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MMBTH10

VHF/UHF NPN SILICON TRANSISTOR

VOLTAGE 25 Volts **POWER** 225 mW

FEATURES

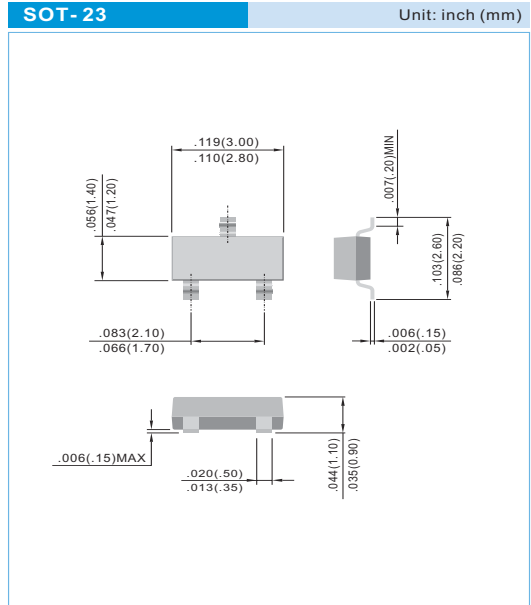
- NPN Silicon
- Pb free product are available : 99% Sn above can meet RoHS environment substance directive request

MECHANICAL DATA

Case : SOT-23, Plastic

Terminals : Solderable per MIL-STD-750, Method 2026

Approx weight : 0.008 gram



MAXIMUM RATINGS

RATING	SYMBOL	VALUE	UNIT
Collector-Emitter Voltage	V _{CEO}	25	Vdc
Collector-Base Voltage	V _{CBO}	30	Vdc
Emitter-Base Voltage	V _{EBO}	3.0	Vdc

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNITS
Total Device Dissipation FR-5 Board (Note 1) T _A =25°C Derate above 25°C	P _D	225 1.8	mW mW/°C
Thermal Resistance Junction to Ambient (Note 1)	R _{θJA}	556	°C/W
Total Device Dissipation Alumina Substrate (Note 2) T _A =25°C Derate above 25°C	P _D	300 2.4	mW mW/°C
Thermal Resistance Junction to Ambient (Note 2)	R _{θJA}	417	°C/W
Junction and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

Note 1. FR-5 = 1.0 x 0.75 x 0.062 in

2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina



MMBTH10

ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise noted)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I _c =1.0mA _{dc} , I _B =0)	V _{(BR)CEO}	25	-	-	V _{dc}
Collector-Base Breakdown Voltage (I _c =100μA _{dc} , I _E =0)	V _{(BR)CBO}	30	-	-	V _{dc}
Emitter-Base Breakdown Voltage (I _E =10mA _{dc} , I _C =0)	V _{(BR)EBO}	3.0	-	-	V _{dc}
Collector Cutoff Current (V _{CB} =25V _{dc} , I _E =0)	I _{CBO}	-	-	100	nA _{dc}
Emitter Cutoff Current (V _{EB} =2.0V _{dc} , I _C =0)	I _{EBO}	-	-	100	nA _{dc}
ON CHARACTERISTICS					
DC Current Gain (I _c =4.0mA _{dc} , V _{CE} =10V _{dc})	h _{FE}	60	-	-	-
Collector-Emitter Saturation Voltage (I _c =4.0mA _{dc} , I _B =0.4mA _{dc})	V _{CE(sat)}	-	-	0.5	V _{dc}
Base-Emitter On Voltage (I _c =4.0mA _{dc} , V _{CE} =10V _{dc})	V _{BE}	-	-	0.95	V _{dc}
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product (I _c =4.0mA _{dc} , V _{CE} =10V _{dc} , f=100MHz)	f _T	650	-	-	MHz
Collector-Base Capacitance (V _{CB} =10V _{dc} , I _E =0, f=1.0MHz)	C _{cb}	-	-	0.7	pF
Common-Base Feedback Capacitance (V _{CB} =10V _{dc} , I _E =0, f=1.0MHz)	C _{rb}	-	-	0.65	pF
Collector-Base Time Constant (I _c =4.0mA _{dc} , V _{CB} =10V _{dc} , f=31.8MHz)	rb'C _c	-	-	9.0	ps



MMBTH10

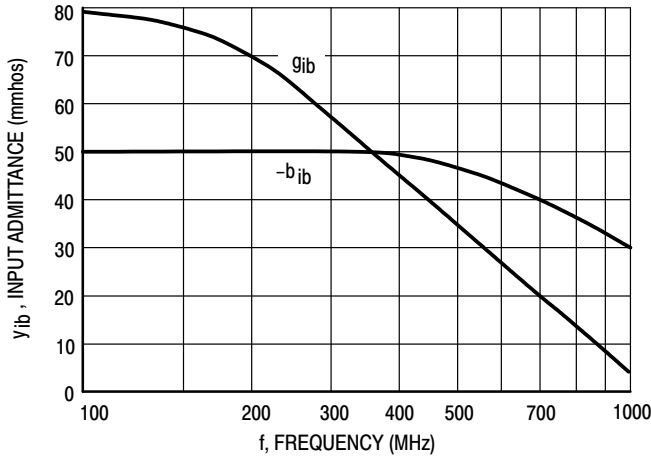


Figure 1. Rectangular Form

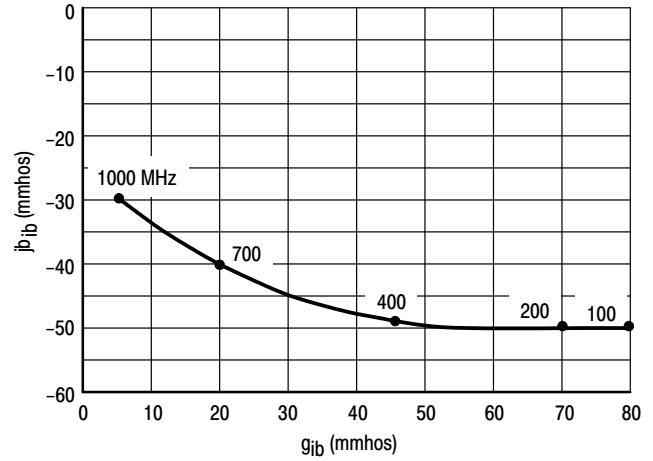


Figure 2. Polar Form

y_{fb} , FORWARD TRANSFER ADMITTANCE

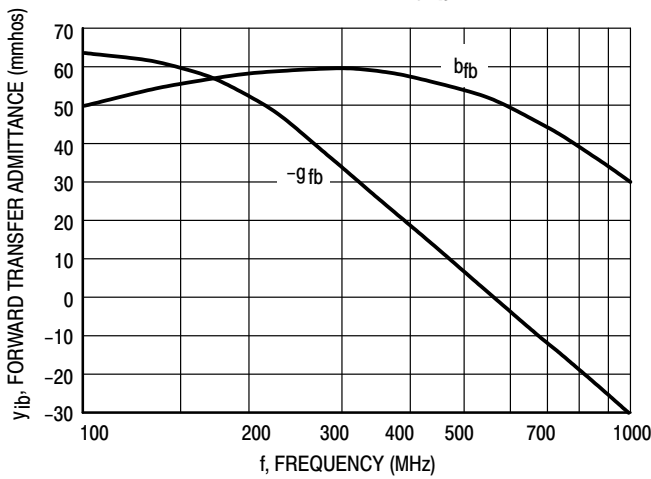


Figure 3. Rectangular Form

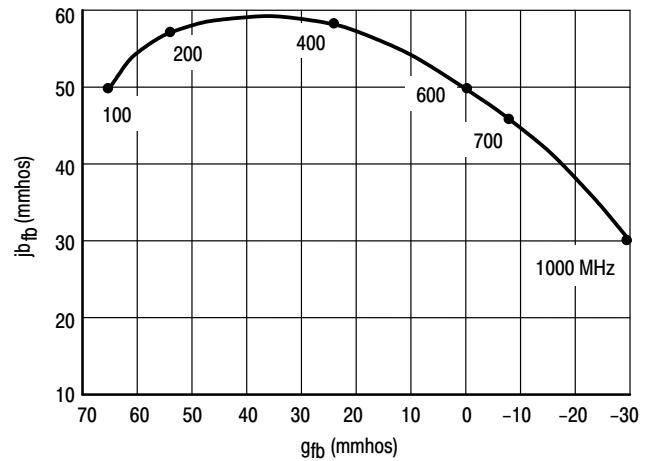


Figure 4. Polar Form



MMBTH10

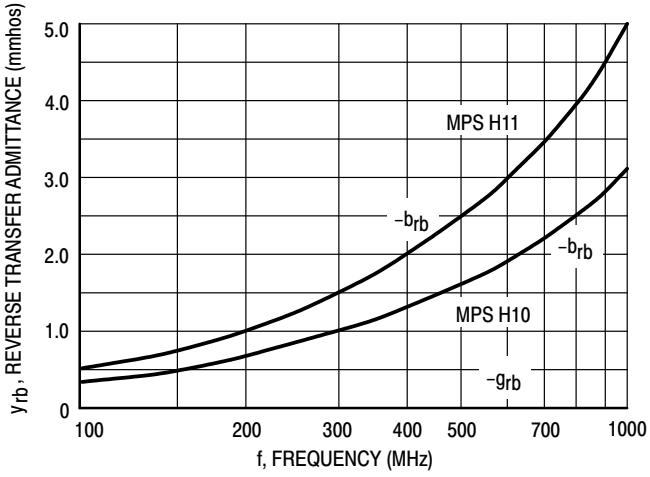


Figure 5. Rectangular Form

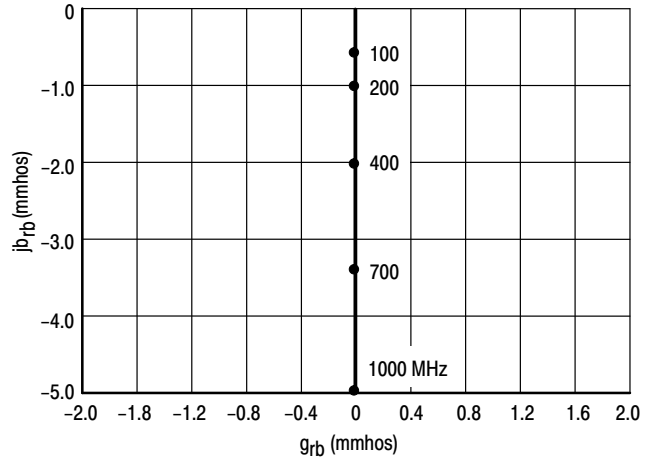


Figure 6. Polar Form

y_ob, OUTPUT ADMITTANCE

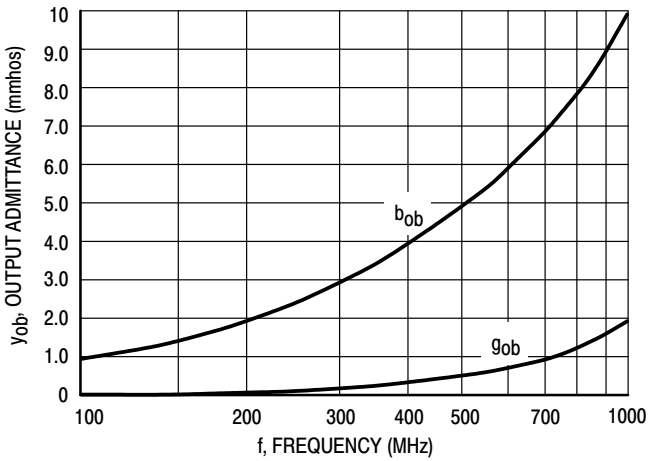


Figure 7. Rectangular Form

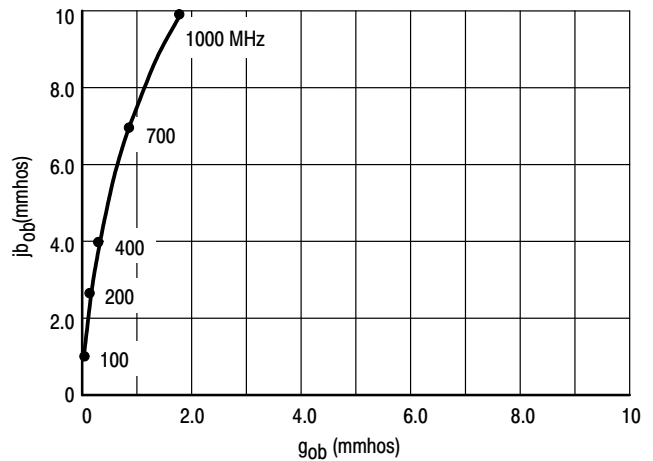
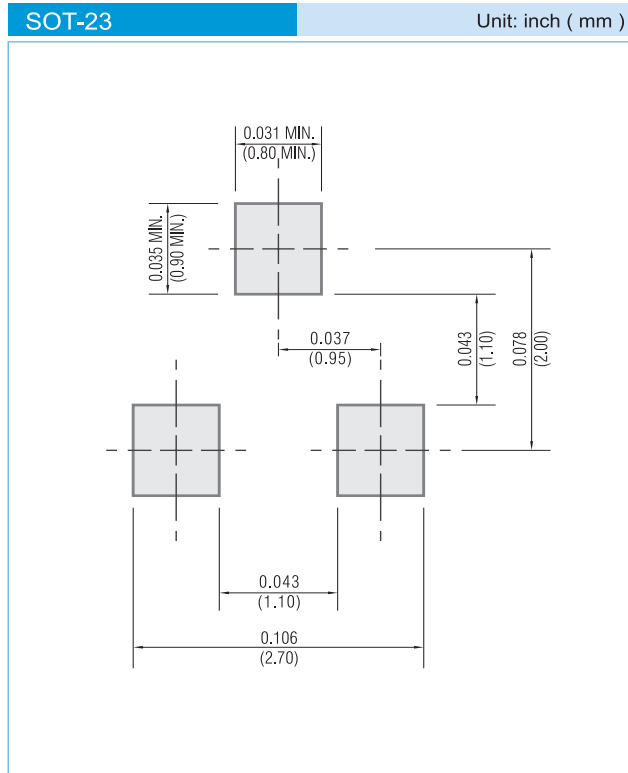


Figure 8. Polar Form



MMBTH10

MOUNTING PAD LAYOUT



ORDER INFORMATION

- Packing information

T/R - 12K per 13" plastic Reel

T/R - 3K per 7" plastic Reel

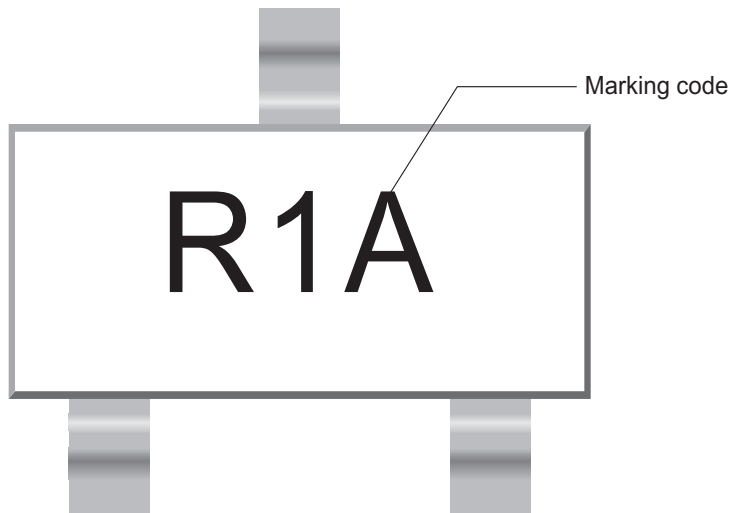
LEGAL STATEMENT

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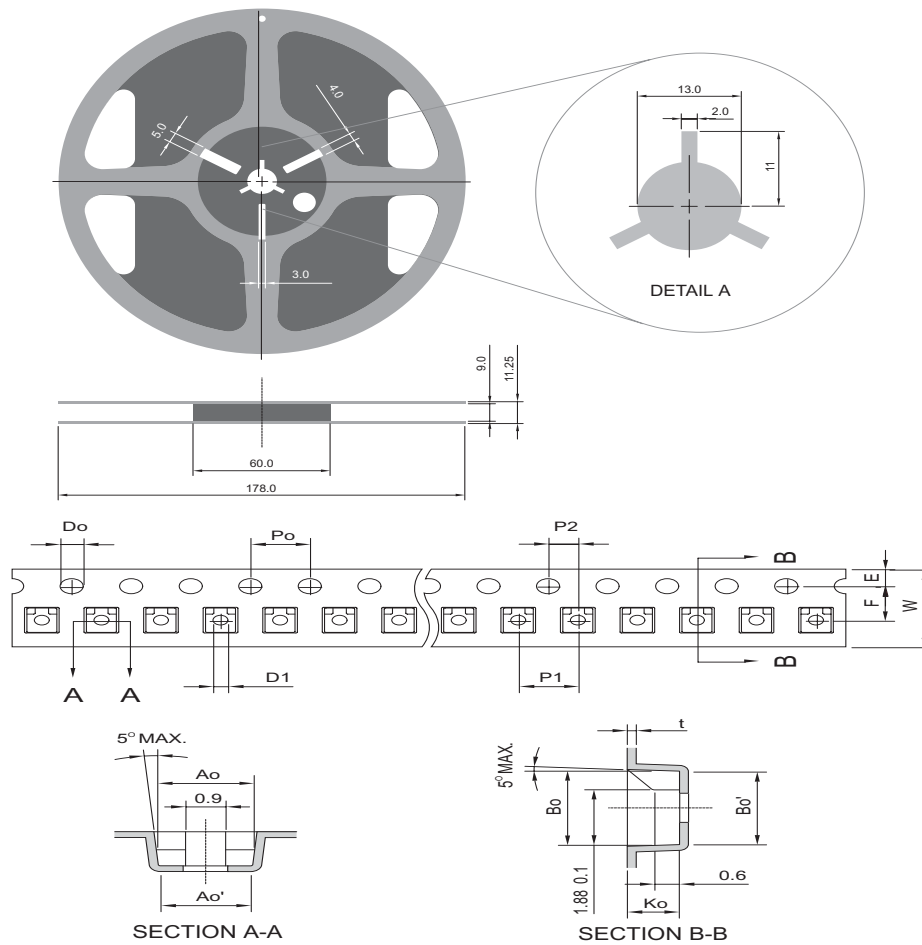


2. MARKING





3. TAPING



SYMBOL	mm (INCH)
TYPE SIZE 8.00 (0.314)	
Ao	3.15 ± 0.10(0.124 ± 0.004)
Bo	2.65 ± 0.10(0.104 ± 0.004)
Do	1.55 ± 0.05(0.610 ± 0.002)
D1	1.00 ± 0.10(0.039 ± 0.004)
E	1.75 ± 0.10(0.069 ± 0.004)
F	3.50 ± 0.05(0.137 ± 0.002)
Ko	1.17 ± 0.10(0.046 ± 0.004)
Po	4.00 ± 0.10(0.157 ± 0.004)
P1	4.00 ± 0.10(0.157 ± 0.004)
P2	2.00 ± 0.05(0.009 ± 0.002)
t	0.20 ± 0.05(0.008 ± 0.002)
W	8.00 ± 0.30(0.314 ± 0.012)
Ao'	3.00 ± 0.10(0.118 ± 0.004)
Bo'	2.55 ± 0.10(0.100 ± 0.004)

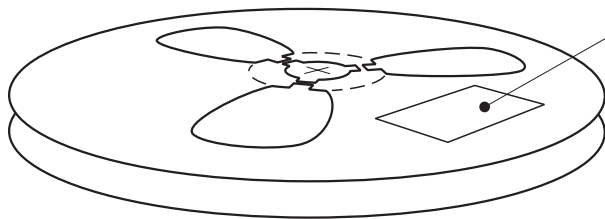
NOTE:

1. There shall be leader of 230 mm minimum which may consist of carrier and or cover tape follower by a minimum of 160 mm of carrier tape sealed with cover tape.
2. There shall e minimum of 160 mm of empty component pockets sealed with cover tape.
3. Devices are packed in accordance whit EIA standard EIA-481-A and specifications given above.



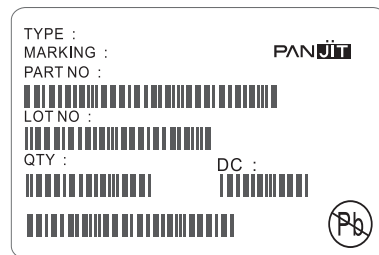
4. PACKING

REEL PACKING

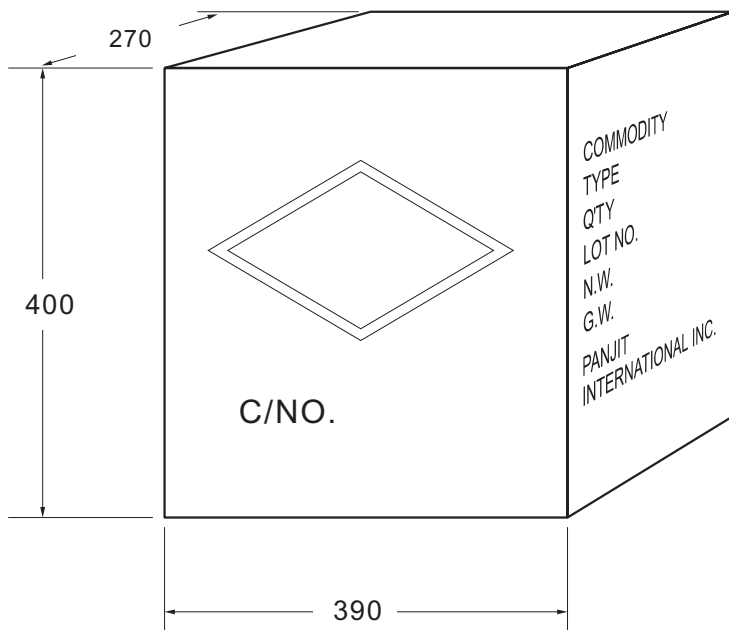


Quantity per Reel: 3,000 pcs

LABEL TYPE

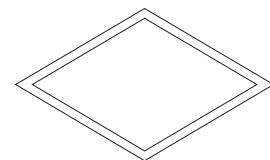


CARTON



Box Dimensions : mm
Quantity per Box: 240,000pcs

SHIPPING MARK



C/NO.
PRODUCT COUNTRY

SIDE MARK

COMMODITY:
TYPE:
Q'TY:
LOT NO.
N.W.
G.W.
PANJIT
INTERNATIONAL INC.



Bulk Packing

PACKAGE	INNER SIZE	BOX	CARTON SIZE	CARTON	APPROX. GROSS WEIGHT
	(m/m)	(EA)	(m/m)	(EA)	(Kg)
Bulk Packing					
A-405	198 x 84 x 20	10,000	459 x 214 x 256	50,000	18.2
AG / RB-20 / WOB	258x190x77	1,000	395x270x400	10,000	17.0
AM	260 x 190 x 80	1,000	400 x 273 x 415	10,000	15
CM / KBPC	193 x 193 x 46	50	405 x 210 x 265	500	18
CMW / KBPC-W	193 x 193 x 46	50	405 x 210 x 265	500	16.5
KBPC-P / CP-15/25/35/50	193 x 193 x 46	50	405 x 210 x 265	500	14.5
KBPC-PW / CPW-15/25/35/50	193 x 193 x 46	50	405 x 210 x 265	500	13
CP-3 / 6	260 x 190 x 80	400	400 x 273 x 415	4,000	8.5
CP-8 / 10	260 x 190 x 80	250	400 x 273 x 415	2,500	14
DIP	-	-	495 x 214 x 256	12,000	8.8
DO-15	200 x 85 x 25	1,000	459 x 214 x 256	40,000	17
DO-201AD	200 x 85 x 40	500	495 x 214 x 256	12,500	15.8
DO-201AE	200 x 85 x 40	500	495 x 214 x 256	12,500	15.8
DO-34	96 x 80 x 42	2,000	410 x 335 x 265	120,000	12
DO-35	96 x 80 x 42	2,000	410 x 335 x 265	120,000	13.8
DO-41	240 x 100 x 90	5,000	410 x 335 x 265	60,000	20
DO-41G	96 x 80 x 42	1,000	410 x 335 x 265	60,000	20
FL	270 x 225 x 50	500	463 x 283 x 185	3,000	18.2
GBJ	352 x 337 x 44	600	375 x 360 x 213	2,400	25.4
GBL	350 x 337 x 44	960	375 x 360 x 213	3,840	13.1
GBP	350 x 337 x 44	1,120	375 x 360 x 213	4,480	10.7
GBPC	195 x 195 x 40	50	460 x 215 x 260	500	14.5
GBPCW	195 x 195 x 40	50	460 x 215 x 260	500	13
GBU	350 x 337 x 44	800	375 x 360 x 213	3,200	17
GL	195 x 195 x 40	80	460 x 215 x 260	800	11
GPJ	500 x 150 x 145	750	572 x 306 x 218	1,500	17
KBJ	219 x 177 x 44	200	367 x 232 x 250	2,000	16.3
KBPM	490 x 150 x 110	1,200	510 x 335 x 240	4,800	19
KBU	270 x 225 x 50	200	463 x 283 x 185	1,200	10
MDI	350 x 337 x 44	6,000	375 x 360 x 390	48,000	14.4
P-600	208 x 90 x 83	500	495 x 214 x 256	5,000	11.9
R-1	198 x 84 x 20	1,000	495 x 214 x 256	50,000	18.2
SDIP	-	-	495 x 214 x 256	24,000	16.8
TO / ITO-220	555 x 145 x 95	2,000	572 x 306 x 218	8,000	19
TO-251AB	560 x 210 x 79	8,400	572 x 306 x 218	33,600	22
TO-247AD	-	-	536 x 243 x 100	1,500	13.2
KBP	258x190x77	1,000	395x270x400	10,000	18.0
KBL	230x147x50	200	460x245x275	3,000	17.25
K3 / K6	210x115x90	200	600x235x198	2,000	7.3/8.8
K8	210x115x90	200	600x235x198	2,000	13.8
K10/K15/K25/K35/K50M	193x193x46	50	405x210x265	500	17.0
K10/K15/K25/K35/K50P	193x193x46	50	405x210x265	500	17.0
K10/K15/K25/K35/K50W	193x193x46	50	405x210x265	500	17.0



Reel Packing

PACKAGE	REEL	COMPONENT SPACE	TAPE SPACE	REEL DIA	CARTON SIZE	CARTON	APPROX. GROSS WEIGHT
	(pcs)	(m/m)	(m/m)	(m/m)	(m/m)	(EA)	(Kg)
Reel Packing							
A-405	5,000	5	52	330	340 x 340 x 410	25,000	11.3
TO-263	800	16	24	330	375 x360 x 390	6,400	15
DO-15	4,000	5	52	330	340 x 340 x 410	20,000	11
DO-201AD	1,250	10	52	330	340 x 340 x 410	6,250	9.2
DO-201AE	1,250	10	52	330	340 x 340 x 410	6,250	9.2
DO-34	10,000	5	52	360	360 x 360 x 395	50,000	9.5
DO-35	10,000	5	52	360	360 x 360 x 395	50,000	12
DO-41	5,000	5	52	330	360 x 360 x 395	25,000	13
DO-41G	5,000	5	52	360	360 x 360 x 395	25,000	13
TO-252	3,000	8	16	330	375 x 360 x 390	42,000	20.2
MDI	3,000	8	12	330	375 x360 x 390	48,000	14.4
QUADRO-MELF	2,500	4	-	178	385 x 380 x 260	200,000	13.5
MELF/DL-41	5,000	4	-	330	350 x 350 x 300	100,000	14
MICRO-MELF	2,500	4	-	178	385 x 380 x 260	200,000	13.5
MINI-MELF	10,000 / 2,500	4	-	330 / 178	360 x 360 x 395 / 385 x 380 x 260	200,000	14.0 / 13.5
P-600	800	10	52	330	340 x 340 x 410	4,000	11
QFN 1.6 x 1.6	4,000	4	8	178	390 x 240 x 420	200,000	7.8
R-1	5,000	5	52	330	340 x 340 x 410	25,000	6.3
SDIP	1,500	12	16	330	375 x360 x 390	21,000	16.3
SMA	7,500 / 1,800	4	12	330 / 178	375 x360 x 390 / 390 x 240 x 420	120,000 / 72,000	17.5 / 10
SMB	3,000 / 500	8	12	330 / 178	375 x360 x 390 / 390 x 240 x 420	48,000 / 20,000	13.6 / 7.5
SMC	3,000 / 500	12	16	330 / 178	375 x360 x 390 / 390 x 240 x 420	42,000 / 15,000	6.2 / 7.3
SOD-123	10,000 / 3,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	120,000 / 240,000	6.4 / 9.4
SOD-123FL	10,000 / 3,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	120,000 / 240,000	6.4 / 9.4
SOD-323	12,000 / 5,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	144,000 / 400,000	10 / 15.2
SOT-23	12,000 / 3,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	144,000 / 240,000	6.4 / 9.4
SOT-323	12,000 / 3,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	144,000 / 240,000	6.4 / 9.4
SOT-363	10,000 / 3,000	4	8	330 / 178	735 x 365 x 292 / 390 x 240 x 420	300,000 / 150,000	15.66 / 7.0
SOT-353	10,000 / 3,000	4	8	330 / 178	735 x 365 x 292 / 390 x 240 x 420	300,000 / 150,000	15.66 / 7.0
TO-92	2,000	-	-	335	390 x 390 x 280	8,000	6.067
SOD-523	12,000 / 5,000	4	8	330 / 178	375 x 360 x 213 / 390 x 270 x 400	144,000 / 400,000	10 / 15.2
QFN 2.0 x 2.0	5,000 / 3,000 / 1,000	4	8	330 / 178 / 178	553 x 365 x 358 / 333 x 240 x 257 / 333 x 240 x 257	45,000 / 39,000 / 13,000	4.5 / 3.0 / 2.5
SOT23-6L	3,000 / 2,500 / 1,000	4	8	330 / 178 / 178	553 x 365 x 358 / 333 x 240 x 257 / 333 x 240 x 257	39,000 / 32,500 / 13,000	3.0 / 3.0 / 2.5
SOIC-08	3,000 / 1,500 / 1,000	4	8	330 / 330 / 178	553 x 365 x 358 / 553 x 365 x 358 / 333 x 240 x 257	39,000 / 13,500 / 13,000	6.5 / 5.0 / 3.5



Ammunition Packing

PACKAGE	AMMO	COMPONENT SPACE	TAPE SPACE	BOX SIZE	CARTON SIZE	CARTON	APPROX. GROSS WEIGHT
	(pcs)	(m/m)	(m/m)	(m/m)	(m/m)	(EA)	(Kg)
Ammunition Packing							
A-405	5,000	5	26	255 x 50 x 150	339 x 276 x 330	60,000	16.0
A-405	5,000	5	52	255 x 75 x 150	339 x 276 x 330	40,000	16.0
DO-15	3,000	5	52	255 x 75 x 150	339 x 276 x 330	24,000	11.9
DO-201AD	1,250	10	52	255 x 75 x 150	339 x 276 x 330	10,000	14.0
DO-201AE	1,250	10	52	255 x 75 x 150	339 x 276 x 330	10,000	14.0
DO-34	5,000	5	26	248 x 80 x 48	410 x 335 x 265	150,000	15.5
DO-34	5,000	5	52	248 x 80 x 75	410 x 335 x 265	100,000	14.1
DO-35	5,000	5	26	248 x 80 x 48	410 x 335 x 265	150,000	20.0
DO-35	5,000	5	52	248 x 80 x 75	410 x 335 x 265	100,000	15.7
DO-41	5,000	5	52	255 x 75 x 150	339 x 276 x 330	40,000	19.1
DO-41G	2,500	5	26	248 x 80 x 48	410 x 335 x 265	75,000	21.5
DO-41G	2,500	5	52	248 x 80 x 75	410 x 335 x 265	50,000	19.0
P-600	400	10	52	255 x 75 x 150	339 x 276 x 330	3,200	9.0
R-1	5,000	5	26	255 x 50 x 150	339 x 276 x 330	40,000	11.0
R-1	5,000	5	52	255 x 75 x 150	339 x 276 x 330	40,000	16.0



5. HIGH RELIABILITY TESTING SPEC.

NO	TEST ITEM	TEST CONDITION	REFERENCE DOCUMENT	LOT QUALITY LEVEL	REMARK
1	TEMPERATURE CYCLING (T.C.T)	Ta = -55 + 0, -3 °C 10min Ta = +150 +/- °C 10min FOR 20 CYCLE	MIL-STD-750D METHOD-1051.5	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
2	HIGH TEMPERATURE STORAGE LIFE (H.T.S.L)	Ta = 150 +/- 5 °C TESTING TIME: 168 HRS 250 HRS 500 HRS	MIL-STD-750D METHOD-1031.2	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
3	SOLDERABILITY TEST	TEMPERATURE OF SOLDER POT = 260 +/- 5 °C TIME FOR DIPPING FLUX = 5-10 SEC TIME FOR DIPPING IN SOLDER = 5 +/- 0.5 SEC DIPPING DEPTH = 0.05 inch max FOR ONE CYCLE	MIL-STD-750D	METHOD-2026.10 LTPD 7 S.s. = 32 ACCEPT FOR 0 FAILURE ONLY.	
4	HIGH TEMPERATURE REVERSE BIAS (H.T.R.B)	Ta = 150 +/- 5 °C VR = 80 % VR (CUSTOM SECP) TESTING TIME: 168 HRS 250 HRS 500 HRS	MIL-STD-750D METHOD-1038.3	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
5	CONTINUE FORWARD OPERATING LIFE (C.F.O.L)	Ta = 55 °C I = IO +/- 10 % TESTING TIME: 168 HRS 250 HRS 500 HRS	MIL-STD-750D METHOD-1027.3	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
6	THERMAL SHOCK (T.S.T)	HOT TANK T = 100 °C + 10 / -2 °C t = 5 min COLD TANK T = 0 °C + 2 / -10 °C t = 5 min 15 CYCLE TIME BETWEEN TRANSFERRING DO'NOT EXCEED 10 SECOND.	MIL-STD-750D METHOD-1056.7	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
7	PRESSURE COOKER (P.C.T)	Ta = 121 °C P = 1.2 kg / cm ² TIME = 96 HRS	JEDEC JESD22-A102-C	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
8	INTERMITTENT FORWARD OPERATING LIFE (I.F.O.L)	I = Io x 1.0 POWER ON : 30 SEC POWER OFF : 50 SEC TESTING TIME: 2000 CYCLES	MIL-STD-750D METHOD 1036.3	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
9	FORWARD SURGE CURRENT (I.F.S.M)	SQ WAVE OR SINE WAVE IFSM-DATE SHEET SPEC. TIME = 8.3 Msec T = 1 CYCLE	MIL-STD-750D METHOD 4066.3	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
10	HUMIDITY	Ta = 85 °C RH = 85 % TESTING TIME: 168 HRS 250 HRS 500 HRS	MIL-STD-750D METHOD 1021.1	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	
11	SOLDERABILITY RESISTANCE	TEMPERATURE OF SOLDER POT = 260 +/- 5 °C TIME FOR DIPPING IN SOLDER = 10 + 2 / -0 SEC DIPPING DEPTH = 1.57 +/- 0.79 mm BELOW BODY FOR ONE CYCLE	MIL-STD-750D METHOD 2031.1	LTPD10 S.s. = 22 ACCEPT FOR 0 FAILURE ONLY.	

*SCHOTTKY PRODUCT TESTING TEMPERATURE 100 °C MAX (NORMAL)