

RURD840, RURD850, RURD860, RURD840S, RURD850S, RURD860S

August 1995

8A, 400V - 600V Ultrafast Diodes

Features

- Ultrafast with Soft Recovery <60ns
- Operating Temperature +175°C
- Reverse Voltage Up To 600V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RURD840, RURD850, RURD860, RURD840S, RURD850S and RURD860S are ultrafast dual diodes with soft recovery characteristics ($t_{RR} < 60\text{ns}$). They have low forward voltage drop and are silicon nitride passivated ion-implanted epitaxial planar construction.

These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

PACKAGE AVAILABILITY

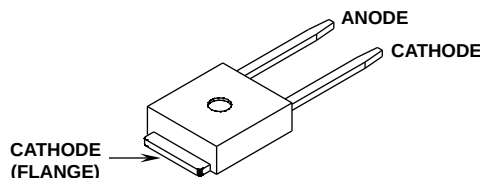
PART NUMBER	PACKAGE	BRAND
RURD840	TO-251	RUR840
RURD850	TO-251	RUR850
RURD860	TO-251	RUR860
RURD840S	TO-252	RUR840
RURD850S	TO-252	RUR850
RURD860S	TO-252	RUR860

NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252 variant in tape and reel, e.g. RURD860S9A.

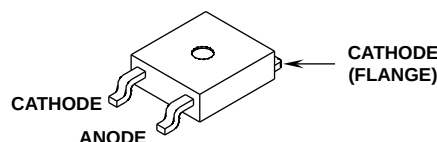
Formerly developmental type TA09616.

Packages

JEDEC STYLE TO-251



JEDEC STYLE TO-252



Symbol



Absolute Maximum Ratings $T_C = +25^\circ\text{C}$, Unless Otherwise Specified

	RURD840 RURD840S	RURD850 RURD850S	RURD860 RURD860S	UNITS
Peak Repetitive Reverse Voltage V_{RRM}	400	500	600	V
Working Peak Reverse Voltage V_{RWM}	400	500	600	V
DC Blocking Voltage V_R	400	500	600	V
Average Rectified Forward Current $I_{F(AV)}$ ($T_C = +155^\circ\text{C}$)	8	8	8	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	16	16	16	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 phase, 60Hz)	40	40	40	A
Maximum Power Dissipation P_D	75	75	75	W
Avalanche Energy (See Figures 10 and 11). E_{AVL}	20	20	20	mJ
Operating and Storage Temperature T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	$^\circ\text{C}$

Specifications RURD840, RURD850, RURD860, RURD840S, RURD850S, RURD860S

Electrical Specifications (per leg) $T_C = +25^{\circ}\text{C}$, Unless Otherwise Specified

SYMBOL	TEST CONDITION	RURD840, RURD840S			RURD850, RURD850S			RURD860, RURD860S			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	$I_F = 8\text{A}, T_C = +25^{\circ}\text{C}$	-	-	1.5	-	-	1.5	-	-	1.5	V
	$I_F = 8\text{A}, T_C = +150^{\circ}\text{C}$	-	-	1.3	-	-	1.3	-	-	1.3	V
I_R	$V_R = 400\text{V}, T_C = +25^{\circ}\text{C}$	-	-	100	-	-	-	-	-	-	μA
	$V_R = 500\text{V}, T_C = +25^{\circ}\text{C}$	-	-	-	-	-	100	-	-	-	μA
	$V_R = 600\text{V}, T_C = +25^{\circ}\text{C}$	-	-	-	-	-	-	-	-	100	μA
I_R	$V_R = 400\text{V}, T_C = +150^{\circ}\text{C}$	-	-	500	-	-	-	-	-	-	μA
	$V_R = 500\text{V}, T_C = +150^{\circ}\text{C}$	-	-	-	-	-	500	-	-	-	μA
	$V_R = 600\text{V}, T_C = +150^{\circ}\text{C}$	-	-	-	-	-	-	-	-	500	μA
t_{RR}	$I_F = 1\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$	-	-	60	-	-	60	-	-	60	ns
	$I_F = 8\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$	-	-	70	-	-	70	-	-	70	ns
t_A	$I_F = 8\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$	-	32	-	-	32	-	-	32	-	ns
t_B	$I_F = 8\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$	-	21	-	-	21	-	-	21	-	ns
Q_{RR}	$I_F = 8\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$	-	195	-	-	195	-	-	195	-	nC
C_J	$V_R = 10\text{V}, I_F = 0\text{A}$	-	25	-	-	25	-	-	25	-	pF
$R_{\theta JC}$		-	-	2	-	-	2	-	-	2	$^{\circ}\text{C}/\text{W}$

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300 μs , D = 2%).

I_R = Instantaneous reverse current.

t_{RR} = Reverse recovery time (See Figure 2), summation of $t_A + t_B$.

t_A = Time to reach peak reverse current (See Figure 2).

t_B = Time from peak I_{RM} to projected zero crossing of I_{RM} based on a straight line from peak I_{RM} through 25% of I_{RM} (See Figure 2).

Q_{RR} = Reverse recovery charge.

C_J = Junction Capacitance.

$R_{\theta JC}$ = Thermal resistance junction to case.

E_{AVL} = Controlled Avalanche Energy (See Figures 10 and 11).

pw = pulse width.

D = duty cycle.

V_1 AMPLITUDE CONTROLS I_F
 V_2 AMPLITUDE CONTROLS dl_F/dt
 L_1 = SELF INDUCTANCE OF
 $R_4 + L_{\text{LOOP}}$

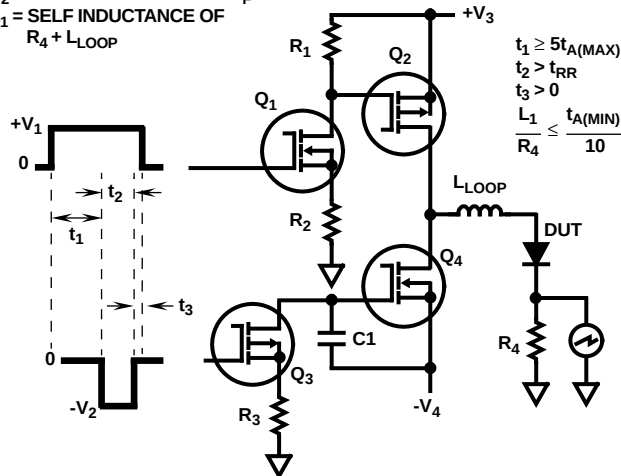


FIGURE 1. t_{RR} TEST CIRCUIT

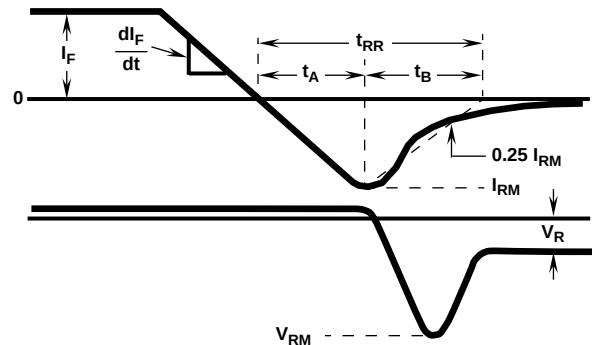


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

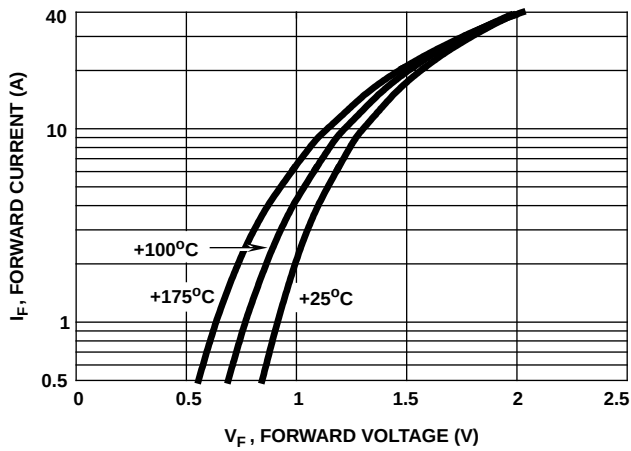


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

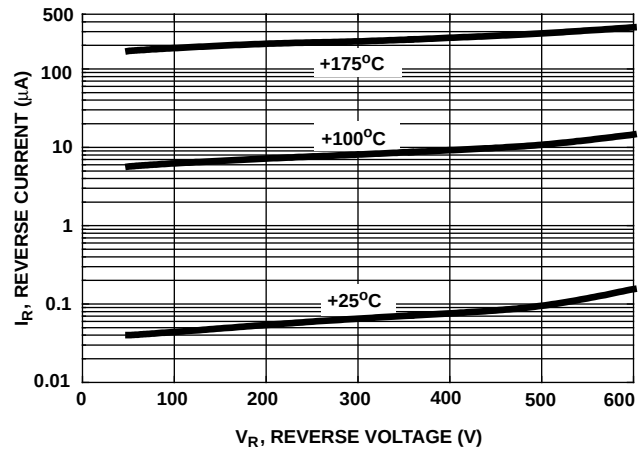


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

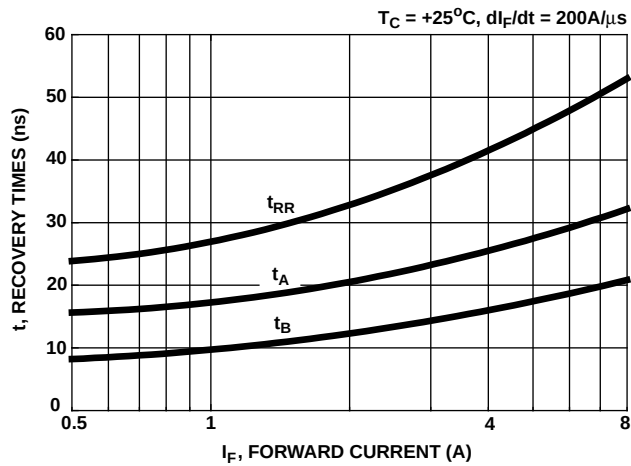


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

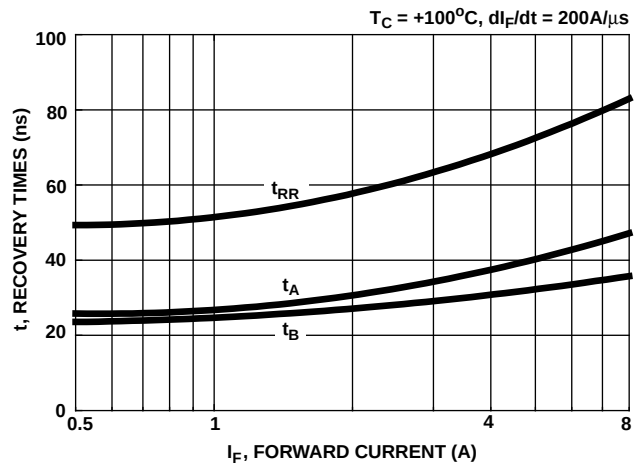


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

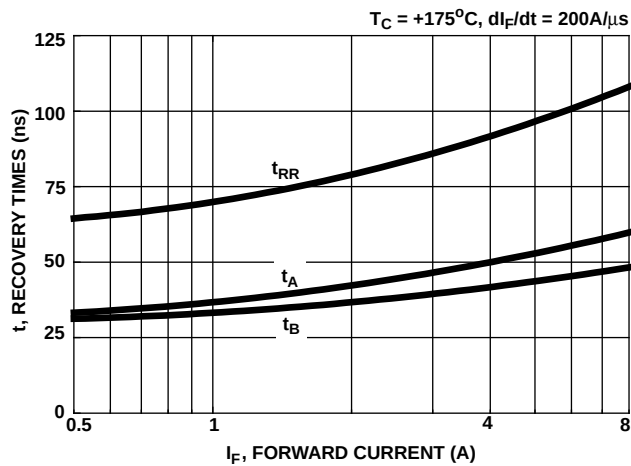


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

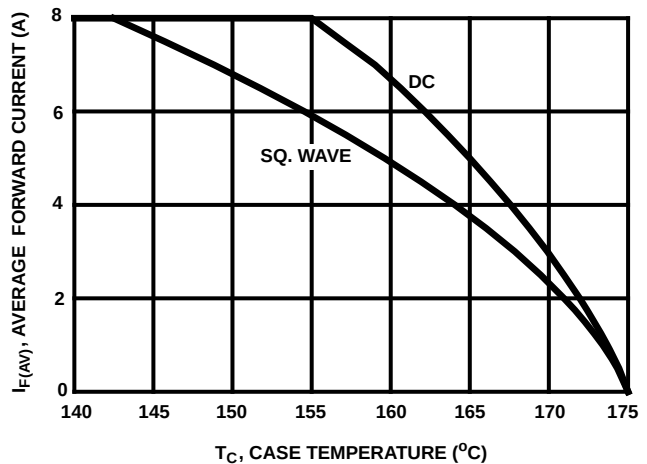


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

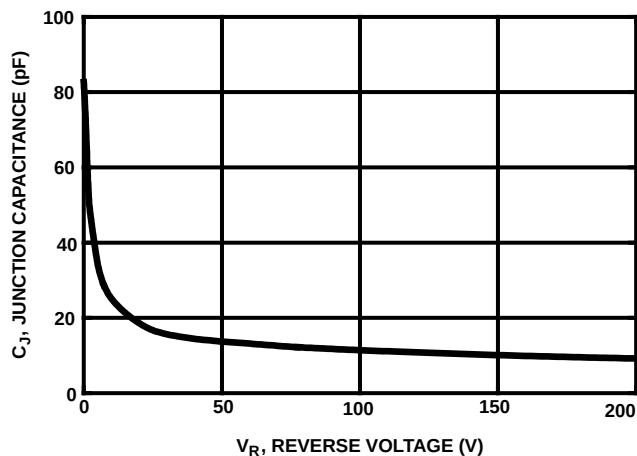


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuit and Waveform

L = 40mH
 R < 0.1Ω
 $E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$
 Q₁ AND Q₂ ARE 1000V MOSFETs

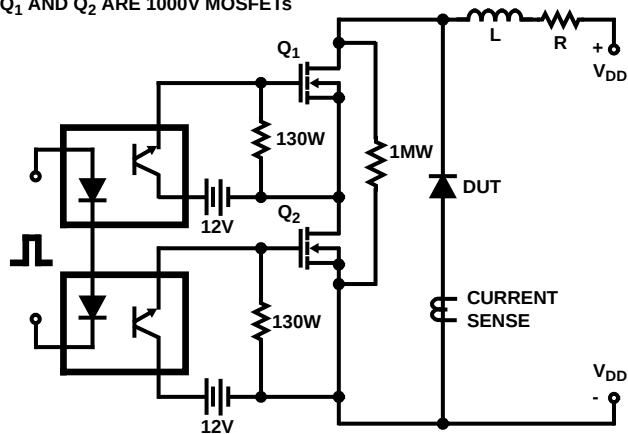


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

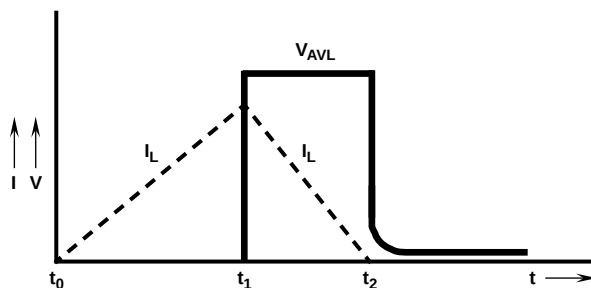
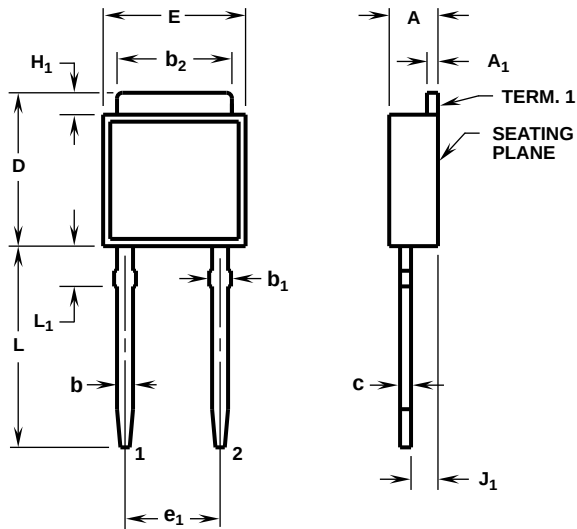


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

Packaging



TERM. 1, LEAD 1. CATHODE
LEAD 2. ANODE

TO-251

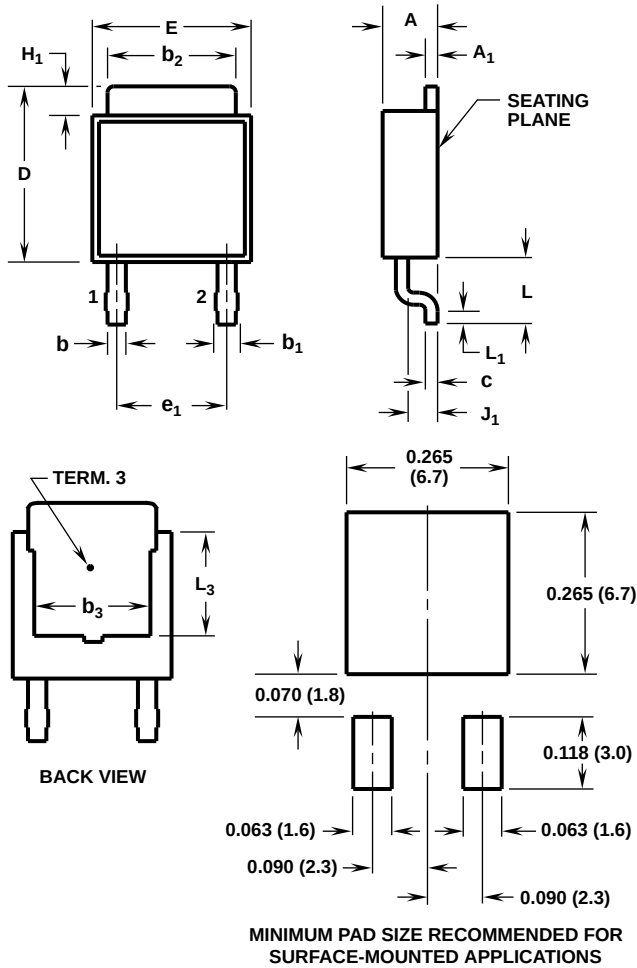
2 LEAD JEDEC STYLE TO-251 PLASTIC PACKAGE
(FOR RECTIFIERS ONLY)

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	-
A ₁	0.018	0.022	0.46	0.55	3, 4
b	0.028	0.032	0.72	0.81	3, 4
b ₁	0.033	0.040	0.84	1.01	3
b ₂	0.205	0.215	5.21	5.46	3, 4
c	0.018	0.022	0.46	0.55	3, 4
D	0.270	0.290	6.86	7.36	-
E	0.250	0.265	6.35	6.73	-
e ₁	0.180 BSC		4.57 BSC		5
H ₁	0.035	0.045	0.89	1.14	-
J ₁	0.040	0.045	1.02	1.14	6
L	0.355	0.375	9.02	9.52	-
L ₁	0.075	0.090	1.91	2.28	2

NOTES:

1. No current JEDEC outline for this package.
2. Solder finish uncontrolled.
3. Dimension (without solder).
4. Add typically 0.0006 inches (0.015mm) for solder coating.
5. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
6. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
7. Controlling dimension: Inch.
8. Revision 1 dated 6-93.

Packaging (Continued)



TERM. 3, LEAD 1. CATHODE
LEAD 2. ANODE

TO-252

**2 LEAD JEDEC STYLE TO-252 PLASTIC PACKAGE
(FOR RECTIFIERS ONLY)**

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	-
A ₁	0.018	0.022	0.46	0.55	4, 5
b	0.028	0.032	0.72	0.81	4, 5
b ₁	0.033	0.040	0.84	1.01	4
b ₂	0.205	0.215	5.21	5.46	4, 5
b ₃	0.190	-	4.83	-	2
c	0.018	0.022	0.46	0.55	4, 5
D	0.270	0.290	6.86	7.36	-
E	0.250	0.265	6.35	6.73	-
e ₁	0.180 BSC		4.57 BSC		7
H ₁	0.035	0.045	0.89	1.14	-
J ₁	0.040	0.045	1.02	1.14	-
L	0.100	0.115	2.54	2.92	-
L ₁	0.020	-	0.51	-	4, 6
L ₃	0.170	-	4.32	-	2

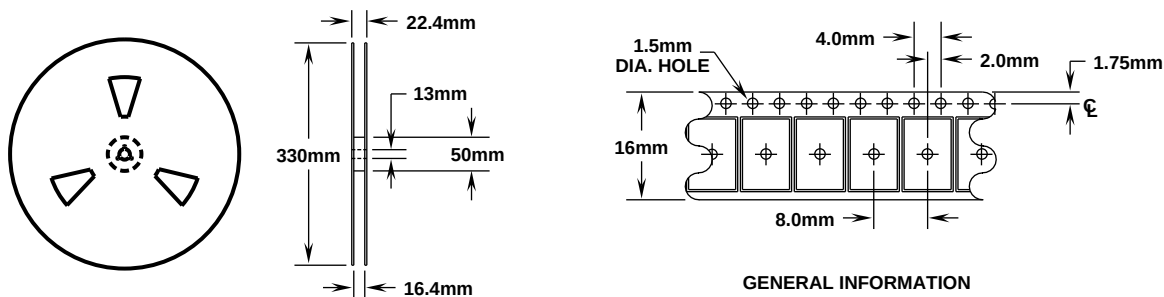
NOTES:

1. No current JEDEC outline for this package.
2. L₃ and b₃ dimensions establish a minimum mounting surface for terminal 3.
3. Solder finish uncontrolled.
4. Dimension (without solder).
5. Add typically 0.0006 inches (0.015mm) for solder coating.
6. L₁ is the terminal length for soldering.
7. Position of lead to be measured 0.090 inches (2.28mm) from bottom of dimension D.
8. Controlling dimension: Inch.
9. Revision 2 dated 3-94.

Plastic Packages

TO-252

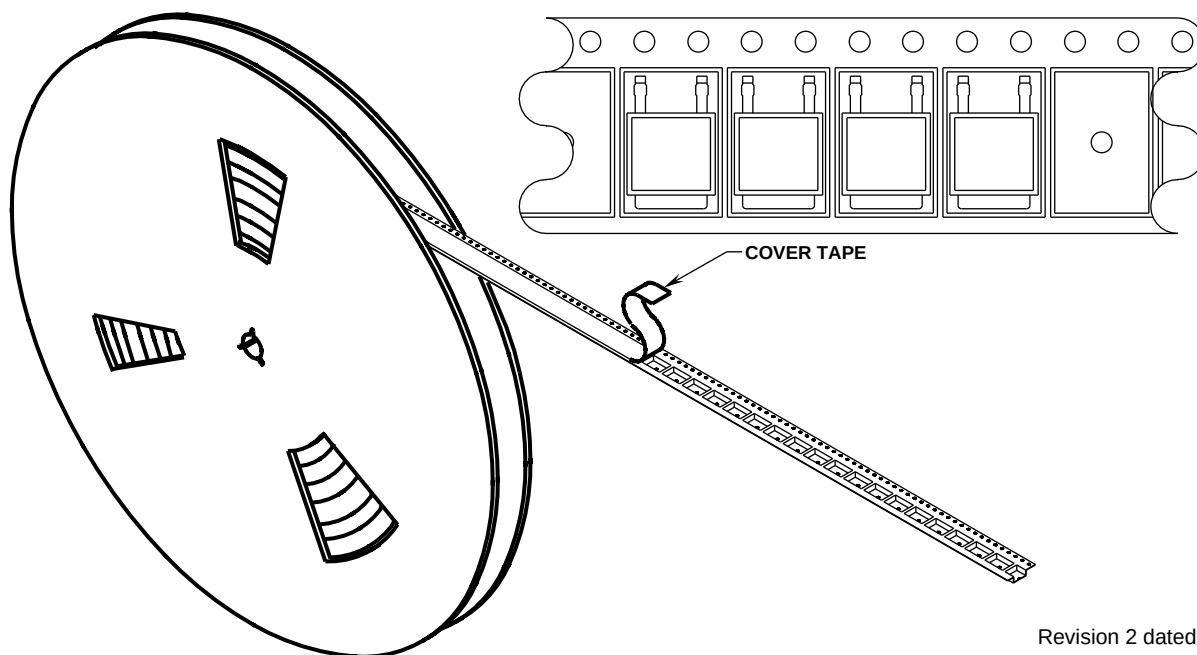
16mm TAPE AND REEL



GENERAL INFORMATION

1. USE "9A" SUFFIX ON PART NUMBER.
2. 2500 PIECES PER REEL.
3. ORDER IN MULTIPLES OF FULL REELS ONLY.
4. MEETS EIA-481 REVISION "A" SPECIFICATIONS.

USER DIRECTION OF FEED



Revision 2 dated 3-94.

All Harris Semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

Harris Semiconductor products are sold by description only. Harris Semiconductor reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Harris is believed to be accurate and reliable. However, no responsibility is assumed by Harris or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Harris or its subsidiaries.

Sales Office Headquarters

For general information regarding Harris Semiconductor and its products, call **1-800-4-HARRIS**

UNITED STATES

Harris Semiconductor
P. O. Box 883, Mail Stop 53-210
Melbourne, FL 32902
TEL: 1-800-442-7747
(407) 729-4984
FAX: (407) 729-5321

EUROPE

Harris Semiconductor
Mercure Center
100, Rue de la Fusee
1130 Brussels, Belgium
TEL: (32) 2.724.2111
FAX: (32) 2.724.22.05

ASIA

Harris Semiconductor PTE Ltd.
No. 1 Tannery Road
Cencon 1, #09-01
Singapore 1334
TEL: (65) 748-4200
FAX: (65) 748-0400

