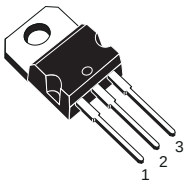
STB8NM60D
STP8NM60D

N-CHANNEL 600V - 0.9Ω - 8A - TO-220/D²PAK
Fast Diode MDmesh™ Power MOSFET

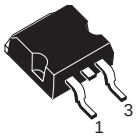
General features

Type	V_{DSS}	$R_{DS(on)}$	I_D	P_{TOT}
STB8NM60D	600V	< 1.0Ω	8A	100W
STP8NM60D	600V	< 1.0Ω	8A	100W

- High dv/dt and avalanche capabilities
- 100% avalanche rated
- Low input capacitance and gate charge
- Low gate input resistance
- Fast internal recovery diode



TO-220

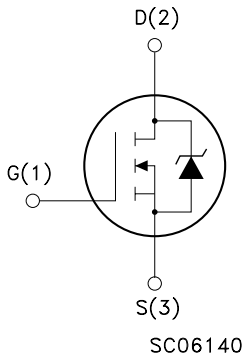


D²PAK

Description

The FDmesh™ associates all advantages of reduced on-resistance and fast switching with an intrinsic fast-recovery body diode. It is therefore strongly recommended for bridge topologies, in particular ZVS phase-shift converters

Internal schematic diagram



Applications

The MDmesh™ family is very suitable for increasing power density of high voltage converters allowing system miniaturization and higher efficiencies.

Order codes

Sales Type	Marking	Package	Packaging
STB8NM60D	B8NM60D	D²PAK	TAPE & REEL
STP8NM60D	P8NM60D	TO-220	TUBE

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20kΩ)	600	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current (continuous) at T_C = 25°C	8	A
I_D	Drain Current (continuous) at T_C=100°C	5	A
I_{DM}(1)	Drain Current (pulsed)	32	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	20	V/ns
T_J T_{stg}	Operating Junction Temperature Storage Temperature	-65 to 150	°C

1. Pulse width limited by safe operating area
2. I_{SD} ≤5A, di/dt ≤400A/µs, V_{DD} =80%$V_{(BR)DSS}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case Max	1.25	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient Max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

Table 3. Avalanche data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by Tjmax)	2.5	A
E_{AS}	Single pulse avalanche energy (starting Tj=25°C, I_D=I_{AR}, V_{DD}=50V)	200	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test Condictions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250µA, V_{GS}= 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating, V_{DS} = Max Rating,Tc=125°C			1 10	µA µA
I_{GSS}	Gate Body Leakage Current (V_{DS} = 0)	V_{GS} = ±30V, V_{DS} = 0			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D = 250µA	3	4	5	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS}= 10V, I_D=2.5A		0.9	1	Ω

Table 5. Dynamic

Symbol	Parameter	Test Condictions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} =$I_{D(on)}$ x $R_{DS(on)max}$ I_D = 2.5A		2.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		380 170 14		pF pF pF
$C_{oss\ eq.}$ (2)	Equivalent Ouput Capacitance	V_{GS}=0, V_{DS} =0V to 480V		60		pF
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}=400V, I_D = 5A V_{GS} =10V (see Figure 13)		15 4 8	18	nC nC nC

1. Pulsed: pulse duration=300µs, duty cycle 1.5%
2. $C_{oss\ eq.}$ 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 6. Switching times

Symbol	Parameter	Test Condictions	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}=300V, I_D=2.5A, R_G=4.7Ω, V_{GS}=10V (see Figure 12)		13 10 26 8		ns ns ns ns
$t_{d(off)}$ t_f t_c	Turn-off Delay Time Fall Time Cross-over Time	V_{DD}=480V, I_D=5A, R_G=4.7Ω, V_{GS}=10V (see Figure 12)		8 8 14		ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test Condictions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(1)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD}(2)	Forward on Voltage	I_{SD}=5A, V_{GS}=0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD}=5A, di/dt = 100A/µs, V_{DD}=50 V, Tj=25°C		107 330 6		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD}=5A, di/dt = 100A/µs, V_{DD}=50 V, Tj=150°C		178 640 7		ns nC 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

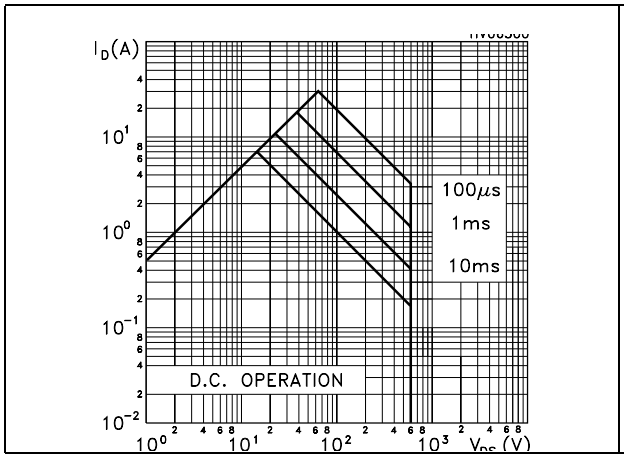


Figure 2. Thermal impedance

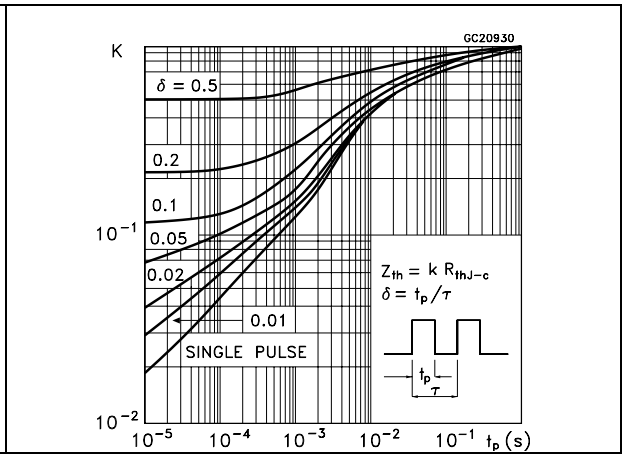


Figure 3. Output characterisics

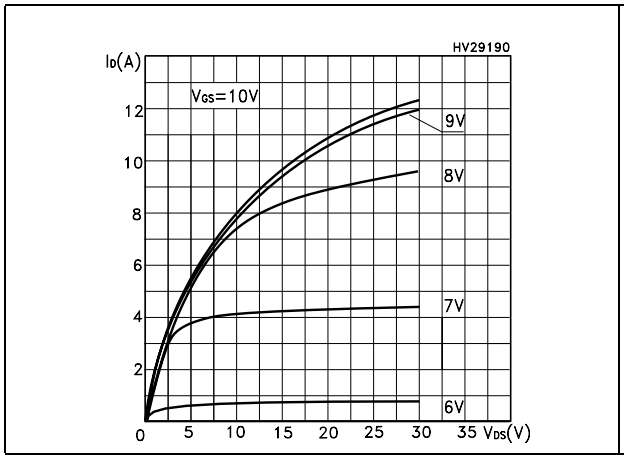


Figure 4. Transfer characteristics

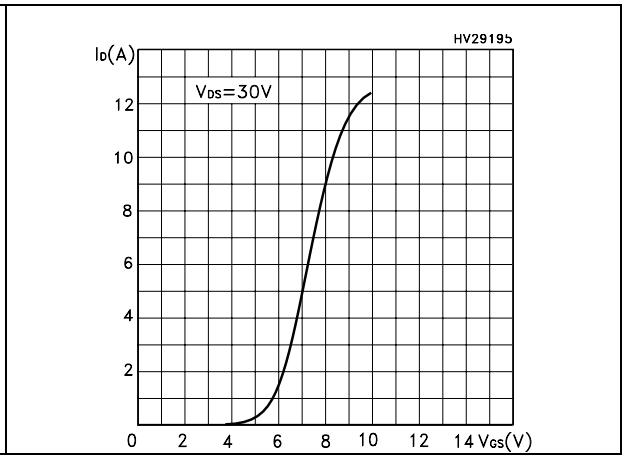


Figure 5. Transconductance

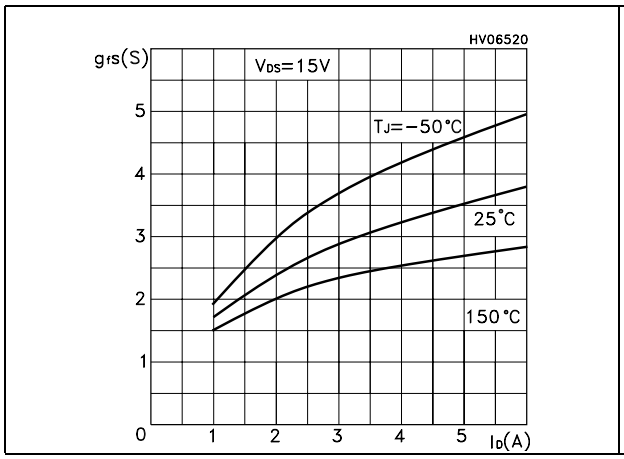


Figure 6. Static drain-source on resistance

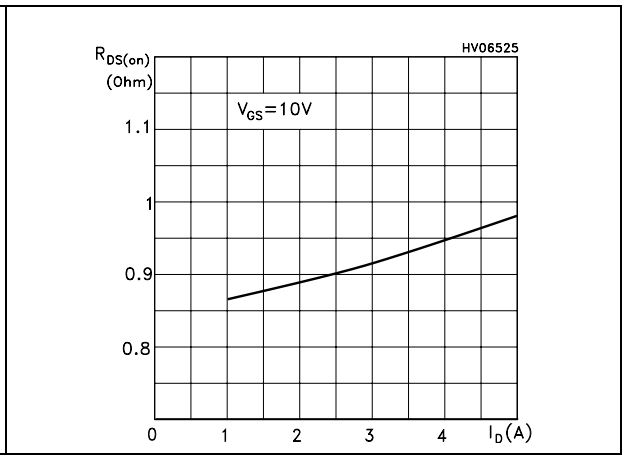


Figure 7. Gate charge vs gate-source voltage

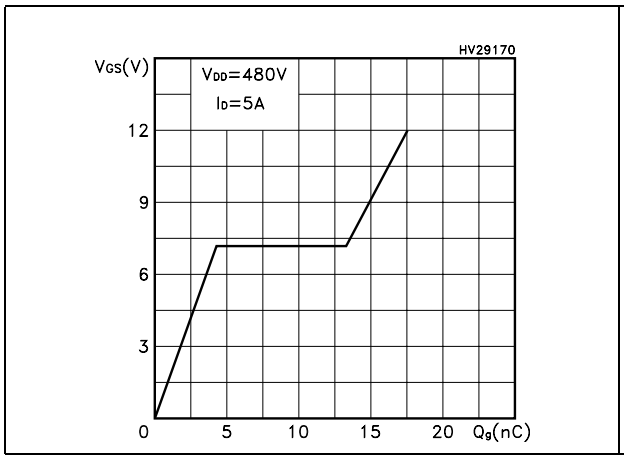


Figure 8. Capacitance variations

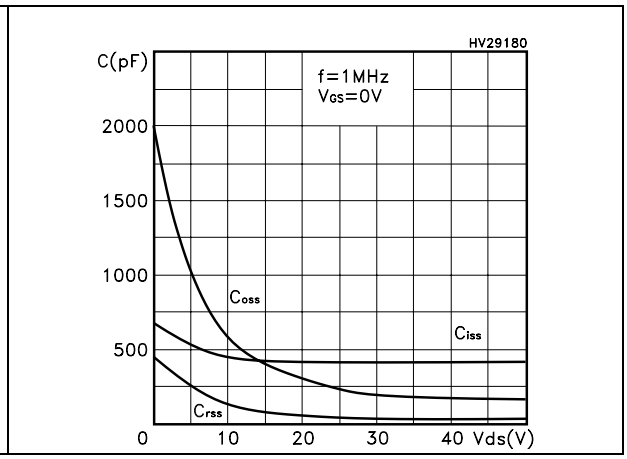


Figure 9. Normalized gate threshold voltage vs temperature

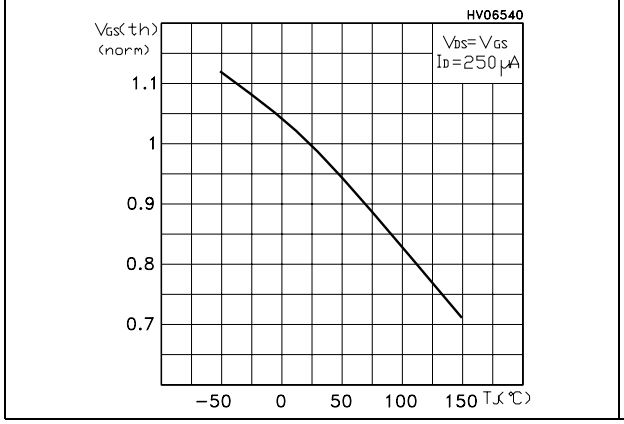


Figure 10. Normalized on resistance vs temperature

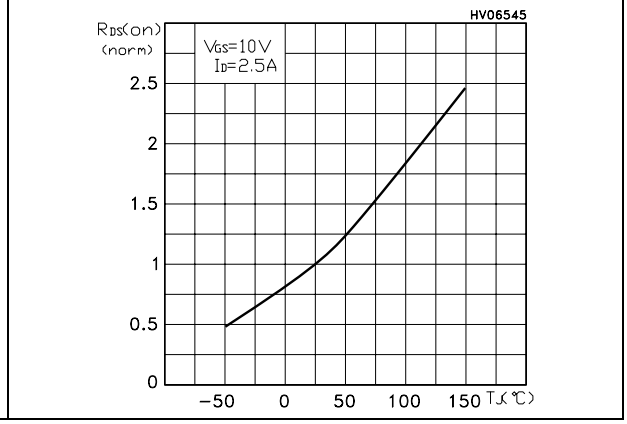
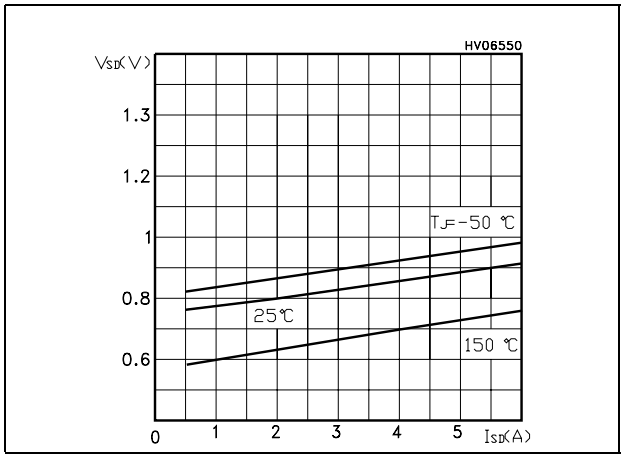


Figure 11. Source-drain diode forward characteristics



3 Test circuit

Figure 12. Switching times test circuit for resistive load

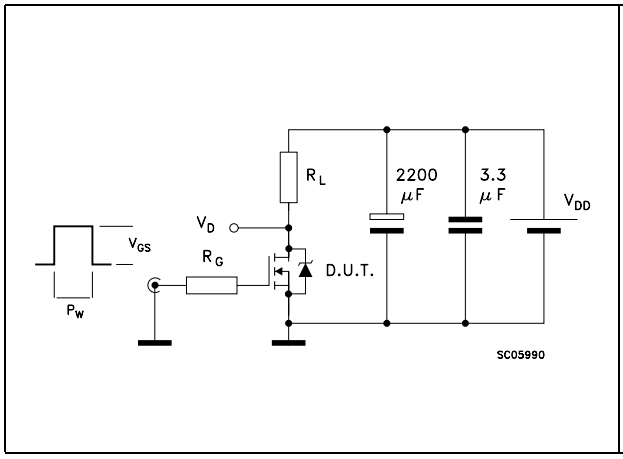


Figure 13. Gate charge test circuit

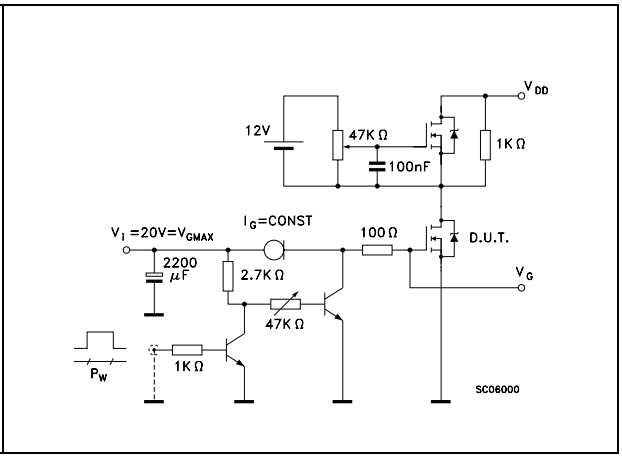


Figure 14. Test circuit for inductive load switching and diode recovery times

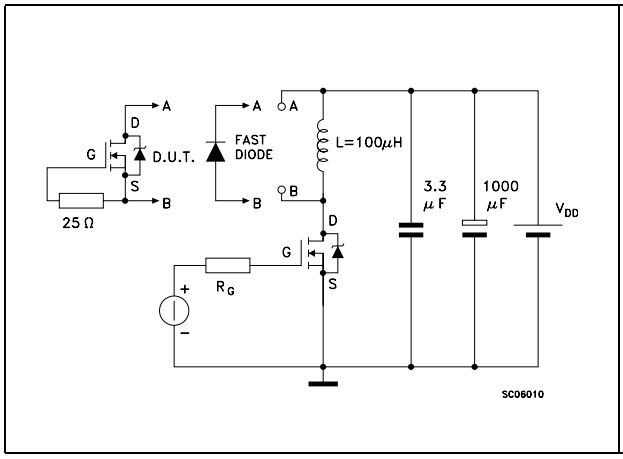


Figure 15. Unclamped Inductive load test circuit

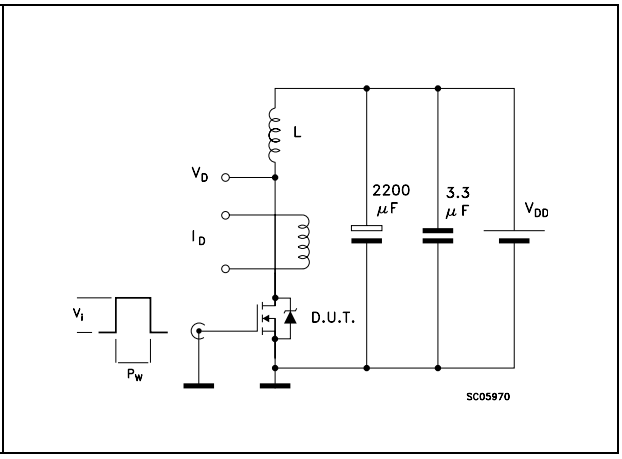


Figure 16. Unclamped inductive waveform

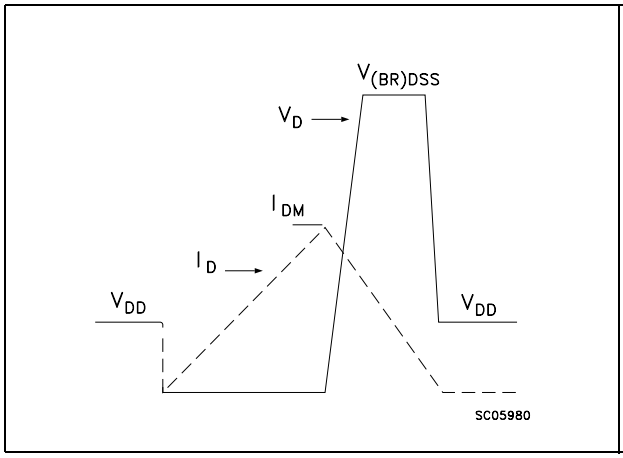
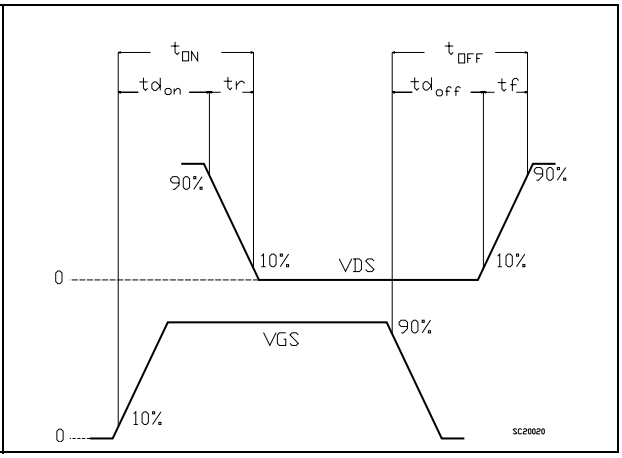


Figure 17. Switching time waveform

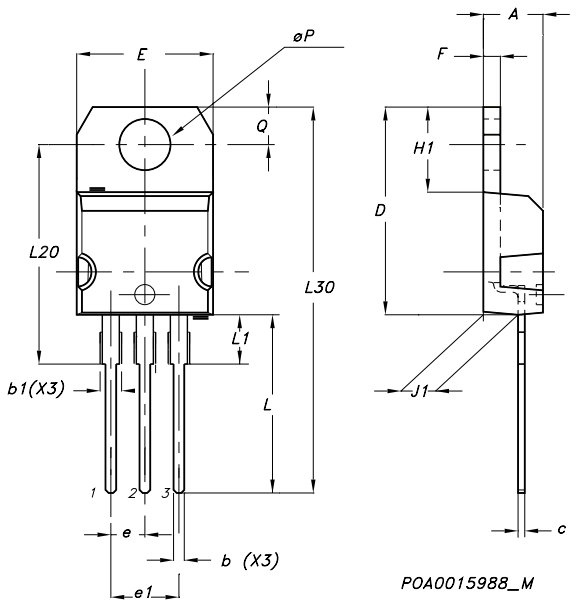


4 Package mechanical data

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

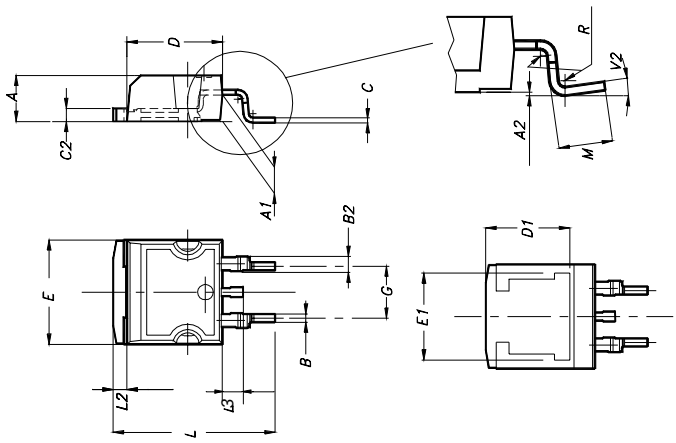
TO-220 MECHANICAL DATA

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



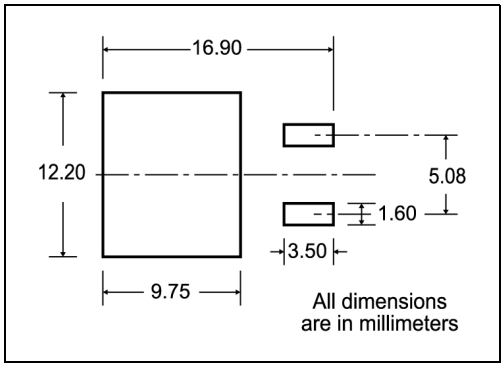
D^2PAK MECHANICAL DATA

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			

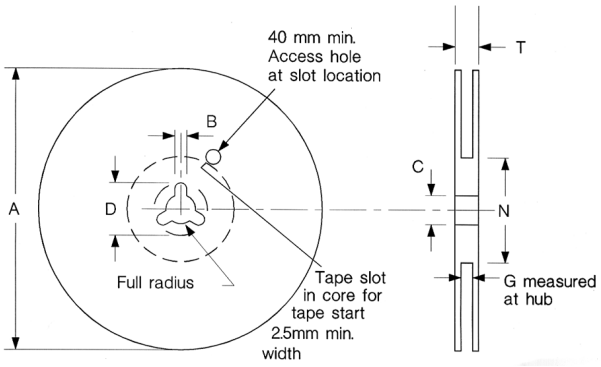


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



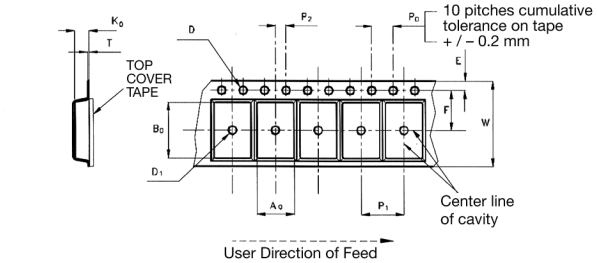
REEL MECHANICAL DATA

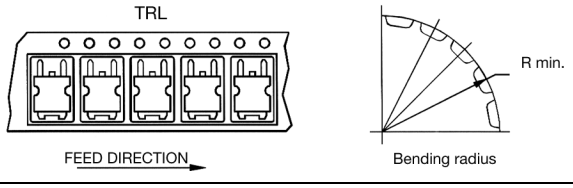
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

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 8. Document revision history

Date	Revision	Changes
13-Jan-2006	1	Initial release.
15-Feb-2006	2	Modified Description on first page