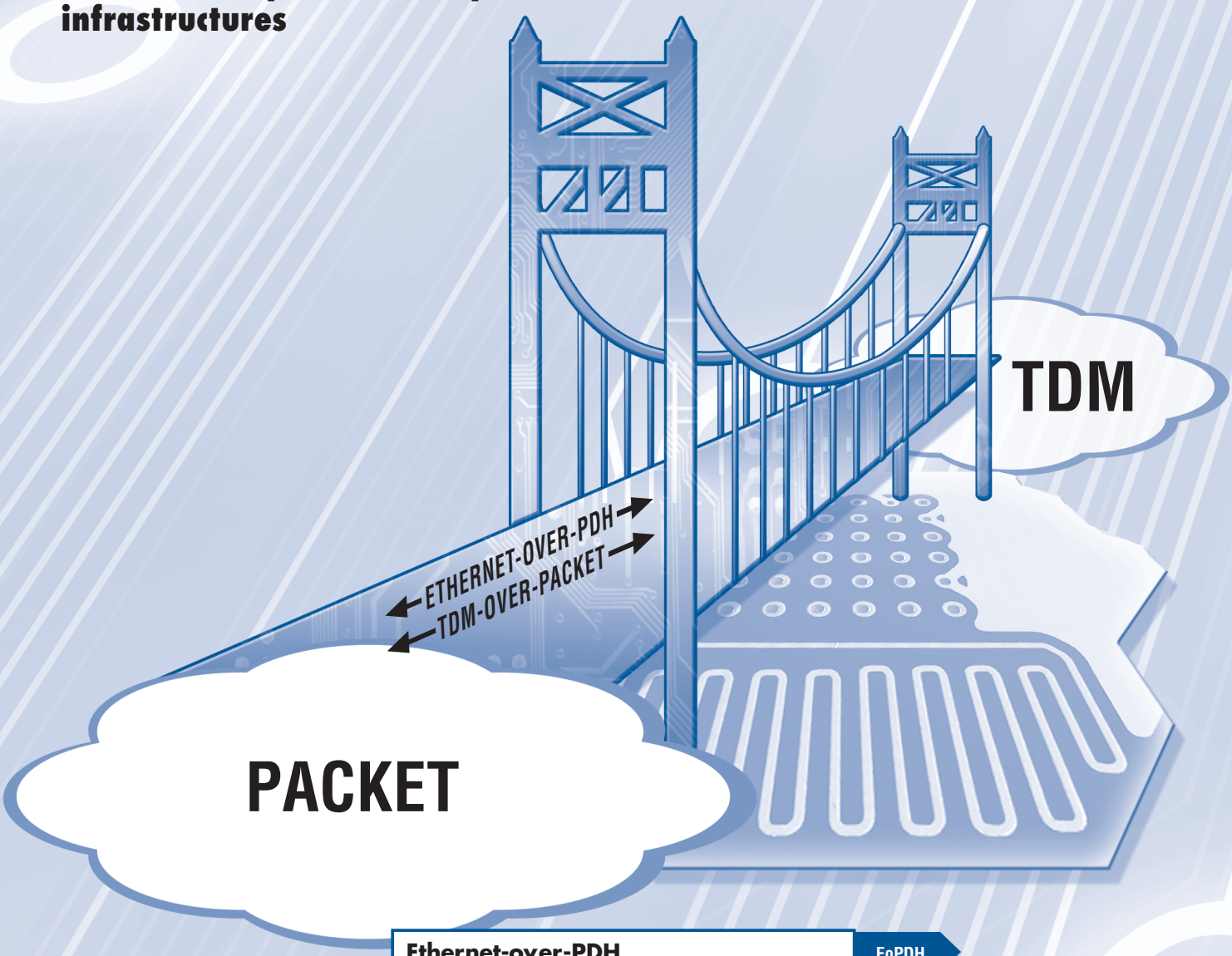
COMMUNICATIONS
Design Guide

8th Edition | April 2009

Bridging two worlds

IC solutions optimize transportation of data between network infrastructures



See inside for more about

Ethernet-over-PDH	EoPDH
TDM-over-Packet	TDMoP
SONET/SDH/SyncE clock sync	Clock sync
T1/E1 and T3/E3 LIUs, LIU plus framer	T1/E1 T3/E3
Design kits/reference designs	DKs

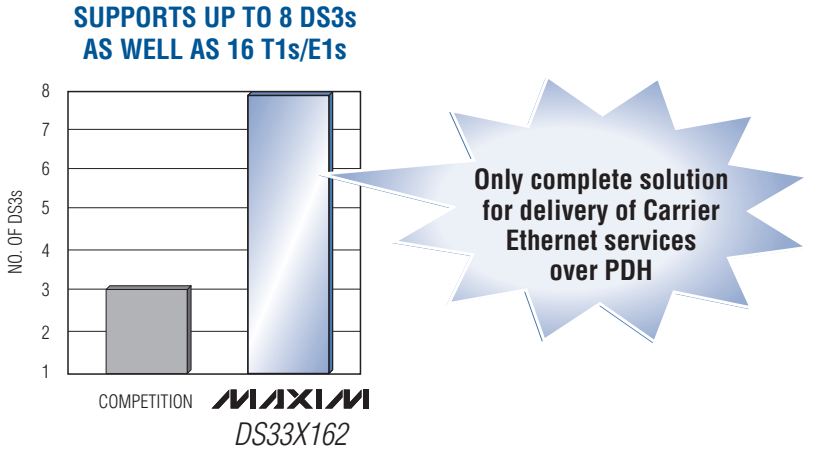
MAXIM

EoPDH

Industry's only complete Ethernet-over-PDH solution

Covers entire ITU standardized range

The DS33X162 family provides the ideal solution for Carrier Ethernet applications by enabling Ethernet-over-PDH (EoPDH) designs ranging from 64kbps to 416Mbps. One PCB footprint covers designs ranging from 4 to 16 PDH interfaces, and one software architecture supports from 1 to 16 PDH interfaces. No other solution covers the complete range of ITU-T standardized EoPDH mapping possibilities like the DS33X162 family of products.



Beats the competition

- Up to 416Mbps symmetrical throughput—3x the competition
- ITU-T standardized EoPDH mapping through GFP/VCAT/LCAS
- Hardware extraction and insertion for ITU-T Y.1731 OAM and other layer-2+ protocols
- VLAN tagging and forwarding

Easy to use

- Single footprint for 4 to 16 PDH interfaces
- Seamless interface to T1/E1 and DS3 SCTs
- Requires only a low-cost microcontroller and SDRAM
- No data-path code development required

Part	TDM Ports	Ethernet Ports	Voice Ports	Package (mm x mm)
DS33X162+	16	2	0	256-CSBGA (17 x 17)
DS33X82+	8		0	
DS33X42+	4		0	
DS33X161+	16	1	0	
DS33X81+	8		0	
DS33W41+	4		1	
DS33X41+	4		0	
DS33W11+	1		1	
DS33X11+	1		0	144-CSBGA (10 x 10)

+ Denotes lead-free package.

www.maxim-ic.com/EoPDH

First TDM-over-Packet converters to integrate framers and LIUs

TDMoP

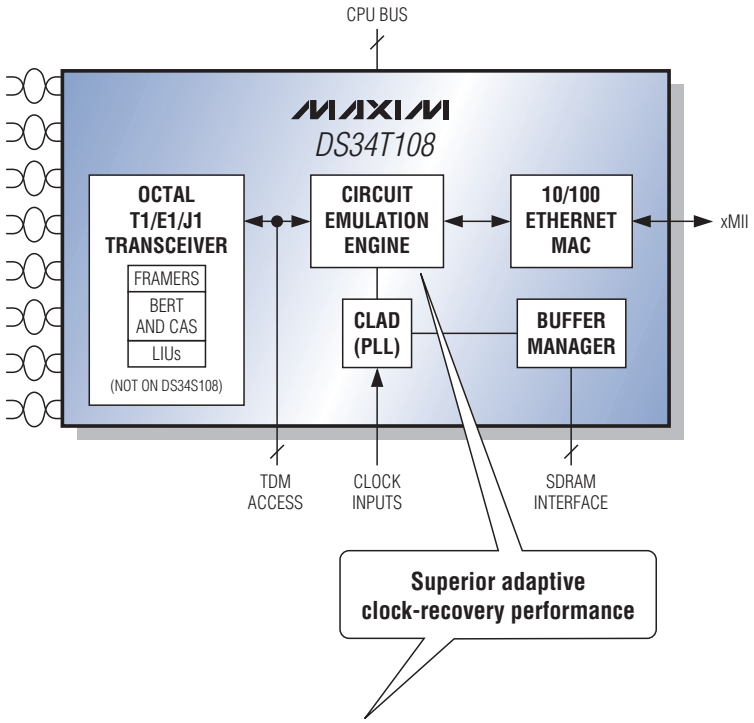
Save 40% cost and eliminate high-powered processor

The DS34T10x/DS34S10x families are the first devices to transport E1/T1/J1/E3/DS3/STS-1 links or serial HDLC links through a switched-IP or MPLS packet network, while integrating up to eight ports of E1/T1/J1 framers with LIUs. This unprecedented level of integration simplifies design, saves board space, and provides up to 40% lower cost versus competing multichip solutions.

Features that beat the competition

- **On-chip hardware resources manage TDM traffic and clock recovery, even with a low-cost CPU**
  - **Host processor not in data path**
- **Independent clock recovery engines provide recovered clock and frame sync outputs for each TDM port**
- **More pseudowire modes than competition: CESoPSN, SAToP, HDLC, TDMoIP**
- **Support 1+1 and 1+n redundancy schemes**

COST-EFFECTIVE DELIVERY OF LEGACY VOICE AND DATA SERVICES OVER NEXT-GENERATION NETWORKS



For additional product information and performance characteristics, go to: www.maxim-ic.com/TDMoP

Part	Ethernet Ports	T1/E1/J1s or Serial TDMs	Temperature Range (°C)	Package (mm x mm)	Price† ($)
DS34T108GN+	1	8 T1/E1/J1	-40 to +85	484-HSBGA (23 x 23)	64.55
DS34T104GN+		4 T1/E1/J1		484-TEBGA (23 x 23)	43.03
DS34T102GN+		2 T1/E1/J1			34.97
DS34T101GN+		1 T1/E1/J1			28.69
DS34S108GN+		8 TDM			48.41
DS34S104GN+		4 TDM		256-CSBGA (17 x17)	33.17
DS34S102GN+		2 TDM			27.34
DS34S101GN+		1 TDM			23.31

+ Denotes lead-free package.

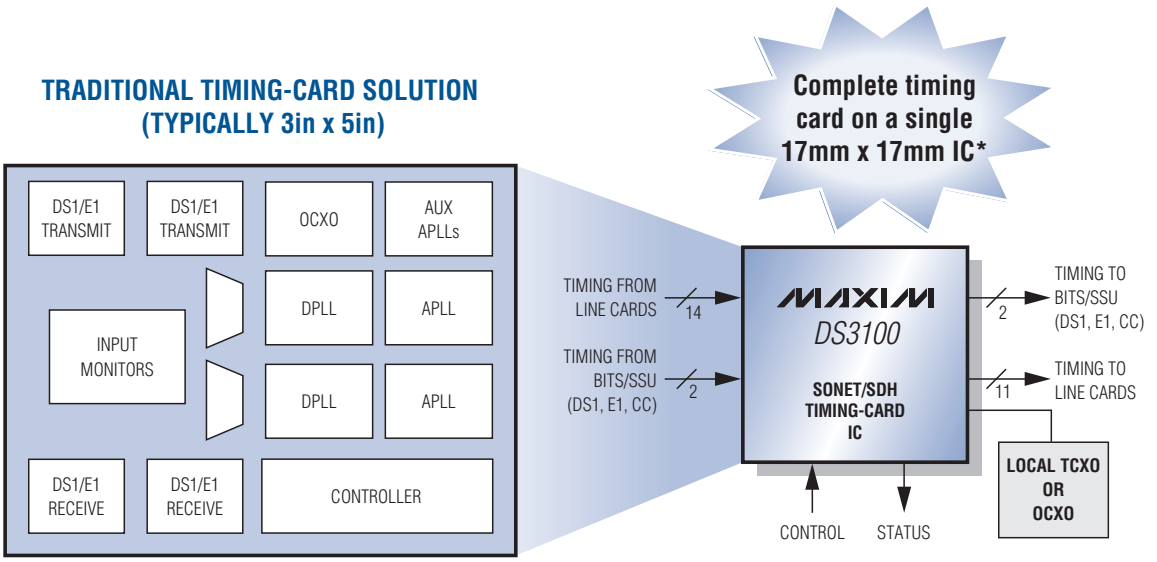
†10k-up recommended resale. Prices provided are for design guidance and are FOB USA. International prices will differ due to local duties, taxes, and exchange rates. Not all packages are offered in 1k increments, and some may require minimum order quantities.

Clock sync

Only Stratum 3/3E-compliant timing-card IC that integrates DS1/E1/2048kHz transceivers

Ideal choice for flexible synchronization and timing-card applications

A typical SONET/SDH timing-card solution has multiple discrete analog and digital components, including PLLs, ASICs, FPGAs, microprocessors, and DS1/E1 transceivers. These solutions tend to be very expensive and require extensive DSP and PLL design knowledge. The DS3100 integrates all timing-card functions into a single-chip solution. The DS3101 is available without the BITS/SSU transceivers.



Fourteen input clocks

- CMOS/TTL and differential LVDS/PECL inputs support rates up to 155.52MHz
- Two 64kHz composite clock receivers
- Support 2kHz, 4kHz, and any multiple of 8kHz up to 155.52MHz

Eleven output clocks

- CMOS/TTL and differential LVDS outputs support rates up to 311.04MHz
- Composite clock and sync pulse outputs
- Support 2kHz, 8kHz, n x DS1, n x E1, n x 19.44MHz, DS3, E3, and 125MHz

General features

- Stratum 3E holdover accuracy
- Hitless reference switching on loss of input
- Phase buildout and transient absorption
- 125.0MHz support for timing over GbE

Two BITS/SSU transceivers (DS3100)

- DS1, E1, 2048kHz, and 6312kHz timing signals
- Insert and extract SSM messages (DS1, E1)

Part	Package	Price† ($)
DS3100GN+	256-CSBGA	60.94
DS3101GN+		49.40

+ Denotes lead-free package.

www.maxim-ic.com/DS3100

*Requires a local TCXO or OCXO.
†10k-up recommended resale. Prices provided are for design guidance and are FOB USA. International prices will differ due to local duties, taxes, and exchange rates. Not all packages are offered in 1k increments, and some may require minimum order quantities.

Clock sync

First line-card timing IC to enable 1G and 10G Synchronous Ethernet

Complete single-IC solution for traditional and next-generation line cards

The DS3104-SE is a low-cost, feature-rich, line-card IC that supports all traditional SONET/SDH clocks and includes additional clock rates that enable Synchronous Ethernet (SyncE) architectures. Gigabit Ethernet (GbE), 10-Gigabit Ethernet (10GbE), and Fast Ethernet xMII clock rates are all supported, allowing clock synchronization at the physical layer per ITU-T Recommendation G.8261. The DS3104-SE operates over the -40°C to +85°C extended temperature range and is packaged in an 81-pin CSBGA (also available in a lead-free CSBGA). Pricing starts at $27.30†.

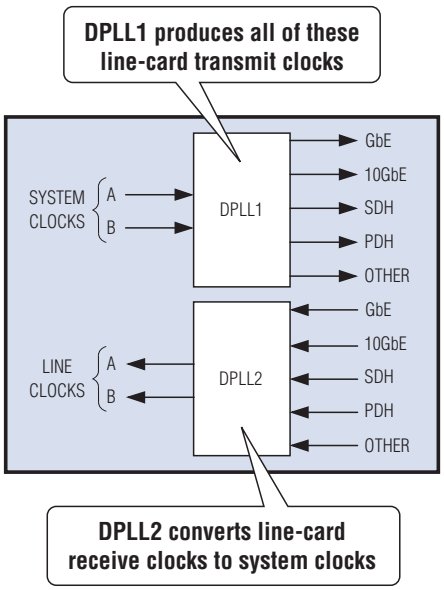
Key features

- **Hitless reference switching: automatic or manual**
- **Holdover on loss of all inputs**
- **Programmable 1Hz to 400Hz PLL bandwidth**
- **Frequency conversion between SONET/SDH rates and Ethernet MII/GMII/xGMII rates**

Supports more industry-standard clock rates than any other single IC

- **Ethernet xMII**
- **SONET/SDH**
- **PDH**
- **Multiple frame syncs**
- **Base stations**
- **Cable routers**
- **Wireless, GPS, and more**

COMPLETELY INDEPENDENT DPLLs



Feature	DS3104-SE	Competitor A	Competitor B
Clock Inputs	**8**	8	3
Differential Clock Inputs	**4**	—	2
Clock Outputs	**14**	6	2
Differential Clock Outputs	**4**	—	1
Two Independent DPLLs	**Yes**	Yes	—
Locks to 25MHz MII Clock	**Yes**	Yes	Yes
Synthesizes 25MHz MII Clock	**Yes**	Yes	—
Locks to 125MHz GMII Clock	**Yes**	—	Yes
Synthesizes 125MHz GMII Clock	**Yes**	—	—
Locks to/Synthesizes 156.25MHz xGMII Clock	**Yes**	—	—
Synthesizes SONET/SDH, MII, GMII, and xGMII Rates at the Same Time	**Yes**	—	—
Custom Frequency Synthesis (Hz)	**n x 2k to 77.76M, n x 8k to 388.79M**	n x 8k to 100M	—

For more information about our clock synchronization products, go to: www.maxim-ic.com/clock-sync

†10k-up recommended resale. Prices provided are for design guidance and are FOB USA. International prices will differ due to local duties, taxes, and exchange rates. Not all packages are offered in 1k increments, and some may require minimum order quantities.

T1/E1

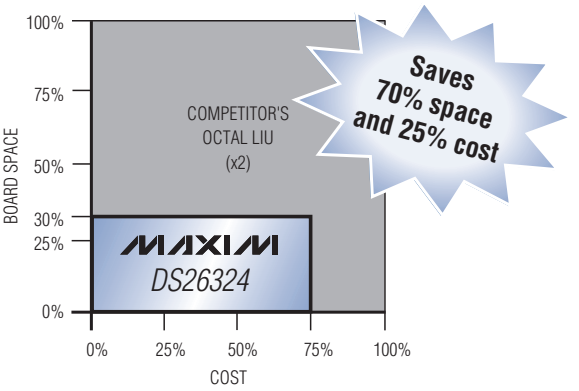
Industry's first 16-port T1/E1/J1 LIUs with or without integrated framers

Offer the highest integration to save space and cost

Industry-leading features

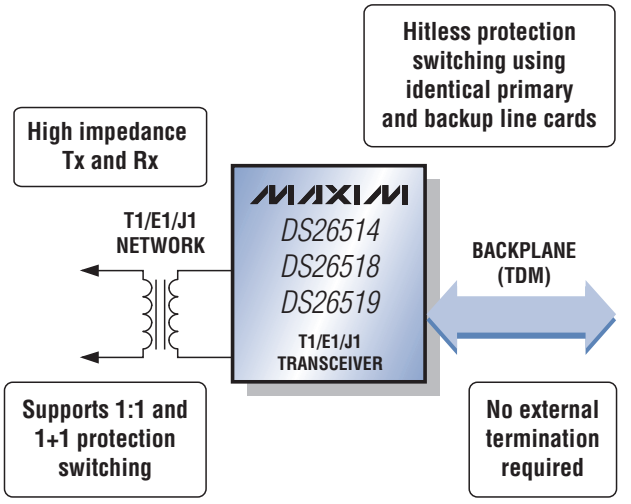
- Relayless redundancy support with Tx- and Rx-side internal resistors for line-impedance matching
- Software-selectable Tx and Rx termination for 100Ω (T1) or 75Ω/120Ω (E1)
- Hitless protection switching support
- Flexible transmit waveform generation
- Bidirectional bit-error-rate tester (BERT)

16-CHANNEL LIU REPLACES COMPETITION'S 8-CHANNEL SOLUTION TO SAVE SPACE AND COST



Integrated framer devices include

- HDLC controller in Tx and Rx paths with access to FDL, Sa, or a single DS0 channel
- High impedance in power-up and power-down modes
- Software compatibility between port densities: 4, 8, or 16
- Serial peripheral interface available



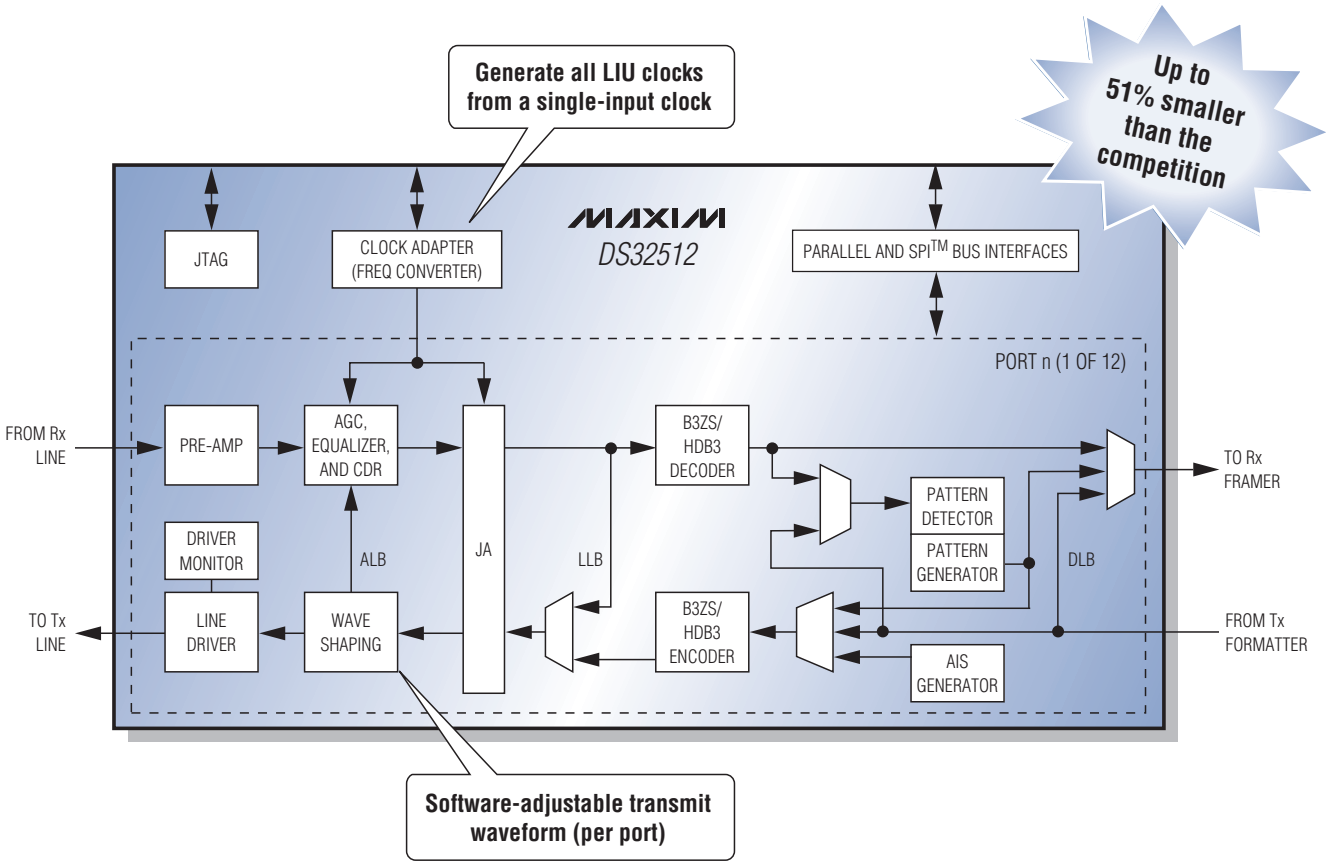
Part	Ports	Integrated Framer	Short Haul	Long Haul	Package
DS26334G+	16		✓	✓	256-CSBGA
DS26324G+	16		✓		256-CSBGA
DS26303L+075/+120	8		✓		144-LQFP
DS21448L+	4		✓	✓	144-TEPBGA/128-LQFP
DS21348T+/DS2148T+	1		✓	✓	44-TQFP/49-CSBGA
DS26519G+	16	✓	✓	✓	484-HSBGA
DS26518G+	8	✓	✓	✓	256-CSBGA
DS26514G+	4	✓	✓	✓	256-CSBGA

+ Denotes lead-free package.

www.maxim-ic.com/tecarrier

Tiny multiport T3/E3 LIUs offer industry-leading features

Less than 140mW per port in a small, 23mm x 23mm TEBGA



Industry-leading LIU features

- Adaptive clock and data recovery for 0 to 1500ft (457m) of cable
- Built-in jitter attenuators (Tx or Rx, 16-/32-/64-/128-bit depth)
- 8-/16-bit parallel, SPI, or hardware-mode control interface

Simplify board design

- Internal software-selectable termination resistors
- High-impedance Tx and Rx enable hot-swappable 1:1 and 1+1 redundancy without relays
- Accept common system clocks (e.g., 19.44MHz); no local oscillators required

Part	Ports	Power (mW)	Package (mm x mm)
DS32512+	12	1680	484-TEBGA (23 x 23)
DS32508+	8	1095	
DS32506+	6	785	

+ Denotes lead-free package.

SPI is a trademark of Motorola, Inc.

DKs

Development kits provide fast part evaluation and verification

Two types of development kits reduce development time. Depending on the part supported, they allow low-cost prototyping, full register access, rapid firmware development, predefined initialization files, and multiple interface connections.

Motherboard/daughter card development kits (T1/E1/J1/T3/E3)

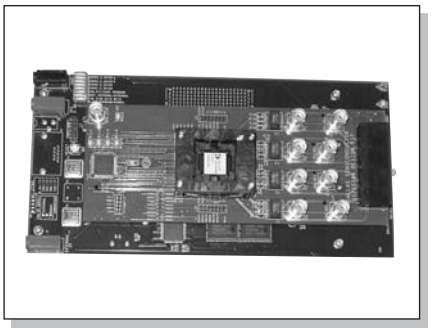
DK2000 Motorola® 8260-based motherboard design kit

- **Communication processor, four daughter card slots**

DK101 Motorola 2107-based motherboard design kit

- **Low cost with hardware prototyping area**
- **Windows® GUI interface**

Daughter cards
DS21352, DS21354
DS2155, DS2156, DS21455, DS21458
DS3112/DS3150
DS2148/DS21348, DS21Q348/DS21448
DS3144/DS3154
DS26401

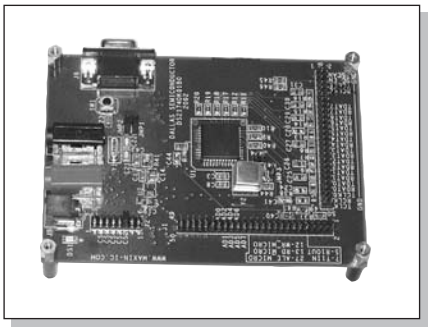


MB/DC development kits

Stand-alone development kits (T1, E1, J1, T3, and E3)

- **On-board 8051 or Motorola 2107 processor**
- **Intuitive, user-friendly design/layout**
- **Windows GUI interface**

DS2174, DS21Q50, DS21Q58, DS21Q59
DS26303, DS26324, DS26334, DS3100
DS26502, DS26503, DS26504, DS2149
DS26514, DS26518, DS26519, DS26522, DS26521
DS3100, DS3102, DS3104, DS3105, DS3106
DS3150, DS3154, DS3254, DS3153, DS3253
DS3164, DS3174, DS3184
DS32506, DS32508, DS32512
DS33Z11, DS33Z41, DS33Z44, DS33R11, DS33R41
DS34S104, DS34S108, DS34T104, DS34T108
DS33W41, DS33X11, DS33X162



Stand-alone development kits

For development kit availability, visit: www.maxim-ic.com/telecom

Communications products

Part	Protocol	Ports	Supply Voltage (V)	Package (mm x mm)	Device Driver	Features	Applications
T1/E1/J1 SINGLE-CHIP TRANSCEIVERS (LIU + FRAMER)							
DS26514/8/9	T1/E1/J1	4/8/16	1.8/3.3	484-HSBGA, 256-CSBGA	✓	4/8/16 independent transceivers, long-/short-haul LIU, internal line termination, Tx and Rx HDLC controller paths with FDL access, muxed TDM bus, EV kit	CSU/DSU, router, mux, PBX, access
DS26524/8	T1/E1/J1	4/8	3.3	256-TEBGA (17 x 17)	✓	4/8 independent transceivers, long-/short-haul LIU, transmit synchronizer HDLC, signaling, elastic stores, jitter attenuator, framer, muxed TDM bus, EV kit	CSU/DSU, router, mux, PBX, access
DS21455	T1/E1/J1	4	3.3	256-BGA (27 x 27)	✓	4 independent transceivers, long-/short-haul LIU, 2 HDLCs per port, signaling, elastic stores, jitter attenuator, framer, muxed TDM bus, BERT, EV kit; replaces DS21Q55	CSU/DSU, router, mux, PBX, access
DS21458	T1/E1/J1	4	3.3	256-CSBGA (17 x 17)	✓	4 independent transceivers, long-/short-haul LIU, 2 HDLCs per port, signaling, elastic stores, jitter attenuator, full layer-1 framer function, muxed TDM bus, BERT, EV kit	CSU/DSU, router, mux, PBX, access
DS26502	T1/E1/J1	1	3.3	64-LQFP (10 x 10)	✓	Building-integrated timing-supply (BITS) clock-recovery element; supports T1, E1, 2048kHz, 64kHz composite clock and 6312kHz timing interfaces; synchronization status message (SSM), EV kit	BITS timing, rate conversion
DS26503	T1/E1/J1	1	3.3	64-LQFP (10 x 10)	✓	BITS clock-recovery element; supports T1, E1, 2048kHz, and 6312kHz synchronization timing interfaces; SSM, EV kit	BITS timing, rate conversion
DS26504	T1/E1/J1	1	3.3	64-LQFP (10 x 10)	✓	BITS clock-recovery element; supports T1, E1, and 6312kHz synchronization timing interfaces (options A and B); GR378, SSM	BITS timing, rate conversion
DS26521	T1/E1/J1	1	3.3	64-LQFP (10 x 10)	✓	1 independent transceiver, long-/short-haul LIU, transmit synchronizer HDLC, signaling, elastic stores, jitter attenuator, framer, muxed TDM bus, EV kit	CSU/DSU, router, mux, PBX, access
DS26522	T1/E1/J1	2	3.3	144-CSBGA (13 x 13)	✓	2 independent transceivers, long-/short-haul LIU, transmit synchronizer HDLC, signaling, elastic stores, jitter attenuator, framer, muxed TDM bus, EV kit	CSU/DSU, router, mux, PBX, access
T1/E1/J1 FRAMERS							
DS21Q42	T1/J1	4	3.3	128-TQFP		4 independent T1 framers, HDLC controllers	ADMs, routers, converters
DS21FT42	T1/J1	12	3.3	300-BGA		12 independent T1 framers, HDLC controllers	ADMs, routers, converters
DS21FF42	T1/J1	16	3.3	300-BGA		16 independent T1 framers, HDLC controllers	ADMs, routers, converters
DS21Q44	E1	4	3.3	128-TQFP		4 independent E1 framers, HDLC controllers	ADMs, routers, converters
DS21FT44	E1	12	3.3	300-BGA		12 independent E1 framers, HDLC controllers	ADMs, routers, converters
DS21FF44	E1	16	3.3	300-BGA		16 independent E1 framers, HDLC controllers	ADMs, routers, converters
DS26401	T1/E1/J1	8	3.3	256-CSBGA		8 independent T1/E1/J1 framers, HDLC controllers, transmit synchronizers, clock synchronizers, synthesizer, BERT, performance monitors, EV kit	ADMs, routers, converters
T1/E1/J1 LINE INTERFACE UNITS							
DS2148	T1/E1/J1	1	5	44-TQFP, 49-CSBGA	✓	Single-port, long-/short-haul LIU, 128-bit crystal-less jitter attenuator, loopbacks, PRBS pattern generator/detector	T1 or E1 line cards
DS26303	T1/E1/J1	8	3.3	144-TQFP, 160-CSBGA	✓	Octal, short-haul LIU, internal software-selectable transmit-/receive-side line termination, hitless protection switching support, 128-bit crystal-less jitter attenuator, built-in BERT and CLAD	T1 or E1 line cards
DS26324	T1/E1/J1	16	3.3	256-TEBGA	✓	16-port, short-haul LIU, internal software-selectable transmit-/receive-side line termination, hitless protection switching support, 128-bit crystal-less jitter attenuator, built-in BERT and CLAD	T1 or E1 line cards
DS26334	T1/E1/J1	16	3.3	256-TEBGA	✓	16-port, long-/short-haul LIU, internal software-selectable transmit-/receive-side line termination, hitless protection switching support, 128-bit crystal-less jitter attenuator, built-in BERT and CLAD	T1 or E1 line cards
DS21348	T1/E1/J1	1	3.3	44-TQFP, 49-CSBGA	✓	Single-port, long-/short-haul LIU, 128-bit crystal-less jitter attenuator, loopbacks, PRBS pattern generator/detector	T1 or E1 line cards
DS21448	T1/E1/J1	4	3.3	144-BGA, 128-LQFP	✓	Quad-port, long-/short-haul LIU, 128-bit crystal-less jitter attenuator, loopbacks, PRBS pattern generator/detector	T1 or E1 line cards
DS21349	T1/J1	1	3.3	28-PLCC		Single-port, long-/short-haul LIU, 128-bit crystal-less jitter attenuator	Low-cost T1 line cards
DS2149	T1/J1	1	5	28-PLCC		Single-port, long-/short-haul LIU, 128-bit crystal-less jitter attenuator	Low-cost T1 line cards

Communications products (cont.)

Part	Protocol	Ports	Supply Voltage (V)	Package (mm x mm)	Device Driver	Features	Applications
ATM PRODUCTS							
DS26556	ATM over T1/E1/J1	4	3.3	256-BGA	✓	4 T1/E1/J1 ports, long-/short-haul LIU, full Layer-1 framer function, 1 HDLC per port, signaling, elastic stores, jitter attenuator, TDM or UTOPIA 2/3 or POS-PHY™ 2/3, SPI-3 bus interface	ADMs, inverse mux ATM (IMA), switches, routers, T1/E1/J1 line cards
DS2156	ATM over T1/E1/J1	1	3.3	100-LQFP	✓	T1/E1/J1 single-channel, long-/short-haul LIU, full Layer-1 framer function, 2 HDLCs, signaling, elastic stores, jitter attenuator, TDM or UTOPIA II bus interface	ADMs, IMA, switches, routers, T1/E1/J1 line cards
DS26102	ATM over T1/E1	16	3.3	256-CSBGA		16 serial TDM ports, UTOPIA II ATM interface, cell buffering, HEC generation and verification, cell filtering; 8-port DS26101 also available	DSLAM, ATM over T1/E1, routers, IMA
HDLC CONTROLLERS							
DS31256	256-channel	16	1.8/3.3	256-BGA (27 x 27)		264Mbps full-duplex throughput, 256 HDLC channels, 16 full-duplex ports, 4 ports operable to 52Mbps, others to 20Mbps, 66MHz 32-bit PCI bus, local bus, BERT, 16kB FIFOs	WAN routers, frame relay, line cards, SONET/SDH overhead termination, HSSI
T3/E3 PRODUCTS							
DS3112	Multiplexer-framer	1	3.3	256-BGA	✓	M13/E13/G.747 mux or unchannelized DS3/E3 framer, M23 or C-bit parity DS3, G.751 E3, HDLC with 256-byte FIFOs, EV kit	M13 and E13 muxes; T3 and E3 line cards for access concentrators, cross-connects, switches
DS3141/2/3/4	T3/E3 framers	1/2/3/4	3.3	144-CSBGA	✓	1/2/3/4 independent T3 framers, HDLC controllers, EV kit	T3 and E3 line cards
DS3146/08/12	T3/E3 framers	6/8/12	3.3	349-PBGA	✓	6/8/12 independent T3 framers, HDLC controllers	T3 and E3 line cards
DS3150	T3/E3/STS-1 LIU, single port	1	3.3	48-TQFP, 28-PLCC		Single-channel LIU, integrated jitter attenuator, hardware interface, drop-in replacement for TDK78P2241/B, pin compatible with TDK78P7200/L, EV kit	T3, E3, and STS-1 line cards
DS3151/2/3/4	T3/E3/STS-1 LIUs	1/2/3/4	3.3	144-CSBGA	✓	Multichannel LIUs, integrated jitter attenuators, CPU bus or hardware mode, EV kit	T3, E3, and STS-1 line cards
DS3161/2/3/4	T3/E3 ATM/ packet PHYs	1/2/3/4	3.3	400-TE-PBGA (27 x 27)	✓	Fully integrated DS3/E3 PHY; maps ATM cells and/or HDLC packets into DS3/E3 data streams; UTOPIA 2/3, POS-PHY 2/3, subrate DS3 supported, EV kit	Access concentrators, multiservice provisioning platforms, ATM/frame relay equipment, switches
DS3170	Single-port T3/E3 SCT	1	3.3	100-CSBGA (11 x 11)	✓	Fully integrated single framer and LIU on a single die	T3 and E3 line cards for access concentrators, cross-connects, switches, routers
DS3171/2/3/4	T3/E3 SCTs	1/2/3/4	3.3	400-TE-PBGA	✓	Fully integrated multiport framers and LIUs on a single die, EV kit	T3 and E3 line cards
DS3181/2/3/4	T3/E3 ATM/ packet PHYs with built-in LIUs	1/2/3/4	3.3	400-TE-PBGA	✓	Fully integrated DS3/E3 PHY plus LIU; maps ATM cells and/or HDLC packets into DS3/E3 data streams	Access concentrators, multiservice provisioning platforms, ATM/frame relay equipment, switches
DS3251/2/3/4	T3/E3/STS-1 LIUs	1/2/3/4	3.3	144-CSBGA	✓	Multiport LIUs, jitter attenuators with provisionable buffer depth, parallel/SPI/hardware modes, built-in CLAD, EV kit	T3, E3, and STS-1 line cards
DS32506/08/12	T3/E3 LIUs	6/8/12	1.8	484-TEBGA	✓	Multiport LIUs, software-adjustable transmit waveform, internal software-selectable termination resistors, high-impedance Tx and Rx	T3, E3, and STS-1 line cards
ETHERNET TRANSPORT MAPPERS							
DS33M31/33	Ethernet over SONET/SDH	1/2	1.8/2.5/ 3.3	256-CSBGA (17 x 17)	✓	Ethernet over OC-3/STM-1; high-order mapping with optional support for new EoPDH standards for Ethernet over DS3 delivery through SONET/SDH	Optical access, Ethernet access, ADMs, ROADMs
DS33M30	Ethernet over SONET/SDH	1/1	1.8/2.5/ 3.3	144-CSBGA (10 x 10)	✓	Ethernet over OC-3/STM-1 at less than 1W of power	Optical access, Ethernet access
DS33R11	Ethernet over T1/E1	1	1.8/3.3	256-BGA	✓	Ethernet over 1 T1/E1 HDLC with integrated T1/E1 transceiver	WAN bridges, LAN extension

Communications products (cont.)

Part	Protocol	Ports	Supply Voltage (V)	Package (mm x mm)	Device Driver	Features	Applications
ETHERNET TRANSPORT MAPPERS (CONT.)							
DS33X41/42/ 81/82/161/162	EoPDH with link aggregation	4/8/16	1.8/2.5/3.3	256-CSBGA (17 x 17)	✓	EoPDH through ITU-T standards (GFP/HDLC) with VCAT/LCAS link aggregation up to 16 PDH links (416Mbps); 1 GbE or 2 10/100; QoS, OAM	Carrier Ethernet demarcation, WAN routers, Ethernet access equipment, microwave radio
DS33X11	EoPDH	1	1.8/2.5/3.3	144-CSBGA (10 x 10)	✓	EoPDH through ITU-T standards (GFP/HDLC); 1 10/100/GbE; VLAN, QoS, and OAM support, Ethernet bridging and filtering at 10/100Mbps	Carrier Ethernet demarcation, WAN routers, Ethernet access equipment, LAN extension
DS33W41/11	EoPDH	1/4	1.8/2.5/3.3	256-CSBGA	✓	EoPDH (GFP/HDLC), with integrated voice support	Integrated access devices (IADs)
TDM-OVER-PACKET							
DS34T101/2/4/8	TDMoP	1/2/4/8	1.8/3.3	484-TEBGA/ HSBGA	✓	Pseudowire circuit emulation of E1/T1/E3/T3/STS-1 over Ethernet/IP/MPLS networks; independent clock recovery engine per port, integrated framers and LIUs; EV kit	TDM-over-PON, leased-line services over PSN, cellular backhaul, TDM-over-cable
DS34S101/2/4/8	TDMoP	1/2/4/8	1.8/3.3	256-CSBGA, 484-TEBGA	✓	Pseudowire circuit emulation of E1/T1/E3/T3/STS-1 over Ethernet/IP/MPLS networks; independent, clock-recovery engine per port; CESoPSN, SAToP, HDLC, TDMoIP; EV kit	TDM-over-PON, leased-line services over PSN, cellular backhaul, TDM-over-cable
BIT-ERROR-RATE TESTERS							
DS2172	52MHz	1	5	32-TQFP		32-bit repetitive pattern memory, polynomial generator/detector for polynomials up to 2^{32} - 1	Provides diagnostics at each network node
DS2174	622Mbps	1	3.3	44-PLCC		512-bit repetitive pattern memory, polynomial generator/detector for polynomials up to 2^{32} - 1, 48-bit count and bit-error count registers, serial, 4-/8-bit parallel interfaces	Provides diagnostics at each network node
DS21372	20MHz	1	3.3	32-TQFP		32-bit repetitive pattern memory, polynomial generator/detector for polynomials up to 2^{32} - 1	Provides diagnostics at each network node
CLOCK SYNCHRONIZATION							
DS3100/1	SONET/SDH Stratum 3/3E, 4, 4E, SMC, SEC, PDH, T1, E1	14/11	1.8/3.3	256-CSBGA	✓	Timing-card ICs; CMOS, TTL, LVDS, and LVPECL support; phase buildout, hitless protection switching, programmable PLL bandwidth; integrated DS1/ E1/2048kHz BITS/SSU transceivers (DS3100)	SONET/SDH, ADMs, MSPPs, digital cross-connects, DSLAMs, routers
DS3102	SONET/SDH Stratum 3 4, 4E, SMC, SEC, PDH, T1, E1	8/7	1.8/3.3	81-CSBGA	✓	Timing-card IC; CMOS, TTL, LVDS, and LVPECL support; phase buildout, hitless protection switching, programmable PLL bandwidth; CMOS, TTL, LVDS and LVPECL support; Ethernet xMII; frequency conversion between SONET/SDH and Ethernet MII, GMII, xGMII rates	SONET/SDH equipment clocks (SECs), SyncE equipment clocks (EECs); WAN equipment (MSPPs, Ethernet switches, routers, DSLAMs, and wireless base stations)
DS3104	SONET/SDH, PDH, SyncE, T1, E1	8/7	1.8/3.3	81-CSBGA	✓	Line-card IC; CMOS, TTL, LVDS and LVPECL support; Ethernet xMII; frequency conversion between SONET/SDH and Ethernet MII, GMII, xGMII rates	SONET/SDH, ADMs, MSPPs, digital cross-connects, DSLAMs, routers
DS3105	SONET/SDH, PDH, SyncE, T1, E1	5/2	1.8/3.3	64-LQFP	✓	Line-card IC; CMOS, TTL, LVDS and LVPECL support; Ethernet xMII; frequency conversion between SONET/SDH and Ethernet MII, GMII, xGMII rates	SONET/SDH, SyncE, PDH; WAN equipment (MSPPs, Ethernet switches, routers, DSLAMs, and wireless base stations)
DS3106	SONET/SDH, PDH, SyncE, T1, E1	2/2	1.8/3.3	64-LQFP	✓	Line-card IC; CMOS, TTL, LVDS and LVPECL support; Ethernet xMII; frequency conversion between SONET/SDH and Ethernet MII, GMII, xGMII rates	SONET/SDH, SyncE, PDH; WAN equipment (MSPPs, Ethernet switches, routers, DSLAMs, and wireless base stations)

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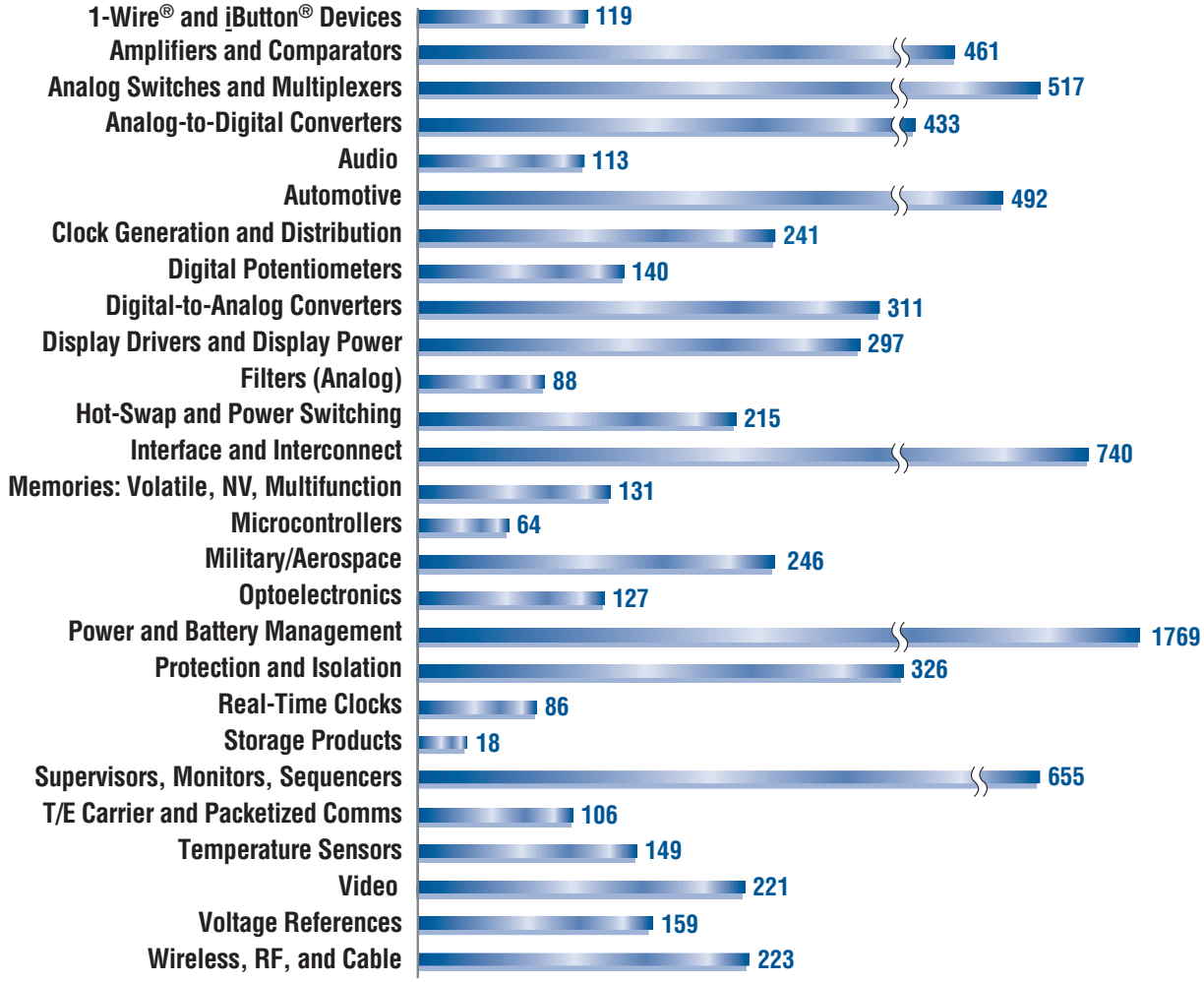

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