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DEPARTMENT OF DEFENSE

HANDBOOK

LIST OF CASE OUTLINES AND DIMENSIONS FOR DISCRETE SEMICONDUCTOR DEVICES

AMSC N/A

FSG 59GP

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FOREWORD

1. This handbook is approved for use by all Departments and Agencies of the Department of Defense (DOD).

2. This handbook is for guidance only.

3. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center, Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD1426) appearing at the end of this document or by letter.

CONTENTS

1. SCOPE

1.1 Scope. This handbook details dimensioning for popular case outlines used with discrete semiconductor devices specified in MIL-PRF-19500.

2. APPLICABLE DOCUMENTS. This section is not applicable to this handbook.

3. GENERAL

3.1 Definitions. The following definitions apply to this handbook.

3.1.1 Seating plane. The reference plane which designates the interface between the package and the surface on which it is mounted.

3.1.2 Body. That part of the package exclusive of electrical terminals, studs, or leads.

3.1.3 Terminal. That part of the package used in making an electrical, mechanical, or thermal connection. Examples of terminals are flexible leads, rigid leads, studs, and cases which serve as electrical connections.

3.1.4 Visual index. A referenced mark, chamfer, notch, tab, flat, extended terminal, or groove which identifies the number one terminal position.

4. CASE OUTLINE PRESENTATION

4.1 Outline identification. Outlines included in this handbook are identified by a letter, a dash, then a number-suffix combination. The letter T is used to designate transistor and thyristor outlines and D for diode outlines. Numbers are assigned sequentially within each group to designate a family of outlines. One suffix letter is added to designate one of a family of outlines (e.g., T-1A, T-1B, D-1A, and D-2B).

4.2 Dimensioning symbols. The symbols for dimensioning case outlines are listed below.

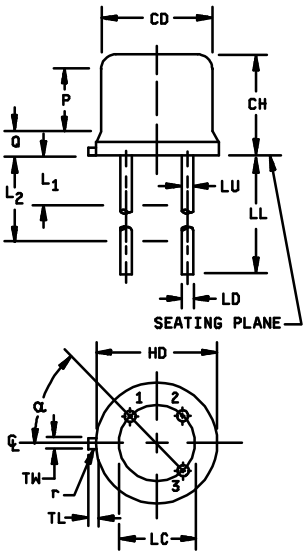
BD	Body diameter.
BL	Body length.
BW	Body width.
CD	Largest diameter of body (case diameter).
CH	Distance from seating plane to top of body (case height).
ECT	End cap thickness.
F	Overall dimension of flange or hexagon zone including any fillet.
F_1	Dimension of a flange or hexagon zone excluding any fillet.
FL	Longest dimension between seating plane and center of hole in the lug of a terminal (flag length).
FW	Major cross section dimension of a terminal (flag width).
HD	Header diameter.
HF	Distance across flats dimension of a hexagon (hexagon flats).
HR	Curve radii associated with body (header radius).

HR2	Curve radii associated with body (header radius).
HT	Header thickness.
LC	Diameter of the circle upon which the terminal positions are located (lead circle).
LD	Diameter of round (wire) terminals (lead diameter).
LL	Overall terminal length (lead length).
L_1	Length of uncontrolled cross section of terminal.
LS	Spacing between leads.
MHD	Diameter of mounting holes (mounting hole diameter).
MHS	Distance between centers of two mounting holes (mounting hole spacing).
OAH	Over all height from seating plane.
P	Length of controlled zone of body.
PS	Linear distance between two terminal centers (pin spacing).
Q	Other dimensions.
SD	Pitch diameter in accordance with FEDSTDH28 (stud diameter).
SL	Overall length of stud.
SU	Length of incomplete or undercut threads (stud undercut).
TL	Length of visual index (tab length).
TW	Width of visual index (tab width).
UD	Diameter of thread relief zone (undercut diameter).
C	Minor cross section dimension of a terminal.
R	Index tab radii.
S	Miscellaneous dimensions of terminal flat relative to terminal hole.
NT	Diameter of hole in terminal.
α	Index datum angle to first terminal position on each pin circle.
ß	Angular spacing between adjacent terminal positions.

NOTE: Subscript numbers may be included when more than one dimension is specified for a given symbol (e.g. F_1, HR_2).

Outline number	Similar to JEDEC number	Figure number	Page number
T-1A (3 - 1.5" leads, number 3 connected to case)	TO-205AA (TO-5)	1	5
T-1B (3 - 1.5" leads, all isolated from case)	TO-205AA (TO-5)	1	5
T-1C (3 - .5 leads, number 3 connected to case)	TO-205AD (TO-39)	1	5
T-1D (3 - .5" leads, all isolated from case)	TO-205AD (TO-39)	1	5
T-1E (3 - .5" leads, number 3 connected to case)	TO-205AF (TO-39)	1	5
T-2A (3 - .5" leads, number 3 connected to case)	TO-206AA (TO-18)	2	6

C-3	Surface mount	17	29
C-4	Surface mount	18	30
C-6	Surface mount	19	31



Symbol	T-1A		T-1B		T-1C		T-1D		T-1E		Notes
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
CD	.305	.355	.305	.355	.305	.355	.305	.355	.305	.355	
CH	.240	.260	.240	.260	.240	.260	.240	.260	.160	.180	
HD	.355	.370	.355	.370	.355	.370	.355	.370	.355	.370	
LC	.200 TP		.200 TP		.200 TP		.200 TP		.200 TP		6
LD	.016	.021	.016	.021	.016	.021	.016	.021	.016	.021	7
LL	1.500	1.750	1.500	1.750	.500	.750	.500	.750	.500	.750	7
LU	.016	.019	.016	.019	.016	.019	.016	.019	.016	.019	7
L1		.050		.050		.050		.050		.050	7
L2	.250		.250		.250		.250		.250		7
TL	.029	.045	.029	.045	.029	.045	.029	.045	.029	.045	3
TW	.028	.034	.028	.034	.028	.034	.028	.034	.028	.034	10
P	.100		.100		.100		.100		.100		5
Q		.040		.040		.040		.040		.040	4
r		.010		.010		.010		.010		.010	11
a	45° TP		45° TP		45° TP		45° TP		45° TP		6
Notes	1, 2, 8, 9		1, 2, 8		1, 2, 8, 9		1, 2, 8		1, 2, 8, 9		

NOTES:

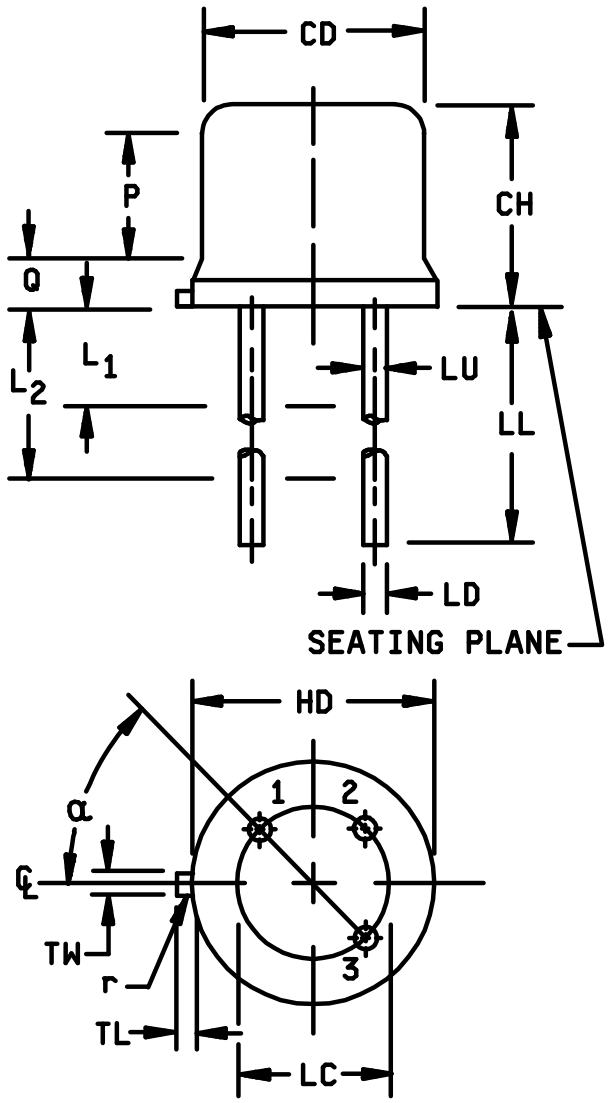
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LD applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum.
8. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor	FET	Thyristor
1	Emitter	Source	Cathode
2	Base	Gate	Gate
3	Collector	Drain	Anode

9. Lead number three is electrically connected to case.
10. Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
11. Symbol r applied to both inside corners of tab.

FIGURE 1. Physical dimensions of T-1 family. (Similar to TO-5, TO-39)

Symbol	T-2A		T-2B		Note
	Min	Max	Min	Max	
CD	.178	.195	.178	.195	
CH	.170	.210	.240	.260	
HD	.209	.230	.209	.230	
LC	.100 TP		.100 TP		6
LD	.016	.021	.016	.021	7
LL	.500	.750	.500	.750	7
LU	.016	.019	.016	.019	7
L_1		.050		.050	7
L_2	.250		.250		7
TL	.028	.048	.028	.048	3
TW	.036	.046	.036	.046	10
P	.100				
Q		.040		.040	4
r		.007		.007	11
α	45° TP		45° TP		6
Notes	1, 2, 8, 9		1, 2, 8, 9		



Inches	mm	Inches	mm
.007	0.18	.170	4.43
.016	0.41	.178	4.52
.019	0.48	.195	4.95
.021	0.53	.209	5.31
.028	0.71	.210	5.33
.036	0.91	.230	5.84
.040	1.02	.240	6.10
.046	1.17	.250	6.35
.048	1.22	.260	6.60
.050	1.27	.500	12.70
.100	2.54	.750	19.05

FIGURE 2. Physical dimensions of T-2 family. (Similar to TO-18, TO-46)

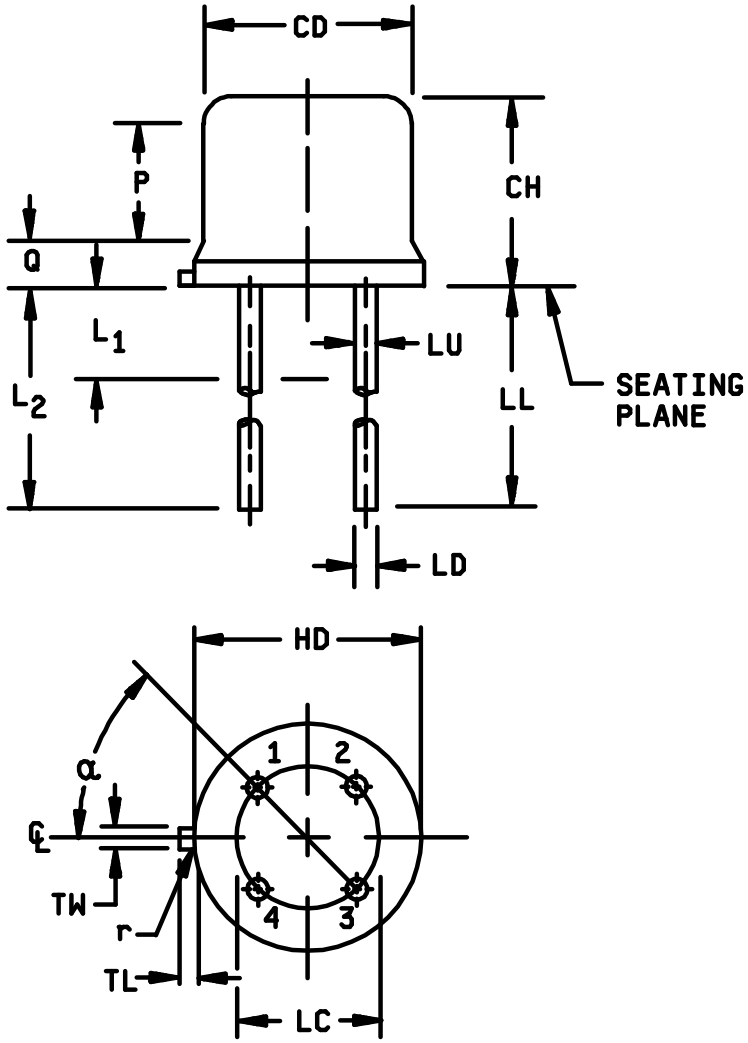
NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of TP relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum.
8. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor	FET	Thyristor
1	Emitter	Gate	Cathode
2	Base	Source	Gate
3	Collector	Drain	Anode

9. Lead number three is electrically connected to case.
10. Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
11. Symbol r applied to both inside corners of tab.

FIGURE 2. Physical dimensions of T-2 family (Similar to TO-18, TO-46) - Continued.

Symbol	T-3A		Note
	Min	Max	
CD	.178	.195	
CH	.170	.210	
HD	.209	.230	
LC	.100 TP		6
LD	.016	.021	7
LL	.500	.750	7
LU	.016	.019	7
L_1	---	.050	7
L_2	.250	---	7
TL	.028	.048	3
TW	.036	.046	10
P	.100	---	
Q	---	.040	4
r	---	.007	11
α	45° TP		6
Notes	1, 2, 8, 9		



Inches	mm	Inches	mm
.007	0.18	.100	2.54
.016	0.41	.170	4.32
.019	0.48	.178	4.52
.021	0.53	.195	4.95
.028	0.71	.209	5.31
.036	0.91	.210	5.33
.040	1.02	.230	5.84
.046	1.17	.250	6.35
.048	1.22	.500	12.70
.050	1.27	.750	19.05

FIGURE 3. Physical dimensions of T-3 family. (Similar to TO-72)

NOTES:

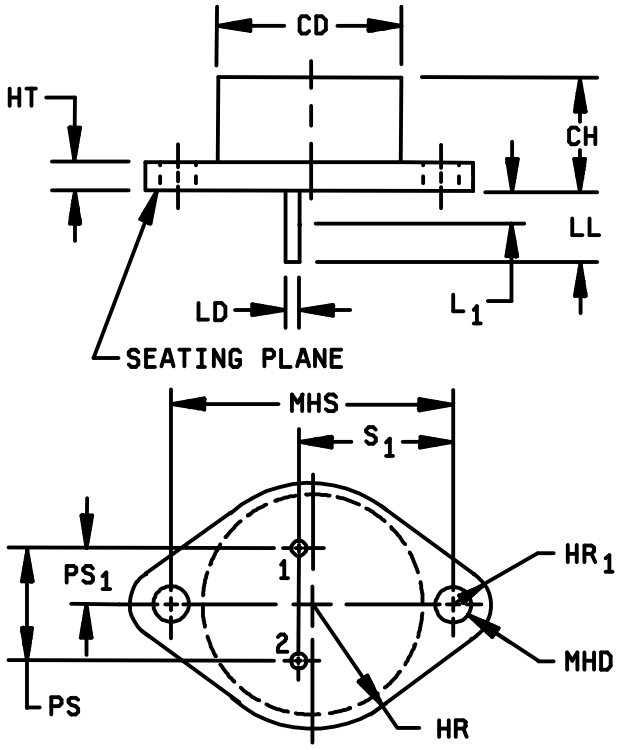
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of TP relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum.
8. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor	FET
1	Emitter	Gate
2	Base	Source
3	Collector	Drain
4	Case	Case

9. Lead number three is electrically connected to case.
10. Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
11. Symbol r applied to both inside corners of tab.

FIGURE 3. Physical dimensions of T-3 family (Similar to TO-72) - Continued.

Inches	mm	Inches	mm	Inches	mm
.038	0.97	.135	3.43	.440	11.18
.043	1.09	.151	3.84	.495	12.57
.048	1.22	.188	4.78	.500	12.70
.050	1.27	.205	5.21	.525	13.34
.053	1.35	.225	5.72	.875	22.22
.058	1.47	.250	6.35	1.177	29.90
.060	1.52	.312	7.92	1.197	30.40
.063	1.60	.360	9.14	1.51	38.4
.131	3.33	.420	10.67	1.65	41.9



NOTES: (for table on next page)

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. These dimensions should be measured at points .050 inch (1.27 mm) +.005 inch (0.13 mm) -.000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
4. Two places.
5. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6. Lead diameter shall not exceed twice LD within L_1.
7. Lead designation, depending on device type, shall be as follows:

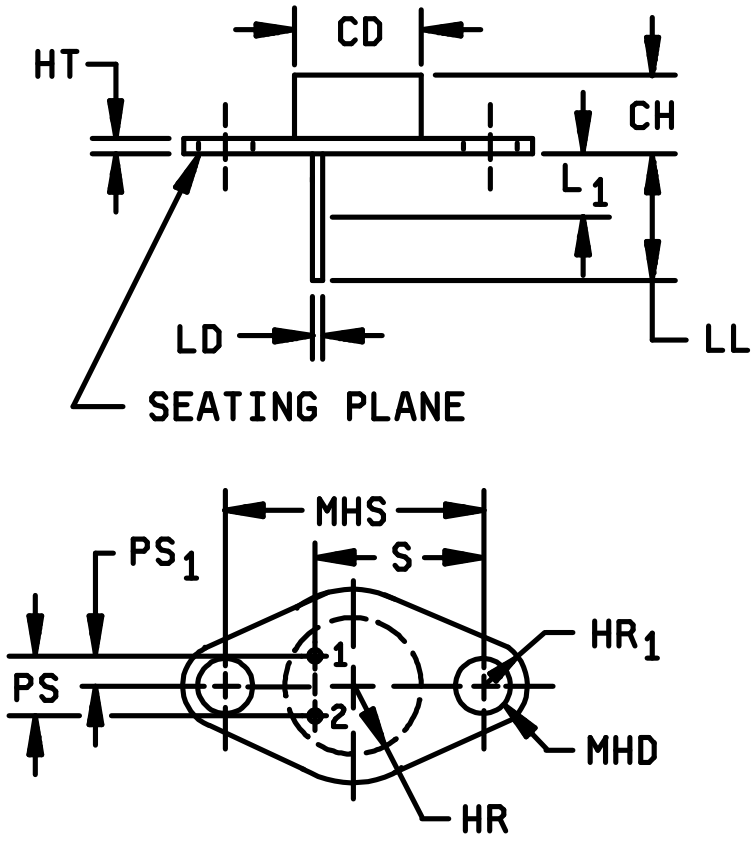
Lead number	Bipolar transistor	FET
1	Emitter	Source
2	Base	Gate
Case	Collector	Drain

FIGURE 4. Physical dimensions of T-4 family. (Similar to TO-3)

Symbol	T-4A		T-4B		T-4C		Note
	Min	Max	Min	Max	Min	Max	
CD		.875		.875		.875	
CH	.250	.360	.250	.360	.250	.360	
HR	.495	.525	.495	.525	.495	.525	4
HR_1	.131	.188	.131	.188	.131	.188	4
HT	.060	.135	.060	.135	.060	.135	
LD	.038	.043	.048	.053	.058	.063	4, 6
LL	.312	.500	.312	.500	.312	.500	
L_1		.050		.050		.050	6
MHD	.151	1.65	1.51	1.65	.151	1.65	4
MHS	1.177	1.197	1.177	1.197	1.177	1.197	
PS	.420	.440	.420	.440	.420	.440	3
PS_1	.205	.225	.205	.225	.205	.225	3
S_1	.655	.675	.655	.675	.655	.675	
Notes	1, 2, 5, 7		1, 2, 5, 7		1, 2, 5, 7		

FIGURE 4. Physical dimensions of T-4 family (Similar to TO-3) - Continued.

Symbol	T-5A		Note
	Min	Max	
CD		.620	
CH	.250	.340	
HR		.350	4
HT	.050	.075	
HR_1	.115	.145	4
LD	.028	.034	4, 6
LL	.360	.500	
L_1		.050	6
MHD	.142	.152	4
MHS	.958	.962	
PS	.190	.210	3
PS1	.093	.107	3
S	.570	.590	
Notes	1, 2, 5, 7		



Inches	mm	Inches	mm
.028	0.71	.250	6.35
.034	0.86	.340	8.64
.050	1.27	.350	8.89
.075	1.91	.360	9.14
.093	2.36	.470	11.94
.107	2.72	.500	12.70
.115	2.92	.570	14.48
.142	3.61	.590	14.99
.145	3.68	.620	15.75
.152	3.86	.958	24.33
.190	4.83	.962	24.43
.210	5.33		

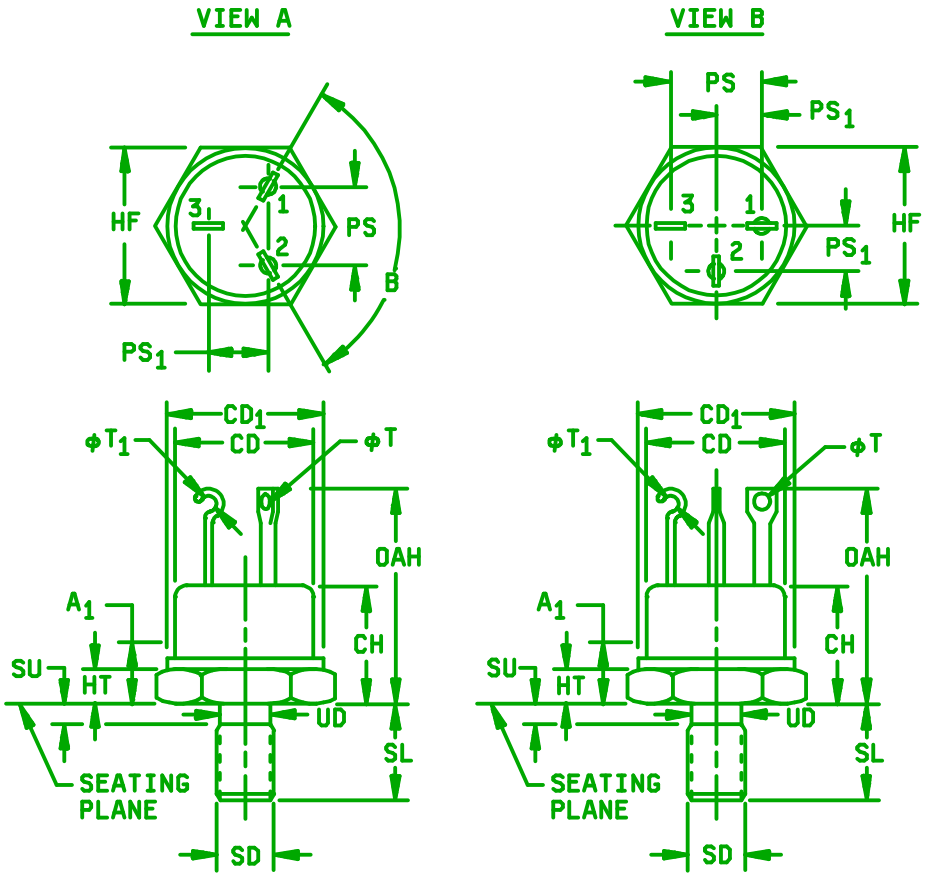
FIGURE 5. Physical dimensions of T-5 family. (Similar to TO-66)

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. These dimensions should be measured at points .050 inch (1.27 mm) +.005 inch (0.13 mm) -.000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
4. Two places.
5. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6. Lead diameter shall not exceed twice LD within L_1.
7. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor	FET
1	Emitter	Source
2	Base	Gate
Case	Collector	Drain

FIGURE 5. Physical dimensions of T-5 family (Similar to TO-66) - Continued.



Inches	mm	Inches	mm	Inches	mm
.040	1.02	.150	3.81	.320	8.13
.045	1.14	.155	3.94	.380	9.65
.065	1.65	.165	4.19	.400	10.16
.070	1.78	.185	4.70	.424	10.77
.078	1.98	.189	4.80	.437	11.10
.090	2.29	.190	4.83	.455	11.56
.110	2.79	.215	5.46	.468	11.89
.125	3.18	.250	6.35	.570	14.48
		.318	8.08	.763	19.38

FIGURE 6. Physical dimensions of T-6 family. (Similar to TO-59)

Symbol	T-6A		T-6B		T-6C		Note
	Min	Max	Min	Max	Min	Max	
CD	.380	.437	.380	.437	.380	.437	9
CD_1	.318	.380	.318	.380	.318	.380	
CH	.320	.468	.320	.468	.320	.468	
HF	.424	.437	.424	.437	.424	.437	
HT	.090	.150	.090	.150	.090	.150	
OAH	.570	.763	.570	.763	.570	.763	
PS	.185	.215	.185	.215	.125	.165	
PS_1	.090	.110	.090	.110	.090	.110	
SD	.190-32 UNF-2A		.190-32 UNF-2A		.190-32 UNF-2A		6
SL	.400	.455	.400	.455	.400	.455	
UD	.155	.189	.155	.189	.155	.189	
SU		.078		.078		.078	
NT	.040	.065	.040	.065	.040	.065	
NT_1	.045	.070	.045	.070	.045	.070	
A_1		.250		.250		.250	
ß	120° Nom		90° Nom		120° Nom		
Notes	1, 2, 3, 4, 5, 7, 10, 11		1, 2, 3, 4, 5, 8, 10		1, 2, 3, 4, 5, 7, 10		

FIGURE 6. Physical dimensions of T-6 family (Similar to TO-59) - Continued.

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Terminal three may be flattened and pierced, or hook type.
4. Orientation of terminals in relation to hexagon is not controlled.
5. Chamfer or undercut on one or both ends of hexagon is optional.
6. Threads shall meet the requirements of FED-STD-H28.
7. View 'A' applicable.
8. View 'B' applicable.
9. Symbol CD_1 shall not exceed actual HF.
10. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor
1	Emitter
2	Base
3	Collector

11. Lead number three is electrically connected to case.

FIGURE 6. Physical dimensions of T-6 family (Similar to TO-59) - Continued.

Symbol	T-7A		T-7B		Note
	Min	Max	Min	Max	
CD	.610	.687	.610	.687	8
CD_1	.570	.610	.570	.610	
CH	.325	.460	.325	.460	
HF	.667	.687	.667	.687	7
HT	.090	.150	.090	.150	
OAH	.640	.875	.640	.875	
PS	.340	.415	.340	.415	
PS_1	.170	.213	.170	.213	
SD	.250-28 UNF-2A		.250-28 UNF-2A		6
SL	.422	.455	.422	.455	
SU		.090		.090	
NT	.047	.072	.047	.072	
NT_1	.046	.077	.046	.077	
UD	.220	.249	.220	.249	
A_1		.270		.270	
Notes	1, 2, 3, 4, 5, 9, 10		1, 2, 3, 4, 5, 9, 10		6

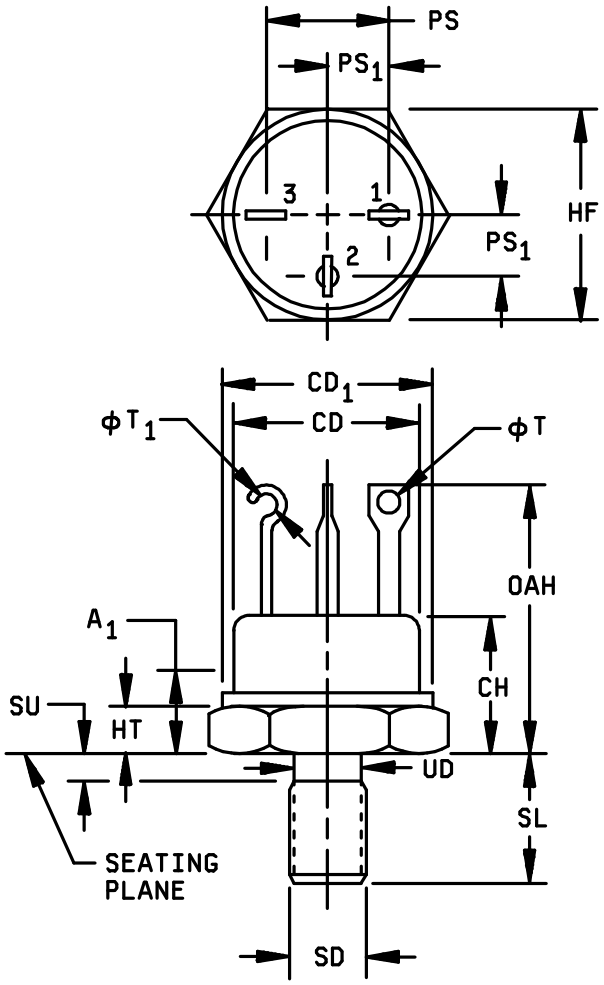


FIGURE 7. Physical dimensions of T-7 family. (Similar to TO-61)

Inches	mm	Inches	mm
.046	1.17	.325	8.26
.047	1.19	.340	8.64
.072	1.83	.415	10.54
.077	1.96	.422	10.72
.090	2.29	.455	11.56
.150	3.81	.460	11.68
.170	4.32	.570	14.48
.213	5.41	.610	15.49
.220	5.59	.640	16.26
.249	6.32	.667	16.94
.250	6.35	.687	17.45
.270	6.86	.875	22.23

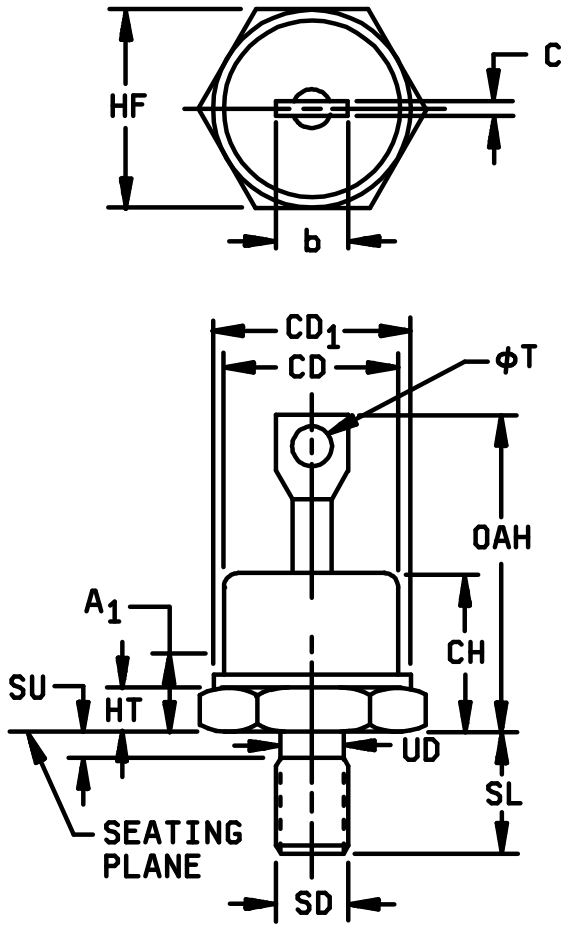
NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Terminal three may be flattened and pierced or hook type.
4. Orientation of terminals in relation to hexagon is not controlled.
5. Chamfer or undercut on one or both ends of hexagon is optional.
6. Threads shall meet the requirements of FED-STD-H28.
7. Three places.
8. Symbol CD1 shall not exceed actual HF.
9. Lead designation, depending on device type, shall be as follows:

Lead number	Bipolar transistor
1	Emitter
2	Base
3	Collector

10. Lead number three is electrically connected to case.

FIGURE 7. Physical dimensions of T-7 family (Similar to TO-61) - Continued.

Symbol	D-1A		D-1B		Note
	Min	Max	Min	Max	
CD		.505		.505	
CD_1	.265	.424	.265	.424	6
CH	.300	.405	.300	.405	
HF	.424	.437	.424	.437	
HT	.075	.175	.075	.175	
OAH	.600	.800	.600	.800	
SD	.190-32 UNF-2A		.190-32 UNF-2		5
SL	.422	.453	.422	.453	
SU		.078		.078	
UD	.163	.189	.163	.189	
NT	.060	.103	.060	.103	
A_1		.250		.250	
b		.250		.250	
C	.018	.065	.018	.065	
Notes	1,2,3,4,6		1,2,3,4,7		

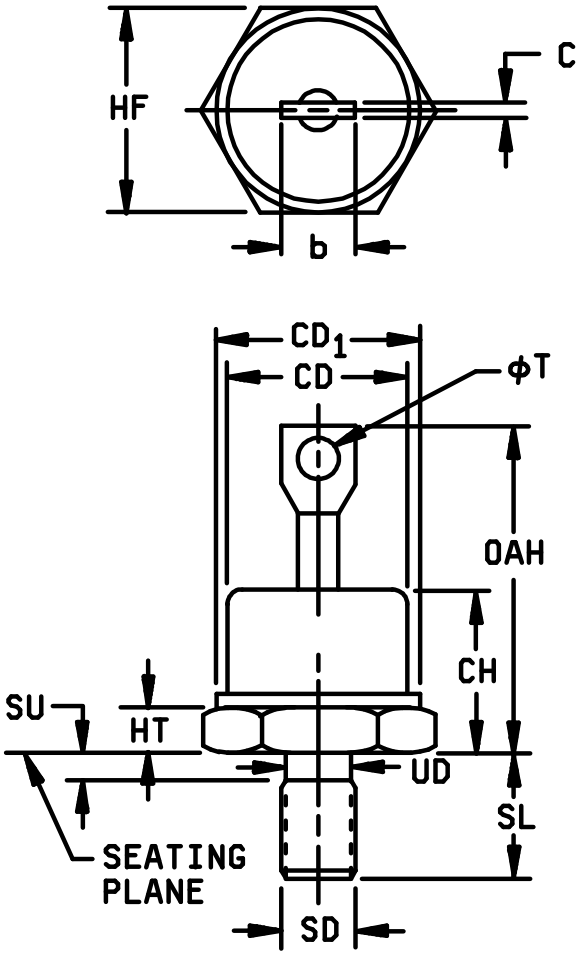


Inches	mm	Inches	mm
.018	0.46	.265	6.73
.060	1.52	.300	7.62
.065	1.65	.405	10.29
.075	1.91	.422	10.72
.078	1.98	.424	10.77
.103	2.62	.437	11.10
.163	4.14	.453	11.51
.175	4.45	.505	12.83
.189	4.80	.600	15.24
.190	4.83	.800	20.32
.250	6.35		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Orientation of terminals in relation to hexagon is not controlled.
4. Chamfer or undercut on one or both ends of hexagon is optional.
5. Threads shall meet the requirements of FED-STD-H28.
6. CD_1 shall not exceed HF.

FIGURE 8. Physical dimensions of D-1 family. (Similar to DO-4)

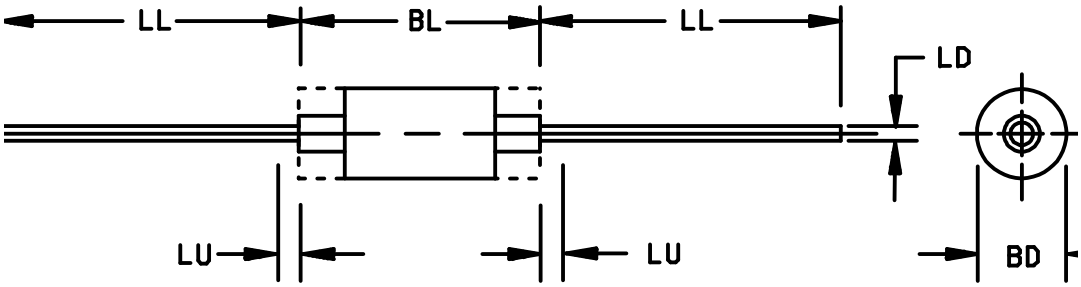
Symbol	D-2A		D-2B		Note
	Min	Max	Min	Max	
CD		.794		.794	
CD_1		.667		.667	6
CH		.450		.450	
HF	.667	.687	.667	.687	
OAH	.750	1.000	.750	1.000	
SD	.250-28 UNF-2A		.250-28 UNF-2A		5
SL	.422	.453	.422	.453	
SU		.090		.090	
UD	.220	.249	.220	.249	
b	.250	.375	.250	.375	
C	.030	.080	.030	.080	
HT	.115	.200	.115	.200	
NT	.140	.175	.140	.175	
Notes	1, 2, 3, 4, 6		1, 2, 3, 4, 7		



Inches	mm	Inches	mm
.030	0.76	.375	9.53
.080	2.03	.422	10.72
.090	2.29	.450	11.43
.115	2.92	.453	11.51
.140	3.56	.667	16.94
.175	4.45	.687	17.45
.200	5.08	.750	19.05
.220	5.59	.794	20.17
.249	6.32	1.000	25.40
.250	6.35		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Orientation of terminals in relation to hexagon is not controlled.
4. Chamfer or undercut on one or both ends of hexagon is optional.
5. Threads shall meet the requirements of FED-STD-H28.
6. CD_1 shall not exceed HF.

FIGURE 9. Physical dimensions of D-2 family. (Similar to DO-5)

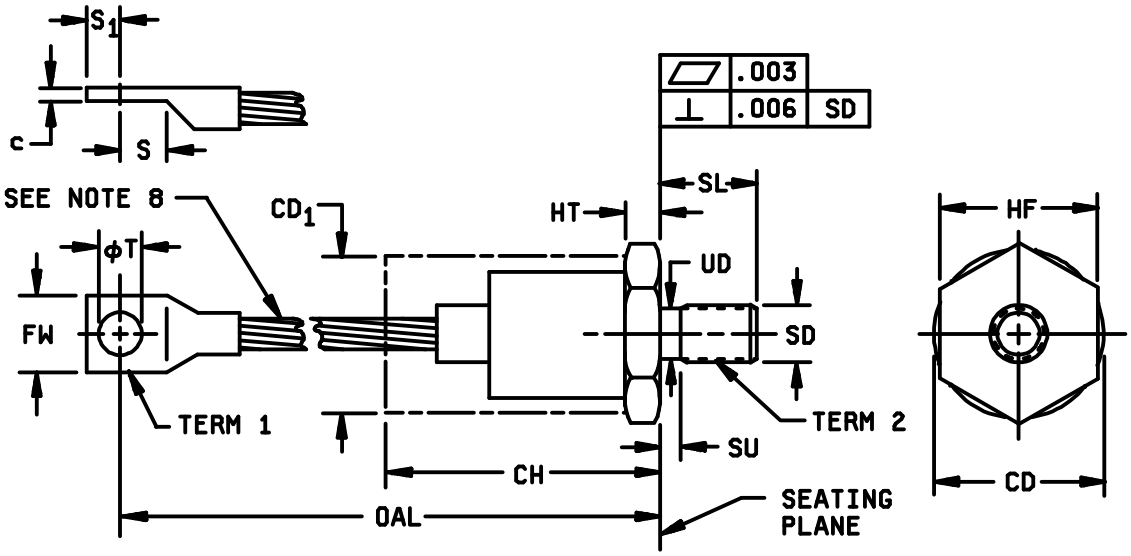


Symbol	D-3A		D-3B		D-3C		D-3D		D-3E		Note
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
BD	.085	.107	.108	.130	.055	.090	.060	.110	.115	.185	3
BL	.230	.300	.230	.300	.120	.200	.125	.215	.130	.195	
LD	.018	.022	.018	.022	.018	.022	.027	.032	.036	.042	
LL	1.000	1.500	1.000	1.500	1.000	1.500	.800	1.300	.900	1.300	
LU		.050		.050		.050		.050		.030	4
Notes	1, 2		1, 2		1, 2		1, 2		1, 2		

Inches	mm	Inches	mm	Inches	mm
.018	0.46	.085	2.16	.195	4.95
.022	0.56	.090	2.29	.200	5.08
.027	0.69	.107	2.72	.215	5.46
.030	0.76	.108	2.74	.230	5.84
.032	0.81	.110	2.79	.300	7.62
.036	0.91	.115	2.92	.800	20.32
.042	1.07	.120	3.05	.900	22.86
.050	1.27	.125	3.18	1.000	25.40
.055	1.40	.130	3.30	1.300	33.02
.060	1.52	.185	4.70	1.500	38.10

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Symbol BD shall be measured at the largest diameter.
4. Within L_1 lead diameter may vary to allow for flash, lead finish build-up, and minor irregularities other than heat slugs.

FIGURE 10. Physical dimensions of D-3 family. (Similar to DO-7, DO-41, DO-35)



Inches	mm	Inches	mm	Inches	mm	Inches	mm
.050	1.27	.310	7.87	.645	16.38	1.250	31.75
.063	1.60	.312	7.92	.650	16.51	1.443	36.65
.100	2.54	.350	8.89	.660	16.76	1.460	37.08
.105	2.67	.374	9.50	.735	18.67	1.647	41.83
.110	2.79	.375	9.53	.749	19.02	1.688	42.88
.125	3.18	.395	10.03	.750	19.05	1.949	49.50
.156	3.96	.420	10.67	.755	19.18	2.500	63.50
.172	4.37	.425	10.80	.793	20.14	3.250	82.55
.187	4.75	.437	11.10	.828	21.03	3.50	88.90
.230	5.84	.499	12.67	1.000	25.40	3.875	98.42
.250	6.35	.500	12.70	1.031	26.19	4.185	106.30
.265	6.73	.520	13.21	1.063	27.00	5.000	127.00
.270	6.86	.530	13.46	1.100	27.94	5.150	130.81
.300	7.62	.605	15.37	1.212	30.78	6.000	152.40
		.630	16.00	1.227	31.17	9.457	240.21
						9.70	246.4

FIGURE 11. Physical dimensions of D-4 family. (Similar to DO-8, DO-9, DO-30)

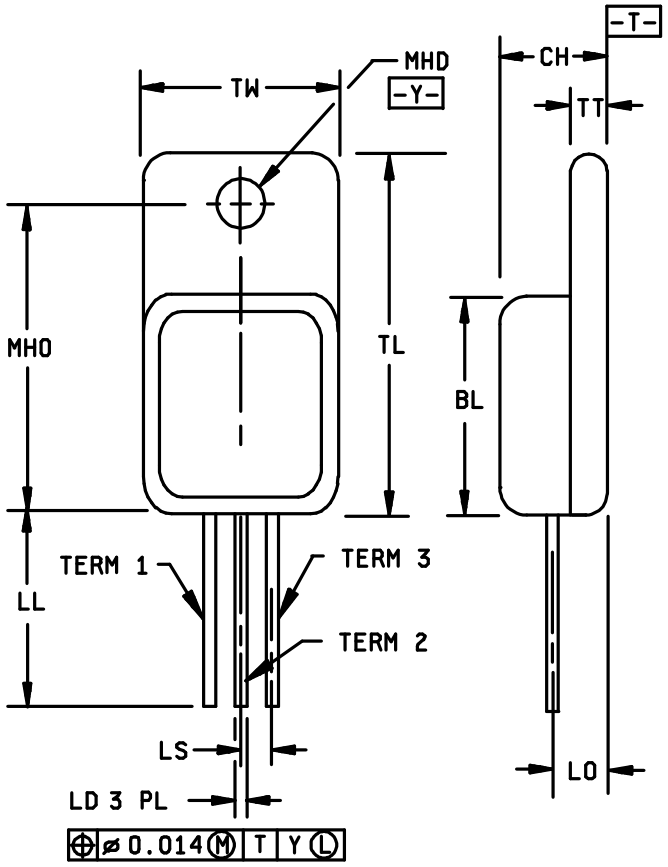
Symbol	Variations (all dimensions shown in inches)											
	D-4AA		Note	D-4AB		Note	D-4AC		Note	D-4AD		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
CH		2.500	4		3.250	4		2.500	4		3.50	4
FW	.437	.650	7	.530	.755	5	.437	.650	7	.735	1.000	
HF	1.031	1.063		1.212	1.250		1.031	1.063		1.647	1.688	
HT	.125	.500	5	.250	.630	4	.187	.500	4		.630	5
OAL	3.875	5.150		5.000	6.000		4.185	5.150		9.457	9.70	
S	.300		8	.375		8	.312		8	.520		8
SD	.375-24 UNF-2A		9	.750-16 UNF-2A		9	.500-20 UNF-2A		9	.750-16 UNF-2A		
S_1	.270		8	.300		8	.270		8	.300		8
SL	.605	.645		.793	.828			.828		1.00	1.100	4
SU		.105			.156		.605	.125			.156	
UD	.312	.374		.660	.749		.425	.499		.660	.750	
c	.050	.110		.063	.172		.050	.110		.100	.230	
CD		1.063	4		1.250			1.063	4		1.460	
CD_1		1.227			1.443			1.227			1.949	
NT	.250	.310		.265	.350		.250	.310		.395	.420	
Note	1, 2, 5, 7			1, 2, 5, 7			1, 2, 5, 7			1, 2, 5, 7		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are for general information only.
3. Dimensioning and tolerancing in accordance with ANSI Y14.5M-1982.
4. The body of the device with the exception of the hexagon and flexible lead extensions lies within cylinder defined by CD_1 and CH, CD_1 not to exceed actual HF.
5. Chamfer or undercut on one or both ends of hexagonal base is optional.
6. Flexible lead.
7. Contour and orientation of terminal lug are optional. Square or radius on end of terminal is optional.
8. Minimum flat.
9. Symbol SD is pitch diameter of coated threads, reference: Unified screw threads, ANSI B1.1-1982.

FIGURE 11. Physical dimensions of D-4 family (Similar to DO-8, DO-9, DO-30) - Continued.

Symbol	TO-254AA	
	Min	Max
BL	.535	.545
CH	.249	.260
LD	.035	.045
LL	0.500	0.750
LO	.150 BSC	
LS	.150 BSC	
MHO	.665	.685
MHD	.139	.149
TL	.790	.800
TT	.040	.050
TW	.535	.545

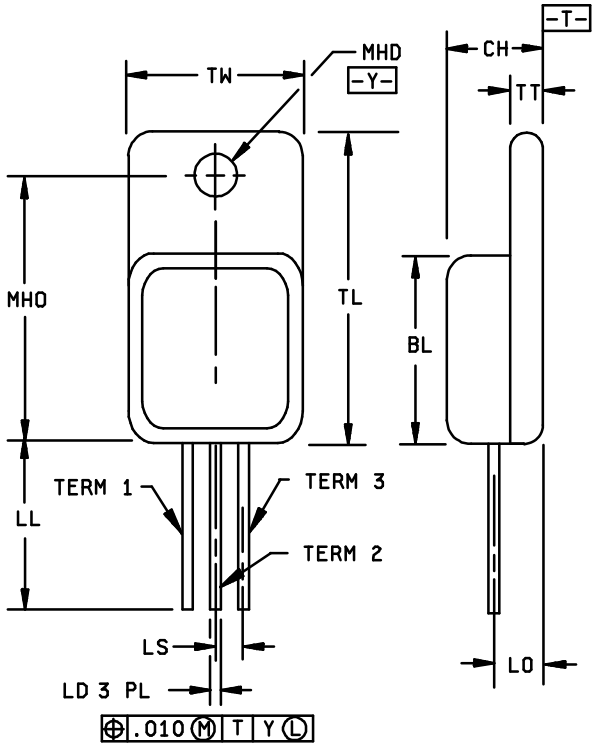


Inches	mm	Inches	mm
.035	0.89	.535	13.59
.040	1.02	.545	13.84
.045	1.14	.665	16.89
.050	1.27	.685	17.40
.139	3.53	.790	20.07
.149	3.78	.800	20.32
.150	3.81	1.195	30.35
.249	6.32	1.235	31.37
.260	6.60		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensioning and tolerancing in accordance with ANSI Y14.5M-1982.
4. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic).

FIGURE 12. Physical dimensions of TO-254.

Symbol	TO-257AA	
	Min	Max
BL	.410	.430
CH	.190	.200
LD	.025	.035
LL	.500	.750
LS	.100 BSC	
MHD	.140	.150
MHO	.527	.537
TL	.645	.665
TT	.035	.045
TW	.410	.420

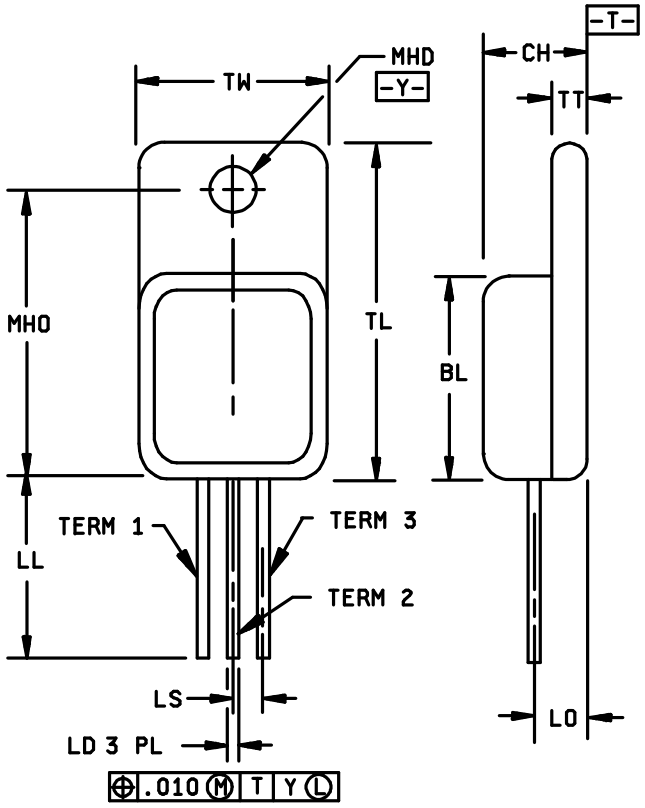


Inches	mm	Inches	mm
.025	0.64	.410	10.41
.035	0.89	.430	10.92
.045	1.14	.500	12.70
.100	2.54	.527	13.39
.140	3.56	.537	13.63
.150	3.81	.645	16.38
.190	4.83	.665	16.89
.200	5.08	.750	19.05

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic).

FIGURE 13. Physical dimensions of TO-257.

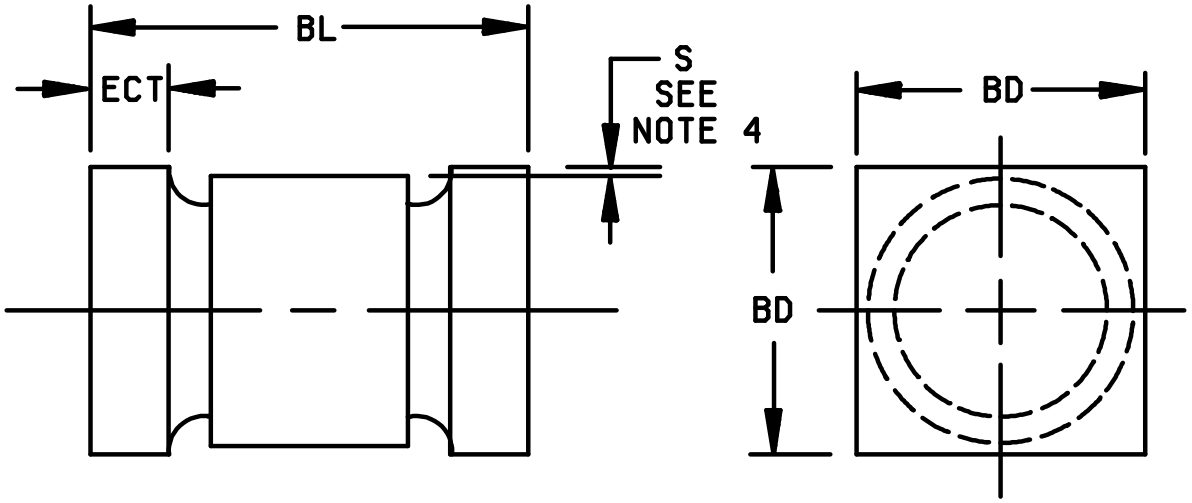
Symbol	TO-258AA	
	Min	Max
BL	.530	.550
CH	.240	.270
LD	.055	.065
LL	.500	.750
LS	.200 BSC	
MHD	.155	.165
MHO	.697	.707
TL	.815	.835
TT	.035	.045
TW	.685	.695



Inches	mm	Inches	mm
.035	0.89	.530	13.46
.045	1.14	.550	13.97
.055	1.40	.685	17.40
.065	1.65	.695	17.65
.155	3.94	.697	17.70
.165	4.19	.707	17.96
.200	5.08	.750	19.05
.240	6.10	.815	20.70
.270	6.86	.835	21.21
.500	12.70		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic).

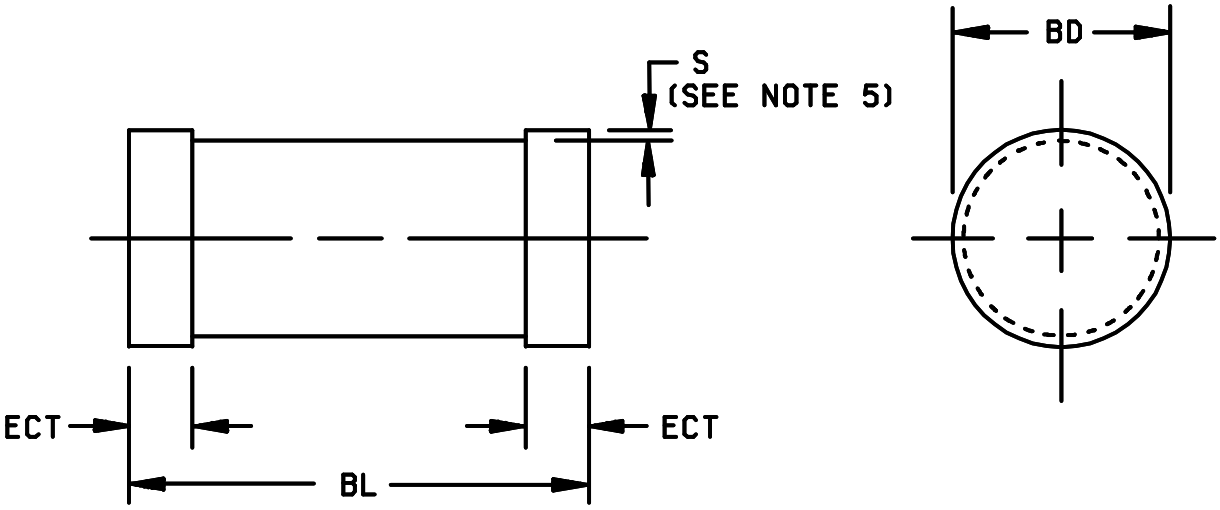
FIGURE 14. Physical dimensions of TO-258.



Symbol	D-5A		D-5B		D-5C		D-5D	
	Min	Max	Min	Max	Min	Max	Min	Max
BL	.168 (4.27)	.200 (5.08)	.200 (5.08)	.225 (5.72)	.205 (5.21)	.245 (6.22)	.165 (4.19)	.195 (4.95)
BD	.091 (2.31)	.103 (2.62)	.137 (3.48)	.148 (3.76)	.183 (4.65)	.202 (5.13)	.070 (1.78)	.085 (2.16)
ECT	.019 (0.48)	.028 (0.71)	.019 (0.48)	.028 (0.71)	.019 (0.48)	.028 (0.71)	.019 (0.48)	.028 (0.71)
S	.003 (0.08)		.003 (0.08)		.003 (0.08)		.003 (0.08)	

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are for general information only.
3. Dimensions are pre-solder dip.
4. Minimum clearance of glass body to mounting surface on all orientations.

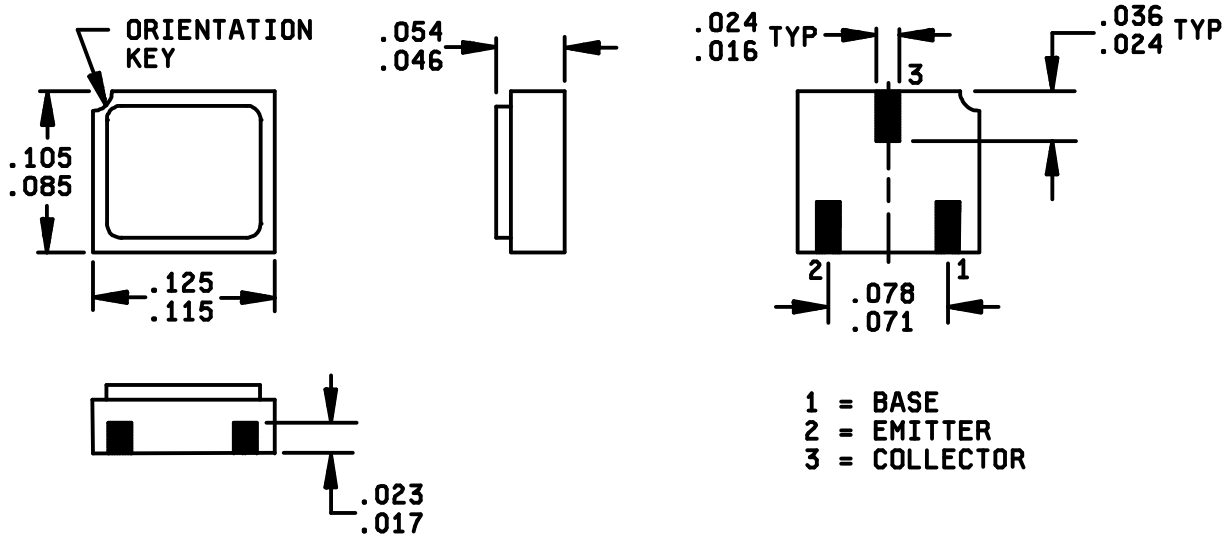
FIGURE 15. Physical dimensions of D5 surface mount family, square end surface mount.



Symbol	Dimensions							
	DO-213AA				DO-213AB			
	Inches		Millimeters		Inches		Millimeters	
	Min	Max	Min	Max	Min	Max	Min	Max
BL	.130	.146	3.30	3.70	.189	.205	4.80	5.20
BD	.063	.067	1.60	1.70	.094	.105	2.39	2.66
ECT	.016	.022	0.41	0.55	.016	.022	0.41	0.55
S	.001 min		0.03 min		.001 min		0.03 min	

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions are pre-solder dip.
4. Minimum clearance of glass body to mounting surface on all orientations.

FIGURE 16. Physical dimensions of DO-213 family, round end surface mount.

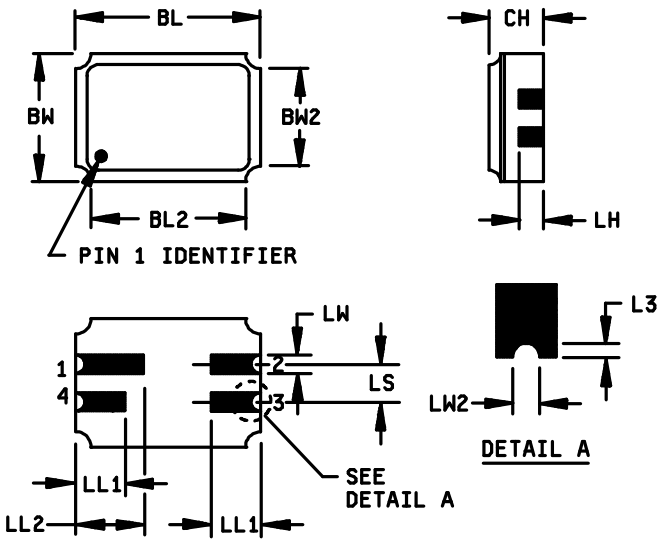


Inches	mm	Inches	mm
.016	0.41	.071	1.80
.017	0.43	.078	1.98
.023	0.58	.085	2.16
.024	0.61	.105	2.67
.036	0.91	.115	2.92
.046	1.17	.125	3.18
.054	1.37		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.

FIGURE 17. Physical dimensions, surface mount C-3.

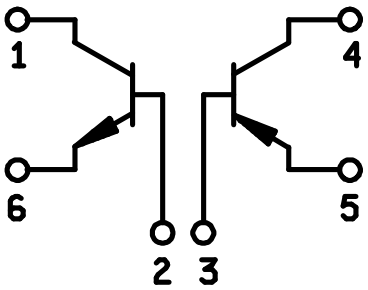
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.215	.225	5.46	5.71
BL2		.225		5.71
BW	.145	.155	3.68	3.93
BW2		.155		3.93
CH	.061	.075	1.55	1.90
L3	.003	.007	0.08	0.18
LH	.029	.044	0.74	1.12
LL1	.032	.048	0.81	1.22
LL2	.072	.088	1.83	2.23
LS	.045	.055	1.14	1.39
LW	.022	.028	0.56	0.71
LW2	.006	.022	0.15	0.56

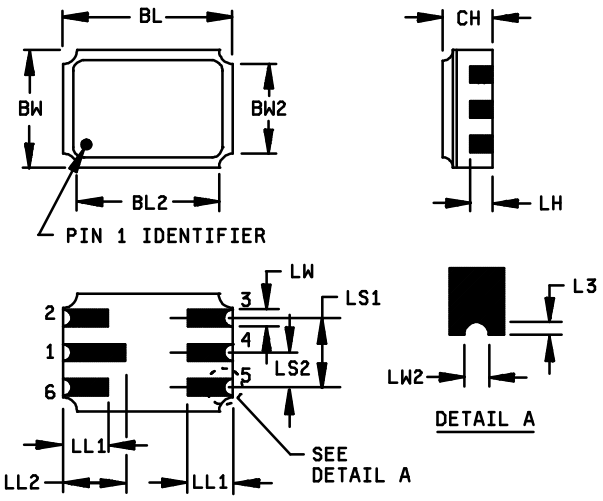


Pin no.	Transistor	MOSFET	Optocoupler
1	Collector	Substrate	Collector
2	Emitter	Source	Cathode
3	Base	Gate	Anode
4	N/C	Drain	Emitter

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The coplanarity deviation of all terminal contact points, as defined by the device seating plane, shall not exceed .006 inch (0.15 mm) for solder dipped leadless chip carriers.

FIGURE 18. Physical dimensions of surface mount C-4.





Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.240	.250	6.10	6.35
BL2	---	.250	---	6.35
BW	.165	.175	4.19	4.44
BW2		.175		4.44
CH	.066	.080	1.68	2.03
L3	.003	.007	0.08	0.18
LH	.026	.034	0.66	0.86
LL1	.060	.070	1.52	1.78
LL2	.082	.098	2.08	2.49
LS1	.095	.105	1.14	2.67
LS2	.045	.055	1.14	1.39
LW	.022	.028	0.56	0.71
LW2	.006	.022	0.15	0.56

Pin no.	Transistor	MOSFET	Optocoupler
1	Collector no. 1	Drain no. 1	Anode
2	Base no. 1	Gate no. 1	N/C
3	Base no. 2	Gate no. 2	Collector
4	Collector no. 2	Drain no. 2	Base
5	Emitter no. 2	Source no. 2	Emitter
6	Emitter no. 1	Source no. 1	Cathode

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The coplanarity deviation of all terminal contact points, as defined by the device seating plane, shall not exceed .006 inch (0.15 mm) for solder dipped leadless chip carriers.

FIGURE 19. Physical dimensions of surface mount C-6.

5. Notes. Not applicable.

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - EC
Air Force - 17
NASA-NA

Preparing activity:
DLA-CC

Review activities:
Army - AR, MI, SM
Navy - AS, CG, MC, OS, SH
Air Force - 19, 85, 99
NASA - NA

(Project 5961-1914)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	**DOCUMENT NUMBER** **MIL-HDBK-6100**	**2. DOCUMENT DATE** **30 JULY 1997**

3. DOCUMENT TITLE **List of Case Outlines and Dimensions for Discrete Semiconductor Devices**

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Alan Barone	b. TELEPHONE (Include Area Code) (1) Commercial 614-692-0510 (2) AUTOVON 850-0510
c. ADDRESS (Include Zip Code) Defense Supply Center Columbus ATTN: DSCC-VAT Columbus, OH 43216-5000	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340