

Broadcast Video Owner's Manual

1st Edition, Spring 2004



Broadcast Video Owner's Manual

Spring 2004
1st Edition

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL 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 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 to the user.

2. A critical component is 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.

Table of contents

Chapter 1 - Introduction to broadcast video

1.1 Introduction	1-1
1.2 Standards organizations	1-1
1.3 Digital video signals	1-1
1.4 Digital video data structures	1-2
1.4.1 Timing reference signals (TRS)	1-4
1.4.2 Serial data representation — standard-definition	1-4
1.4.3 Serial data representation — high-definition	1-5
1.4.4 Pathological data sequences	1-5
1.5 Serial digital interface electrical parameters	1-7
1.6 Serial digital interface mechanical parameters	1-7

Chapter 2 - System design elements

2.1 Power systems	2-1
2.1.1 Power and grounds	2-1
2.1.2 PCB layout for serial digital video systems	2-3
2.1.3 Voltage regulators and local supply regulation	2-8
2.1.4 Planes, pads, and vias	2-8
2.2 Transmission line systems	2-9
2.2.1 Network topologies	2-9
2.2.2 Differential lines	2-11
2.2.3 Termination	2-16
2.2.4 System-to-system transmission	2-19
2.3 Signal path inputs and outputs	2-25
2.3.1 Network component and layout guidelines	2-25
2.3.2 Bipolar cable driver inputs — CLC005, CLC006, and CLC007	2-26
2.3.3 Cable driver outputs — voltage mode	2-28
2.3.4 Cable driver outputs — current mode	2-30
2.3.5 ECL-compatible inputs	2-31
2.3.6 ECL-compatible outputs	2-31
2.3.7 CLC011 CMOS outputs	2-33
2.3.8 CLC012 and CLC014 Adaptive cable equalizer data inputs	2-33

Chapter 3 - Serial digital video integrated circuits

3.1 Adaptive cable equalizers	3-2
3.1.1 Basic operation	3-2
3.1.2 CLC014	3-3
3.1.3 CLC012	3-4
3.1.4 Typical application	3-4
3.1.5 Equalizer application tips	3-6
3.2 Reclockers	3-9
3.2.1 Basic operation	3-9
3.2.2 CLC016	3-10
3.2.3 Typical application	3-10
3.2.4 Reclocker application tips	3-12
3.3 Cable drivers	3-12
3.3.1 CLC001	3-12
3.3.2 Typical application	3-13
3.3.3 CLC005/CLC006/CLC007	3-13
3.3.4 Cable driver application tips	3-14
3.4 Serializers	3-15
3.4.1 Basic operation	3-15
3.4.2 CLC020	3-17
3.4.3 CLC021	3-17
3.4.4 Typical application	3-17
3.4.5 CLC020/CLC021 application tips	3-19
3.4.6 CLC030	3-19
3.4.7 Typical application	3-19
3.4.8 CLC030 application tips	3-20
3.5 Deserializers	3-20
3.5.1 Basic operation	3-20
3.5.2 CLC011	3-22
3.5.3 Typical application	3-22
3.5.4 CLC011 application tips	3-22
3.5.5 CLC031	3-22
3.5.6 Typical application	3-22
3.5.7 CLC031 application tips	3-23
3.6 Crosspoint switches	3-23
3.6.1 Basic operation	3-23
3.6.2 CLC018	3-24

Table of contents

Chapter 4 - System testing	
4.1 Digital video system testing	4-1
4.1.1 Test equipment	4-1
4.1.2 Signal generation	4-1
4.1.3 Signal and data analysis	4-1
4.1.4 Eye pattern testing	4-2
4.1.5 Digital stress testing	4-3
4.1.6 The SDI check field	4-3
4.1.7 EDH and CRC error testing	4-4
4.1.8 Jitter testing	4-4
4.2 The role of built-in self-test in SDV devices and systems	4-4
4.2.1 Digital video data basics	4-5
4.2.2 Device BIST architecture	4-6
4.2.3 BIST and TPG operation	4-7
4.3 Using BIST at the system level	4-8
4.3.1 Conclusions	4-11

Chapter 5 - SDV evaluation boards	
5.1 SDV evaluation/demo boards	5-1
5.2 Adaptive cable equalizer evaluation boards	5-2
5.2.1 SD012EVK and SD014EVK — overview	5-2
5.3 Cable driver evaluation boards	5-3
5.3.1 SD001EVK/SD005EVK/SD006EVK/SD007EVK — overviews	5-3
5.4 SMPTE 295 serial digital video receiver (equalizer, retimer and decoder, and cable driver)	5-4
5.4.1 SD901EVK — overview	5-4
5.5 SD serializers	5-5
5.5.1 SD020EVK — overview	5-5
5.5.2 SD021-5EVK and SD021-3EVK — overview	5-5
5.6 SD/HD serializer and deserializers	5-6
5.6.1 SD130EVK/SD131EVK — overview	5-6
5.6.2 SD130EVK — CLC030 serializer	5-6
5.6.3 SD131EVK — CLC031 deserializer	5-7

Chapter 6 - RAPIDESIGNER slide rule	
6.1 RAPIDESIGNER slide rule	6-1

Bibliography	
Books and publications	B-1
Standards	B-2
Useful websites	B-3

Glossary	
Glossary	G-1