STB40NF10

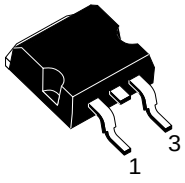
N-CHANNEL 100V - 0.025Ω - 50A - D²PAK
LOW GATE CHARGE STripFET™II MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STB40NF10T4	100 V	< 0.028 Ω	50 A

- TYPICAL $R_{DS}(on)$ = 0.025Ω
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION
- 100% AVALANCHE TESTED

Figure 1: Package

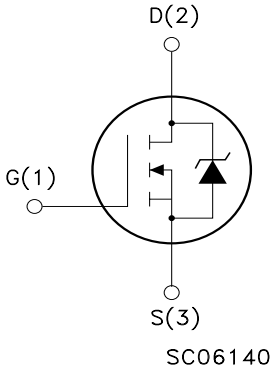


D²PAK

DESCRIPTION

This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Figure 2: Internal Schematic Diagram



APPLICATIONS

- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- AUTOMOTIVE ENVIRONMENT

Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STB40NF10T4	B40NF10	D²PAK	TAPE & REEL

Rev.2

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate- source Voltage	± 20	V
I_D(*)	Drain Current (continuous) at T_C = 25°C	50	A
I_D	Drain Current (continuous) at T_C = 100°C	35	A
I_{DM} (•)	Drain Current (pulsed)	200	A
P_{TOT}	Total Dissipation at T_C = 25°C	150	W
	Derating Factor	1	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	20	V/ns
E_{AS} (2)	Single Pulse Avalanche Energy	150	mJ
T_{stg}	Storage Temperature	– 55 to 175	°C
T_j	Operating Junction Temperature		

(•) Pulse width limited by safe operating area

(*) Limited by Package

(1) $I_{SD} \leq 50A$, $di/dt \leq 600$ A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

(2) Starting T_j = 25°C, I_D = 50A, V_{DD} = 25V

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	1	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300	°C

ELECTRICAL CHARACTERISTICS (T_{CASE} =25°C UNLESS OTHERWISE SPECIFIED)

Table 5: On/Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage	V_{DS} = Max Rating			1	µA
	Drain Current (V_{GS} = 0)	V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V			±100	nA
$V_{GS(th}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	2.8	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 25 A		0.024	0.028	Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 6: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} = 25V, I_D = 25 A		20		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		1780		pF
C_{oss}	Output Capacitance			265		pF
C_{rss}	Reverse Transfer Capacitance			112		pF

Table 7: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 50 V, I_D = 25 A		28		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10V (see test circuit, Figure 3)		63		ns
Q_g	Total Gate Charge	V_{DD}= 80V, I_D= 50A, V_{GS} = 10V		60.6	80	nC
Q_{gs}	Gate-Source Charge			9.6		nC
Q_{gd}	Gate-Drain Charge			22.8		nC

Table 8: Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	V_{DD} = 50 V, I_D = 25 A,		84		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 3)		28		ns

Table 9: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				50	A
I_{SDM} (2)	Source-drain Current (pulsed)				200	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 50 A, V_{GS} = 0			1.3	V
t_{rr}	Reverse Recovery Time	I_{SD} = 50 A, di/dt = 100A/µs, V_{DD} = 25V, T_j = 150°C (see test circuit, Figure 5)		114		ns
Q_{rr}	Reverse Recovery Charge			456		nC
I_{RRM}	Reverse Recovery Current			8		A

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

Figure 3: Safe Operating Area

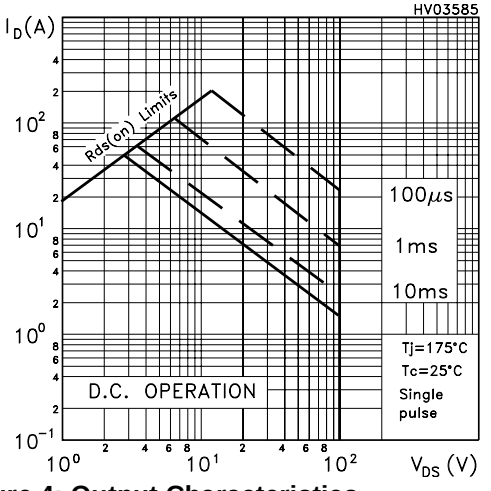


Figure 4: Output Characteristics

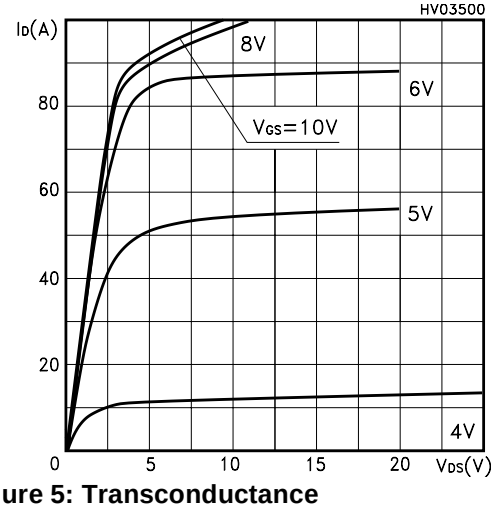


Figure 5: Transconductance

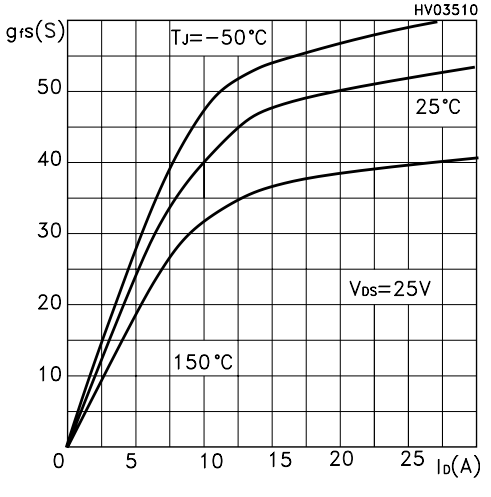


Figure 6: Thermal Impedance

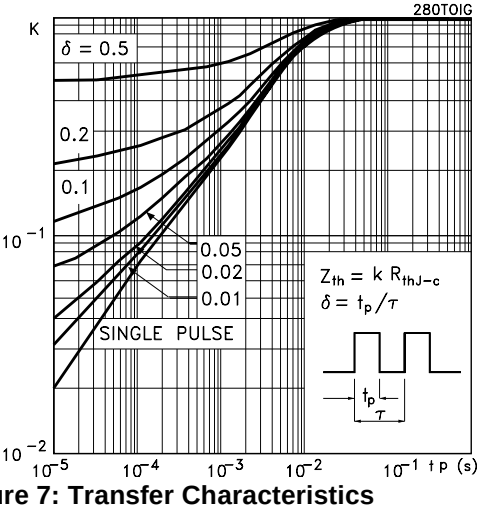


Figure 7: Transfer Characteristics

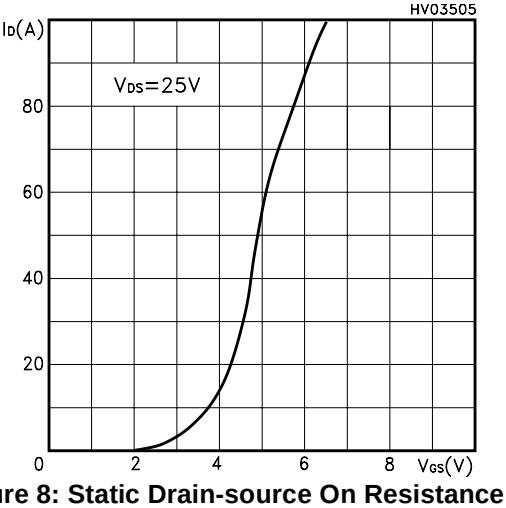


Figure 8: Static Drain-source On Resistance

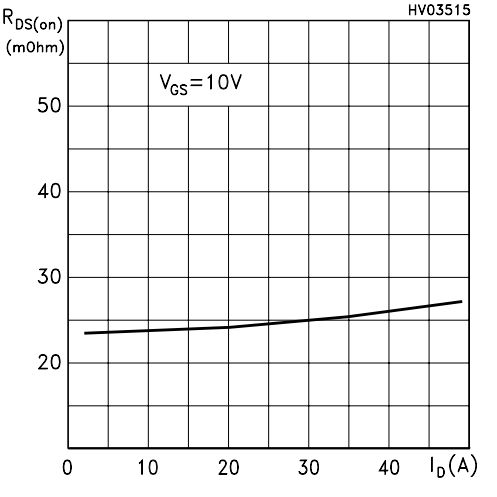


Figure 9: Gate Charge vs Gate-source Voltage

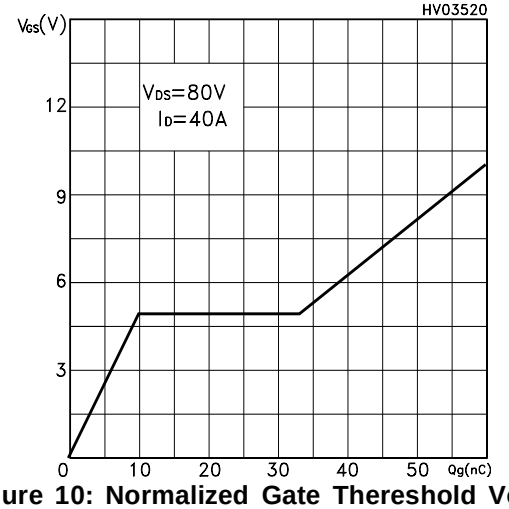


Figure 10: Normalized Gate Thereshold Voltage vs Temperature

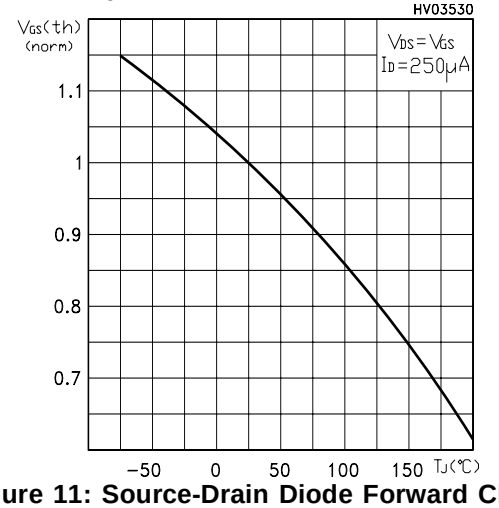


Figure 11: Source-Drain Diode Forward Characteristics

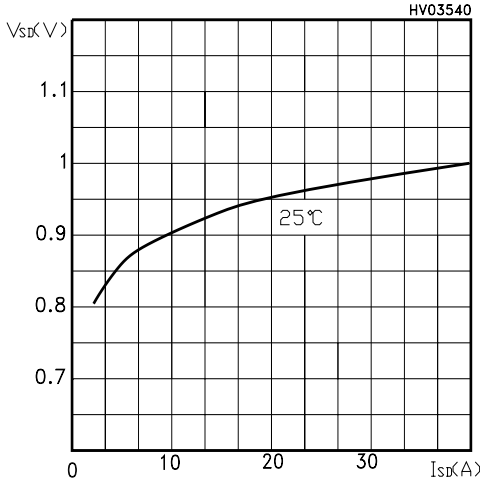


Figure 12: Capacitance Variations

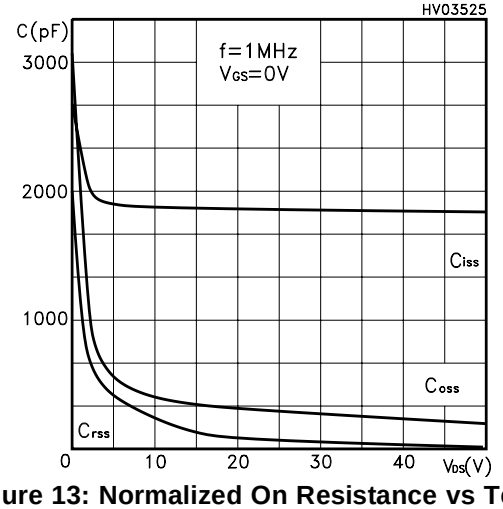


Figure 13: Normalized On Resistance vs Temperature

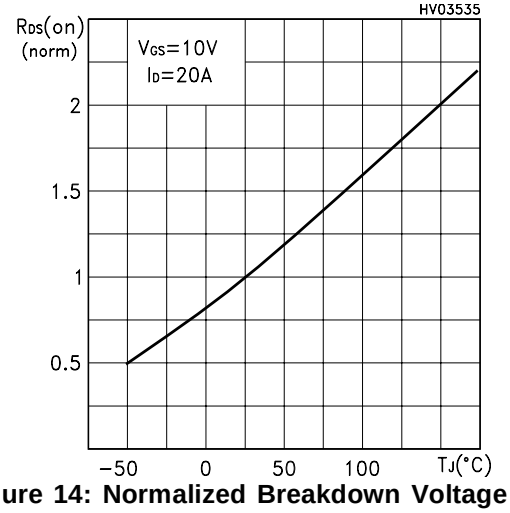


Figure 14: Normalized Breakdown Voltage vs Temperature

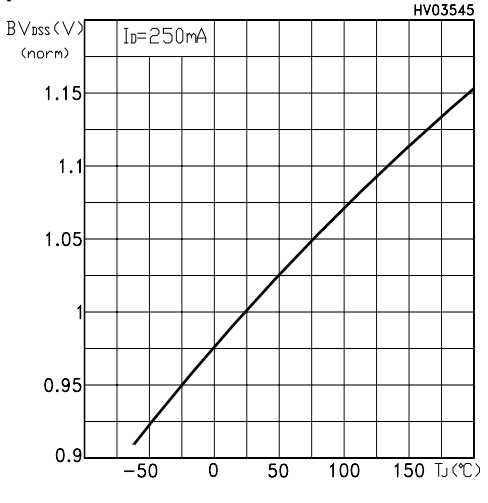


Figure 15: Unclamped Inductive Load Test Circuit

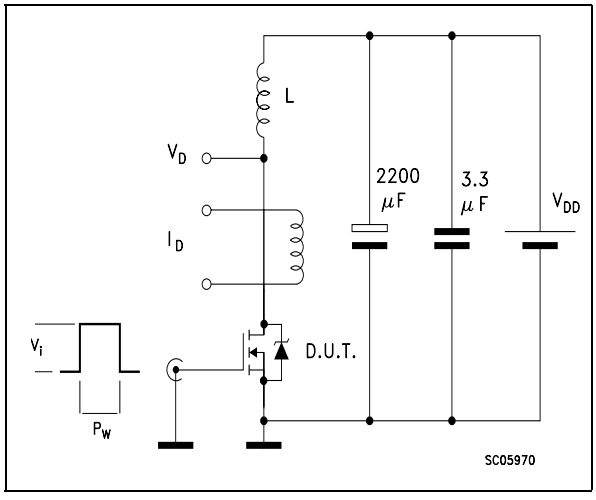


Figure 16: Switching Times Test Circuit For Resistive Load

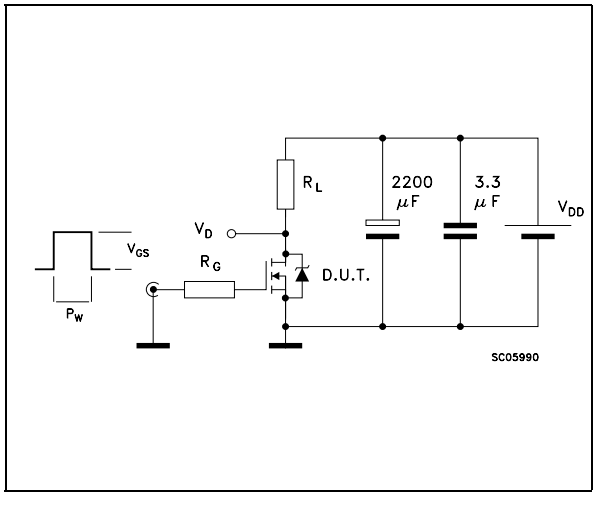


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

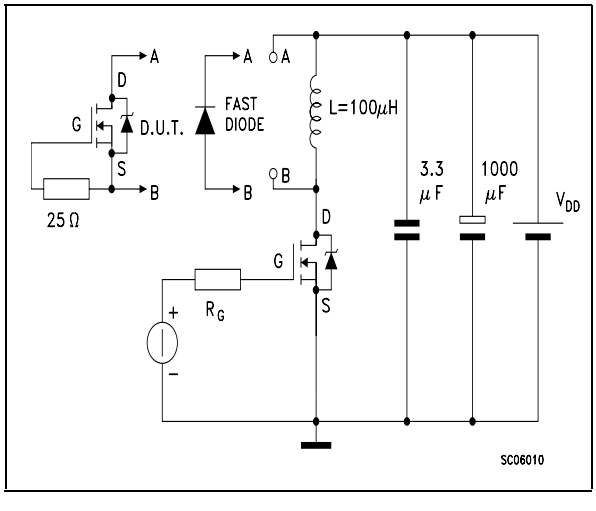


Figure 18: Unclamped Inductive Wafeform

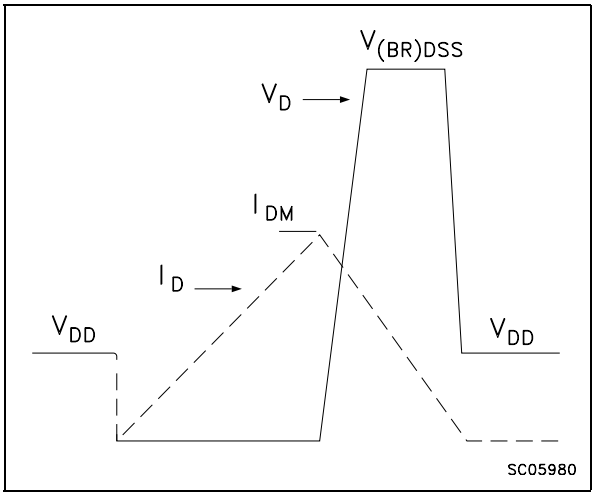
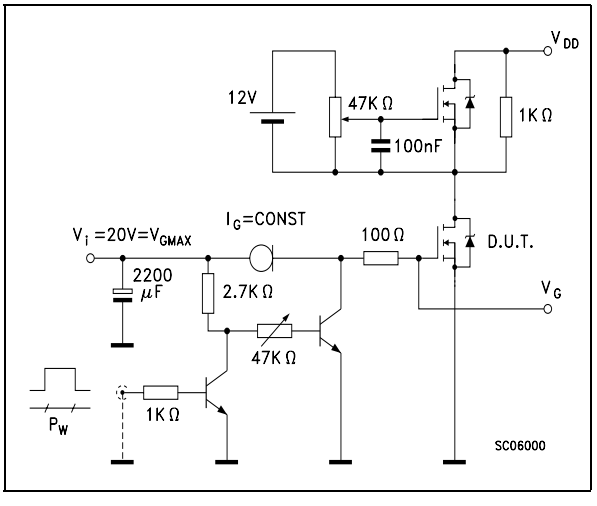
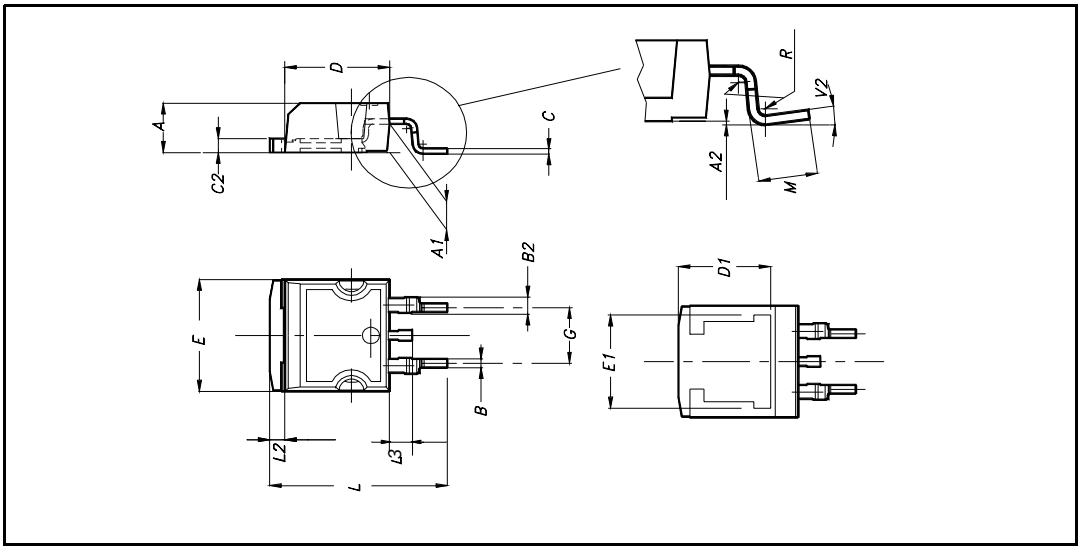


Figure 19: Gate Charge Test Circuit

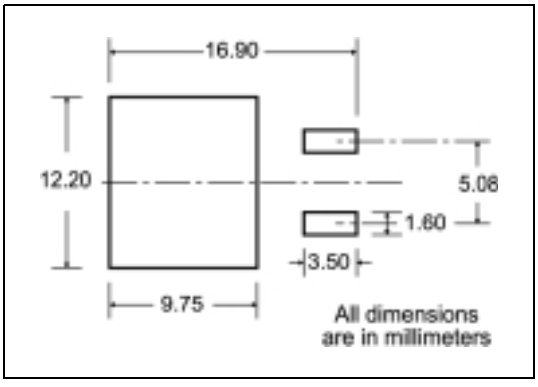


D^2PAK MECHANICAL DATA

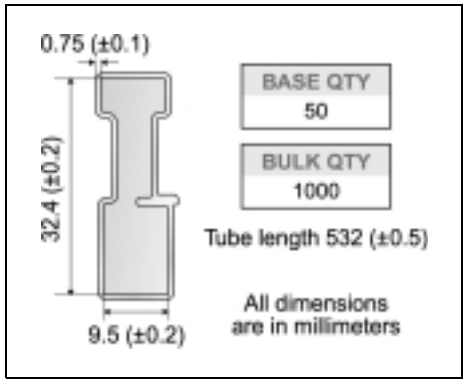
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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			



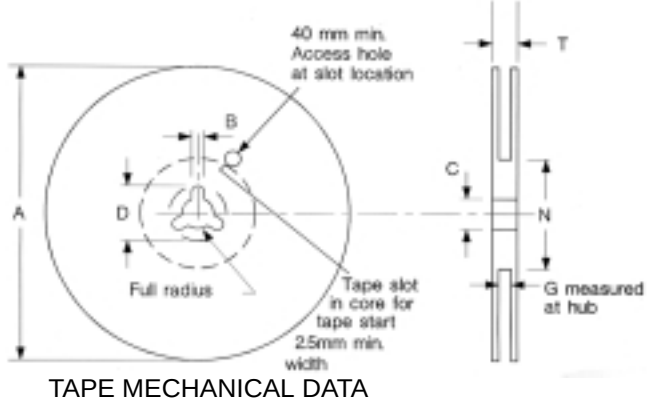
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



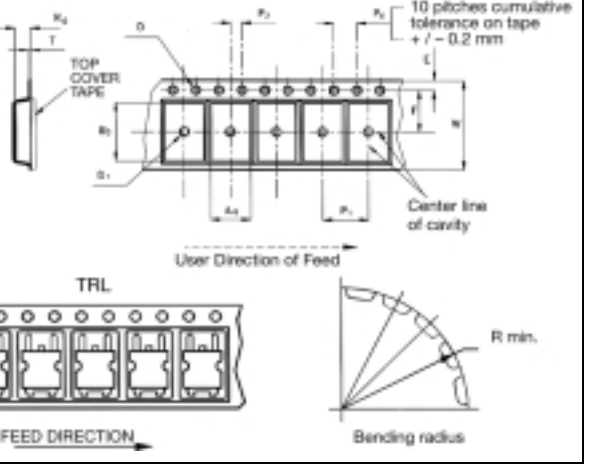
REEL MECHANICAL DATA

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

Table 10: Revision History

Date	Revision	Description of Changes
14-Dec-2004	2	New Stylesheet