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REV. P1.0.0

**GENERAL DESCRIPTION**

The XRK39351 is a low voltage PLL based clock driver designed for high speed clock distribution applications.

The XRK39351 has two reference clock inputs, one LVPECL and the other LVCMOS. The REF\_SEL input selects clock input to be used as the PLL's reference source.

The XRK39351 uses PLL technology to frequency lock its outputs to the clock reference input. The divider in the feedback path will determine the frequency of the VCO. The XRK39351 provides 9 LVCMOS outputs that are separated into 4 banks. Each of the separate output banks can individually divide down the VCO output frequency. This allows the XRK39351 to generate a variety of output-to-input frequency ratios (1:1, 1:2, 1:4, 2:1 and 4:1). All outputs provide LVCMOS compatible levels while driving 50Ω terminated transmission lines.

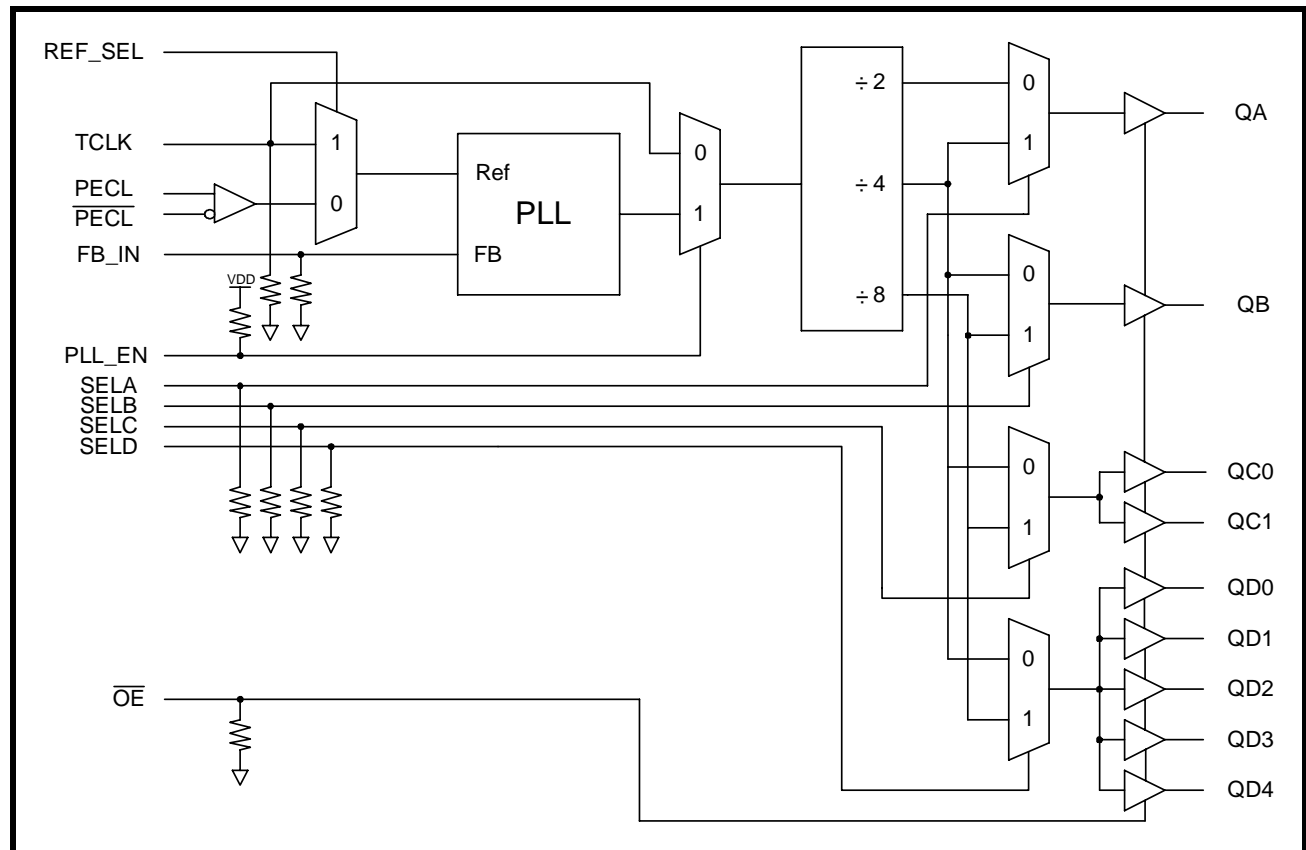
The input reference clock can be directly applied to the output dividers bypassing the PLL when PLL\_EN

input is pulled low. This is a test mode intended for system debug purposes.

The XRK39351 has an output/input frequency range of 25MHz to 200MHz with the PLL enabled and an input frequency range of 2MHz to 300MHz when the PLL is disabled (test mode).

**FEATURES**

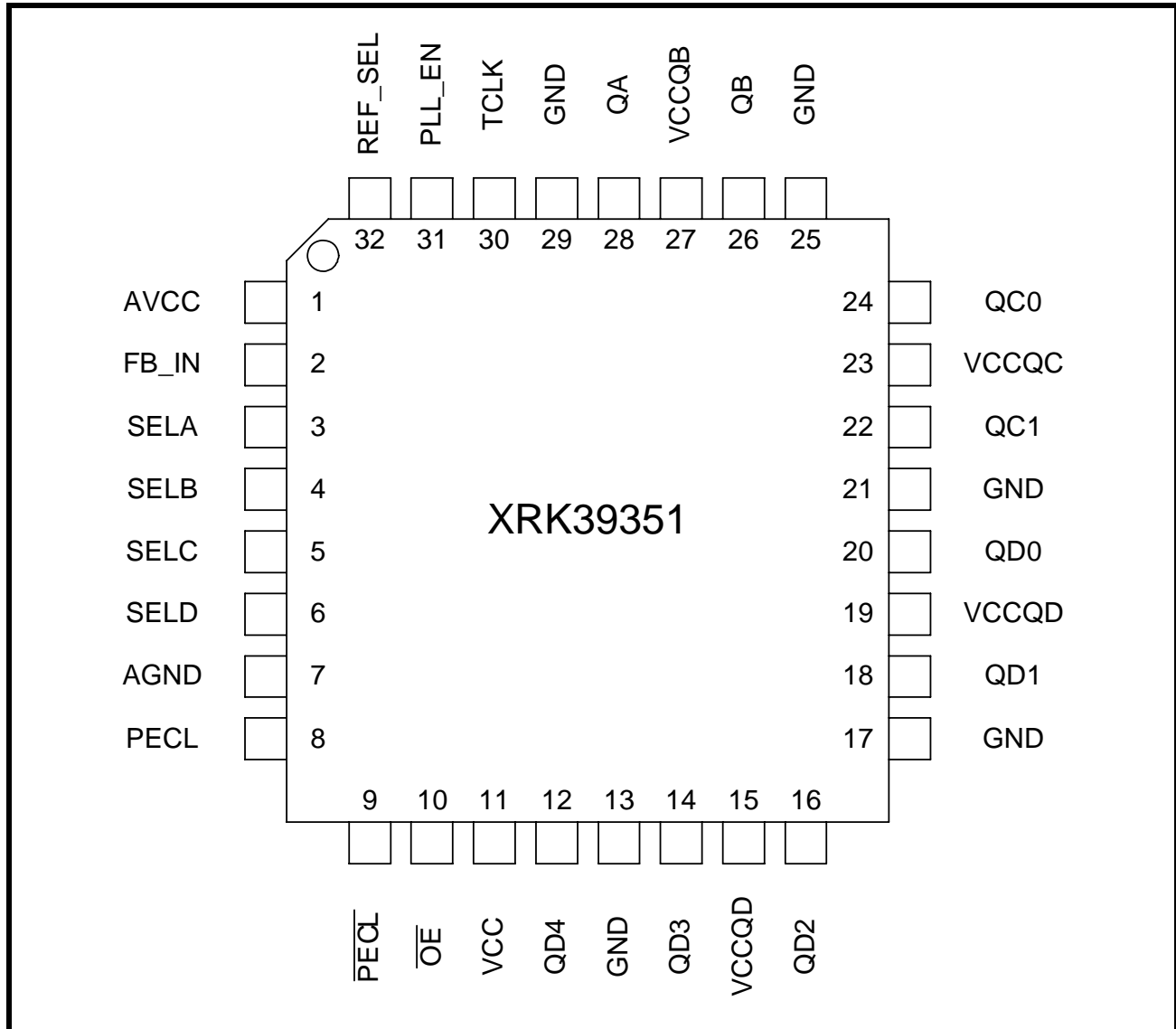
- 9 LVCMOS Outputs (4 banks)
- 25 - 200 MHz output frequency range
- Fully Integrated PLL
- 2.5V or 3.3V Operation
- Selectable reference clock input, LVCMOS or LVPECL
- 150ps max output to output skew
- Pin compatible with MPC9351
- Industrial temp range: -40°C to +85°C
- 32-Lead TQFP Packaging

**FIGURE 1. BLOCK DIAGRAM OF THE XRK39351**

**PRODUCT ORDERING INFORMATION**

PRODUCT NUMBER	PACKAGE TYPE	OPERATING TEMPERATURE RANGE
XRK39351IQ	32-Lead TQFP	-40°C to +85°C

FIGURE 2. PIN OUT OF THE XRK39351



**PIN DESCRIPTIONS**

NUMBER	NAME	TYPE		DESCRIPTION
1	AVCC	Power		Power supply for PLL
2	FB_IN	Input	pull-down	External PLL feedback clock input
3	SELA	Input	pull-down	Selects divider value for Bank A output
4	SELB	Input	pull-down	Selects divider value for Bank B output
5	SELC	Input	pull-down	Selects divider value for Bank C outputs
6	SELD	Input	pull-down	Selects divider value for Bank D outputs
7	AGND	Power		PLL ground
8	PECL	Input		LVPECL - pos differential reference clock
9	$\overline{\text{PECL}}$	Input		LVPECL - neg differential reference clock
10	OE	Input	pull-down	Output enable/disable and device reset
11	VCC	Power		Power supply for core, inputs and bank A output clock
12, 14, 16, 18, 20	QD[4:0]	Output		Bank D clock outputs
13, 17, 21, 25, 29	GND	Power		Ground
15, 19	VCCQD	Power		Power supply for bank D output clocks
20, 22	QC[1:0]	Output		Bank C clock outputs
23	VCCQC	Power		Power supply for bank C output clocks
26	QB	Output		Bank B clock output
27	VCCQB	Power		Power supply for bank B output clock
28	QA	Output		Bank A clock output
30	TCLK	Input	pull-down	LVC MOS reference clock input
31	PLL_EN	Input	pull-up	Selects PLL or PLL-bypass (test mode) operation
32	REF_SEL	Input	pull-down	Selects primary reference clock source

TABLE 1: CONTROL INPUT FUNCTION TABLE

PIN NAME	0	1	DEFAULT
REF_SEL	PECL clock inputs selected as reference	TCLK input selected as reference	0
PLL_EN	PLL is bypassed. Test Mode. TCLK reference source drives the divider select blocks	PLL enabled. Normal operation. VCO output drives the divider select blocks	1
SELA	Bank A divider = 2	Bank A divider = 4	0
SELB	Bank B divider = 4	Bank B divider = 8	0
SELC	Bank C divider = 4	Bank C divider = 8	0
SELD	Bank D divider = 4	Bank D divider = 8	0
OE	Outputs enabled	Outputs tri-stated, VCO running at minimum frequency	0

DC CHARACTERISTICS ( $V_{CC} = 3.3 \pm 5\%$ ,  $T_A = -40^\circ\text{C}$  TO  $+85^\circ\text{C}$ )

SYMBOL	CHARACTERISTICS	MIN	TYP	MAX	UNIT	CONDITION
$V_{CMR}^a$	PECL Clock inputs common mode range	1.2		$V_{CC}-0.9$	V	
$V_{PP}$	PECL Clock peak-to-peak input voltage	500		1000	mV	
$V_{IH}$	Input voltage high	2.0		$V_{CC}+0.3$	V	
$V_{IL}$	Input voltage low			0.8	V	
$V_{OH}$	Output High Voltage <sup>a</sup>	2.4			V	$I_{OH}=-24\text{mA}$
$V_{OL}$	Output Low Voltage <sup>a</sup>			0.55 0.30	V V	$I_{OL}=24\text{mA}$ $I_{OL}=12\text{mA}$
$Z_{OUT}$	Output Impedance		14-17		$\Omega$	
$I_{IN}$	Input leakage current			$\pm 150$	$\mu\text{A}$	$V_{IN}=V_{CC}$ or $V_{IN}=\text{GND}$
$I_{CC\_PLL}$	Maximum PLL supply current		3.0	5.0	mA	$AV_{CC}$ pin
$I_{CC}$	Maximum Quiescent supply current			4	mA	All $V_{CCQX}$ pins
$V_{TT}$	Output Termination Voltage		$V_{CC}\div 2$		V	

a.  $V_{CMR}$  is the cross point of the differential input signal.

AC CHARACTERISTICS ( $V_{CC} = 3.3 \pm 5\%$ ,  $T_A = -40^\circ\text{C}$  TO  $+85^\circ\text{C}$ )<sup>a</sup>

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
f <sub>VCO</sub>	VCO Frequency	200		400	MHz	
f <sub>ref</sub>	Input Reference Frequency	÷2 feedback ÷4 feedback ÷8 feedback PLL Bypass	100 50 25 2		200 100 50 300	MHz PLL_EN = 1 PLL_EN = 1 PLL_EN = 1 PLL_EN = 0
f <sub>MAX</sub>	Max Output Frequency	÷2 feedback ÷4 feedback ÷8 feedback	100 50 25		200 100 50	MHz
t <sub>ir</sub> /t <sub>if</sub>	Input Rise/Fall time			1.0	ns	0.8 to 2.0V
f <sub>refDC</sub>	Input Clock duty cycle	25		75	%	
t <sub>pd</sub>	Propagation Delay - (SPO, Input clock to FB)					
	TCLK to FB_IN	-50		150	ps	PLL Locked
	PECL to FB_IN	-25		325	ps	PLL Locked
t <sub>skew</sub>	Output-to-Output Skew			150	ps	
t <sub>JIT(CC)</sub>	Cycle-to-Cycle Jitter (RMS)	÷4 feedback	10	22	ps	All outputs set to ÷4
t <sub>JIT(PER)</sub>	Period Jitter (RMS)	÷4 feedback	8	15	ps	All outputs set to ÷4
t <sub>JIT(I/O)</sub>	I/O Phase Jitter (RMS)		4 - 17		ps	
BW	PLL bandwidth	÷2 feedback ÷4 feedback ÷8 feedback		9.0-20.0 3.0-9.5 1.2-2.1	MHz MHz MHz	
DC	Output duty cycle	÷2 feedback ÷4 feedback ÷8 feedback	45 47.5 48.75	50 50 50	55 52.5 51.75	% % %
						100 - 200MHz 50 - 100MHz 25 - 50MHz
t <sub>LOCK</sub>	Maximum PLL Lock Time			1.0	ms	
t <sub>or</sub> /t <sub>of</sub>	Output Rise/Fall time		100	1000	ps	0.55 to 2.4V
t <sub>PLZ,HZ</sub>	Output Disable Time			10	ns	
t <sub>PHZ,LZ</sub>	Output Enable Time			10	ns	

a. AC characteristics apply for parallel output termination of 50Ω to V<sub>TT</sub>.

DC CHARACTERISTICS ( $V_{CC} = 2.5 \pm 5\%$ ,  $T_A = -40^{\circ}\text{C}$  TO  $+85^{\circ}\text{C}$ )

SYMBOL	CHARACTERISTICS	MIN	TYP	MAX	UNIT	CONDITION
$V_{CMR}^a$	PECL Clock inputs common mode range	1.2		$V_{CC}-0.6$	V	
$V_{PP}$	PECL Clock peak-to-peak input voltage	500		1000	mV	
$V_{IH}$	Input voltage high	1.7		$V_{CC}+0.3$	V	
$V_{IL}$	Input voltage low			0.7	V	
$V_{OH}$	Output High Voltage	1.8			V	$I_{OH} = -15\text{mA}$
$V_{OL}$	Output Low Voltage			0.6	V	$I_{OL} = 15\text{mA}$
$Z_{OUT}$	Output Impedance		17-20		$\Omega$	
$I_{IN}$	Input leakage current			$\pm 150$	$\mu\text{A}$	$V_{IN} = V_{CC}$ or $V_{IN} = \text{GND}$
$I_{CC\_PLL}$	Maximum PLL supply current		3.0	5.0	mA	$AV_{CC}$ pin
$I_{CC}$	Maximum Quiescent supply current			1	mA	All $V_{CCQX}$ pins
$V_{TT}$	Output Termination Voltage		$V_{CC} \div 2$		V	

a.  $V_{CMR}$  is the cross point of the differential input signal.

AC CHARACTERISTICS ( $V_{CC} = 2.5 \pm 5\%$ ,  $T_A = -40^\circ\text{C}$  TO  $+85^\circ\text{C}$ )<sup>a</sup>

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
f <sub>VCO</sub>	VCO Frequency	200		400	MHz	
f <sub>ref</sub>	Input Reference Frequency	÷2 feedback ÷4 feedback ÷8 feedback PLL Bypass	100 50 25		200 100 50	MHz PLL_EN = 1 PLL_EN = 1 PLL_EN = 1 PLL_EN = 0
f <sub>MAX</sub>	Max Output Frequency	÷2 feedback ÷4 feedback ÷8 feedback	100 50 25		200 100 50	MHz
t <sub>ir</sub> /t <sub>if</sub>	Input Rise/Fall time			1.0	ns	0.7 to 1.7V
f <sub>refDC</sub>	Input Clock duty cycle	25		75	%	
t <sub>pd</sub>	Propagation Delay - (SPO, Input clock to FB)	TCLK to FB_IN PECL to FB_IN	-100 0		100 300	ps ps PLL Locked PLL Locked
t <sub>skew</sub>	Output-to-Output Skew			150	ps	
t <sub>JIT(CC)</sub>	Cycle-to-Cycle Jitter (RMS)	÷4 feedback		10	22	ps All outputs set to ÷4
t <sub>JIT(PER)</sub>	Period Jitter (RMS)	÷4 feedback		8	15	ps All outputs set to ÷4
t <sub>JIT(I/O)</sub>	I/O Phase Jitter (RMS)			6 - 25		ps
BW	PLL bandwidth	÷2 feedback ÷4 feedback ÷8 feedback		4.0-15.0 2.0-7.0 0.7-2.0		MHz MHz MHz
DC	Output duty cycle	÷2 feedback ÷4 feedback ÷8 feedback	45 47.5 48.75	50 50 50	55 52.5 51.75	% % % 100 - 200MHz 50 - 100MHz 25 - 50MHz
t <sub>LOCK</sub>	Maximum PLL Lock Time				1.0	ms
t <sub>or</sub> /t <sub>of</sub>	Output Rise/Fall time		100		1000	ps 0.55 to 2.4V
t <sub>PLZ,HZ</sub>	Output Disable Time				12	ns
t <sub>PHZ,LZ</sub>	Output Enable Time				12	ns

a. AC characteristics apply for parallel output termination of 50Ω to V<sub>TT</sub>.

**ABSOLUTE MAXIMUM RATINGS<sup>a</sup>**

SYMBOL	CHARACTERISTICS	MIN	MAX	UNIT	CONDITION
V <sub>CC</sub>	Supply Voltage	-0.3	4.6	V	
V <sub>IN</sub>	DC Input Voltage	-0.3	V <sub>CC</sub> +0.3	V	
V <sub>OUT</sub>	DC Output Voltage	-0.3	V <sub>CC</sub> +0.3	V	
I <sub>IN</sub>	DC Input Current		±20	mA	
I <sub>OUT</sub>	DC Output Current		±50	mA	
T <sub>S</sub>	Storage Temperature	-55	150	°C	

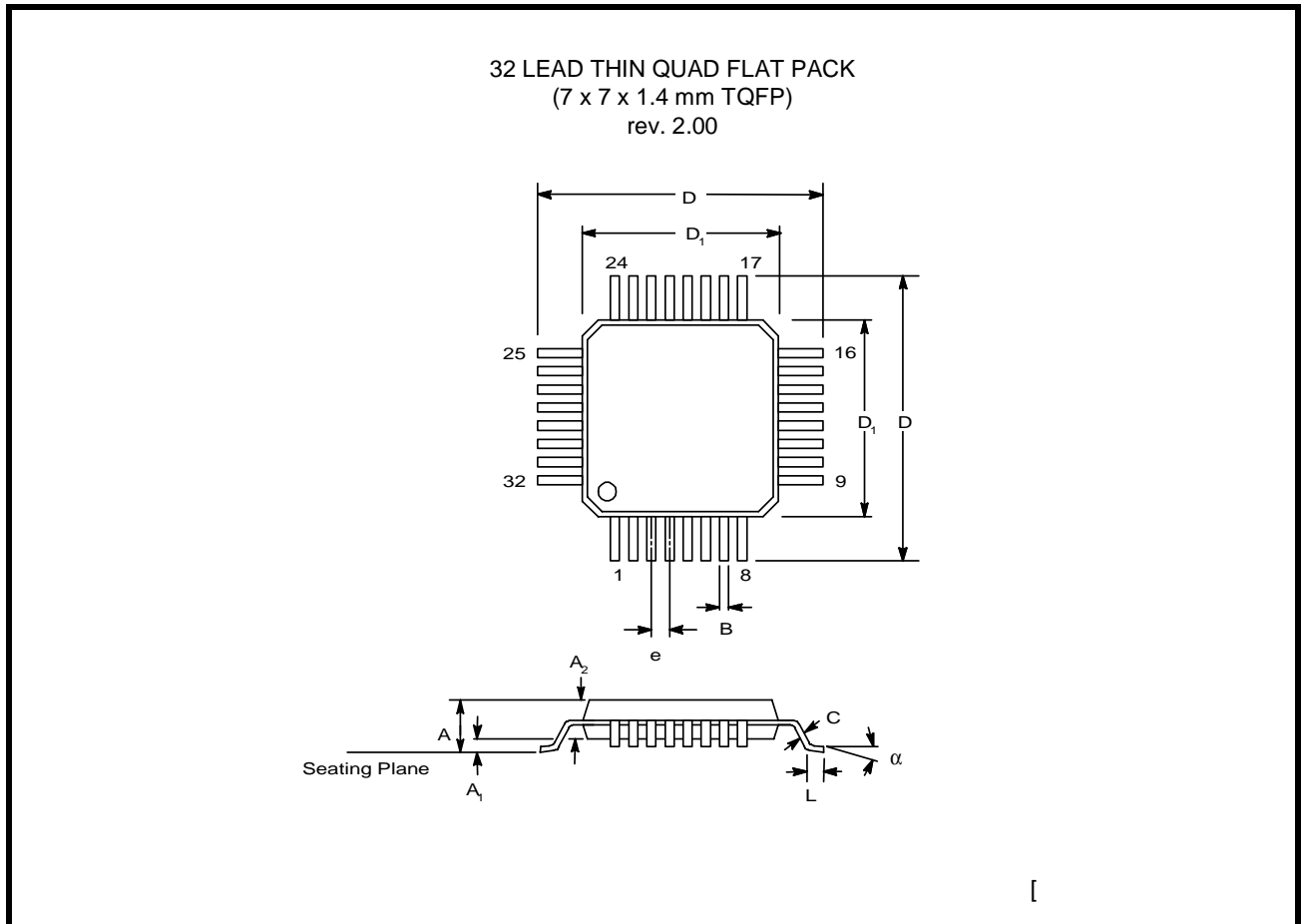
a. Absolute maximum continuous ratings are those maximum values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability.

**GENERAL SPECIFICATIONS**

SYMBOL	CHARACTERISTICS	MIN	TYP	MAX	UNIT	CONDITION
V <sub>TT</sub>	Output termination voltage		V <sub>CC</sub> ÷2		V	
MM	ESD Protection (Machine model)	200			V	
HBM	ESD Protection (Human body model)	2000			V	
LU	Latch-up immunity	200			mA	
C <sub>IN</sub>	Input Capacitance		4.0		pF	Inputs
θ <sub>JA</sub>	Thermal resistance junction to ambient JESD 51-3, single layer test board			62.0	°C/W	Natural convection
	JESD 51-6, multi layer test board			47	°C/W	
θ <sub>JC</sub>	Thermal resistance junction to case			14	°C/W	
	Operating junction temperature			115	°C	



**PACKAGE DIMENSIONS**



Note: The control dimension is the millimeter column

SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.055	0.063	1.40	1.60
A <sub>1</sub>	0.002	0.006	0.05	0.15
A <sub>2</sub>	0.053	0.057	1.35	1.45
B	0.012	0.018	0.30	0.45
C	0.004	0.008	0.09	0.20
D	0.346	0.362	8.80	9.20
D <sub>1</sub>	0.272	0.280	6.90	7.10
e	0.0315 BSC		0.80 BSC	
L	0.018	0.030	0.45	0.75
α	0°	7°	0°	7°

