VTTA-3B

EG&G VACTEC

OPTOELECTRONICS

PHOTOTRANSISTORS VTT
PHOTODARLINGTONS VTA
CHIPS VTA-C/VTT-C
MATCHED LED-TRANSISTORS VTM

10900 PAGE BLVD. ST. LOUIS, MO. 63132 USA PHONE 314-423-4900 TWX 910-764-0811

FEATURES

- *6 standard chips*
- *16 standard packages in hermetic and low cost epoxy*
- *end viewing and side viewing*
- *graded sensitivity*
- *low leakage*

PRODUCT DESCRIPTION

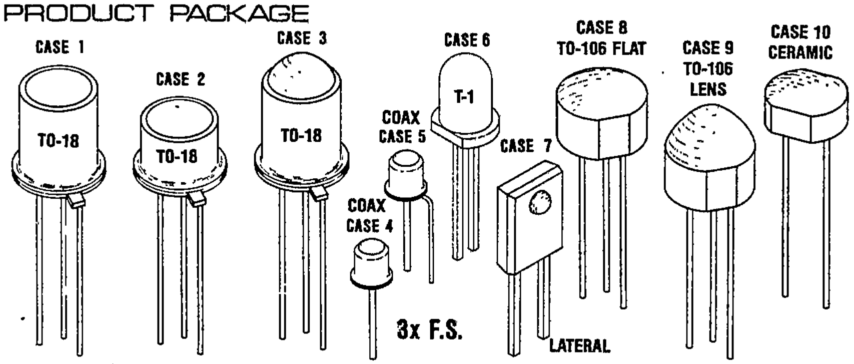
This series of phototransistors and photodarlingtons consists of six standard chips in 16 different cases to provide a broad range of devices and characteristics. End viewing and side viewing (lateral) devices are included. All chips are planar, epitaxial, fully passivated silicon NPN devices and are available for customer mounting.

A series of matched GaAs LED-phototransistors and photodarlingtons providing guaranteed minimum characteristics are listed in this bulletin.

ABSOLUTE MAXIMUM RATINGS

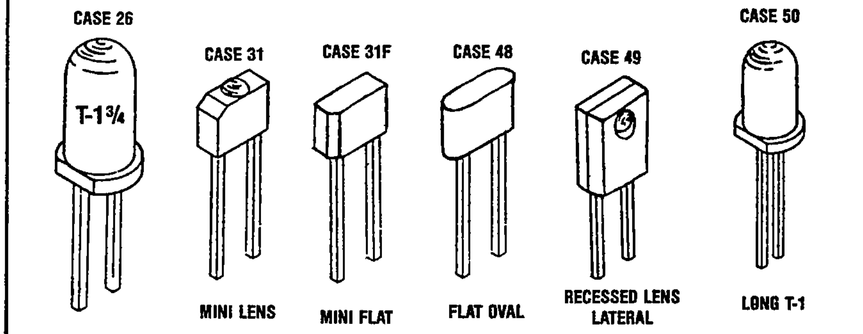
PARAMETER	SYMBOL	TO-18	COAX	CERAMIC	MOLDED	UNITS
MAXIMUM CONTINUOUS POWER DISSIPATION	P_D	250	50	100	50	mW
(Derate above 25 C)		2.5	0.5	1.67	0.67	mW/ C
MAXIMUM CURRENT						
LED	I_F	—	—	—	50	mA
(Derate above 25 C)		—	—	—	0.55	mA/ C
25A/25T CHIP	I_C	50	25	25	25	mA
40T CHIP	I_C	—	—	—	25	mA
50A/50T CHIP	I_C	200	—	50	—	mA
60T CHIP	I_C	200	—	—	—	mA
TEMPERATURE RANGE						
OPERATING	T_A	+125	+125	+70	+85	C
STORAGE	T_S	-65+150	-65+150	-55+100	-40+100	C
LEAD SOLDERING TEMP (1.6 mm from case, 5 Sec Max)		260	260	260	230	C

PRODUCT PACKAGE



VTT PHOTOTRANSISTORS

PRODUCT PACKAGE



ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

PART NO.	CHIP TYPE	Light[1] Current I_C mA min	I_C mA max	Condition H fc	Condition V_{CE} Volts	Dark Current I_{CEO} (H=0) nA max	V_{CE} Volts	Collector Breakdown $V_{BR(CEO)}$ I_C=100 uA H=0 Volts, min	Emitter Breakdown $V_{BR(ECO)}$ I_E=100 uA H=0 Volts, min	Saturation Voltage $V_{CE(SAT)}$ I_C=1.0 mA H=400 fc Volts, max	Rise/Fall Time t_r, t_f I_C=1.0 mA R_L=100 usec, typ	Ang.[2] Resp. θ typ	CASE[3] STYLE	CASE NO.
PHOTOTRANSISTOR														
VTT1012	50T	0.2	0.6	100	5.0	25	20	50	6.0	0.40	3	35°	TO-18 FLAT WINDOW	1
VTT1011		0.4	1.2	100	5.0	25	20	40	6.0	0.40	5			
VTT1010		1.0	3.0	100	5.0	25	20	30	6.0	0.40	5			
VTT1013		2.5	10.0	100	5.0	25	10	20	4.0	0.40	8			
VTT1020	25T	0.075	0.20	100	5.0	10	20	50	6.0	0.25	1.5			
VTT1021		0.15	0.35	100	5.0	10	20	50	6.0	0.25	2			
VTT1022		0.30	0.75	100	5.0	10	20	40	6.0	0.25	3			
VTT1023		0.60	—	100	5.0	100	10	30	4.0	0.25	4			
VTT1031	60T	1.0	—	100	5.0	100	10	40	5.0	0.40	5	35°	TO-18 FLAT WINDOW	2
VTT1032		4.0	—	100	5.0	100	10	40	5.0	0.40	10			
VTT1033		8.0	—	100	5.0	100	10	40	5.0	0.40	15			
VTT1110	50T	1.0	3.0	100	5.0	25	20	50	6.0	0.40	3	15°	TO-18 LENSED	3
VTT1111		2.0	6.0	100	5.0	25	20	40	6.0	0.40	5			
VTT1112		4.0	10.0	100	5.0	25	20	30	6.0	0.40	5			
VTT1113		8.0	—	100	5.0	100	10	20	4.0	0.40	8			
VTT1114		15.0	—	100	5.0	100	10	20	4.0	0.40	8			
VTT1120	25T	0.25	0.75	100	5.0	10	20	50	6.0	0.25	1.5	6°		
VTT1121		0.65	1.50	100	5.0	10	20	50	6.0	0.25	2			
VTT1122		1.25	3.50	100	5.0	10	20	40	6.0	0.25	3			
VTT1123		3.0	—	100	5.0	100	10	30	4.0	0.25	4			
VTT1131	60T	1.0	—	20	5.0	100	10	40	5.0	0.40	5	10°		
VTT1132		4.0	—	20	5.0	100	10	40	5.0	0.40	10			
VTT1133		8.0	—	20	5.0	100	10	40	5.0	0.40	15			
VTT1211	40T	1.3	—	20	5.0	100	10	30	5.0	0.25	3	10°	MOLDED CLEAR EPOXY T-1¾	26
VTT1212		2.0	—	20	5.0	100	10	30	5.0	0.25	4			
VTT1213		2.7	—	20	5.0	100	10	30	5.0	0.25	5			
VTT1214		4.0	—	20	5.0	100	10	30	5.0	0.25	6			
VTT1221	25T	4.0	—	100	5.0	100	10	30	5.0	0.25	1.5	5°	MOLDED CLEAR EPOXY T-1¾	26
VTT1222		6.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT1223		8.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT1224		12.0	—	100	5.0	100	10	30	5.0	0.25	4			
VTT1221W	25T	0.1	—	100	5.0	100	10	30	5.0	0.25	1.5	40°	MOLDED CLEAR EPOXY T-1¾	26
VTT1222W		0.9	—	100	5.0	100	10	30	5.0	0.25	2			
VTT1223W		1.5	—	100	5.0	100	10	30	5.0	0.25	3			

ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

PART NO.	CHIP TYPE	Light Current[1] I_C mA min	Light Current I_C mA max	Condition H fc	Condition V_{CE} Volts	Dark Current I_{CEO} (H=0) nA max	Dark Current V_{CE} Volts	Collector Breakdown $V_{BR(CEO)}$ (I_C=100 uA, H=0) Volts, min	Emitter Breakdown $V_{BR(ECO)}$ (I_E=100 uA, H=0) Volts, min	Saturation Voltage $V_{CE(SAT)}$ (I_C=1.0 mA, H=400 fc) Volts, max	Rise/Fall Time t_r, t_f (I_C=1.0 mA, R_L=100) usec, typ	Ang. Resp.[2] θ typ	CASE STYLE[3]	CASE NO.
PHOTOTRANSISTOR														
VTT1311	40T	0.8	—	20	5.0	100	10	30	5.0	0.25	3	10°	MOLDED IRT* EPOXY T-1¾	26
VTT1312		1.2	—	20	5.0	100	10	30	5.0	0.25	4			
VTT1313		1.6	—	20	5.0	100	10	30	5.0	0.25	5			
VTT1314		2.4	—	20	5.0	100	10	30	5.0	0.25	6			
VTT1321	25T	1.0	—	100	5.0	100	10	30	5.0	0.25	1.5	5°	MOLDED IRT* EPOXY T-1¾	26
VTT1322		2.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT1323		4.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT1324		6.0	—	100	5.0	100	10	30	5.0	0.25	4			
VTT1321W	25T	0.06	—	100	5.0	100	10	30	5.0	0.25	1.5	40°	MOLDED IRT* EPOXY T-1¾	26
VTT1322W		0.50	—	100	5.0	100	10	30	5.0	0.25	2			
VTT1323W		0.90	—	100	5.0	100	10	30	5.0	0.25	3			
VTT3121	25T	0.5	1.5	100	5.0	10	20	50	6.0	0.25	1.5	8°	COAX	4
VTT3122		1.2	5.0	100	5.0	10	20	40	6.0	0.25	2.5			
VTT3123		4.0	—	100	5.0	100	10	30	4.0	0.25	4			
VTT3121E	25T	0.5	1.5	100	5.0	10	20	50	6.0	0.25	1.5	8°	COAX EMITTER LEAD	5
VTT3122E		1.2	5.0	100	5.0	10	20	40	6.0	0.25	2.5			
VTT3123E		4.0	—	100	5.0	100	10	30	4.0	0.25	4			
VTT3321	25T	1.0	—	100	5.0	100	10	50	5.0	0.25	1.5	28°	MOLDED CLEAR EPOXY T-1	6
VTT3322		2.0	—	100	5.0	100	10	50	5.0	0.25	2			
VTT3323		4.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT3324		6.0	—	100	5.0	100	10	30	5.0	0.25	4			
VTT3325		9.0	—	100	5.0	100	10	30	5.0	0.25	5			
VTT3321A	25T	1.0	—	100	5.0	100	10	30	5.0	0.25	1.5	20°	MOLDED CLEAR EPOXY T-1 0.1" LEADS	6A
VTT3322A		2.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT3323A		4.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT3324A		6.0	—	100	5.0	100	10	30	5.0	0.25	4			
VTT3325A		9.0	—	100	5.0	100	10	30	5.0	0.25	5			
VTT3321L	25T	0.5	—	20	5.0	100	10	30	5.0	0.25	1.5	10°	MOLDED CLEAR EPOXY LONG T-1	50
VTT3322L		1.0	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3323L		2.0	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3324L		4.0	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3325L		6.0	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3321LA	25T	0.5	—	20	5.0	100	10	30	5.0	0.25	1.5	10°	MOLDED CLEAR EPOXY LONG T-1 0.1" LEADS	50A
VTT3322LA		1.0	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3323LA		2.0	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3324LA		4.0	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3325LA		6.0	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3421	25T	0.6	—	100	5.0	100	10	30	5.0	0.25	1.5	20°	MOLDED IRT* EPOXY T-1	6
VTT3422		1.2	—	100	5.0	100	10	30	5.0	0.25	2			
VTT3423		2.4	—	100	5.0	100	10	30	5.0	0.25	3			
VTT3424		3.6	—	100	5.0	100	10	30	5.0	0.25	4			
VTT3425		5.4	—	100	5.0	100	10	30	5.0	0.25	5			
VTT3421A	25T	0.6	—	100	5.0	100	10	30	5.0	0.25	1.5	20°	MOLDED IRT* EPOXY T-1 0.1" LEADS	6A
VTT3422A		1.2	—	100	5.0	100	10	30	5.0	0.25	2			
VTT3423A		2.4	—	100	5.0	100	10	30	5.0	0.25	3			
VTT3424A		3.6	—	100	5.0	100	10	30	5.0	0.25	4			
VTT3425A		5.4	—	100	5.0	100	10	30	5.0	0.25	5			
VTT3421L	25T	0.3	—	20	5.0	100	10	30	5.0	0.25	1.5	10°	MOLDED IRT* EPOXY LONG T-1	50
VTT3422L		0.6	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3423L		1.2	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3424L		2.4	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3425L		3.6	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3421LA	25T	0.3	—	20	5.0	100	10	30	5.0	0.25	1.5	10°	MOLDED IRT* EPOXY LONG T-1 0.1" LEADS	50A
VTT3422LA		0.6	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3423LA		1.2	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3424LA		2.4	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3425LA		3.6	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3521	25T	0.05	—	20	5.0	100	10	30	5.0	0.25	1.5	20°	MOLDED CLEAR EPOXY MINI LENS	31
VTT3522		0.15	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3523		0.30	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3524		0.70	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3525		1.20	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3521F	25T	0.10	—	20	5.0	100	10	30	5.0	0.25	1.5	60°	MOLDED CLEAR EPOXY MINI FLAT	31F
VTT3522F		0.20	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3523F		0.40	—	20	5.0	100	10	30	5.0	0.25	3			

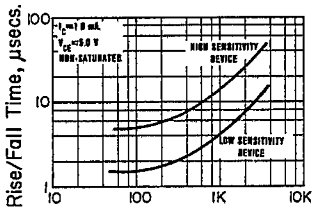
*IRT=INFRARED TRANSMITTING

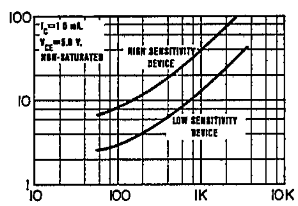
ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

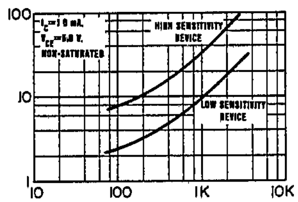
PART NO.	CHIP TYPE	Light Current[1] I_C mA min	Light Current I_C mA max	Condition H fc	Condition V_{CE} Volts	Dark Current I_{CEO} (H=0) nA max	Dark Current V_{CE} Volts	Collector Breakdown $V_{BR(CEO)}$ (I_C=100 uA, H=0) Volts, min	Emitter Breakdown $V_{BR(ECO)}$ (I_E=100 uA, H=0) Volts, min	Saturation Voltage $V_{CE(SAT)}$ (I_C=1.0 mA, H=400 fc) Volts, max	Rise/Fall Time t_r, t_f (I_C=1.0 mA, R_L=100) usec, typ	Ang. Resp.[2] θ typ	CASE STYLE[3]	CASE NO.
PHOTOTRANSISTOR														
VTT3621	25T	0.03	—	20	5.0	100	10	30	5.0	0.25	1.5	20°	MOLDED IRT* EPOXY MINI LENS	31
VTT3622		0.09	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3623		0.18	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3624		0.42	—	20	5.0	100	10	30	5.0	0.25	4			
VTT3625		0.72	—	20	5.0	100	10	30	5.0	0.25	5			
VTT3621F	25T	0.06	—	20	5.0	100	10	30	5.0	0.25	1.5	60°	MOLDED IRT* EPOXY MINI FLAT	31F
VTT3622F		0.12	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3623F		0.24	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3721	25T	0.05	—	20	5.0	100	10	30	5.0	0.25	1.5	60°	MOLDED CLEAR EPOXY FLAT OVAL	48
VTT3722		0.10	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3723		0.20	—	20	5.0	100	10	30	5.0	0.25	3			
VTT3821	25T	0.03	—	20	5.0	100	10	30	5.0	0.25	1.5	60°	MOLDED IRT* EPOXY FLAT OVAL	48
VTT3822		0.06	—	20	5.0	100	10	30	5.0	0.25	2			
VTT3823		0.12	—	20	5.0	100	10	30	5.0	0.25	3			
VTT7111	40T	0.5	—	100	5.0	100	10	30	5.0	0.40	3	50°	MOLDED CLEAR EPOXY LATERAL	7
VTT7112		2.0	—	100	5.0	100	10	30	5.0	0.40	4			
VTT7113		3.5	—	100	5.0	100	10	30	5.0	0.40	5			
VTT7114		6.0	—	100	5.0	100	10	30	5.0	0.40	6			
VTT7121	25T	0.5	—	100	5.0	100	10	30	5.0	0.25	1.5	30°		
VTT7122		1.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7123		2.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7124		3.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT7125		4.5	—	100	5.0	100	10	30	5.0	0.25	4			
VTT7221	25T	0.25	—	100	5.0	100	10	30	5.0	0.25	1	30°	MOLDED IRT* EPOXY LATERAL	
VTT7222		0.50	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7223		1.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7224		1.5	—	100	5.0	100	10	30	5.0	0.25	3			
VTT7225		2.25	—	100	5.0	100	10	30	5.0	0.25	4			
VTT7311	40T	0.5	—	100	5.0	100	10	30	5.0	0.40	3	60°	MOLDED CLEAR EPOXY RECESSED LENS LATERAL	49
VTT7312		2.0	—	100	5.0	100	10	30	5.0	0.40	4			
VTT7313		3.5	—	100	5.0	100	10	30	5.0	0.40	5			
VTT7314		6.0	—	100	5.0	100	10	30	5.0	0.40	6			
VTT7321	25T	0.5	—	100	5.0	100	10	30	5.0	0.25	1.5	40°		
VTT7322		1.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7323		2.0	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7324		3.0	—	100	5.0	100	10	30	5.0	0.25	3			
VTT7325		4.5	—	100	5.0	100	10	30	5.0	0.25	4			
VTT7421	25T	0.3	—	100	5.0	100	10	30	5.0	0.25	1	40°	MOLDED IRT* EPOXY RECESSED LENS LATERAL	
VTT7422		0.8	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7423		1.2	—	100	5.0	100	10	30	5.0	0.25	2			
VTT7424		1.8	—	100	5.0	100	10	30	5.0	0.25	3			
VTT7425		2.7	—	100	5.0	100	10	30	5.0	0.25	4			
VTT9011	50T	0.5	3.0	100	5.0	100	5	30	6.0	0.55	2	50°	CERAMIC EPOXY WINDOW	8
VTT9012		2.0	6.0	100	5.0	100	5	30	6.0	0.55	4			
VTT9013		5.0	—	100	5.0	100	5	30	4.0	0.55	10			
VTT9111	50T	2.0	8.0	100	5.0	100	5	30	6.0	0.55	2	42°	CERAMIC EPOXY LENS	9
VTT9112		6.0	18.0	100	5.0	100	5	30	4.0	0.55	4			
VTT9113		14.0	—	100	5.0	100	5	30	4.0	0.55	8			
VTT9310	50T	0.2	0.6	100	5.0	25	20	50	6.0	0.40	3	55°	CERAMIC EPOXY LENS	10
VTT9311		0.4	1.2	100	5.0	25	20	40	6.0	0.40	5			
VTT9312		1.0	3.0	100	5.0	25	20	30	6.0	0.40	5			
VTT9313		2.5	10.0	100	5.0	100	10	20	4.0	0.40	8			
VTT9320	25T	0.075	0.20	100	5.0	10	20	50	6.0	0.25	1			
VTT9321		0.15	0.35	100	5.0	10	20	50	6.0	0.25	2			
VTT9322		0.30	0.75	100	5.0	10	20	40	6.0	0.25	3			
VTT9323		0.60	—	100	5.0	100	10	30	4.0	0.25	4			

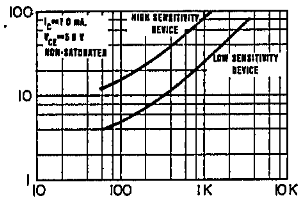
*IRT=INFRARED TRANSMITTING

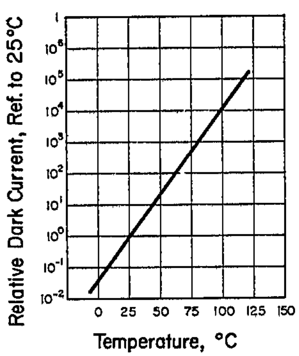
ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

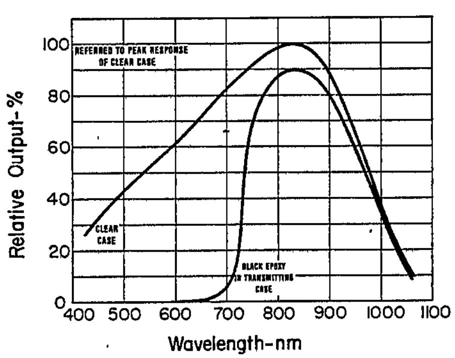








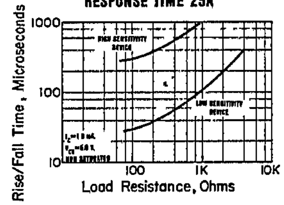


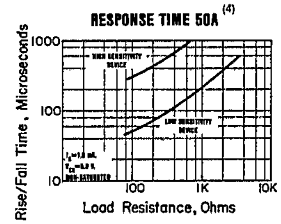


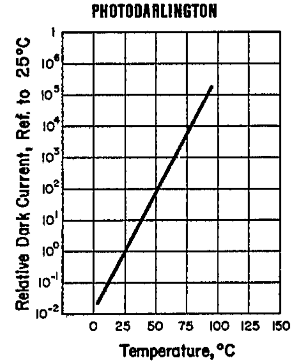
EG&G VACTEC

ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

PART NO.	CHIP TYPE	Light Current[1] I_C mA min	I_C mA max	Condition H fc	Condition V_{CE} Volts	Dark Current I_{CEO} H=0 nA max	V_{CE} Volts	Collector Breakdown $V_{BR(CEO)}$ I_C=100 uA H=0 Volts min	Emitter Breakdown $V_{BR(ECO)}$ I_E=100 uA H=0 Volts min	Saturation Voltage $V_{CE(SAT)}$ I_C=1.0 mA H=400 fc Volts max	Rise/Fall Time t_r, t_f I_C=1.0 mA R_L=100 usec typ	Ang. Resp.[2] θ typ	CASE STYLE[3]	CASE NO.
PHOTODARLINGTON														
VTA1011	50A	1	4	40	50	100	10	50	6.0	1.5	60	35°	TO-18 FLAT WINDOW	1
VTA1012		3	10	40	50	500	10	40	60	1.5	120			
VTA1013		8	—	40	50	1000	10	30	60	1.5	250			
VTA1021	25A	0.25	1.0	4.0	50	200	10	50	60	1.5	30			
VTA1022		0.75	2.5	40	5.0	200	10	40	60	1.5	60			
VTA1023		2.0	—	40	5.0	500	10	30	6.0	1.5	150			
VTA1111	50A	4	20.0	40	5.0	100	10	40	60	1.5	100	15°	TO-18 LENSED	3
VTA1112		15	—	40	5.0	100	10	30	60	1.5	250			
VTA1121	25A	1.0	5.0	40	50	100	10	40	60	1.5	60	8°		
VTA1122		3.0	—	40	50	100	10	30	60	1.5	150			
VTA3121	25A	1.0	5.0	40	50	100	10	40	60	1.5	50	8°	COAX	4
VTA3122		4.0	—	40	50	100	10	30	60	1.5	150			
VTA3121E	25A	1.0	5.0	40	50	100	10	40	60	1.5	50		COAX EMITTER LEAD	5
VTA3122E		4.0	—	40	50	100	10	30	60	1.5	100			
VTA3321	25A	1.0	—	40	50	100	10	30	60	1.5	50	20°	MOLDED CLEAR T-1	6
VTA3322		3.0	—	40	50	200	10	30	60	1.5	100			
VTA7121	25A	0.4	—	40	50	100	10	30	60	1.5	30	20°	MOLDED CLEAR EPOXY LATERAL	7
VTA7122		0.8	—	40	5.0	100	10	30	60	1.5	60			
VTA7123		1.6	—	40	50	200	10	30	60	1.5	150			
VTA9311	50A	1	4.0	40	50	100	10	50	60	1.5	60	65°	CERAMIC EPOXY LENS	10
VTA9312		3	10.0	40	50	500	10	40	6.0	1.5	120			
VTA9313		8	—	4.0	50	1000	10	30	60	1.5	250			
VTA9321	25A	0.25	1.0	40	50	100	10	50	60	1.5	30			
VTA9322		0.75	2.5	40	50	200	10	40	60	1.5	60			
VTA9323		2.0	—	40	50	200	10	30	6.0	1.5	150			







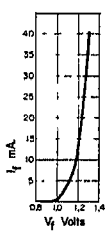
EG&G VACTEC

ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

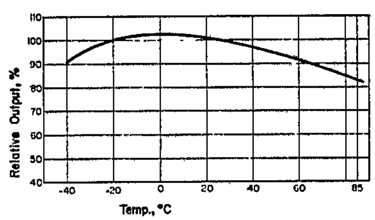
PART NO.	Light Current				Dark[7] Current	Collector[7] Breakdown	Emitter[7] Breakdown	Saturation Voltage			Rise/Fall Time	LED Forward Volts	OUTPUT DEVICE	
	I_C				I_{CEO}	$V_{BR(CEO)}$	$V_{BR(ECO)}$	$V_{CE(SAT)}$			t_r, t_f	V_F		
		Condition			V_{CE}=10V H=0	I_C=100 uA H=0	I_E=100 uA H=0		Cond		I_C=1.0 mA R_L=100	I_F=20 mA		
	mA. min.	I_F[5] mA.	V_{CE} Volts	d[6] mm.	nA, max	Volts, min	Volts, min	Volts max	I_C mA	I_F mA	usec,typ	Volts max		CASE
MATCHED LED - PHOTOTRANSISTOR/LED - PHOTODARLINGTON														
VTM 3321	1 0	20	5 0	6.5	100	30	5 0	0 4	0 25	20	3	1 6	PHOTOTRANSISTOR	6
VTM 3322	3 0	20	5 0	6 5	100	30	5 0	0 6	1 8	20	4	1 6		
VTM 3323	1.0	20	5 0	3 0	100	30	5 0	1 0	0 25	20	50	1 6	PHOTODARLINGTON	
VTM 7121	0 05	20	5 0	3 0	100	30	5 0	0 4	0 05	20	3	1 6	PHOTOTRANSISTOR	7
VTM 7122	0 5	20	5 0	3 0	100	30	5.0	0 4	0 25	20	3	1 6		
VTM 7123	1 0	20	5 0	3 0	100	30	5.0	0 4	0 25	20	4	1 6		
VTM 7124	2 0	20	5 0	3 0	100	30	5 0	0 6	1 8	20	7	1 6		
VTM 7125	0.5	20	5 0	3 0	100	30	5 0	1 0	0 25	20	50	1.6	PHOTODARLINGTON	

Each matched set consists of a discrete GaAs infra-red emitting diode (IRED) and a discrete silicon phototransistor (photodarlington).

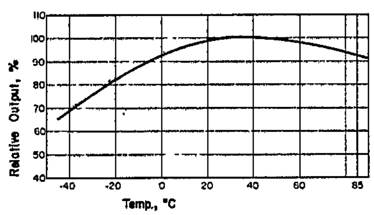
LED FWD VOLTAGE DROP



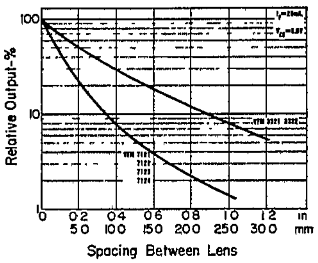
LED/PHOTOTRANSISTOR OUTPUT CURRENT VS TEMPERATURE (REFERRED TO 25° C)



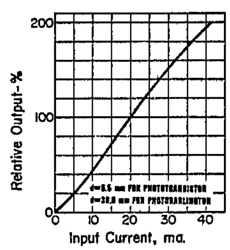
LED/PHOTODARLINGTON OUTPUT CURRENT VS TEMPERATURE (REFERRED TO 25 C)



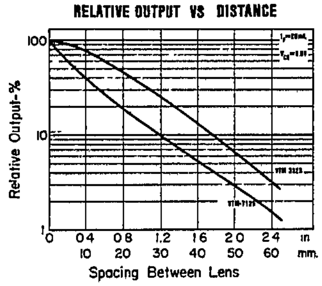
LED/PHOTOTRANSISTOR RELATIVE OUTPUT VS DISTANCE



RELATIVE OUTPUT VS INPUT CURRENT (REFERRED TO 20mA)



LED/PHOTODARLINGTON RELATIVE OUTPUT VS DISTANCE

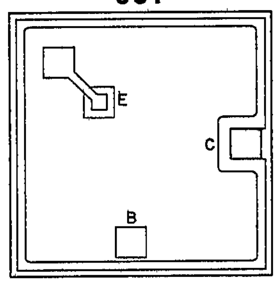


ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

PART NO		D.C. Current[8] Gain				Dark Current	Collector Breakdown	Emitter Breakdown	Saturation Voltage	Rise/Fall Time	Collector-Base[9] Sensitivity	
		Beta		Test Condition		H=0	$V_{BR(CEO)}$	$V_{BR(ECO)}$	$V_{CE(SAT)}$	t_r, t_f	$S_{R(CBO)}$ (typ)	
						V_{CE}=10V I_B=0	I_C=100 uA	I_E=100 uA	I_C=1 0 mA I_B=50 uA	I_C=1.0 mA R_L=100	V_{CB}=5 0 V	
	CHIP TYPE	min	typ	I_B uA	V_{CE} Volts	nA, max	Volts min	Volts min	Volts, max	usec, typ	2850 K nA/fc	940 nm nA/(uW/cm²)
CHIPS												
VTA-C25	25A	10K	50K	0 02	5 0	200	30	5 0	1 5	100	8	0 5
VTA-C50	50A	5K	35K	0 24	5 0	100	30	6 0	1 5	150	53	3.0
VTT-C25	25T	250	500	1 3	5 0	100	30	6 0	0 25	3	14	0.8
VTT-C40	40T	150	550	4 0	5 0	100	30	6 0	0 4	4	35	2.1
VTT-C50	50T	200	350	6 0	5 0	100	30	6 0	0 4	5	70	4 0
VTT-C60	60T	200	500	10 0	5 0	100	40	5 0	0 4	8	115	6 6

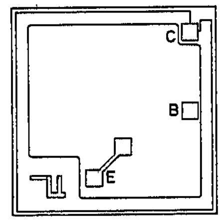
PHOTOTRANSISTOR mm (inch)

60T



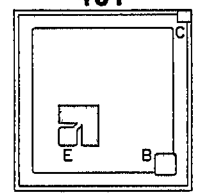
(0.060 x 0.060 x 0.017 THK.)
1.52 x 1.52 x 0.43 THK.

50T



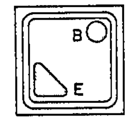
(0.050 x 0.050 x 0.017 THK)
1.27 x 1.27 x 0.43 THK

40T



(0.040 x 0.040 x 0.017 THK)
1.02 x 1.02 x 0.43 THK

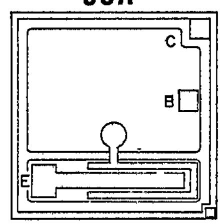
25T



(0.025 x 0.025 x 0.009)
0.64 x 0.64 x 0.23 THK

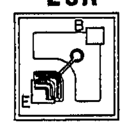
PHOTODARLINGTON

50A



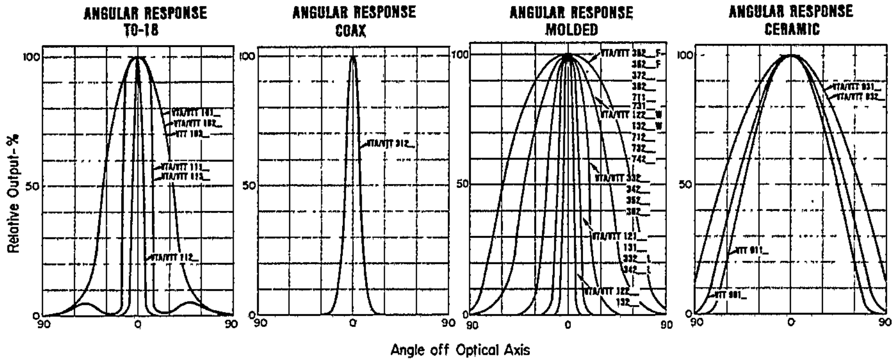
(0.050 x 0.050 x 0.017 THK)
1.27 x 1.27 x 0.43 THK

25A



(0.025 x 0.025 x 0.009 THK)
0.64 x 0.64 x 0.23 THK

ELECTRO-OPTICAL CHARACTERISTICS (at 25°C)

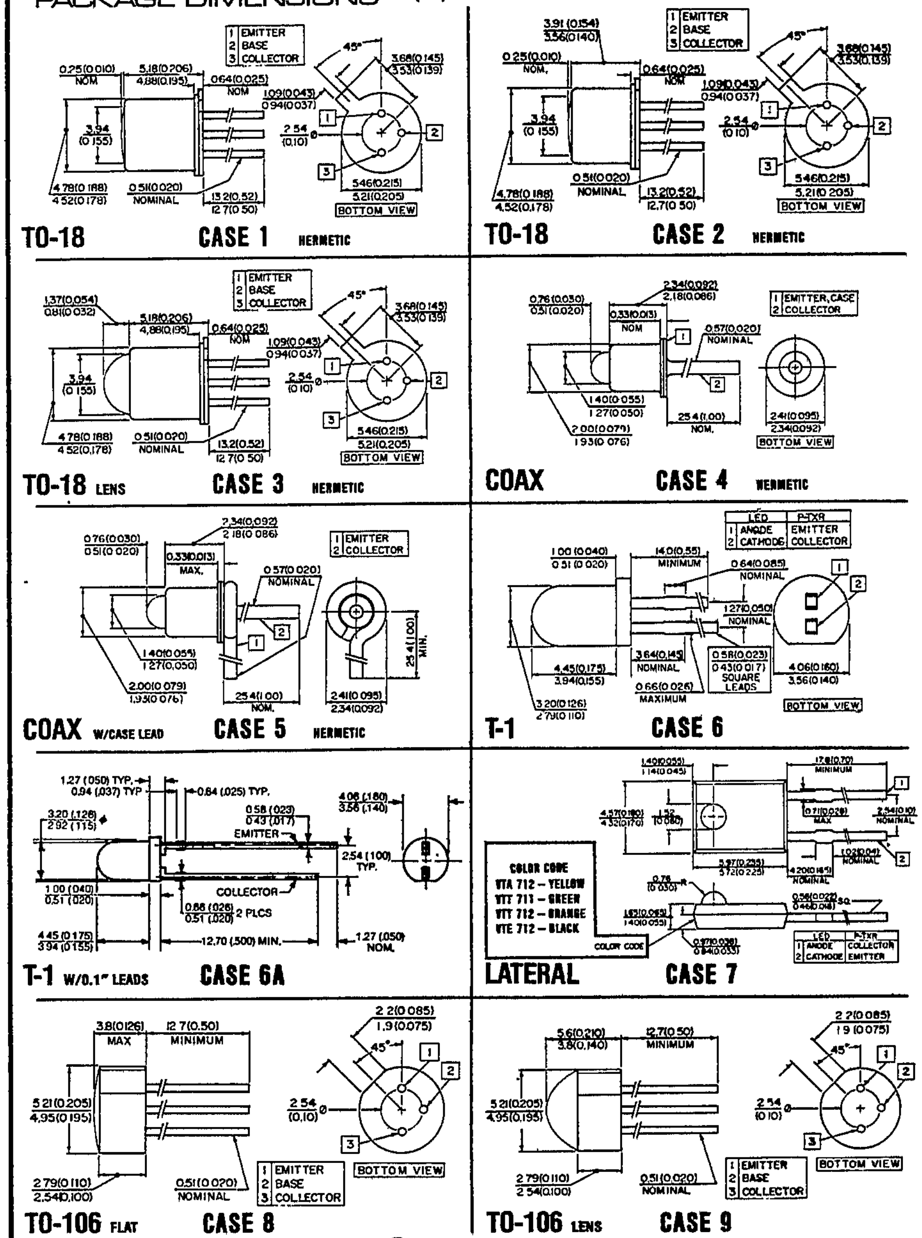


NOTES

1. Light source is a tungsten incandescent lamp operating at 2850 K.,100 fc from this source is a nominal 5mW/cm^2 (1 mW/cm^2=19.2 fc @ 2850 K).
2. Angular response is the angle between the optical axis and the angle for which the response is 50%.
3. On a 3 terminal device, the base terminal is connected. All specifications are with zero base current (I_B).
4. Response time curves show typical characteristics for devices having the lowest and highest light current in any series. (Example) VTT 1020 (lowest sensitivity) and VTT 1023 (highest sensitivity). Interpolate curves for intermediate sensitivity devices
5. I_F is LED forward current.
6. d is the lens to lens spacing between the LED and detector.
7. I_F=O.
8. H=O for all chip tests.
9. $I_C=S_{R(CBO)} \times I_C \times$ Beta Beta is base drive dependent and therefore is a function of light level. At base drive lower than that specified, the Beta falls off somewhat, and is higher at greater base drives
10. E, B and C are bond pads for Emitter, Base and Collector. Chips are supplied with nickel or gold over nickel backside for silver epoxy die attach only. The collector connection should be made through the backside.
11. Chips are supplied in bulk form in vials or in chip trays. Quality is verified by a sampling plan. Selected chips from a wafer are mounted on a TO-18 header, sealed and tested to the specification

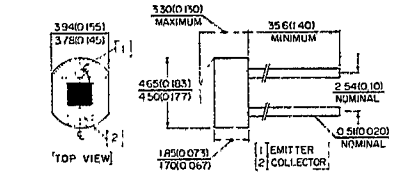
EG&G VACTEC

PACKAGE DIMENSIONS mm (inch)

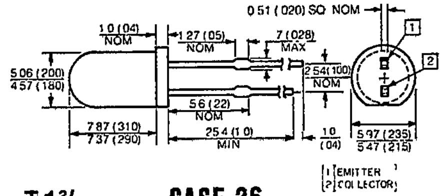


EG&G VACTEC

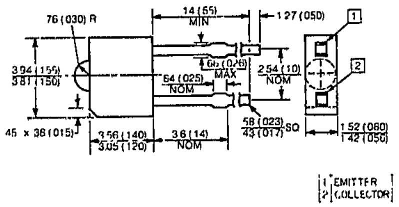
PACKAGE DIMENSIONS mm (inch)



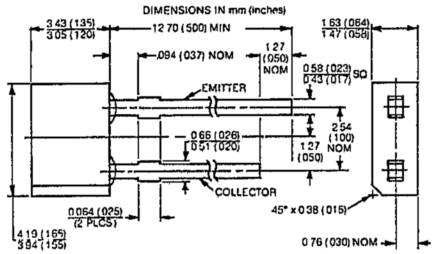
CERAMIC CASE 10



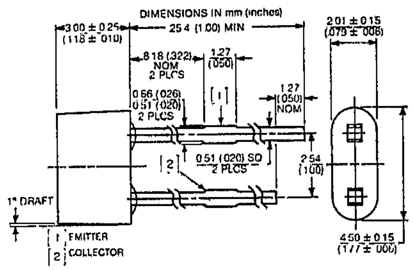
T-1¾ CASE 26



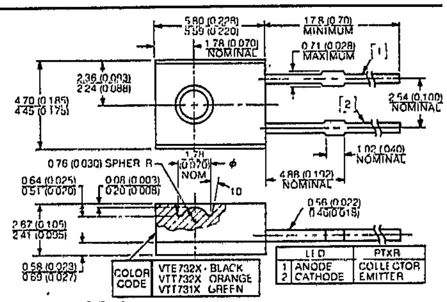
MINI LENS CASE 31



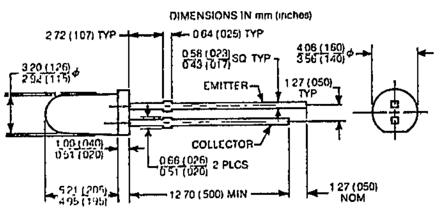
MINI FLAT CASE 31F



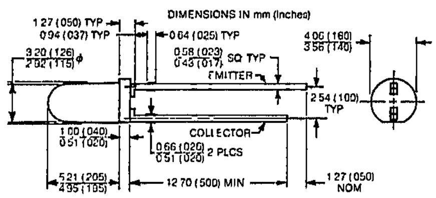
FLAT OVAL CASE 48



RECESSED LENS LATERAL CASE 49



LONG T-1 CASE 50



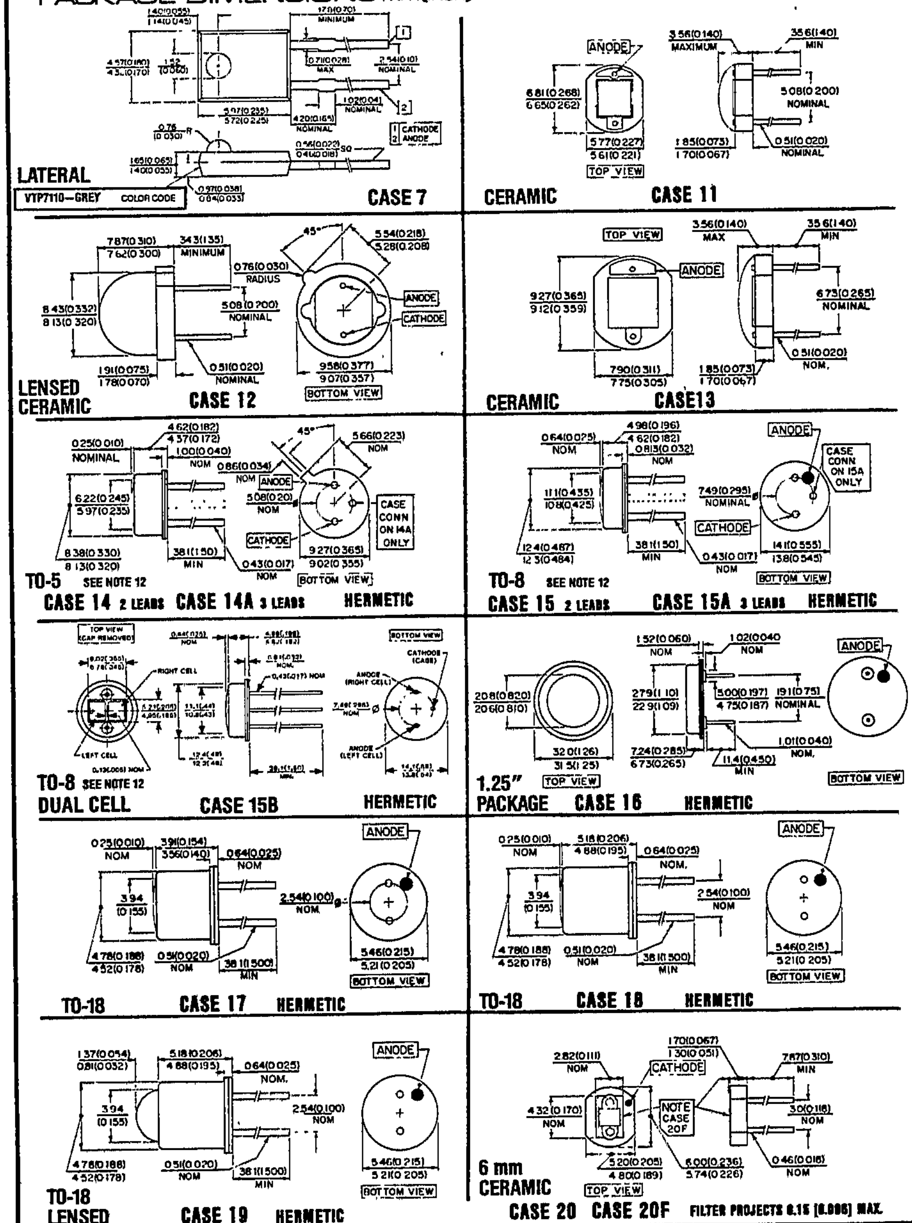
LONG T-1 W/0.1" LEADS CASE 50A

EG&G VACTEC

SILICON PHOTODIODES

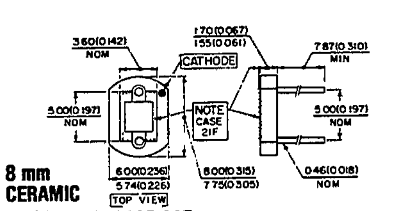
EG&G VACTEC

PACKAGE DIMENSIONS mm(inch)

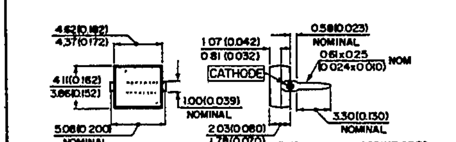


EG&G VACTEC

PACKAGE DIMENSIONS mm(inch)

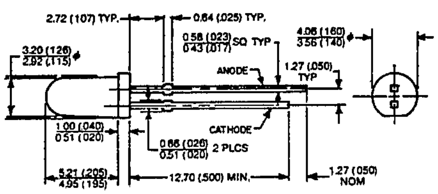


8 mm CERAMIC
CASE 21 CASE 21F FILTER PROJECTS 0.15 (0.006) MAX.

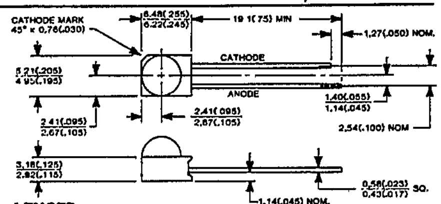


MINI-DIP **CASE 22**

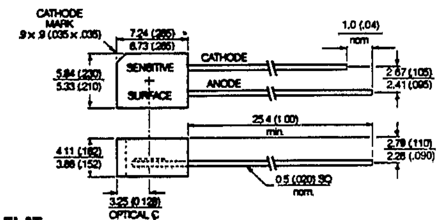
P/N	ACTIVE AREA
VTB851X	1.00(.039) × 1.55(.061)
VTP855X, VTP865X	2.79(.110) × 2.79(.110)



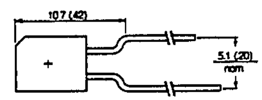
LONG T-1 **CASE 50**



LENSED SIDELOOKER **CASE 51**



FLAT SIDELOOKER **CASE 52**



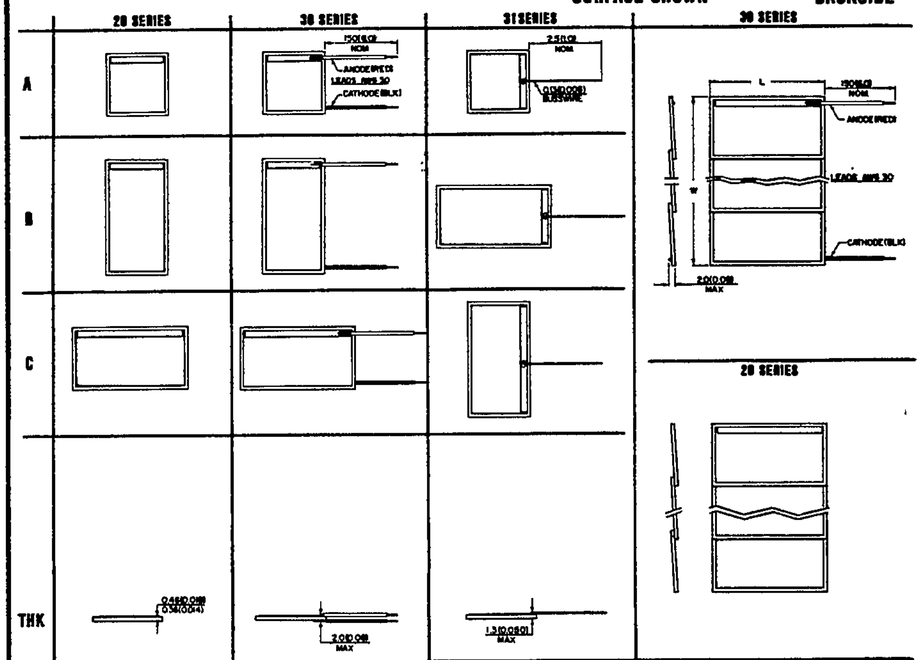
(CASE DIMENSIONS SAME AS CASE 52)

FLAT SIDELOOKER **CASE 52A**

EG&G VACTEC

PACKAGE DIMENSIONS mm (inch)

ANODE (ACTIVE) SURFACE SHOWN **CATHODE IS BACKSIDE**



NOTES

APPLICATION INFORMATION

ABSOLUTE MAXIMUM RATINGS

PARAMETER	CASE STYLE					
	HERMETIC		CERAMIC	EPOXY	UNMOUNTED	
	14 14A 15 15A 17 18 19	16	11 12 13 20 20F 21 21F	7 22 50 51 52 52A	44 45 20 SERIES 31 SERIES	44 45 30 SERIES
TEMPERATURE RANGE OPERATING - °C STORAGE - °C	−40 + 125 −65 + 150	−40 + 85 −40 + 100	−20 + 75 −40 + 85	−40 + 85 −40 + 100	−40 + 125 −65 + 150	−40 + 105 −40 + 105
LEAD SOLDERING TEMP. (1.6 mm from case, 5 Sec max.) °C	260	260	260	230	NOTE (10)	NOTE (10)

GENERAL

All silicon diodes are light sensitive. When the junction geometry is such that the light sensitivity is optimized, the device is called a photodiode. Photodiodes may be operated with reverse voltage bias (photoconductive mode) or without (photovoltaic mode). In either case, the current through the diode is proportional to the radiation falling on the junction. Photodiodes which are intended for photovoltaic operation may not have a reverse voltage rating but in all other respects are the same as any other photodiode. Diodes which are used for solar power conversion are called photovoltaic cells because they are always operated in the photovoltaic mode.

Most detector diodes are used in the photovoltaic mode with a short circuit termination. This yields the most linear light to current conversion. Short circuit operation is simply achieved using an operational amplifier with a transimpedance connection. A typical circuit is shown on page 10. Since there is no dark current through the cell, as there is no applied voltage, detection and measurement circuits can be operated on a DC basis avoiding the extra hardware and circuitry required by chopped light sources.

CASE STYLE AND HANDLING PRECAUTION

Diodes presented in this catalogue are mounted in several different types of cases or may be supplied unmounted. A brief description of the case style for each item is given in the tables.

Hermetic cases have glass to metal seals. The chips are mounted directly to the case or may be insulated from the case. The latter allows the metal can to be used as a shield to reduce noise pickup in high gain circuits. Hermetic cases, while quite rugged, must be protected from stresses on the glass seal around the wires and lens.

EQUIVALENT CIRCUIT

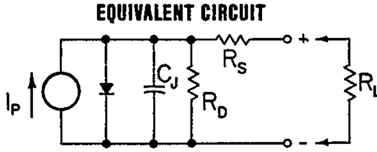


FIGURE I

Ceramic cases utilize an epoxy overcoating to protect the chip. These are very rugged parts but in some units, the chip is close to the surface.

Epoxy cases may be molded or cast. Scratches on the epoxy will degrade electro-optical characteristics.

Unmounted cells in the VTS1, 2 and 3 series are fragile, especially when the area is large. The front and back electrodes are solder coated and may be soldered using a 60/40 tin-lead solder. The flux should be active so that the joint may be made quickly to minimize heating. Whenever, possible, it is recommended that soldering be done at VACTEC since excessive heat may degrade the device parameters. Avoid handling leadless cells with bare fingers since they do not have the protective coating provided on cells with flying leads.

ELECTRO OPTICAL CHARACTERISTICS

The equivalent circuit of a photodiode is shown in Figure I. It consists of an ideal current generator in parallel with an ideal diode. The junction capacitance, dark resistance and series resistance account for the other diode parameters.

a. ***Radiometric sensitivity***: The current generated depends upon the energy and wavelength of the radiation actually falling on the junction. The Absolute Response curves indicate the amperes generated by a diode for each watt irradiating the junction when the wavelength is known and is independent of the junction area.

b. ***Quantum efficiency*** of a diode is related to the radiometric sensitivity by the following formula

$$Q.E. = \frac{124\, S_R}{\lambda}\ \%$$

Where S_R = radiometric sensitivity, amperes per watt
λ = wavelength, micrometers

The equation relates the energy per photon and the quantum yield, electrons per photon. One hundred percent Q.E. indicates that each photon produces one electron.

c. ***Responsivity***, R_E is the parameter which accounts for chip area and is the output current per unit of irradiance.

$$R_e = \frac{I_p}{E_e}\ \mu A/(\mu W/cm^2)$$

Also $R_e = K S_R A$

Where I_p = Photo generated current, μA
E_e = Irradiance, uW/cm²
A = Active area of the chip, cm²
K = constant and accounts for case effects such as lensing, coating etc.

d. ***Light current***, I_L, is the current produced by the diode under a specified irradiation, E_e, or illumination, E_V. Typical types of radiation sources are incandescent lamps (2850K source), LED's (typically 940 nm), mercury line source (365nm) and solar equivalent illumination (100 mW/cm²).

e. ***Linearity*** The voltage-current transfer curves are shown in Figure II. The polarity convention used is the same as a non-light sensitive diode. Photovoltaic operation occurs in the 4th quadrant. The open circuit voltage is shown as the intersection of the transfer curve and the horizontal axis. The short circuit current is shown as the intersection of the transfer curves and the vertical axis. This is the most linear method of operation. In the 3rd quadrant, the diode is operating with reverse bias and it is apparent that the current changes only a few percent with changes in voltage. The diode can therefore be considered a constant current source. In the 1st quadrant, the diode is forward biased. Forward voltage drop for 10mA of forward current varies from 500mV to 1.2V depending on the chip size and process. Linearity is limited at the high current level by the internal series resistance. At the low current level the limitation is the dark resistance. Diodes with very high dark resistance may be operated at levels from picoamperes to milliamperes with only 1-2% linearity errors.

VOLT-AMPERE CHARACTERISTICS

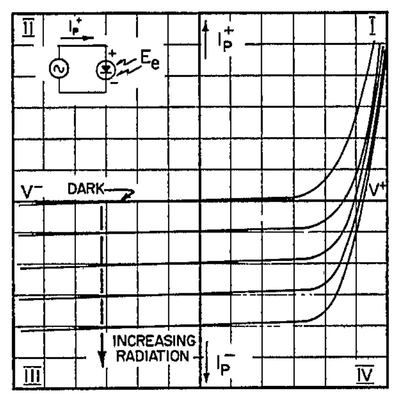


FIGURE II

f. ***Dark resistance*** is determined by the application of a small voltage to the cell, typically 10mV and measuring the current. This parameter is voltage sensitive but is useful in calculating the offset gain ($G_{os} = 1 + R_F/R_D$) in transimpedance amplifier circuits.

g. ***Dark current*** is measured with a reverse voltage applied to the cell. This voltage may be as low as 100mV or as high as 50V and the dark currents may vary from pA to μA depending upon the chip size and process. It changes very little with reverse voltage but diodes should not be operated at any voltage higher than the dark test voltage or the breakdown voltage if it is stated as a minimum.

h. ***Breakdown voltage*** is determined by the process but is a screened parameter. Diodes normally intended for photovoltaic operation do not have this parameter specified.

i. ***Open circuit*** voltage has a logarithmic characteristic, limited at low illumination levels by the dark resistance. Due to the high temperature coefficient, this characteristic is difficult to use since it requires careful compensation.

j. ***Response time*** of a diode depends upon the wavelength of the radiation, applied voltage, junction capacitance and load resistance. Characteristic curves given with each process show that the non-saturated response time is largely dependent upon the product of the junction capacitance and load resistance. However, when this product is small, other effects become significant and limit the response time. Long wavelength irradiation is absorbed below the depletion region and carriers diffuse slowly since there is little accelerating potential. When carrier lifetime is high, this component will be a significant portion of the photocurrent causing the response time to deviate from a single exponential curve. Increasing the bias voltage widens the depletion region so that more carriers are generated there. At 940nm, the 90% absorption depth is 115 micrometers. The VTP diodes require 50V to achieve this depletion width. For fastest response, use shorter wavelength sources. Request NOTE 82M62 for a more detailed discussion.

k. ***Temperature*** affects the spectral response as well as the dark resistance and current. Typical temperature variation of spectral sensitivity characteristics are shown for each process. The primary source of this variation is the change in absorption coefficient with temperature. In effect, this causes a shift in the absolute spectral response to the longer wavelengths.

l. ***Noise*** in diodes is generated by random fluctuations of carriers. In measurement and control applications, the major concern is flicker and "popcorn" noise. When the signal level is low, noise bursts can be a problem. Noise currents on the VTB and VTP process diodes are in the range of 10^{-13} to 10^{-14} A/Hz½. Noise currents on the VTS1, 2 and 3 process are slightly higher. Request NOTE 82M63 for more detailed discussion.