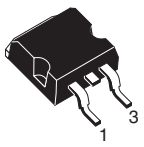
STB85NF3LL

N-channel 30V - 0.006Ω - 85A - D²PAK
Low gate charge STripFET™ II Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STB85NF3LL	30V	<0.008Ω	85A

- Optimal R_{DS}(on) x Qg trade-OFF @4.5V
- COnduction losses reduced
- Switching losses reduced

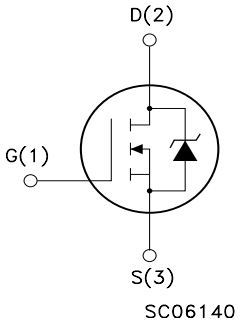


D²PAK

Description

This application specific Power MOSFET is the third genaration of STMicroelectronics unique " Single Feature Size" strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STB85NF3LLT4	B85NF3LL	D²PAK	Tape & reel

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20KΩ)	30	V
V_{GS}	Gate-source voltage	± 16	V
V_{GSM}	Gate-source voltage pulsed (t_p ≤50µs; duty cycle 25%; T_J ≤150°C)	± 20	V
I_D	Drain current (continuous) at T_C = 25°C	85	A
I_D	Drain current (continuous) at T_C=100°C	60	A
I_{DM}(1)	Drain current (pulsed)	340	A
P_{TOT}	Total dissipation at T_C = 25°C	110	W
	Derating factor	0.73	W/°C
T_{stg}	Storage temperature	–65 to 175	°C
T_J	Max. Operating Junction Temperature	175	°C

1. Pulse width limited by safe operating area

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case Max	0.36	°C/W
R_{thJA}	Thermal resistance junction-ambient Max	62.5	°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	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating @125°C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±16V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10V, I_D= 40A V_{GS} = 4.5V, I_D = 40A		0.006 0.0075	0.008 0.0095	Ω Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$, I_D = 40 A		30		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25V, f = 1 MHz, V_{GS} = 0		2210 635 138		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} =24V, I_D = 60A V_{GS} =4.5V		30 9 12.5	40	nC nC nC

1. Pulsed: pulse duration=300µs, duty cycle 1.5%

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD}= 15V, I_D= 30A, R_G=4.7Ω, V_{GS}=4.5V *Figure 12 on page 8*		22 130 36.5 36.5		ns ns ns ns
$t_{d(off)}$ t_f t_c	Off-voltage rise time Fall time Cross-over time	Vclamp =24V, I_D =30A R_G = 4.7Ω, V_{GS} = 4.5V *Figure 14 on page 8*		32 23 40		ns ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				85	A
I_{SDM} (1)	Source-drain current (pulsed)				340	A
V_{SD} (2)	Forward on voltage	I_{SD} = 85A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 85A, di/dt = 100A/µs, V_{DD} = 15V, T_J = 150°C *Figure 14 on page 8*		65 105 3.4		ns µC A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

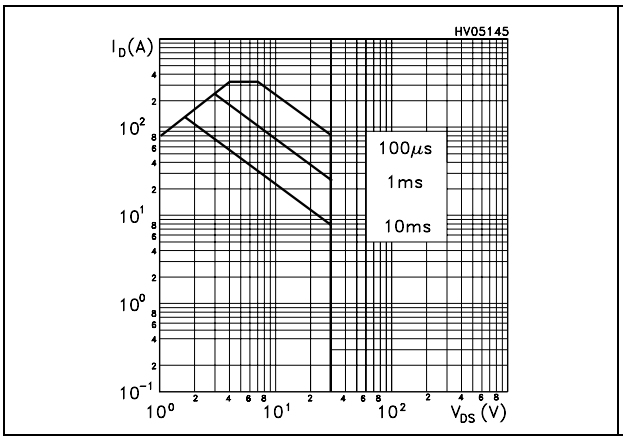


Figure 2. Thermal impedance

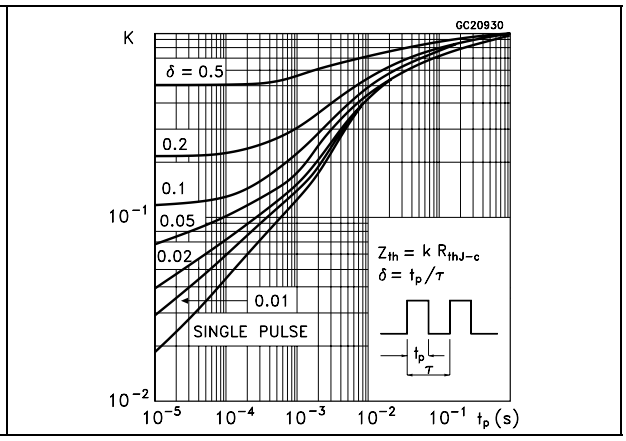


Figure 3. Output characterisics

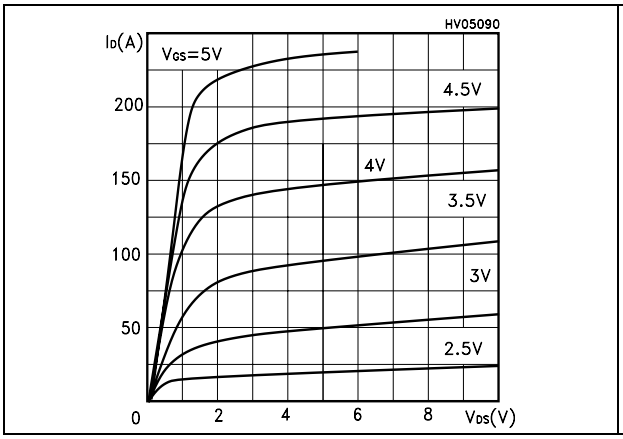


Figure 4. Transfer characteristics

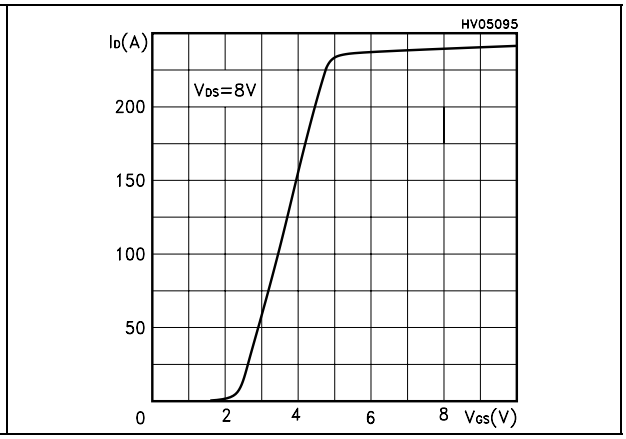


Figure 5. Transconductance

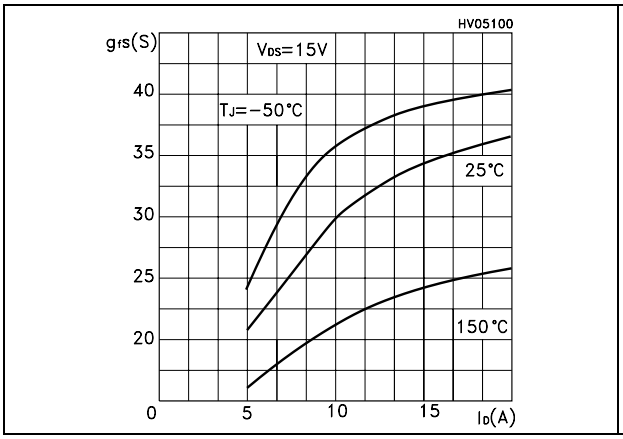


Figure 6. Static drain-source on resistance

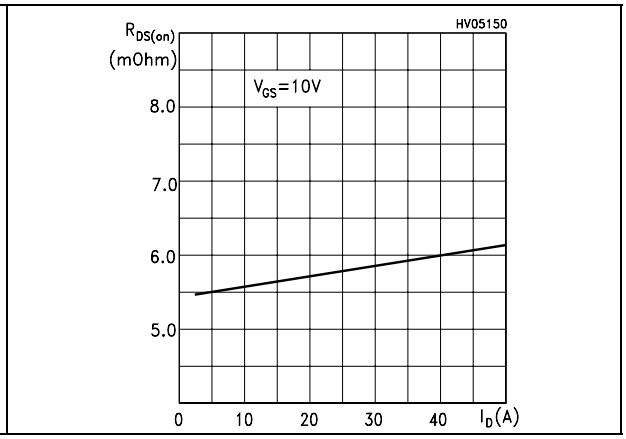


Figure 7. Gate charge vs gate-source voltage

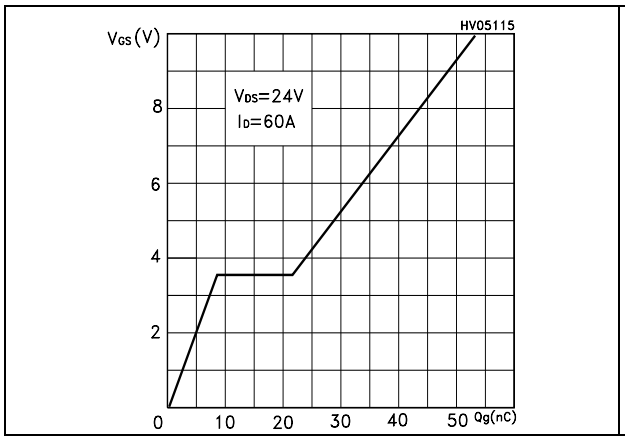


Figure 8. Capacitance variations

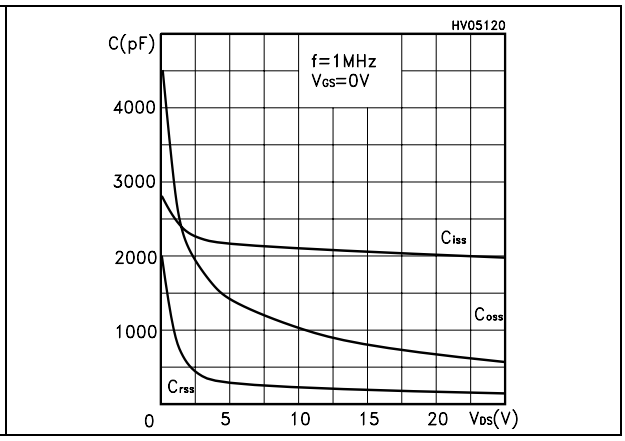


Figure 9. Normalized gate threshold voltage vs temperature

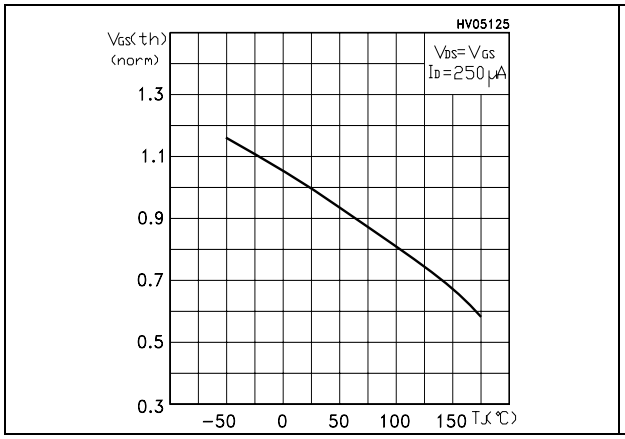


Figure 10. Normalized on resistance vs temperature

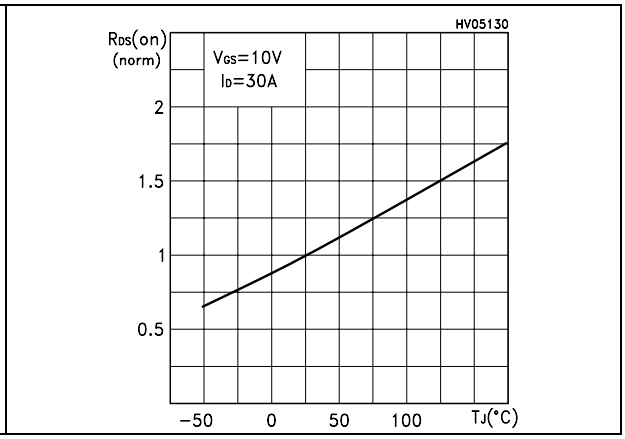
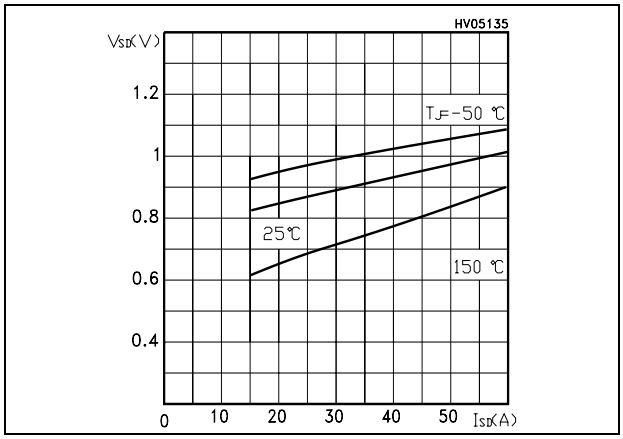


Figure 11. Source-drain diode forward characteristics



3 Test circuit

Figure 12. Switching times test circuit for resistive load

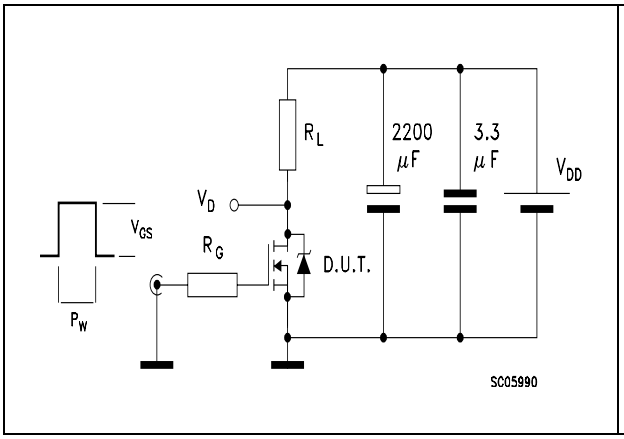


Figure 13. Gate charge test circuit

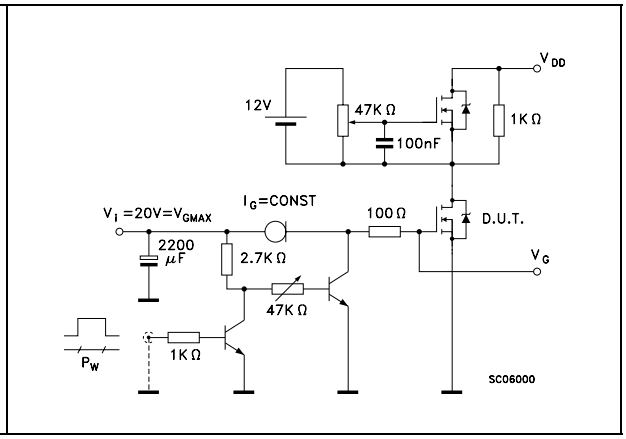


Figure 14. Test circuit for inductive load switching and diode recovery times

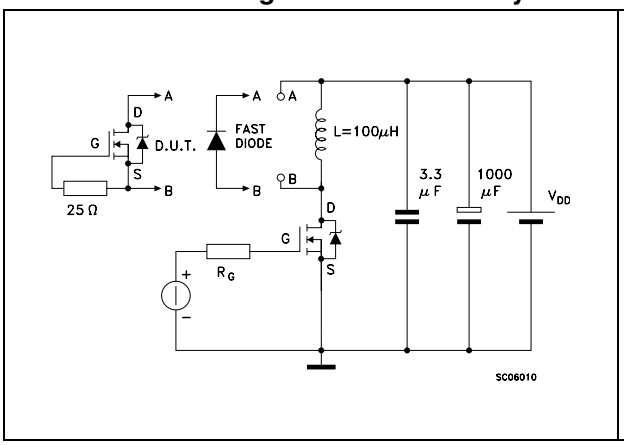


Figure 15. Unclamped Inductive load test circuit

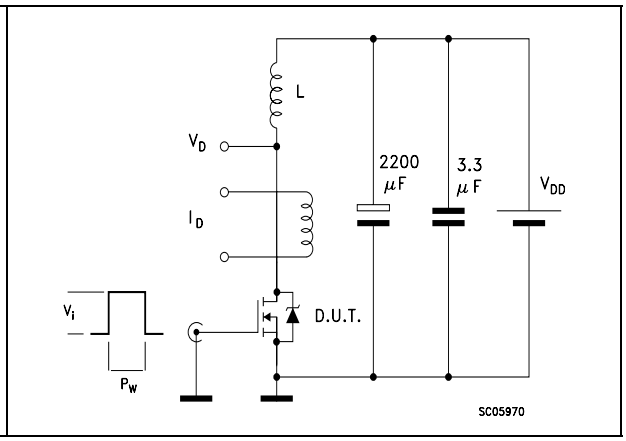
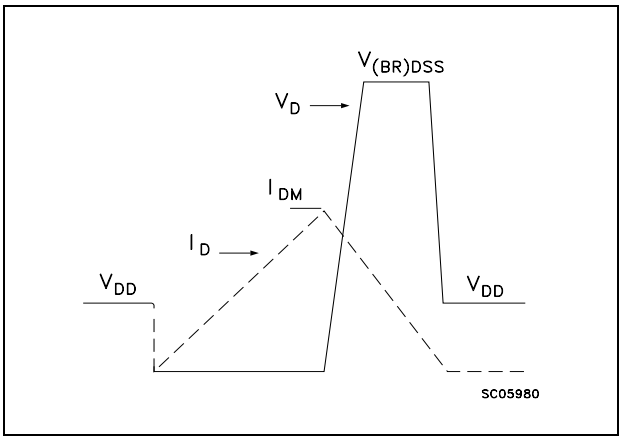


Figure 16. Unclamped inductive waveform

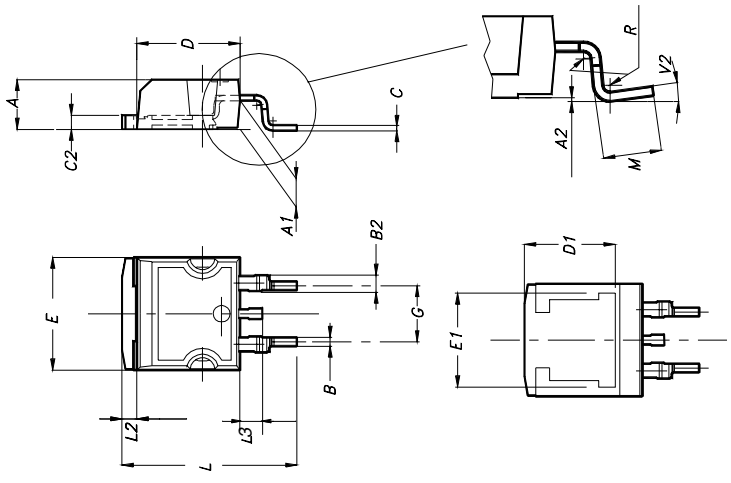


4 Package mechanical data

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

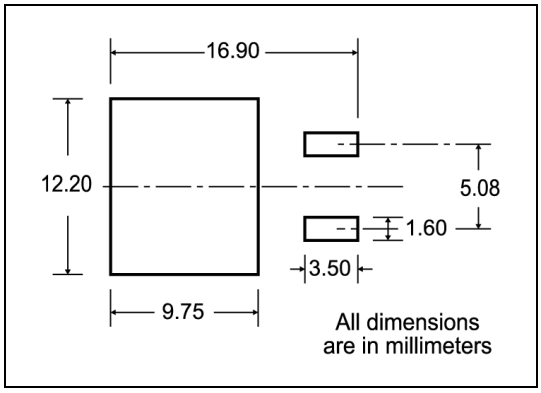
D²PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0º		4º			

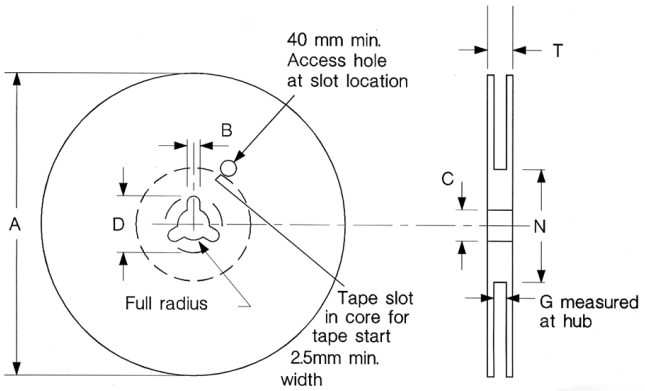


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



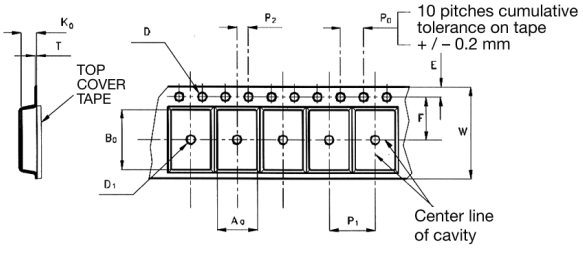
REEL MECHANICAL DATA

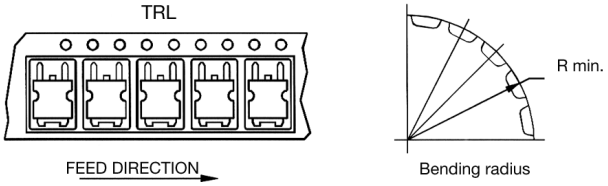
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956





* on sales type

6 Revision history

Table 7. Revision history

Date	Revision	Changes
09-Sep-2004	3	Complete document
28-Jul-2006	4	New template, SOA updated

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