mm)
- SO8 (5mm x 6mm)
- SOT23 (3.0mm x 1.7mm)
- SOT223 (6.7mm x 3.7mm)
- SOT323 (2.0mm x 1.25mm)
- SOT346 (1.65mm x 2.9mm)
- SOT363 (1.25mm x 2mm)
- SOT457 (3.0mm x 2.2mm)
- SOT523 (1.6mm x 0.8mm)
- SOT669 (3.3mm x 2.1mm)
- SOT1205 (5mm x 6mm)
- SOT1210 (3mm x 3mm)
 - LFPK33
- SOT1220 (2.0mm x 2.0mm)
- SSO8 (5mm x 6mm)
 - LFPK56
- TOLL/sTOLL (5mm x 6mm)
- TOLT (10.1mm x 9.9mm)
- WDFN8 (3.3mm x 3.3mm)

LDO

Device Requirement:

- All LDO shall comply with AEC-Q100

Packages Allowed:

- SON-6 (2mm x 2mm)
- SON-8 (3mm x 3mm)
- SOP-8 (3.9mm x 4.9mm)
- SOT23-5 (3mm x 3mm)
- SOT89-5 (3.6mm x 4.6mm)
- SOT223 (3.5mm x 6.5mm)
- TO-252 (6.5mm x 10mm)
 - 3 and 5 pin

Operational Amplifier

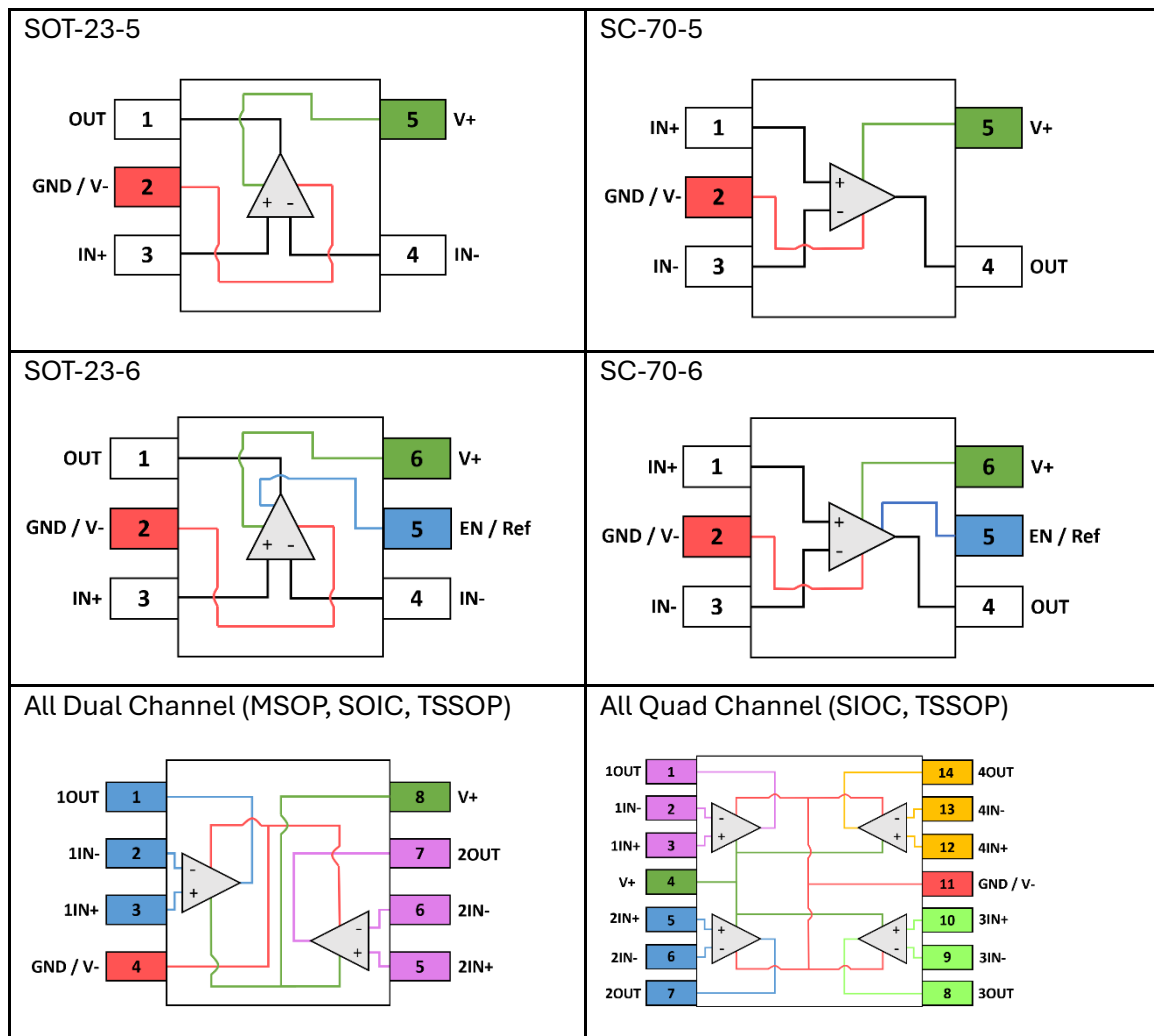
Device Requirement:

- All operational amplifiers shall comply with AEC-Q100

Packages Allowed:

- SOT-23-5
- SOT-23-6
- SC-70-5
- SC-70-6
- MSOP-8
- SOIC-8
- TSSOP-8
- SOIC-14
- TSSOP-14

Pinouts Allowed:

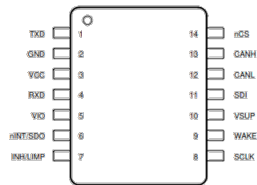
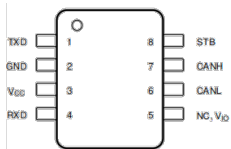
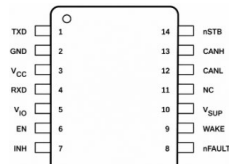
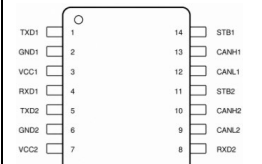
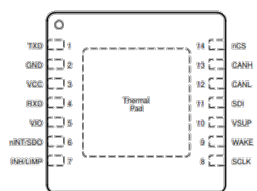
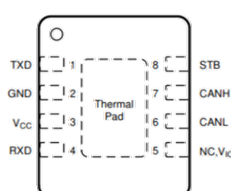
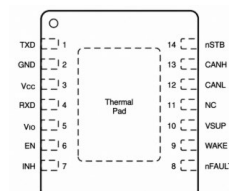
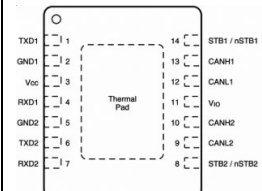


Transceiver, CAN

Device Requirements:

- All CAN transceivers shall comply with AEC-Q100. If copper wire bonds are used, transceiver shall comply with AEC-Q006.
- All CAN transceivers shall comply with SAE J2962-2.

Packages and Pinouts Allowed:

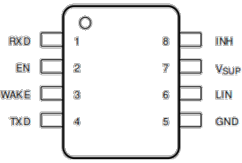
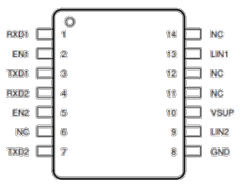
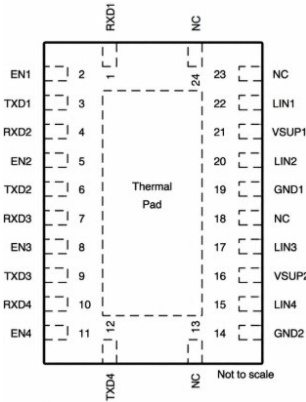
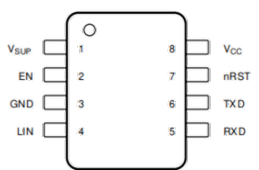
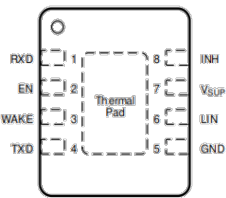
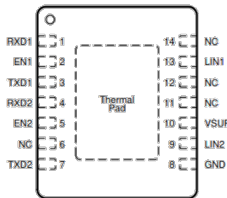
	Partial Networking	Non-Partial Networking (Single)		Non-Partial Networking (Dual)
Features	Selective Wake INH _{V10}	Selectable V ₁₀	Wake INH V ₁₀	Selectable V ₁₀
Package & Pin-Out	SOIC-14 	SOIC-8 	SOIC-14 	SOIC-14 
	DFN/VSON-14 	DFN/VSON-8 	DFN/VSON-14 	DFN/VSON-14 

Transceiver, LIN

Device Requirements:

- All LIN transceivers shall comply with AEC-Q100; if copper wire bonds are used, transceiver shall comply with AEC-Q006.
- All LIN transceivers shall comply with SAE J2962-1

Packages and Pinouts Allowed:

	Single Channel	Dual Channel	Quad Channel	Single LIN+LDO
Features	Dominant state time out Thermal Protection Wake INH	Dominant state time out Thermal Protection Wake INH	Dominant state time out Thermal Protection Wake INH	Dominant state time out Thermal Protection Voltage regulator supporting 3.3V/5V
Package & Pin-Out	SOIC-8 	SOIC-14 	VQFN-24 	SOIC-8 
	DFN/VSON-8 	DFN/VSON-14 		DFN/VSON-8 