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Wireless Access Method and Physical Specification

Title: **Comparative Study of Commercial LEDs and PINs for Wireless LANs**

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Abstract: This paper presents the available devices (LEDS and PINS) from several manufacurers. The study has been made with a database from 40 manufactures and it include 660 light emitting diodes (LEDS), 439 pin-photodiodes (PIN) and 165 laser diodes (LD). This database will be presented in the next meeting. The most useful LEDs for wireless LANs are few. Only four manufacturers present LEDS with rise and fall times less than 10 ns and radiant power greater than 10 mW. Large and fast photodiodes (active area greater than 100 mm^2) are manufacured only by two.

Introduction

This paper presents the avalaible optolectronic components in the market and some statistics for them. This work has been made using commercial databooks from several manufacturers. We designed a database for IREDs, PINs and LDs. The database was called COMP1. This program manages the information from databooks. For example, if rise time is not in databook this field in database is 0.

We used databooks from 40 diferent manufacturers and worked with 660 IREDs, 439 PINs and 165 LDs. Table 1 presents the manufacturers used and the number of IREDs, PINs and LDs from each in COMP1.

Although we have introduced data for LDs, we can avoid them for this statistic because critical parameters for wireless LANS are for IREDs and PINs.

IREDs

Adequate LEDs for IR wireless systems are those who have high optical output power and minimum rise and fall time. These are requieres for high bit rate (2 - 10 Mbps).

Figure 1 shows IREDs clasified in function of their optical power and rise time. Three groups have been made. First is for IREDs with optical output power less than 1 mW (177 of 533). Second for

MANUFACTURER	IRED	PIN	LD
ABB HAFO	22	0	0
AME	0	10	0
ANTEL OPTRONICS	0	13	0
BT&D	0	5	1
CENTRONIC	0	34	0
EG&G VACTEC	43	108	0
EPITAXX	0	10	0
EVERLIGHT	0	2	0
FUJITSU	3	5	1
GERMANIUM POWER DEVICES	0	28	0
HAMAMATSU	24	32	6
HARRIS	21	0	0
HEWLETT PACKARD	2	0	0
HIRSCHMANN	4	1	0
HITACHI	31	4	43
HONEYWELL	34	8	0
MITSUBISHI	2	1	0
MORIRICA	0	8	0
MOTOROLA	5	3	0
NATIONAL SEMICONDUCTOR	47	0	0

MANUFACTURER	IRED	PIN	LD
NEC	26	11	45
OKI	2	0	6
OPTEK	67	12	0
OPTO DIODE CORP.	42	0	0
PHILIPS	20	6	3
PLESSEY	0	4	0
RCA	0	27	21
SEMICOA OPTOELECTRONICS	0	5	0
SHARP	12	6	25
SHIMADZU	0	3	0
SIEMENS	60	25	6
SILICON DETECTOR CORP.	0	5	0
STANLEY ELECTRIC CO.	38	1	0
TELEFUNKEN	51	32	0
TEXAS INSTRUMENT	8	3	0
THOMSON HYBRIDES	0	1	4
THREE-FIVE SEMICONDUCTOR	46	0	0
TOSHIBA	22	6	4
TRW	25	2	0
UNITED DETECTOR TECHNOLOG	0	33	0

Table 1. Manufacturers used in COM1 program and the number of IREDs, PINs and LDs from each.

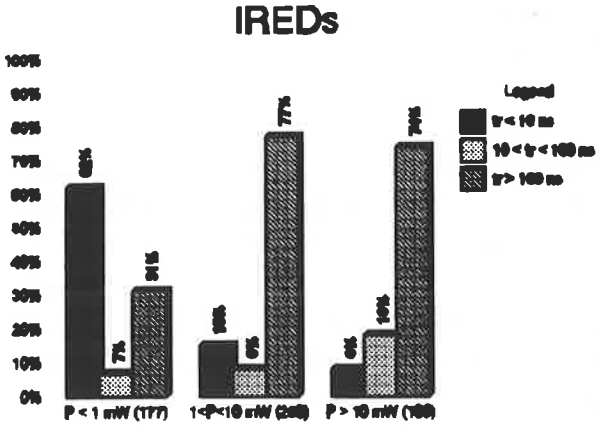

Fig 1. IREDs from COMP1 program in function of emitted power and rise time.

power between 1 and 10 mW (250). Last, for IREDs with power greater than 10 mW (106). Subgroups are for three rise time categories. These are for rise time less than 10 ns, between 10 and 100 ns, and greater than 100 ns respectively.

IREDs with optical output power less than 1 mW are adequate for fiber optic systems. When the power is between 1 and 10 mW the device can be used in wireless systems (using arrays or lenses, for example). The most usefull diodes for wireless communications are those who can radiate power greater than 10 mW.

In the case of rise time, we can see that better devices (tr < 10 ns) are a few in front of slow devices (tr > 100 ns) for each power range. When requiered power is greater than 10 mW and rise time less than 10 ns only have 10 devices (all of them from HITACHI, FUJITSU and STANLEY ELECTRIC). Table 2 presents IREDs with power greater than 5 mW and rise time less than 10 ns.

We can conclude that for fast wireless systems there are some IREDs availables. But they are few. With them or using arrays it is possible to get the required power with fast response. However, by now, a few manufacturers preent high power and fast IREDs.

PINs

In the case of PIN photodiodes there are a lot of them with rise time less than 10 ns. Figure 2 shows PINs with active areas less than 10 mm^2 (145 of 210), between 10 and 100 mm^2 (48), and grater than 100 mm^2 (17) for three rise time ranges. Active area can be a desig parameter in wireless system if we want avoid aditional optics. The study shows that other requiered parameters as NEP, dark current or capacitance, can be found for each application.

Table 4 presents a list of PINs with active area greater than 100 mm^2 and rise time less than 10

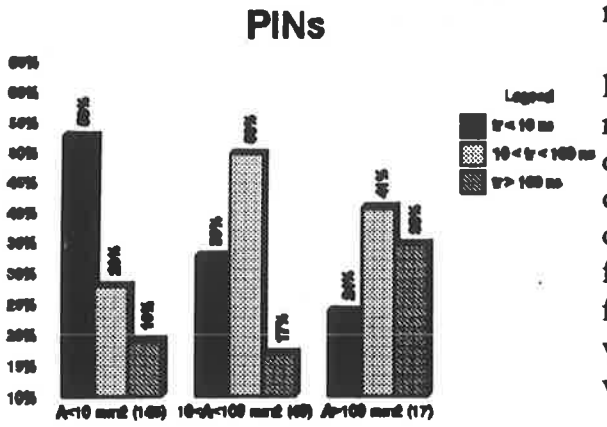

Fig 2. PINS from WINS1 program in function of active area and rise time.

ns.

Again only a few manufacturers have fast and large area photodiodes as in the case of IREDs. The reason is because most manufacturers make devices oriented to fiber optic systems not for wireless communication systems. Other way to find optoelectronic devices for wireless systems is in the field of remote control systems. The devices adequates for them are slow (t_r > 300 ns). As in the IREDs case we can conclude that there are devices usefull for wireless communication systems, but they are a few.

References

Data books from manufacturers listed in Table I.

Infrared Emitting Diodes (WINS)

Manufacturer	Code	Package	IF(mA)	Ú1/2	tr(ns)	tf (ns)	e(µW)
FUJITSU	FED086K1WA	TO-18	150	5	10	10	10000
HAMAMATSU	L3989		70	0	10	10	8000
HITACHI	HE7601SG		250	50	10	10	30000
HITACHI	HE8404SG		250	50	10	10	40000
HITACHI	HE8811		200	60	5	7	30000
HITACHI	HE8812SG		250	50	10	10	40000
STANLEY ELECTRIC CO.	DN106	TO-18	100	4	10	10	7000
STANLEY ELECTRIC CO.	DN202	TO-18	100	20	10	10	8000
STANLEY ELECTRIC CO.	DN304	TO-18	100	17	10	10	15000
STANLEY ELECTRIC CO.	DN305	TO-18	100	8	10	10	12000
STANLEY ELECTRIC CO.	DN319	TO-18	100	15	10	10	8000
STANLEY ELECTRIC CO.	DN501	TO-18	100	22	10	10	10000
STANLEY ELECTRIC CO.	DN504	TO-18	100	40	10	10	12000
STANLEY ELECTRIC CO.	DN505	TO-18	100	15	10	10	12000

Table 2. IREDS from COMP1 program with t_r < 10 ns and Optical Power > 5 mW.

PIN Photodiodes (WINS)

Manufacturer	Code	Package	A(mm2)	Ú1/2	tr(ns)	C (pF)	Id(nA)
CENTRONIC	OSD100-2		100.00	0	10	150	800
CENTRONIC	OSD100-3		100.00	0	10	150	800
CENTRONIC	OSD200-2		200.00	0	10	250	1800
CENTRONIC	OSD200-3		200.00	0	10	250	1800
CENTRONIC	OSD300-2		300.00	0	10	400	3000
CENTRONIC	OSD300-3		300.00	0	10	400	3000
RCA	C30846		100.00	36	8	22	500

Table 3. PINs from COMP1 program with t_r < 10 ns A_R > 100 mm².