



Is Now Part of



ON Semiconductor®

**To learn more about ON Semiconductor, please visit our website at
www.onsemi.com**

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

FIN1108 — LVDS 8-Port, High-Speed Repeater

Features

- Greater than 800Mbps Data Rate
- 3.3V Power Supply Operation
- 3.5ps Maximum Random Jitter and 135ps Maximum Deterministic Jitter
- Wide Rail-to-Rail Common Mode Range
- LVDS Receiver Inputs Accept LVPECL, HSTL, and SSTL-2 Directly
- Ultra-low Power Consumption
- 20ps Typical Channel-to-Channel Skew
- Power-Off Protection
- 7.5kV HBM ESD Protection
- Meets or Exceeds the TIA/EIA-644-A LVDS Standard
- 48-Lead TSSOP Package
- Open-Circuit Fail-Safe Protection
- V_{BB} Reference Output

Descriptions

This eight-port repeater is designed for high-speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology.

The FIN1108 accepts and outputs LVDS levels with a typical differential output swing of 330mV, which provides low EMI at ultra-low power dissipation even at high frequencies. The FIN1108 provides a V_{BB} reference for AC coupling on the inputs. In addition, the FIN1108 can directly accept LVPECL, HSTL, and SSTL-2 for translation to LVDS.

Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
FIN1108MTD	-40 to +85°C	48-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide	Tube
FIN1108MTDX	-40 to +85°C	48-Lead, Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide	Tape and Reel

Pin Configuration

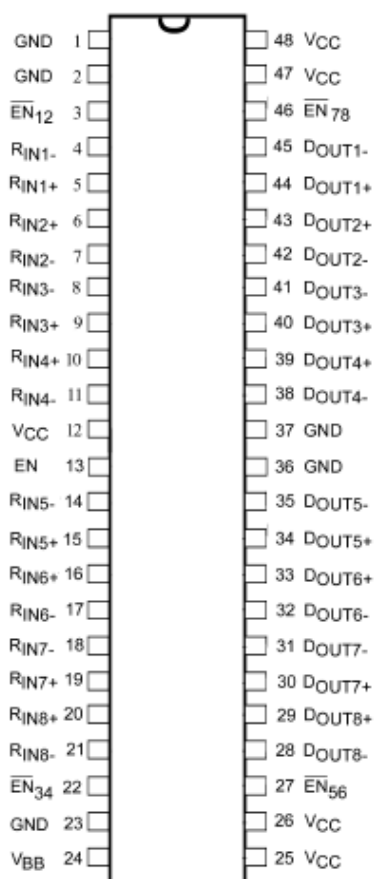


Figure 1. Pin Configuration

Pin Definitions

Pin #	Name	Description
1,2,23,37,36	GND	Ground.
3	$\overline{EN}_{12}$	Inverting driver enable for D_{OUT1} and D_{OUT2} .
4,7,8,11,14,17,18,21	$R_{IN1-}, R_{IN2-}, R_{IN3-}, R_{IN5-}, R_{IN6-}, R_{IN7-}, R_{IN8-}$	Inverting LVDS input.
5,6,9,10,15,16,19,20	$R_{IN1+}, R_{IN2+}, R_{IN3+}, R_{IN5+}, R_{IN6+}, R_{IN7+}, R_{IN8+}$	Non-inverting LVDS input.
12,25,26,47,48	VCC	Power supply pin.
13	EN	Driver enable for all outputs.
22	$\overline{EN}_{34}$	Inverting driver enable for D_{OUT3} and D_{OUT4} .
24	V_{BB}	Reference voltage output.
27	$\overline{EN}_{56}$	Inverting driver enable for D_{OUT5} and D_{OUT6} .
28,31,32,35,38,41,42,45	$D_{OUT8-}, D_{OUT7-}, D_{OUT6-}, D_{OUT5-}, D_{OUT4-}, D_{OUT3-}, D_{OUT2-}, D_{OUT1-}$	Inverting drive output.
29,30,33,34,39,40,43,44	$D_{OUT8+}, D_{OUT7+}, D_{OUT6+}, D_{OUT5+}, D_{OUT4+}, D_{OUT3+}, D_{OUT2+}, D_{OUT1+}$	Non-inverting drive output.
46	$\overline{EN}_{78}$	Inverting driver enable for D_{OUT7} and D_{OUT8} .

Functional Diagram

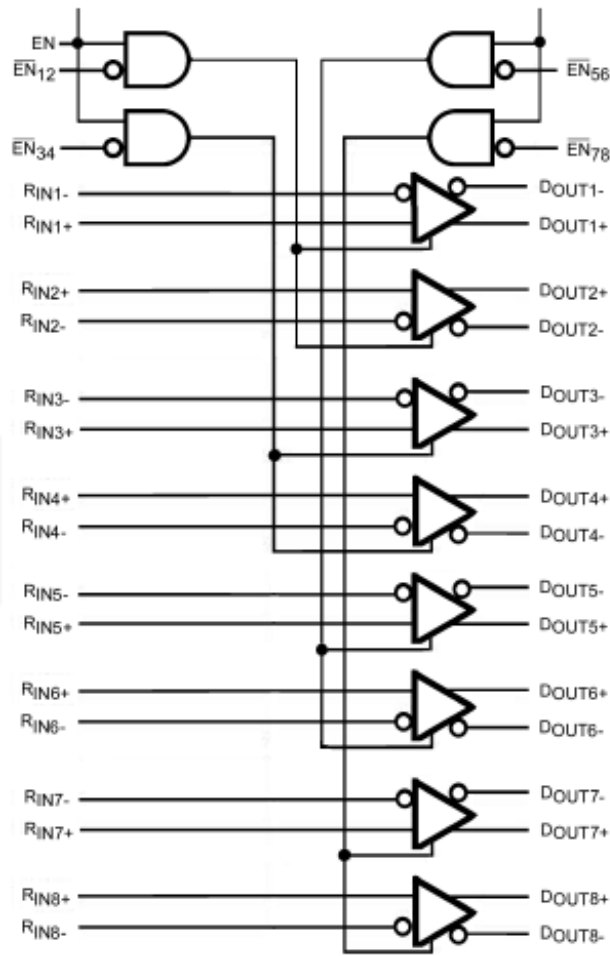


Figure 2. Functional Diagram

Table 1. Function Table

Inputs				Outputs	
EN	/EN _{xx}	D _{IN+}	D _{IN-}	D _{OUT+}	D _{OUT-}
HIGH	LOW	HIGH	LOW	HIGH	LOW
HIGH	LOW	LOW	HIGH	LOW	HIGH
HIGH	LOW	Fail-Safe		HIGH	LOW
Don't Care	HIGH	Don't Care	Don't Care	High Impedance	High Impedance
LOW	Don't Care	Don't Care	Don't Care	High Impedance	High Impedance

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	-0.5	+4.6	V
V_{IN}	LVDS DC Input Voltage	-0.5	+4.6	V
V_{OUT}	LVDS DC Output Voltage	-0.5	+4.6	V
I_{OSD}	Driver Short-Circuit Current	Continuous	10	mA
T_{STG}	Storage Temperature Range	-65	+150	°C
T_J	Junction Temperature		+150	°C
T_L	Lead Temperature, Soldering, 10 seconds		+260	°C
ESD	Human Body Model, JESD22-A114		7500	V
	Machine Model, JEDEC: JESD22-A115		400	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	3.0	3.6	V
$ V_{ID} $	Magnitude of Differential Voltage	100	mV to V_{CC}	V
V_{IC}	Common Mode Voltage Range	$(0V + V_{ID} /2)$	$(V_{CC} - V_{ID} /2)$	V
T_A	Operating Temperature	-40	+85	°C

DC Electrical Characteristics

Typical values are at $T_A=25^{\circ}\text{C}$ with $V_{CC}=3.3\text{V}$.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{TH}	Differential Input Threshold HIGH	$V_{IC}=+0.05\text{V}$, $+1.2\text{V}$, or $V_{CC} - 0.05\text{V}$ Figure 3			100	mV
V_{TL}	Differential Input Threshold LOW	$V_{IC}=+0.05\text{V}$, $+1.2\text{V}$, or $V_{CC} - 0.05\text{V}$ Figure 3	-100			mV
V_{IH}	Input HIGH Voltage (EN or /EN)		2.0		V_{CC}	V
V_{IL}	Input LOW Voltage (EN or /EN)		GND		0.8	V
V_{OD}	Output Differential Voltage	$R_L=100\Omega$, Driver Enabled, Figure 4	250	330	450	mV
ΔV_{OD}	V_{OD} Magnitude Change from Differential LOW-to-HIGH				25	mV
V_{OS}	Offset Voltage		1.125	1.230	1.375	V
ΔV_{OS}	Offset Magnitude Change from Differential LOW-to-HIGH				25	mV
I_{OS}	Short-Circuit Output Current	$D_{OUT+}=0\text{V}$ and $D_{OUT-}=0\text{V}$, Driver Enabled		-3.4	-6.0	mA
		$V_{OD}=0\text{V}$, Driver Enabled		± 3.4	± 6.0	mA
I_{IN}	Input Current (EN, /EN, D_{INX+} , D_{INX-})	$V_{IN}=0\text{V}$ to V_{CC} , Other Input= V_{CC} or 0V for Differential Input			± 20	μA
I_{OFF}	Power-off Input or Output Current	$V_{CC}=0\text{V}$, V_{IN} or $V_{OUT}=0\text{V}$ to 3.6V			± 20	μA
I_{CCZ}	Disabled Power Supply Current	Drivers Disabled			20	mA
I_{CC}	Power Supply Current	Drivers Enabled, Any Valid Input Condition			80	mA
I_{OZ}	Disabled Output Leakage Current	Driver Disabled, $D_{OUT+}=0\text{V}$, to 3.6V or $D_{OUT-}=0\text{V}$ to 3.6V			± 20	μA
V_{IC}	Common Mode Voltage Range		$V_{ID}/2$		$V_{CC} - (V_{ID}/2)$	V
C_{IN}	Input Capacitance	Enable Input		3		pF
		LVDS Input		3		
C_{OUT}	Output Capacitance			3		pF
V_{BB}	Output Reference Voltage	$V_{CC}=3.3\text{V}$, $I_{BB}=0$ to $-275\mu\text{A}$	1.125	1.200	1.375	V

AC Electrical Characteristics

Typical values are at $T_A=25^\circ\text{C}$ with $V_{CC}=3.3\text{V}$.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t _{PLHD}	Differential Output Propagation Delay LOW-to-HIGH	R _L =100Ω, C _L =5pF V _{ID} =200mV to 450mV, V _{IC} = V _{ID} /2 to V _{CC} – (V _{ID} /2) Duty Cycle=50% Figure 3	0.75	1.10	1.75	ns
t _{PHLD}	Differential Output Propagation Delay HIGH-to-LOW		0.75	1.10	1.75	ns
t _{TLHD}	Differential Output Rise Time (20% to 80%)		0.29	0.40	0.58	ns
t _{THLD}	Differential Output Fall Time (80% to 20%)		0.29	0.40	0.58	ns
t _{SK(P)}	Pulse Skew t _{PLH} - t _{PHL}			0.02	0.20	ns
t _{SK(LH)}	Channel-to-Channel Skew ⁽¹⁾			0.02	0.15	ns
t _{SK(HL)}				0.02	0.15	
t _{SK(PP)}	Part-to-Part Skew ⁽²⁾				0.5	ns
f _{MAX}	Maximum Frequency ⁽³⁾⁽⁴⁾			400	>630	
t _{PZHD}	Differential Output Enable Time from Z to HIGH	R _L =100Ω, C _L =5pF Figure 4, Figure 5		3.0	5.0	ns
t _{PZLD}	Differential Output Enable Time from Z to LOW			3.1	5.0	ns
t _{PHZD}	Differential Output Disable Time from HIGH to Z			2.2	5.0	ns
t _{PLZD}	Differential Output Disable Time from LOW to Z			2.5	5.0	ns
t _{DJ}	LVDS Data Jitter, Deterministic	V _{ID} =300mV, PRBS=2 ²³ -1, V _{IC} =1.2V at 800Mbps		80	135	ps
t _{RJ}	LVDS Clock Jitter, Random (RMS)	V _{ID} =300mV V _{IC} =1.2V at 400Mbps		1.9	3.5	ps

Notes:

1. $t_{SK(LH)}$, $t_{SK(HL)}$ is the skew between specified outputs of a single device when the outputs have identical loads and are switching in the same direction.
2. $t_{SK(PP)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices switching in the same direction (either LOW-to-HIGH or HIGH-to-LOW) when both devices operate with the same supply voltage, same temperature, and have identical test circuits.
3. Passing criteria for maximum frequency is the output $V_{OD} > 250\text{mV}$ and the duty cycle is better than 45% / 55% with all channels switching.
4. Output loading is transmission-line environment only; C_L is <1pF of stray test fixture capacitance.

Test Diagrams

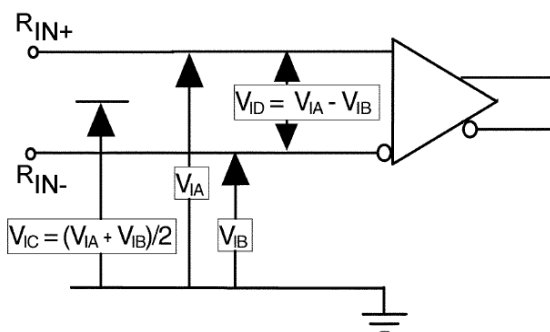


Figure 3. Differential Receiver Voltage Definitions

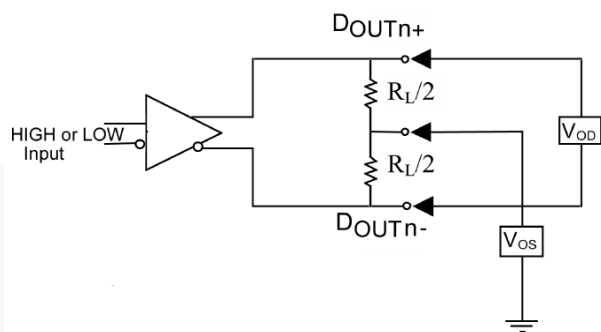
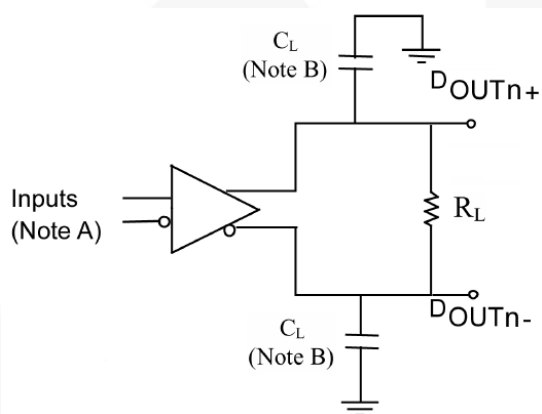


Figure 4. Differential Driver DC Test Circuit



Notes: All LVDS input pulses have frequency=10MHz, t_R or $t_F < 0.5\text{ns}$.
 C_L includes all probe and jig capacitance.

Figure 5. Differential Driver Propagation Delay and Transition Time Test Circuit

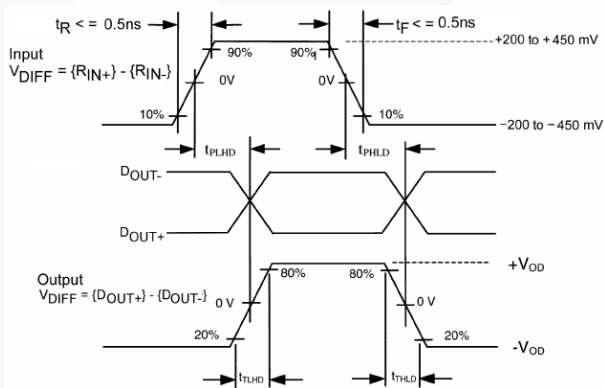
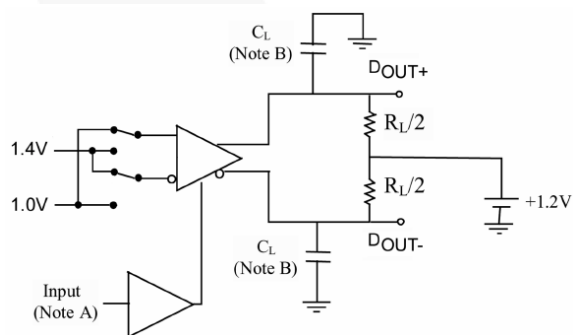


Figure 6. AC Waveform



Notes: All LVTTTL input pulses have frequency=10MHz, t_R or $t_F < 2\text{ns}$.
 C_L includes all probe and jig capacitance.

Figure 7. Differential Driver Enable and Disable Circuit

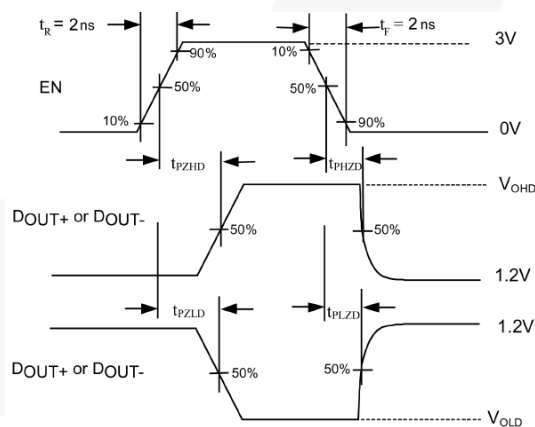


Figure 8. Enable and Disable AC Waveforms

Physical Dimensions

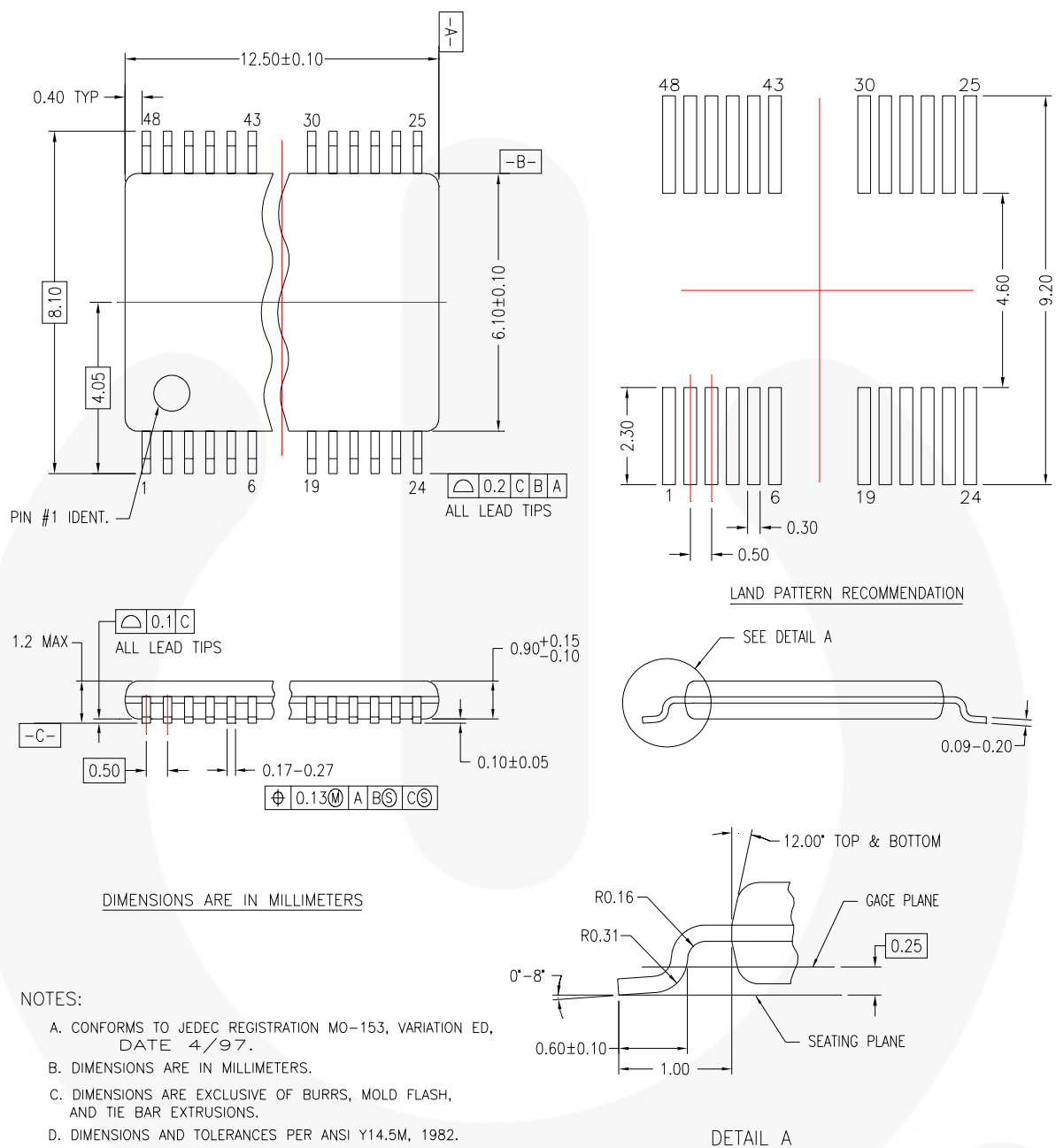


Figure 9. 48-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/packaging/>



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
Auto-SPM™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
f®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®
FPS™

F-PFS™
FRFET®
Global Power Resource™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
Motion-SPM™
OptoHIT™
OPTOLOGIC®
OPTOPLANAR®
PDP SPM™

Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QST™
Quiet Series™
RapidConfigure™
Saving our world, 1mW/W/KW at a time™
SignalWise™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™.3
SuperSOT™.6
SuperSOT™.8
SupreMOS®
SyncFET™
Sync-Lock™

SYSTEM GENERAL®
The Power Franchise®
the power franchise
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TriFault Detect™
TRUECURRENT™*
µSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XST™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD 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 (c) 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 of the user.
2. A critical component in 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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. 149

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative