STD22NM20N

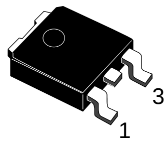
N-CHANNEL 200V - 0.088Ω - 22A DPAK
ULTRA LOW GATE CHARGE MDmesh™ II MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STD22NM20N	200 V	< 0.105 Ω	22 A

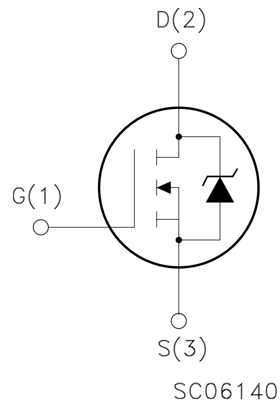
- WORLDWIDE LOWEST GATE CHARGE
- TYPICAL R_{DS}(on) = 0.088 Ω
- HIGH dv/dt and AVALANCHE CAPABILITIES
- LOW INPUT CAPACITANCE
- LOW GATE RESISTANCE

Figure 1: Package



DPAK

Figure 2: Internal Schematic Diagram



DESCRIPTION

This 200V MOSFET with a new advanced layout brings all unique advantages of MDmesh technology to lower voltages. The device exhibits worldwide lowest gate charge for any given on-resistance. Its use is therefore ideal as primary switch in isolated DC-DC converters for Telecom and Computer applications. Used in combination with secondary-side low-voltage STripFET™ products, it contributes to reducting losses and boosting effeciency.

APPLICATIONS

The MDmesh™ family is very suitable for increasing power density allowing system miniaturization and higher efficiencies

Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STD22NM20NT4	D22NM20N	DPAK	TAPE & REEL

Rev. 4

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	200	V
V_{GS}	Gate- source Voltage	± 20	V
I_D	Drain Current (continuous) at T_C = 25° Drain Current (continuous) at T_C = 100°	22 13.7	A A
I_{DM} (*)	Drain Current (pulsed)	88	A
P_{TOT}	Total Dissipation at T_C = 25°C	100	W
	Derating Factor	0.8	W/°C
dv/dt (2)	Peak Diode Recovery voltage slope	14	V/ns
T_j T_{stg}	Storage Temperature Max Operating Junction Temperature	150 -65 to 150	°C °C

(*) I_{SD} ≤ 22A, di/dt ≤ 400A/µs, V_{DD} = 80% $V_{(BR)DSS}$

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	1.25	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
Rthj-ambT_l	Thermal Resistance Junction-pcb (*) Maximum Lead Temperature For Soldering Purpose	43 275	°C/W °C

(*) When mounted on 1 inch² FR-4 board, 2 oz Cu, t ≤ 10 sec

Table 5: Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I_{AS}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	22	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, I_D = 22 A, V_{DD} = 50 V)	380	mJ

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

Table 6: On/Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1mA, V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating, T_C = 125 °C			1 10	µA 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	3.5	4.2	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 11 A		0.088	0.105	Ω

Table 7: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (2)	Forward Transconductance	V_{DS} = 15 V, I_D=11 A		8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		800 330 130		pF pF pF
$C_{oss\ eq.}$ (**)	Equivalent Output Capacitiance	V_{GS} = 0 V, V_{DS} = 0 V to 400 V		225		pF
R_G	Gate Input Resistance	f= 1MHz Gate DC Bias = 0 Test Sgnal Level = 20 mV Open Drain		5		Ω
$t_{d(on)}$ t_r $t_{r(Voff)}$ t_f	Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 100 V, I_D = 11 A R_G = 4.7Ω V_{GS} = 10 V (see Figure 15)		40 15 40 11		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 100 V, I_D = 20 A, V_{GS} = 10 V (see Figure 19)		32 6 25	50	nC nC nC

(**) $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 8: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain Current Source-drain Current (pulsed)				22 88	A A
V_{SD} (2)	Forward On Voltage	I_{SD} = 20 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 20 A, di/dt = 100 A/µs V_{DD} = 100V, T_j = 25°C (see test circuit, Figure 17)		160 960 128		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 20 A, di/dt = 100 A/µs V_{DD} = 100V, T_j = 150°C (see test circuit, Figure 17)		225 1642 15		ns µC A

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

Figure 3: Safe Operating Area

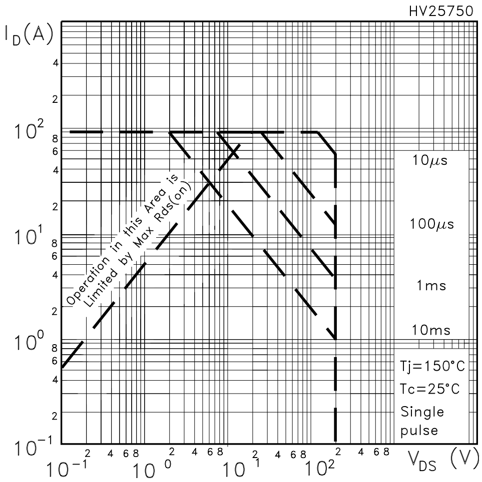


Figure 4: Output Characteristics

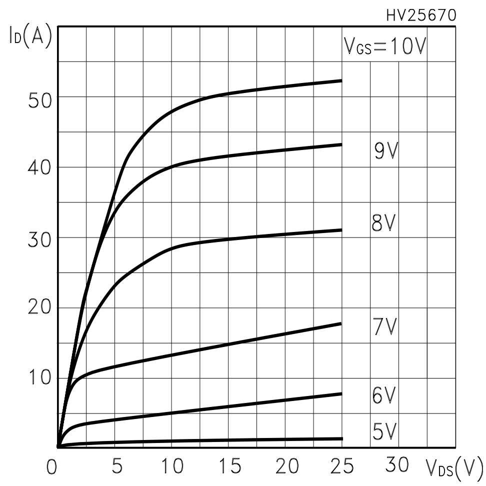


Figure 5: Transconductance

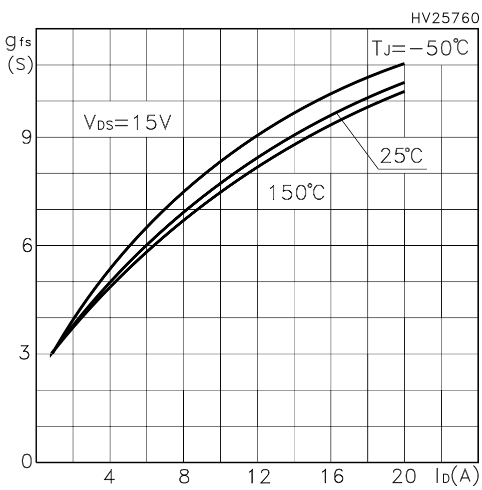


Figure 6: Thermal Impedance

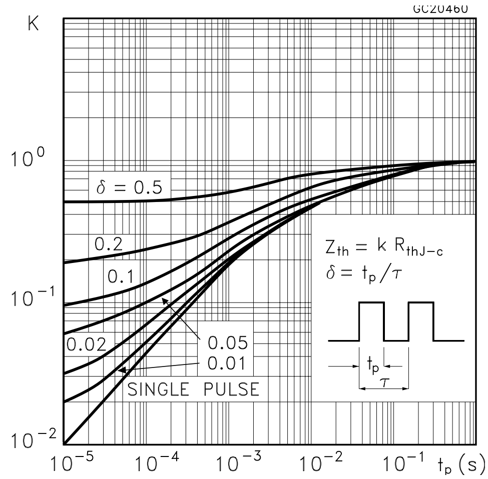


Figure 7: Transfer Characteristics

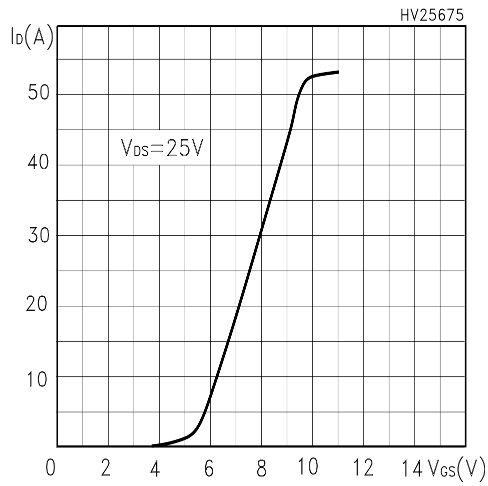


Figure 8: Static Drain-source On Resistance

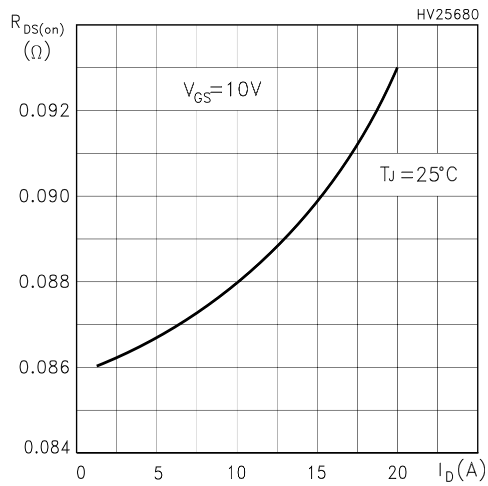


Figure 9: Gate Charge vs Gate-source Voltage

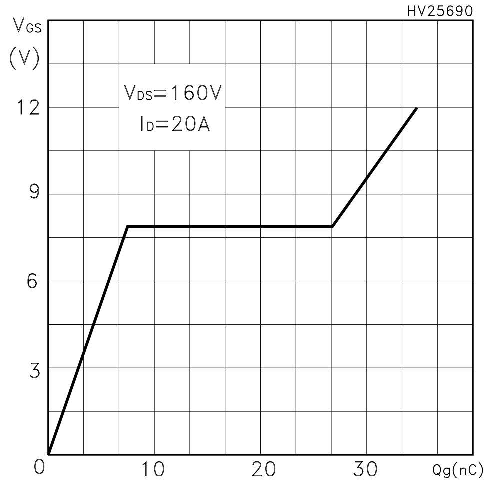


Figure 12: Capacitance Variations

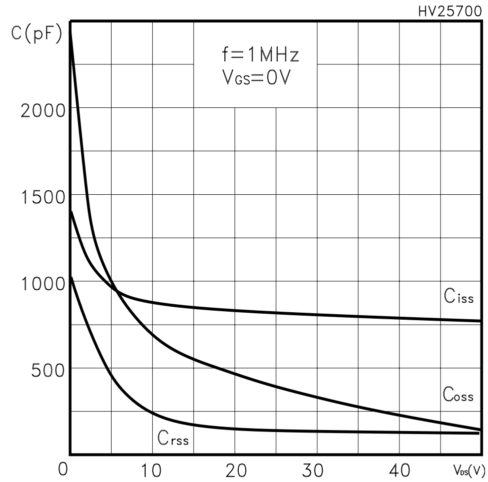


Figure 10: Normalized Gate Thereshold Voltage vs Temperature

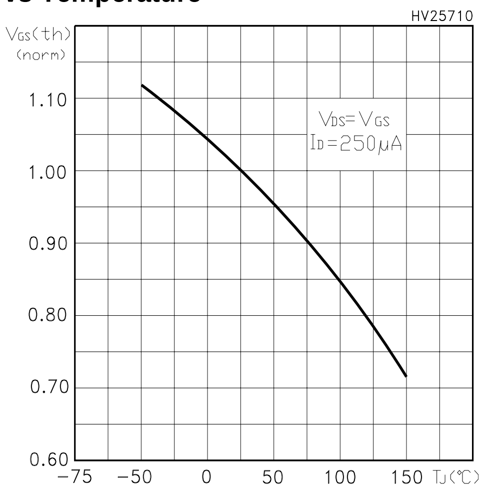


Figure 13: Normalized On Resistance vs Temperature

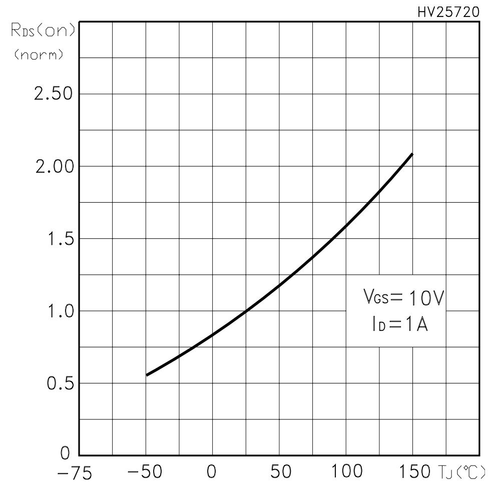


Figure 11: Source-Drain Diode Forward Characteristics

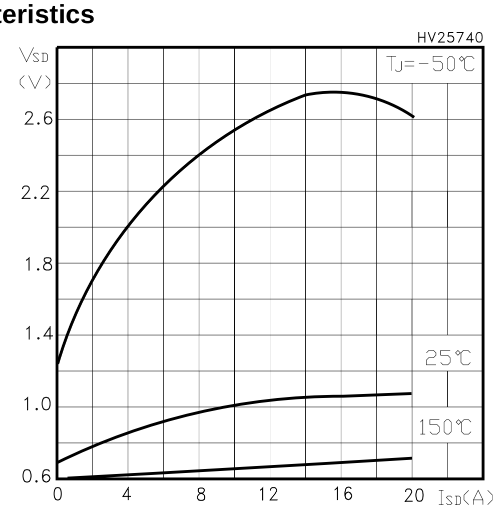


Figure 14: Normalized BVdss vs Temperature

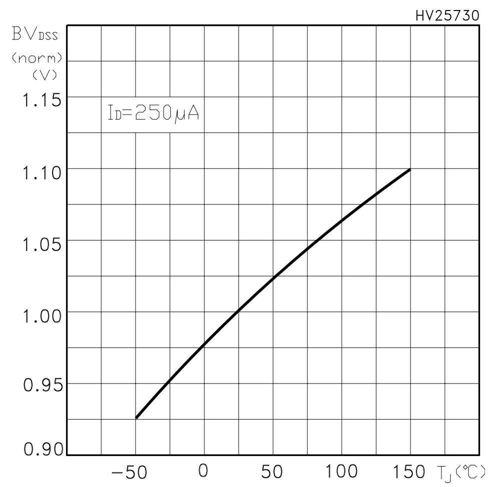


Figure 15: Unclamped Inductive Load Test Circuit

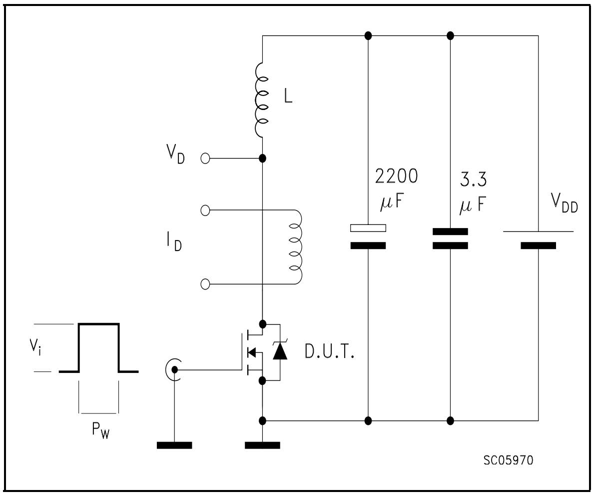


Figure 18: Unclamped Inductive Wafeform

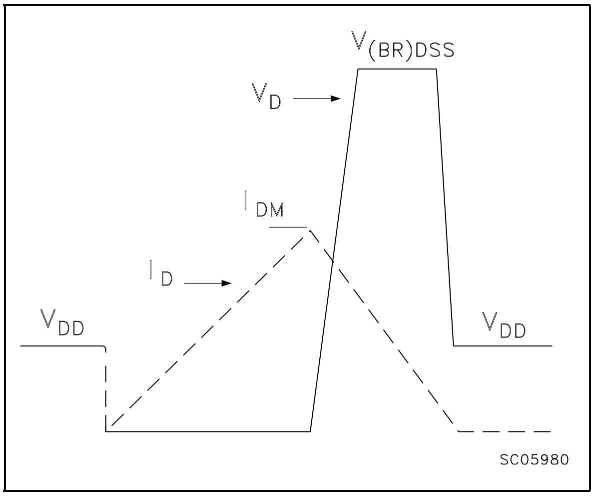


Figure 16: Switching Times Test Circuit For Resistive Load

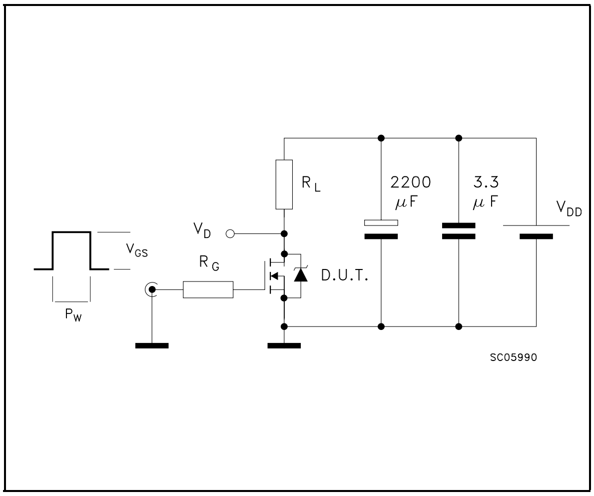


Figure 19: Gate Charge Test Circuit

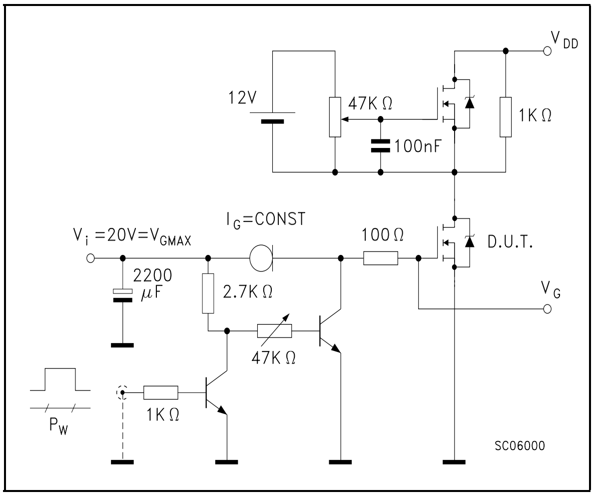
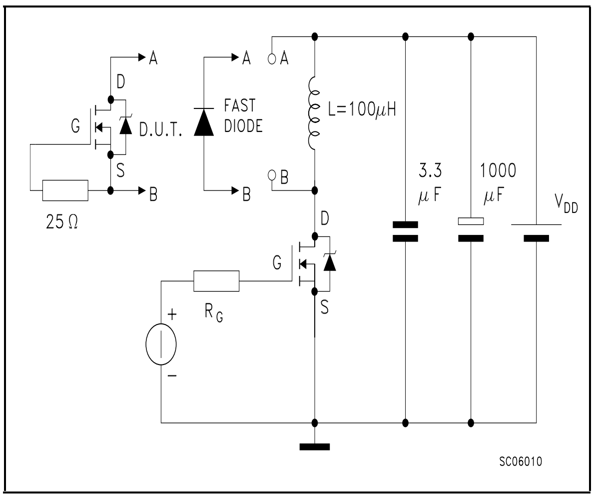
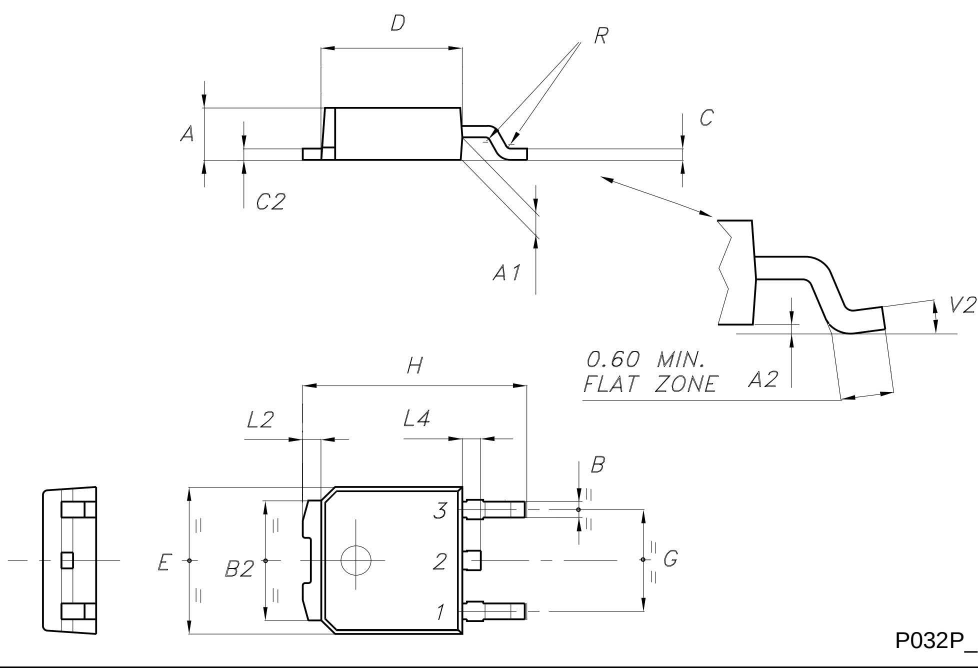


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times



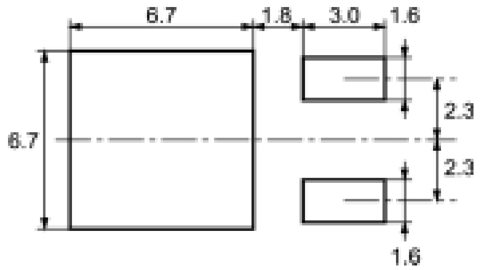
TO-252 (DPAK) MECHANICAL DATA

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°		8°	0°		0°



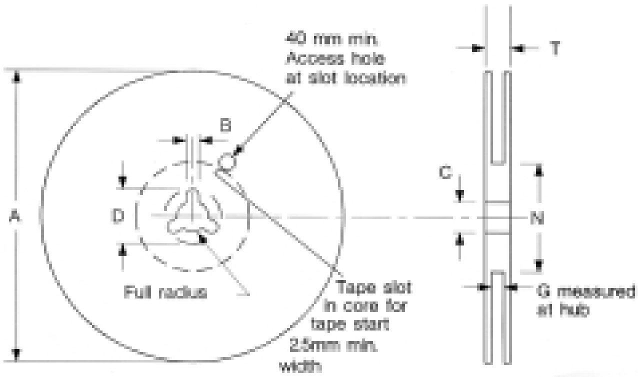
P032P_B

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

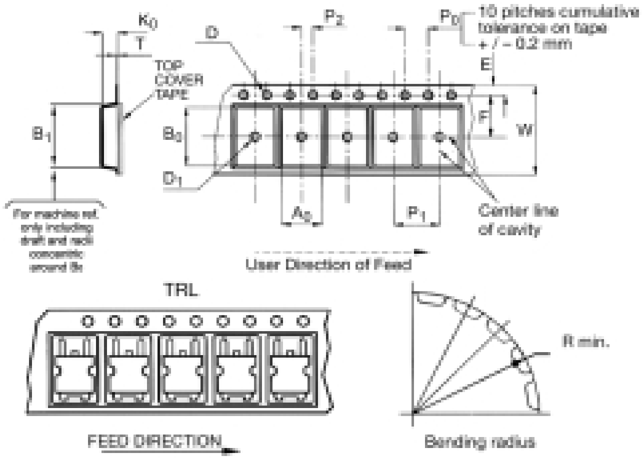


Table 9: Revision History

Date	Revision	Description of Changes
31-May-2004	1	First Release.
15-Mar-2005	2	Update version.
09-May-2005	3	Complete version.
09-Jun-2005	4	New update