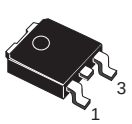
STP95N04
STD95N04

N-CHANNEL 40V - 5.4mΩ - 80A - DPAK - TO-220
STripFET™ Power MOSFET

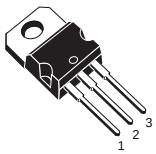
General features

Type	V_{DSS}	$R_{DS(on)}$	I_D	Pw
STD95N04	40V	<6.5mΩ	80A	110W
STP95N04	40V	<6.5mΩ	80A	110W

- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED



DPAK

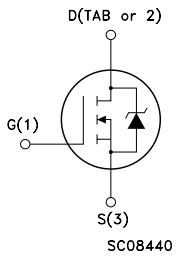


TO-220

Description

This N-Channel enhancement mode MOSFET is the latest refinement of STMicroelectronic unique "Single Feature Size™" strip-based process with less critical aligment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

Internal schematic diagram



Applications

- HIGH CURRENT,SWITCHING APPLICATION
- AUTOMOTIVE

Order codes

Sales Type	Marking	Package	Packaging
STD95N04	D95N04	DPAK	TAPE & REEL
STP95N04	P95N04	TO-220	TUBE

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS}=0)	40	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D *Note* 1	Drain Current (continuous) at T_C = 25°C	80	A
I_D	Drain Current (continuous) at T_C = 100°C	65	A
I_{DM} *Note* 2	Drain Current (pulsed)	320	A
P_{TOT}	Total Dissipation at T_C = 25°C	110	W
	Derating Factor	0.73	W/°C
dv/dt *Note* 3	Peak Diode Recovery voltage slope	8	V/ns
E_{AS} *Note* 4	Single Pulse Avalanche Energy	400	mJ
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 175	°C

Table 2. Thermal data

		TO-220	DPAK	
Rthj-case	Thermal Resistance Junction-case Max	1.36		°C/W
Rthj-a	Thermal Resistance Junction-ambient Max	62.5	--	°C/W
Rthj-pcb *Note* 5	Thermal Resistance Junction-ambient Max	--	50	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300	--	°C

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250µA, V_{GS}= 0	40			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating, V_{DS} = Max Rating,Tc = 125°C			10 100	µA µA
I_{GSS}	Gate Body Leakage Current (V_{DS} = 0)	V_{GS} = ±20V			±200	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D = 250µA	2		4	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS}= 10V, I_D= 40A		5.4	6.5	mΩ

Table 4. Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} *Note* 6	Forward Transconductance	V_{DS} =25V, I_D=40A		100		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		2200 580 40		pF pF pF
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}=20V, I_D = 80A V_{GS} =10V (see Figure 13)		40 11 8	54	nC nC nC

Table 5. Switching times

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{DD}=20V, I_D= 40A, R_G=4.7Ω, V_{GS}=10V (see Figure 12)		15 50		ns ns
$t_{d(off)}$ t_f	Turn-off Delay Time FallTime	V_{DD}=20V, I_D= 40A, R_G=4.7Ω, V_{GS}=10V (see Figure 12)		40 15		ns ns

Table 6. Source drain diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} *Note* 2	Source-drain Current Source-drain Current (pulsed)				80 320	A A
V_{SD}*Note* 6	Forward on Voltage	I_{SD}=80A, V_{GS}=0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD}=80A, di/dt = 100A/µs, V_{DD}=30V, Tj=150°C		45 60 2.8		ns nC A

(1) Current limited by package

(2) Pulse width limited by safe operating area

(3) I_{SD} ≤ 80 A, di/dt ≤ 400A/µs, V_{DS} ≤ $V_{(BR)DSS}$, Tj≤ Tjmax

(4) Starting Tj=25°C, Id =40A, Vdd=30V

(5) When mounted on 1inch² FR4 2Oz Cu board

(6)Pulsed: pulse duration = 300µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe Operating Area

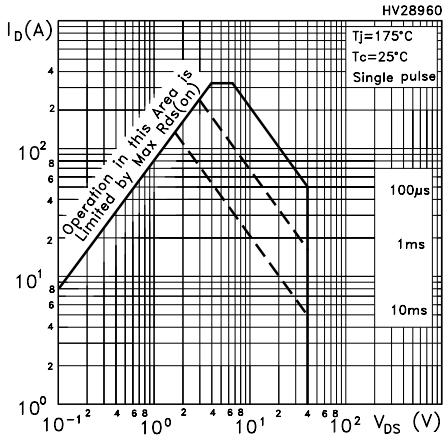


Figure 2. Thermal Impedance

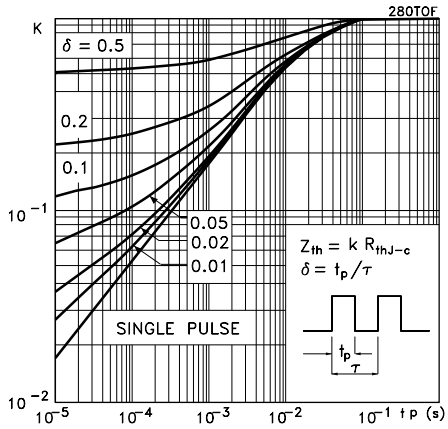


Figure 3. Output Characteristics

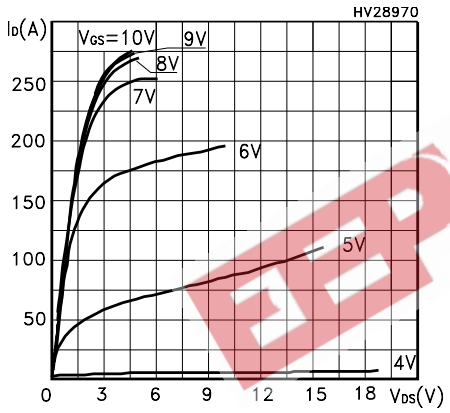


Figure 4. Transfer Characteristics

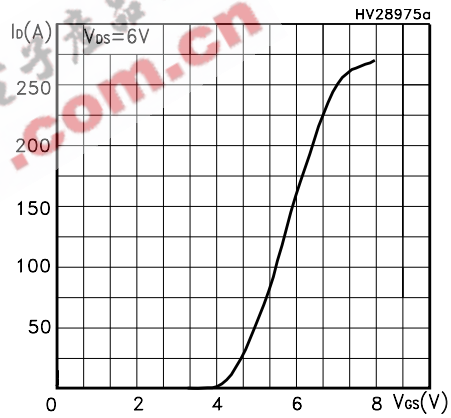


Figure 5. Static Drain-source on Resistance

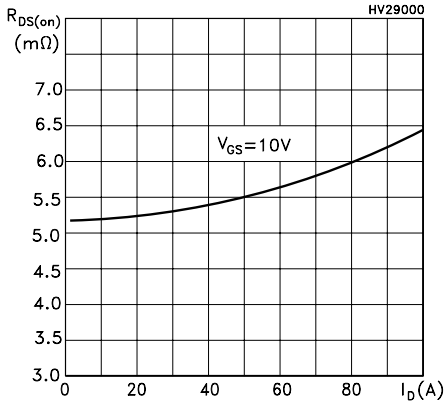


Figure 6. Normalized BVDSS vs Temperature

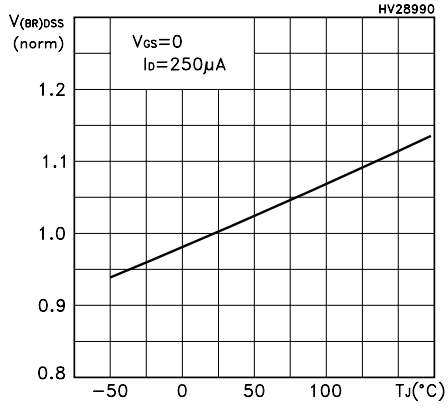


Figure 7. Gate Charge vs Gate-source Voltage

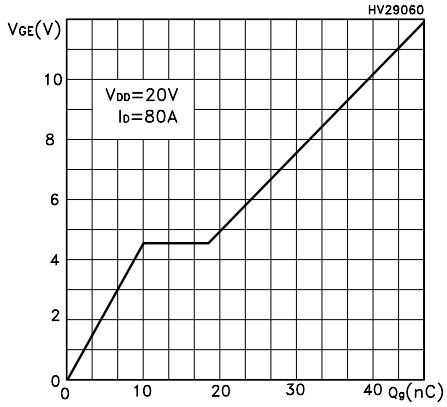


Figure 8. Capacitance Variations

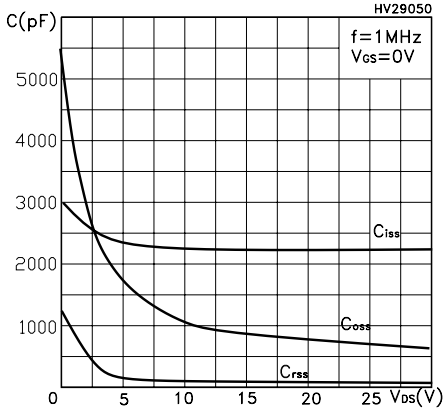


Figure 9. Normalized Gate Threshold Voltage vs Temperature

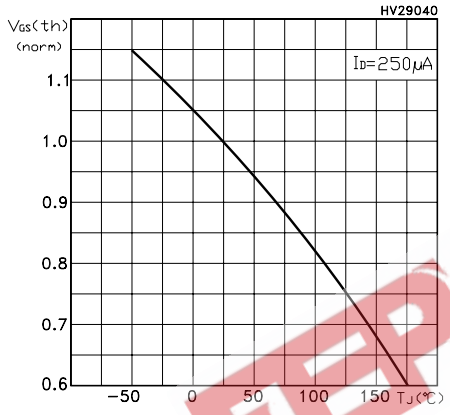


Figure 10. Normalized on Resistance vs Temperature

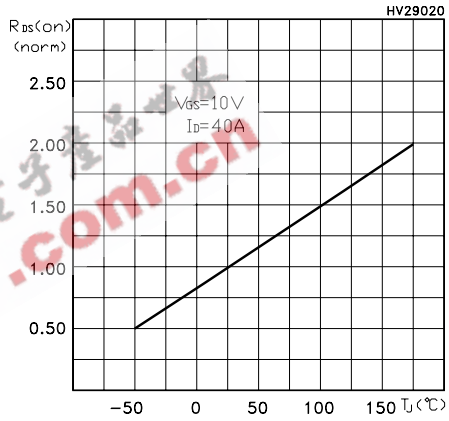
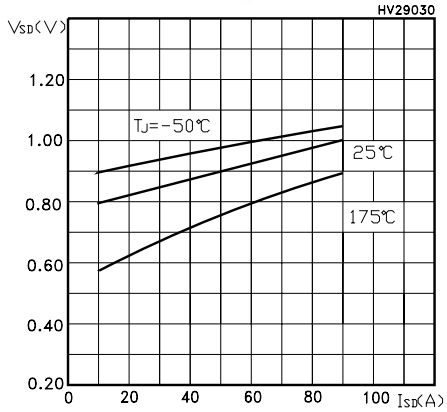


Figure 11. Source-drain Diode Forward Characteristics



3 Test circuits

Figure 12. Switching Times Test Circuit for Resistive Load

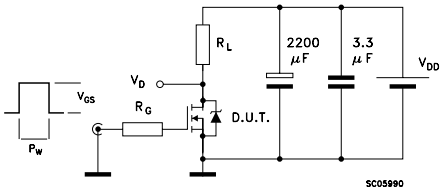


Figure 13. Gate Charge Test Circuit

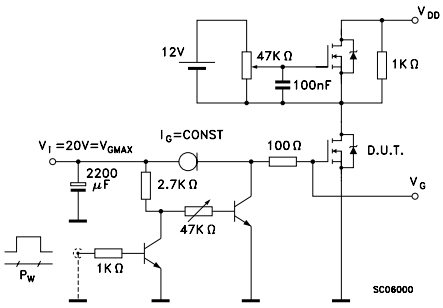


Figure 14. Test Circuit for Inductive Load Switching and Diode Recovery Times

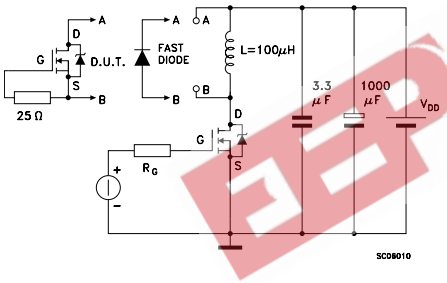


Figure 15. Unclamped Inductive Load Test Circuit

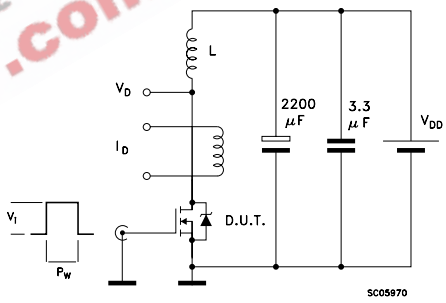


Figure 16. Unclamped Inductive Waveform

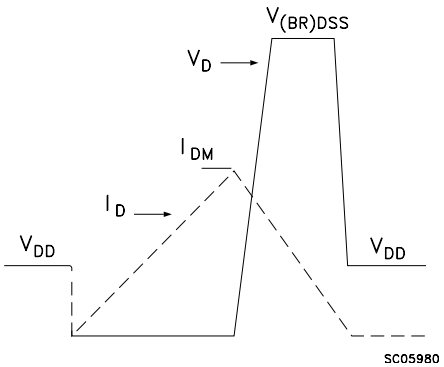


Figure 17. Switching Time Waveform

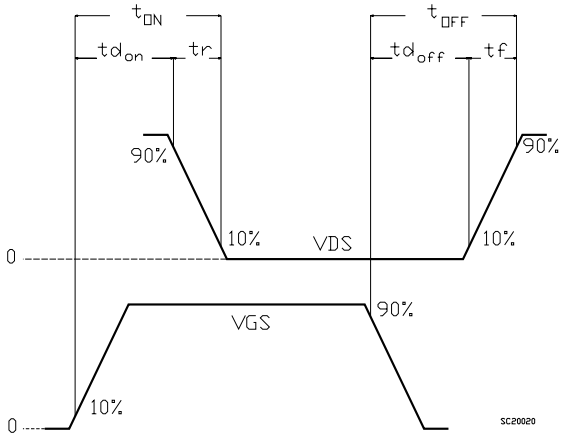
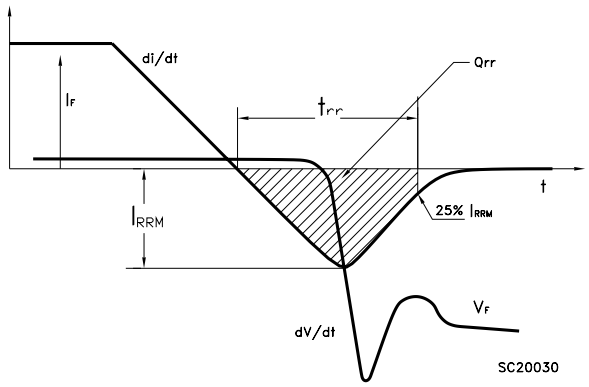


Figure 18. Diode Reverse Recovery Waveform

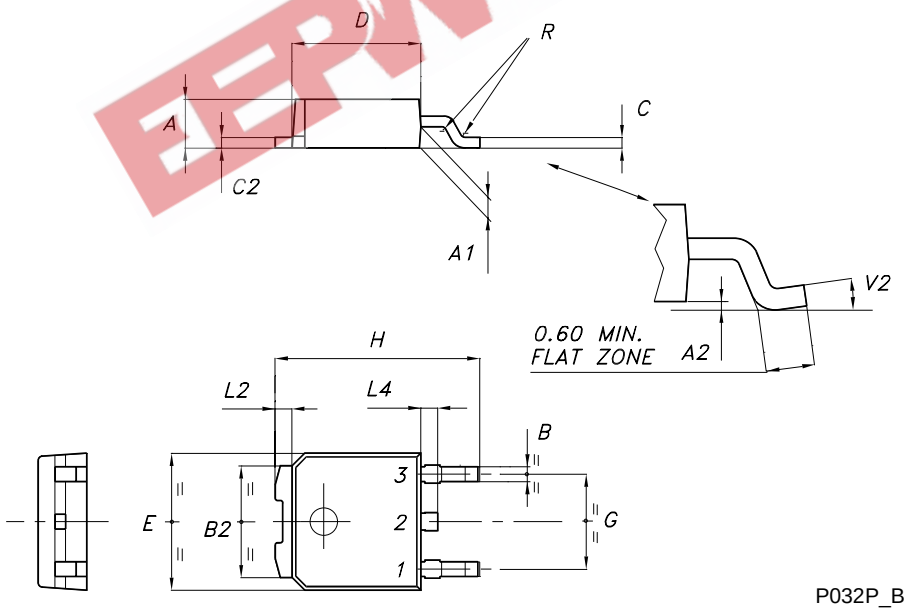


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

TO-252 (DPAK) MECHANICAL DATA

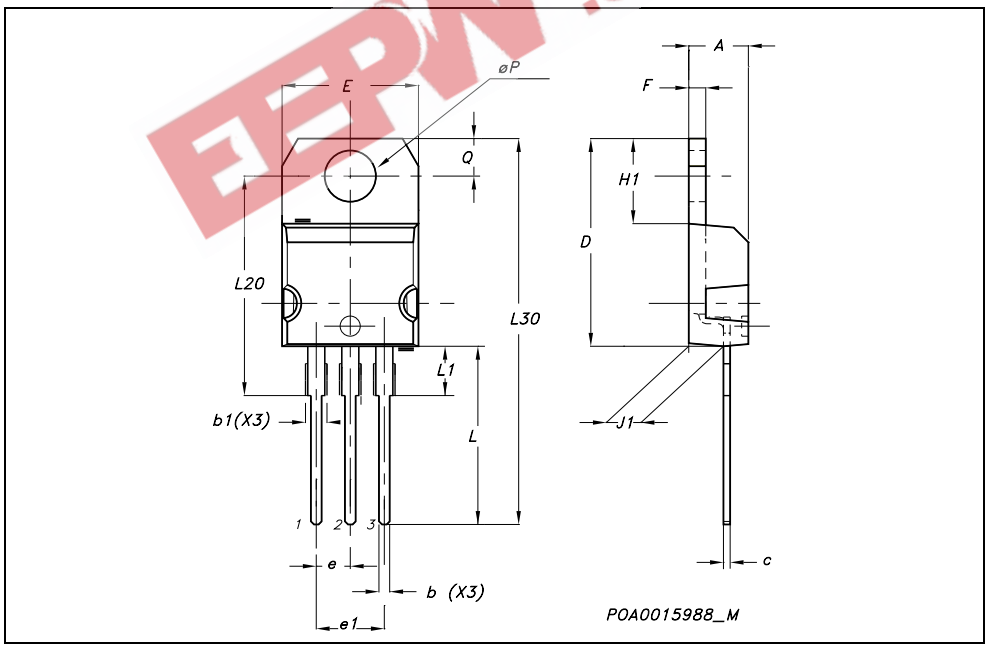
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0^o		8^o	0^o		0^o



P032P_B

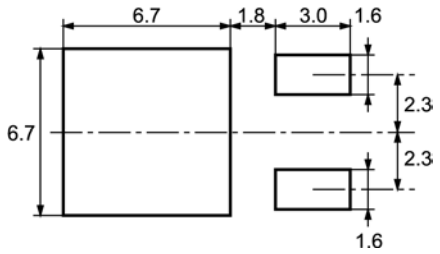
TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



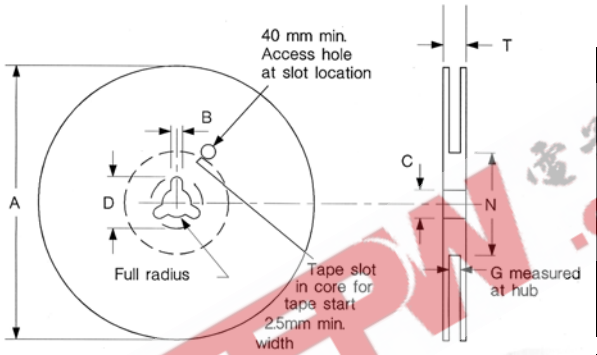
5 Packing mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



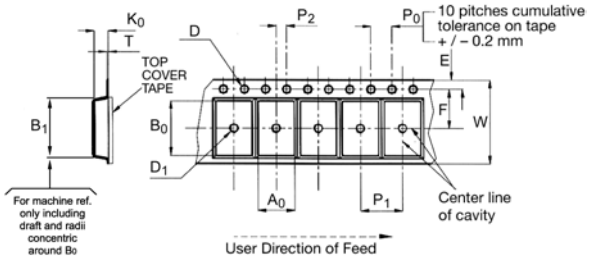
REEL MECHANICAL DATA

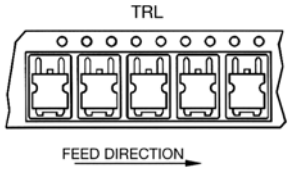
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

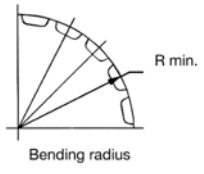
BASE QTY	BULK QTY
2500	2500

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641







6 Revision History

Date	Revision	Changes
24-Oct-2005	2	Inserted ecopack indication
07-Dec-2005	3	Complete version