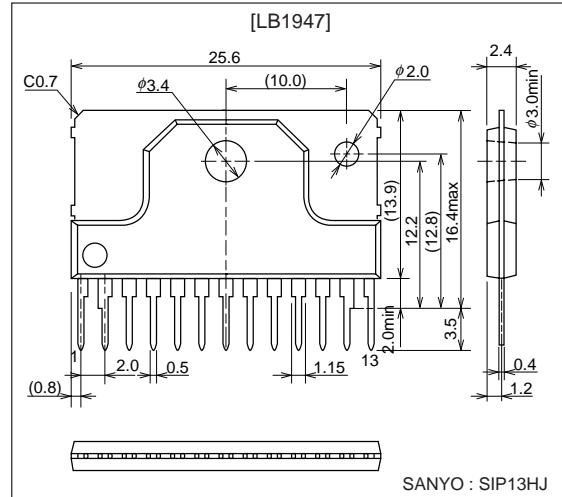


**LB1947****PWM Current Control Type DC Motor Driver****Preliminary****Features**

- PWM current control (fixed OFF time)
- Selectable current decay pattern (FAST, SLOW, and MIX DECAY modes)
- Simultaneous ON prevention function (feedthrough current prevention)
- Built-in thermal shutdown circuit
- Built-in noise canceler

**Package Dimensions**

unit: mm

**3249-SIP13HJ****Specifications****Absolute Maximum Ratings at Ta = 25°C**

Parameter	Symbol	Conditions	Ratings	Unit
Maximum motor supply voltage	V <sub>BB</sub> max		50	V
Output peak current	I <sub>OPEAK</sub>	tw ≤ 20 μs	2.25	A
Output continuous current	I <sub>O</sub> max		2.0	A
Logic supply voltage	V <sub>CC</sub> max		7.0	V
Logic input voltage range	V <sub>IN</sub>		-0.3 to V <sub>CC</sub>	V
Emitter output voltage	V <sub>E</sub> max		1.1	V
Reference voltage	V <sub>REF</sub>		-0.3 to V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>		-20 to +85	°C
Storage temperature	T <sub>stg</sub>		-55 to +150	°C
Allowable power dissipation	P <sub>d</sub> max	Ta = 25°C	1.6	W

**Allowable Operating Ranges at Ta = 25°C**

Parameter	Symbol	Conditions	Ratings	Unit
Motor supply voltage	V <sub>BB</sub>		10 to 45	V
Logic supply voltage	V <sub>CC</sub>		4.75 to 5.25	V
Reference voltage	V <sub>REF</sub>		0 to (V <sub>CC</sub> -2)	V

■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

# LB1947

## Electrical Characteristics at Ta = 25°C, VBB = 42V, VCC = 5V, VREF = 1.0V

Parameter	Symbol	Conditions	Ratings			Unit	
			min	typ	max		
Output Block	Output stage supply current	I <sub>BB ON</sub>	No-load state	0.4	0.6	1.0	mA
		I <sub>BB BR</sub>	No-load state	0.2	0.4	0.8	mA
		I <sub>BB OFF</sub>	No-load state	0.2	0.4	0.8	mA
		I <sub>BBWT</sub>	No-load state			0.1	mA
	Output saturation voltage	V <sub>osat 1</sub>	I <sub>o</sub> = +1.0A sink		1.2	1.5	V
		V <sub>osat 2</sub>	I <sub>o</sub> = +2.0A sink		1.6	1.9	V
		V <sub>osat 3</sub>	I <sub>o</sub> = -1.0A source		1.8	2.2	V
		V <sub>osat 4</sub>	I <sub>o</sub> = -2.0A source		2.1	2.4	V
	Output leak current	I <sub>o1(leak)</sub>	V <sub>o</sub> = V <sub>BB</sub> sink			50	μA
		I <sub>o2(leak)</sub>	V <sub>o</sub> = 0V source	-50			μA
Output sustain voltage	V <sub>SUS</sub>	L = 3.9 mH I <sub>o</sub> = 2.0A *1	50			V	
Logic Block	Logic supply current	I <sub>CC ON</sub>	IN1 : High, IN2 : Low, ST = High	11	16	21	mA
		I <sub>CC BR</sub>	IN1 : Low, IN2 : High, ST = High	11	16	21	mA
		I <sub>CC OFF</sub>	IN1 : Low, IN2 : Low, ST = High	11	16	21	mA
		I <sub>CCWT</sub>	ST : Low	1.0	2	3.0	mA
	Input voltage	V <sub>INH</sub>		2			V
		V <sub>INL</sub>				0.8	V
	Input current	I <sub>INH</sub>	V <sub>IN</sub> = 5V	60	90	120	μA
		I <sub>INL</sub>	V <sub>IN</sub> = 0.8V	6	10	13	μA
	Sensing voltage	V <sub>E</sub>		0		1.1	V
	Sensing voltage 25H	V <sub>EH25</sub>	V <sub>I</sub> = High, V <sub>REF</sub> = 2.5V	0.970	1.0	1.030	V
	Sensing voltage 25L	V <sub>EL25</sub>	V <sub>I</sub> = Low, V <sub>REF</sub> = 2.5V	0.483	0.5	0.513	V
	Sensing voltage 10H	V <sub>EH25</sub>	V <sub>I</sub> = High, V <sub>REF</sub> = 1.0V	0.385	0.4	0.410	V
	Sensing voltage 10L	V <sub>EL25</sub>	V <sub>I</sub> = Low, V <sub>REF</sub> = 1.0V	0.190	0.2	0.210	V
	Sensing voltage 05H	V <sub>EH25</sub>	V <sub>I</sub> = High, V <sub>REF</sub> = 0.5V	0.190	0.2	0.210	V
	Sensing voltage 05L	V <sub>EL25</sub>	V <sub>I</sub> = Low, V <sub>REF</sub> = 0.5V	0.092	0.1	0.108	V
	Reference current	I <sub>ref</sub>	V <sub>ref</sub> = 1.0V	-0.5		0.5	μA
	CR pin current	I <sub>CR</sub>	CR = 1.0V	-1.56	-1.3	-1.04	mA
	MD pin voltage	V <sub>MDH</sub>		V <sub>CC</sub> -0.3			V
		V <sub>MDM</sub>		0.3V <sub>CC</sub>		V <sub>CC</sub> -1.0	V
		V <sub>MDL</sub>				0.4	V
MD pin current	I <sub>MDH</sub>	MD = (V <sub>CC</sub> -0.5)V, CR = 1.0V	-1.0		1.0	μA	
	I <sub>MDL</sub>	MD = 0.4V, CR = 2.0V	-5.0			μA	
Thermal shutdown temperature	T <sub>SD</sub>			170		°C	

\*1: Guaranteed design

### Truth Table

IN 1	IN 2	ST	V <sub>I</sub>	MD	OUT	OUT-	Operating mode
H	L	H	H	L	H	L	Forward, 2/5 times, FAST
H	L	H	H	M	H	L	Forward, 2/5 times, MIX
H	L	H	H	H	H	L	Forward, 2/5 times, SLOW
H	L	H	L	L	H	L	Forward, 1/5 times, FAST
H	L	H	L	M	H	L	Forward, 1/5 times, MIX
H	L	H	L	H	H	L	Forward, 1/5 times, SLOW
H	H	H	H	L	L	H	Reverse, 2/5 times, FAST
H	H	H	H	M	L	H	Reverse, 2/5 times, MIX
H	H	H	H	H	L	H	Reverse, 2/5 times, SLOW
H	H	H	L	L	L	H	Reverse, 1/5 times, FAST
H	H	H	L	M	L	H	Reverse, 1/5 times, MIX
H	H	H	L	H	L	H	Reverse, 1/5 times, SLOW
L	H	H	H	L	L	L	Brake, 2/5 times, FAST
L	H	H	H	M	L	L	Brake, 2/5 times, MIX
L	H	H	L	L	L	L	Brake, 1/5 times, FAST
L	H	H	L	M	L	L	Brake, 1/5 times, MIX
L	H	H	X	H	L	L	Brake, no current limiting
L	L	H	X	X	OFF	OFF	Output OFF
X	X	L or OPEN	X	X	OFF	OFF	Standby mode (circuit OFF)

Except for MD pin, Low at input OPEN MD M: determined by external voltage

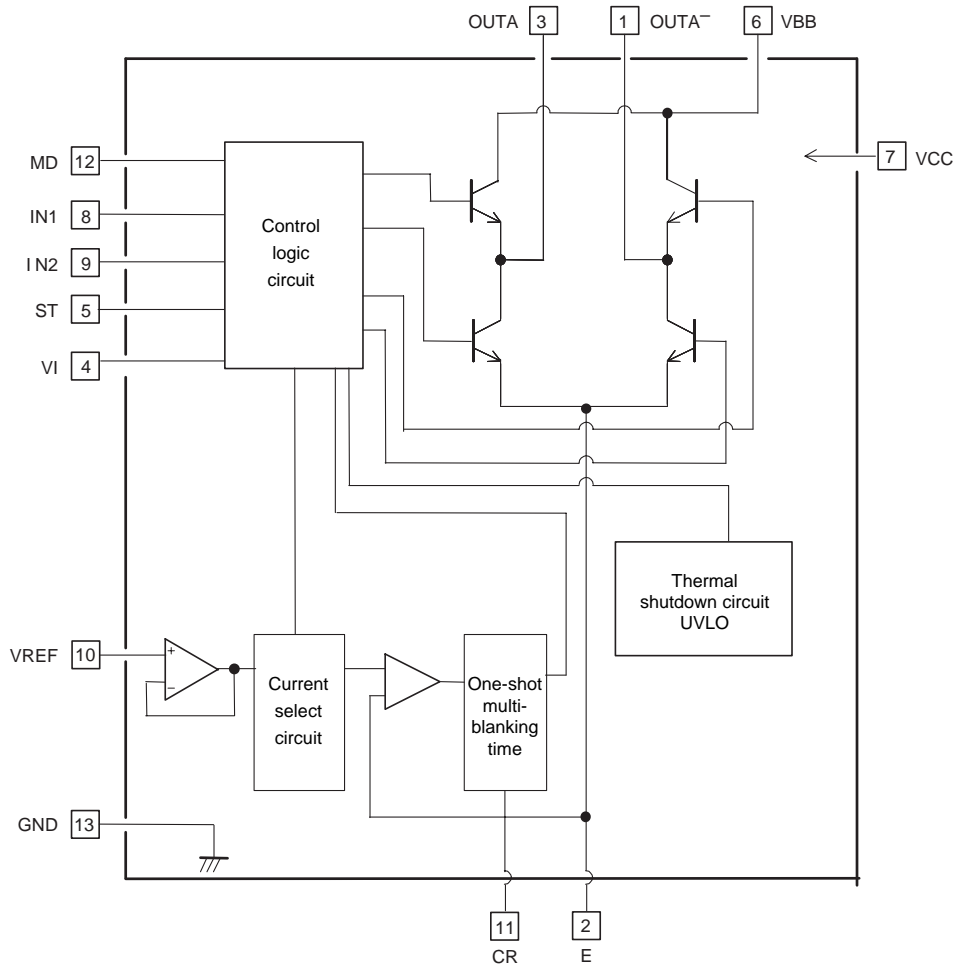
# LB1947

## Pin Description

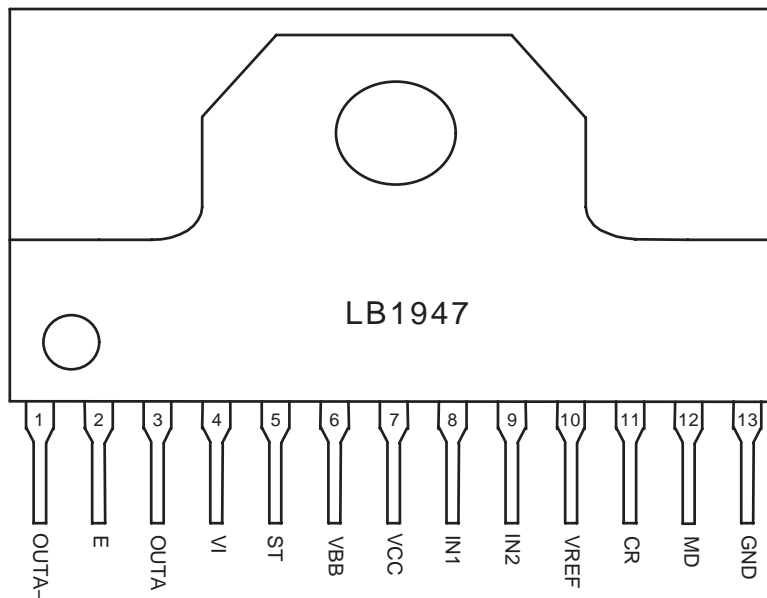
Pin number	Pin name	Equivalent circuit	Pin function
1 3	OUTA- OUTA		Output pin
2	E		Sense voltage control pin
4 5 8 9	VI ST IN1 IN2		<b>VI</b> High : sense voltage is 2/5 of $V_{REF}$ Low : sense voltage is 1/5 of $V_{REF}$  <b>ST</b> High : circuit operation ON Low : standby mode  <b>IN1</b> High : rotation mode Low : brake mode  <b>IN2</b> High : reverse mode Low : forward mode
6	VBB		Motor power supply voltage
7	VCC		Logic power supply voltage
10	VREF		Output current setting reference pin Setting range: 0 to ( $V_{CC}-2V$ )
11	CR		Oscillator with self-excitation
12	MD		Current attenuation switching pin Low : FAST DECAY High : SLOW DECAY M : MIX DECAY M is set by external power supply voltage. Range : 1.1 to 4.0V
13	GND		Ground pin

# LB1947

## Block Diagram

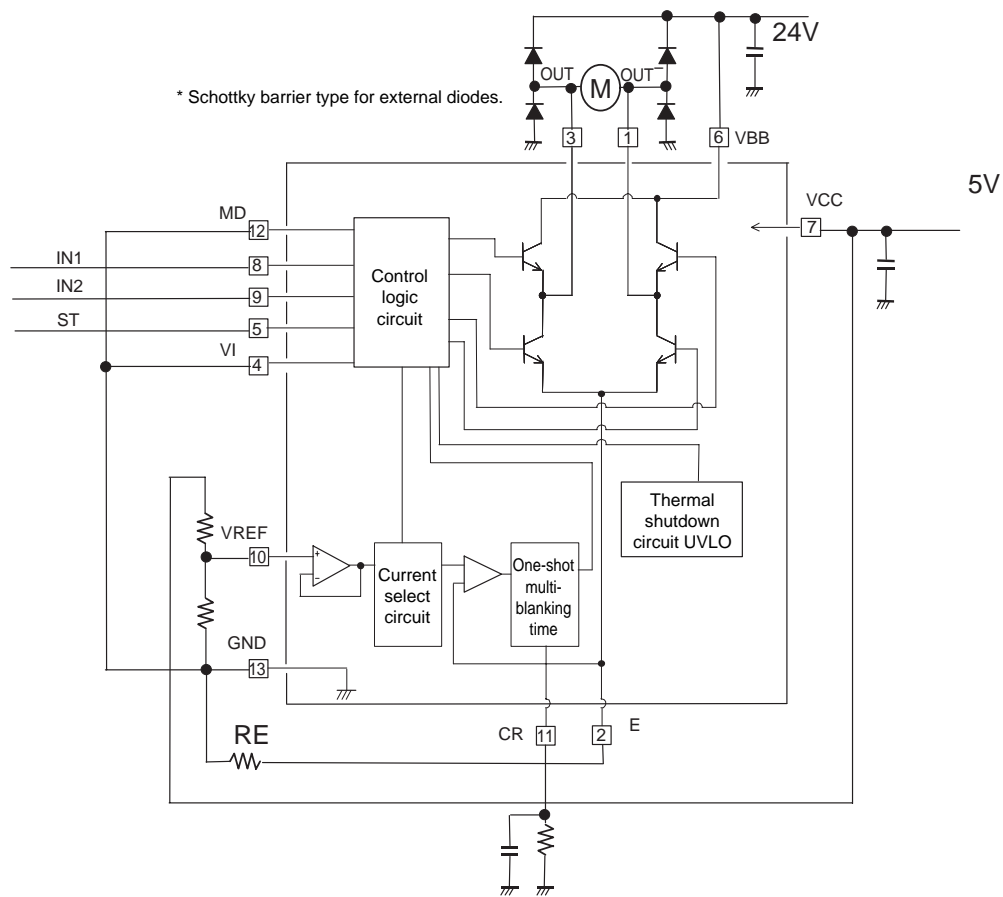


## Pin Assignment



Sample Application Circuits

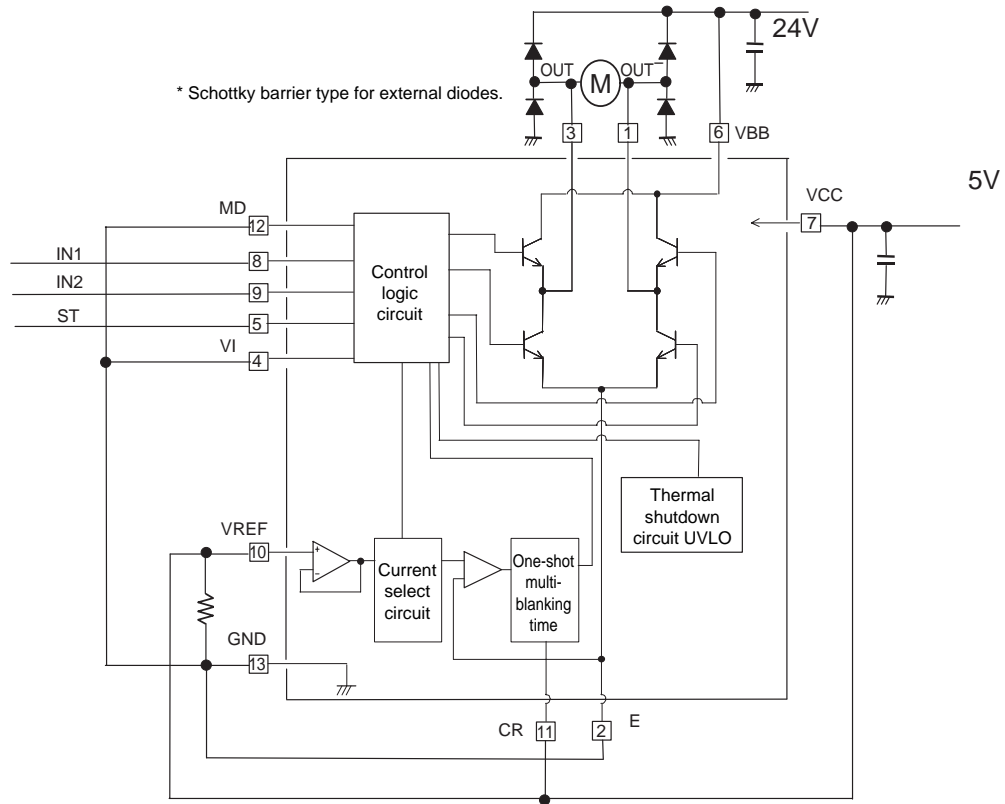
1. Forward/reverse motor with current limiter



Limiter current setting method  $I = V_{REF} / (5 \times RE)$

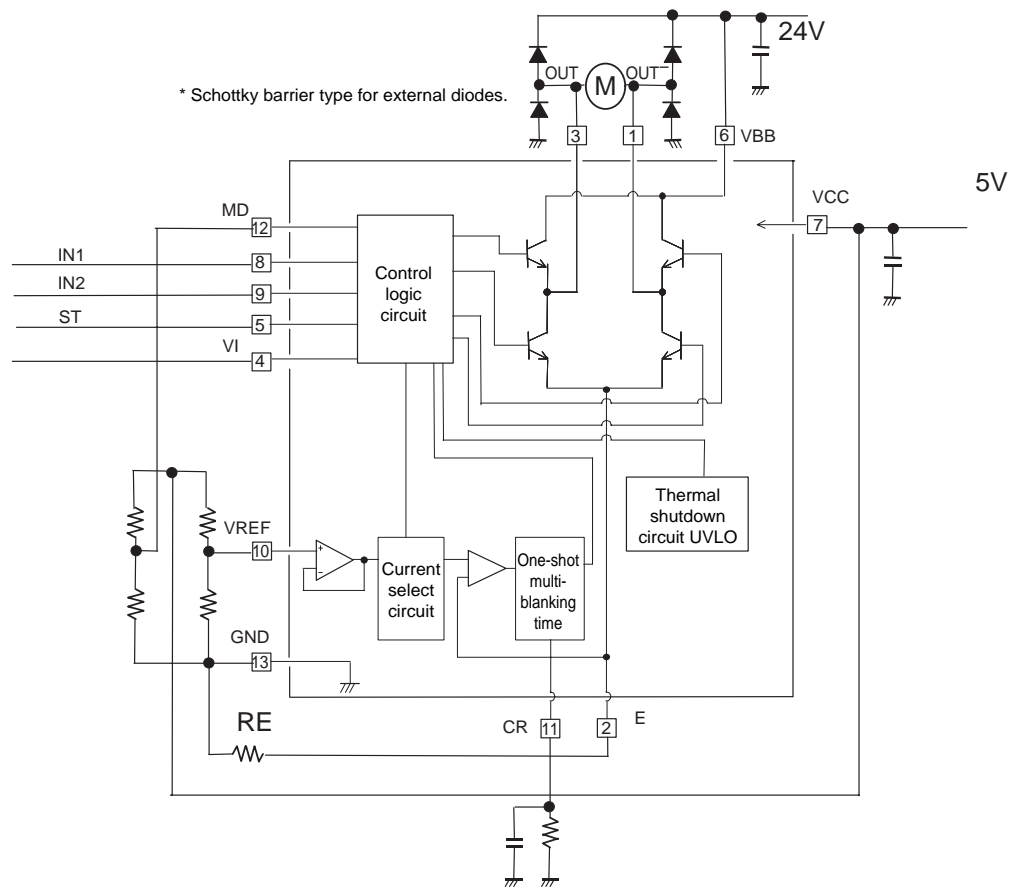
IN1	IN2	ST	OUT	OUT-	Mode
H	H	H	L	H	Reverse
H	L	H	H	L	Forward
L	H	H	L	L	Brake
L	L	H	OFF	OFF	Output OFF
-	-	L	OFF	OFF	Standby mode

2. Forward/reverse motor



IN1	IN2	ST	OUT	OUT-	Mode
H	H	H	L	H	Reverse
H	L	H	H	L	Forward
L	H	H	L	L	Brake
L	L	H	OFF	OFF	Output OFF
-	-	L	OFF	OFF	Standby mode

3. PWM current control forward/reverse motor (MIX DECAY)



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of August, 1999. Specifications and information herein are subject to change without notice.