STB85NS04Z
STB85NS04Z-1

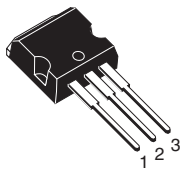
N-channel 11mΩ - 80A - D²PAK - I²PAK SAFeFET™ Power MOSFET

General features

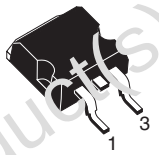
Type	V_{DSS}	$R_{DS(on)}$	I_D
STB85NS04Z	Clamped	< 0.015Ω	80A(1)
STB85NS04Z-1	Clamped	< 0.015Ω	80A(1)

1. Current limited by wire bonding

- 100% avalanche tested
- Low capacitance and gate charge
- 175°C maximum junction temperature



I²PAK

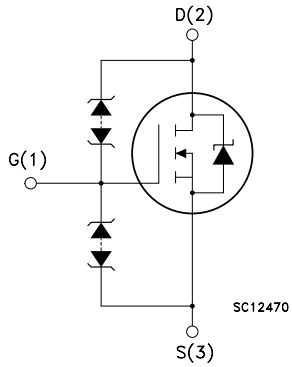


D²PAK

Description

This fully clamped Power MOSFET is produced by using the latest advanced Company's Mesh Overlay™ process which is based on a novel strip layout. The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitole for the harshest operation conditions such as those encountered inthe automotive environment. Any other application requiring extra ruggedness is also recommended.

Internal schematic diagram



Applications

- Switching application
  - Automotive

Order codes

Part number	Marking	Package	Packaging
STB85NS04ZT4	B85NS04Z	D²PAK	Tape &reel
STB85NS04Z-1	B85NS04Z-1	I²PAK	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS}=0)	33 (1)	V
V_{GS}	Gate-source voltage	± 18	V
I_D	Drain current (continuous) at T_C = 25°C	80 (2)	A
I_D	Drain current (continuous) at T_C = 100°C	60	A
I_{DG}	Drain gate current (continuous)	± 50	mA
I_{GS}	Gate source current (continuous)	± 50	mA
I_{DM} (3)	Drain current (pulsed)	320	A
	Derating factor	1.43	W/°C
P_{TOT}	Total dissipation at T_C = 25°C	215	W
$V_{ESD(G-S)}$	Gate-source ESD (HBM-C=100pF, R=1.5kΩ)	2	kV
$V_{ESD(G-D)}$	Gate-drain ESD (HBM-C=100pF, R=1.5kΩ)	4	kV
$V_{ESD(D-S)}$	Drain-source ESD (HBM-C=100pF, R=1.5kΩ)	4	kV
T_j	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		

1. Voltage is limited by zener diodes
2. Current limited by wire bonding
3. Pulse width limited by safe operating area

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		D²PAK	I²PAK	
Rthj-case	Thermal resistance junction-case max	0.7		°C/W
Rthj-pcb (1)	Thermal resistance junction-pcb max	35	--	°C/W
Rthj-amb	Thermal resistance junction-amb max	62.5		°C/W
T_l	Maximum lead temperature for soldering purpose	300		°C

1. When mounted on 1inch² FR-4 board, 2 oz Cu

Table 3. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	60	A
E_{AS}	Single pulse avalanche energy (starting Tj=25°C, I_D=I_{AS}, V_{DD}= 30V)	550	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS}= 0	33			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 16V, V_{DS} = 16V, Tc=125°C			10 100	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±10V			10	µA
V_{GSS}	Gate-source breakdown voltage	I_{GS} = 100µA	13		25	V
R_G	Series gate resistance			14		Ω
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 1mA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10V, I_D= 30A		11	15	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
gfs	Forward transconductance	V_{DS} = 25V, I_D= 30A		50		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25V, f=1MHz, V_{GS}=0		2500 800 150		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=16V, I_D = 60A V_{GS} =10V *(see Figure 14)*		68 15 19	100	nC nC nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage rise time Fall time Cross-over time	V_{clamp}=30V, I_D=60A R_G=4.7Ω, V_{GS}=10V *(see Figure 15)*		85 145 90		ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)				80 320	A A
V_{SD} (1)	Forward on voltage	I_{SD}=60A, V_{GS}=0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}=60A,V_{DD}=100V di/dt=25A/µs,Tj=150°C *(see Figure 18)*		65 0.15 4.5		ns µC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

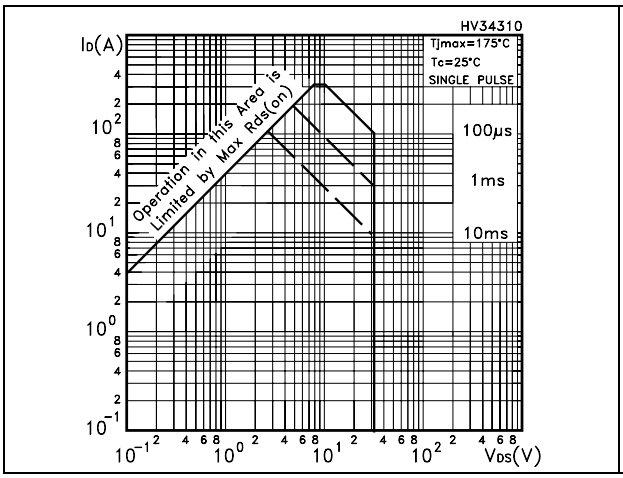


Figure 2. Thermal impedance

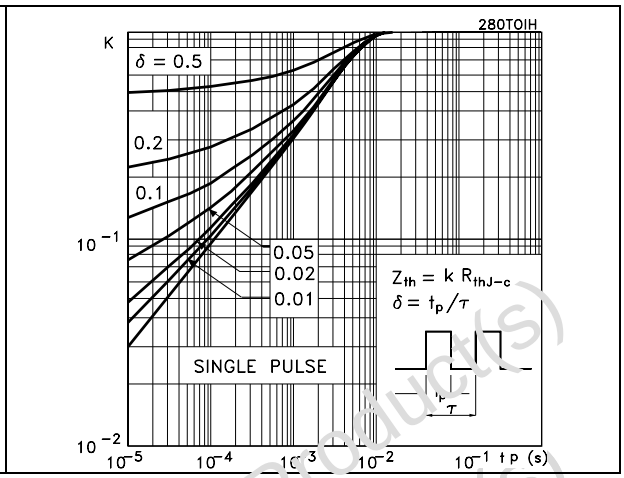


Figure 3. Output characteristics

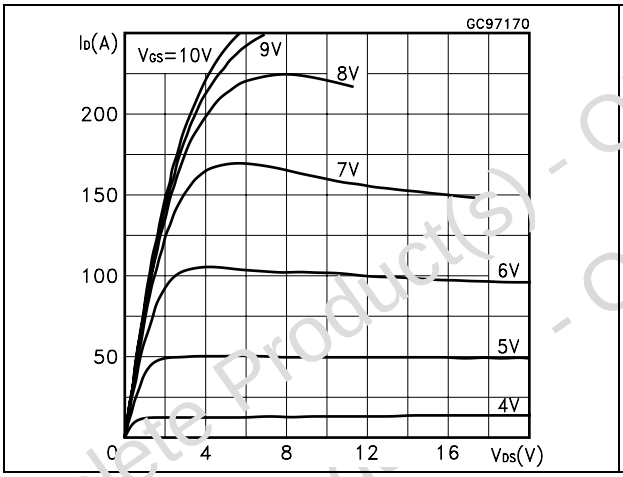


Figure 4. Transfer characteristics

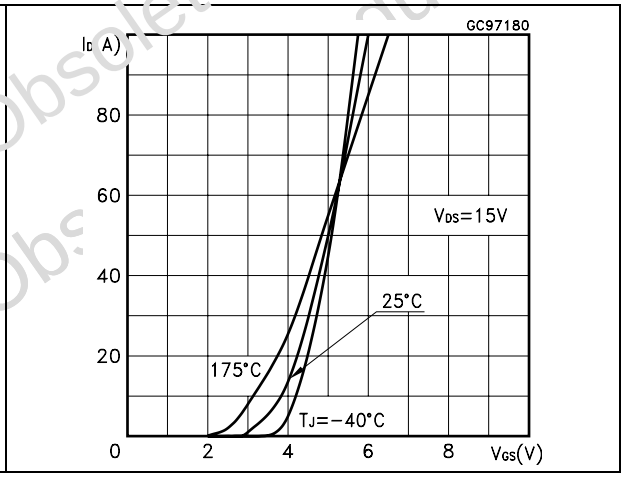


Figure 5. Transconductance

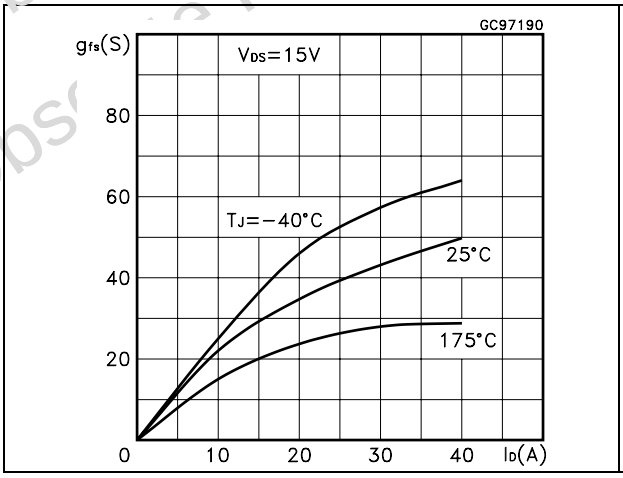


Figure 6. Static drain-source on resistance

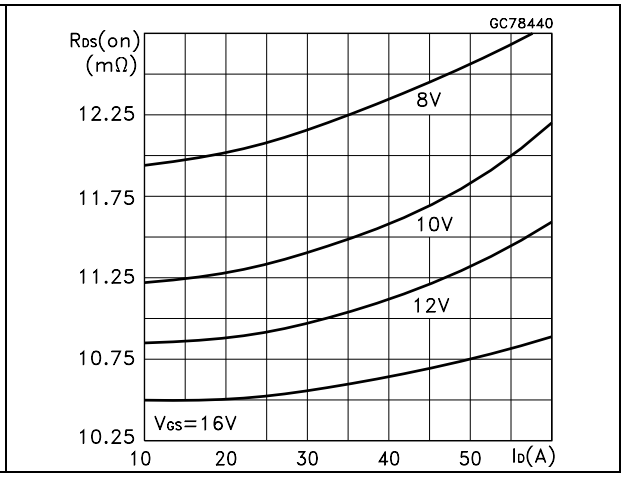


Figure 7. Gate charge vs gate-source voltage

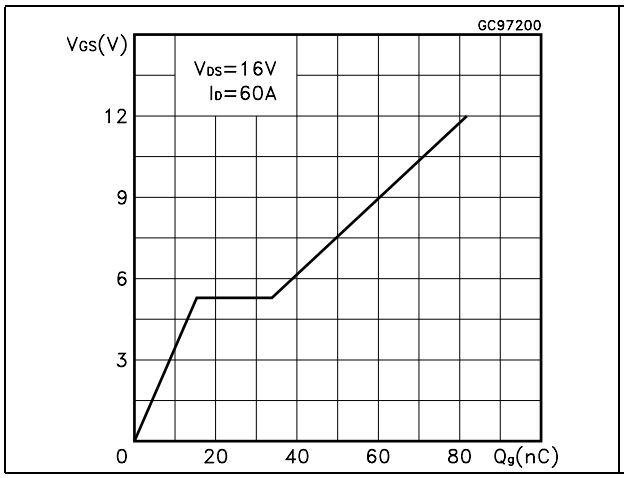


Figure 8. Capacitance variations

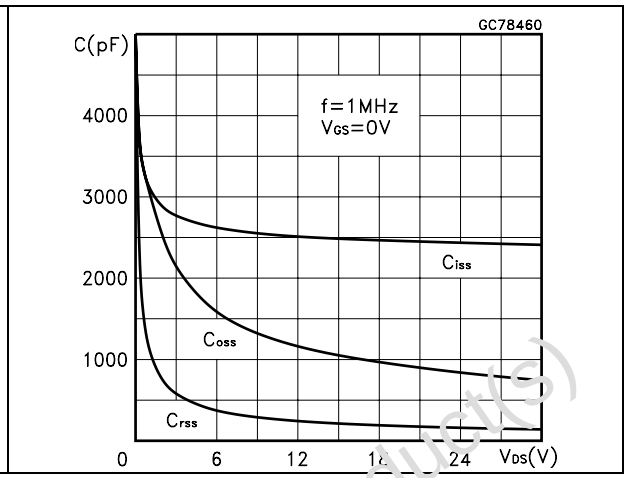


Figure 9. Normalized gate threshold voltage vs temperature

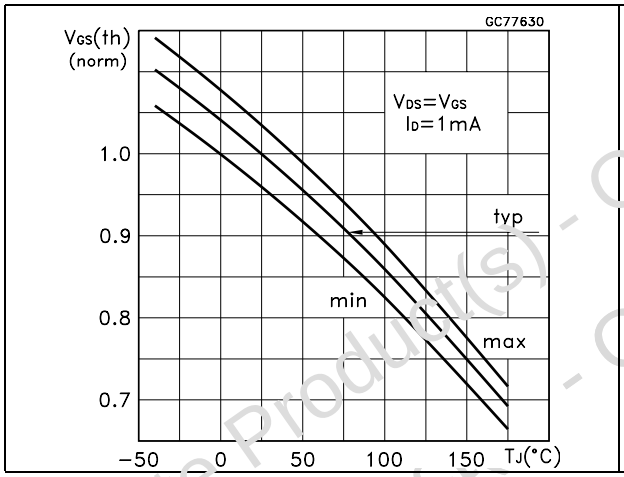


Figure 10. Normalized on resistance vs temperature

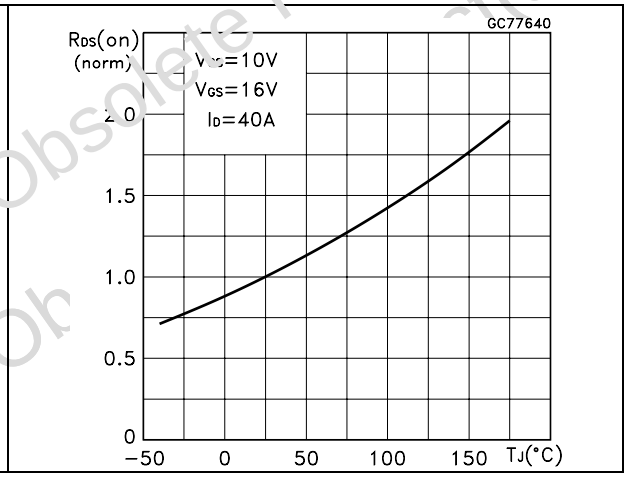


Figure 11. Zero gate voltage drain current vs temperature

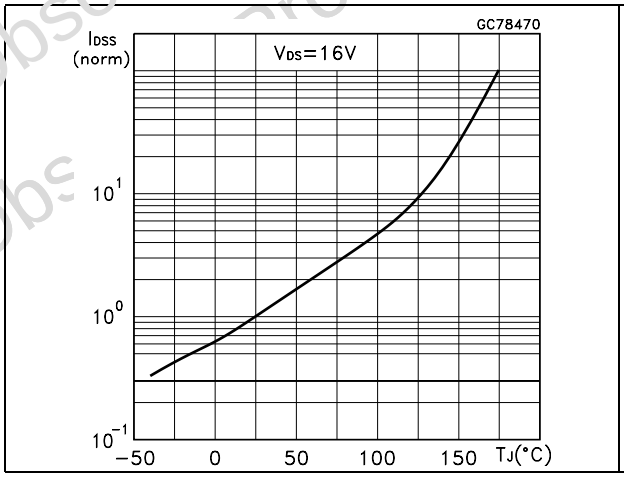
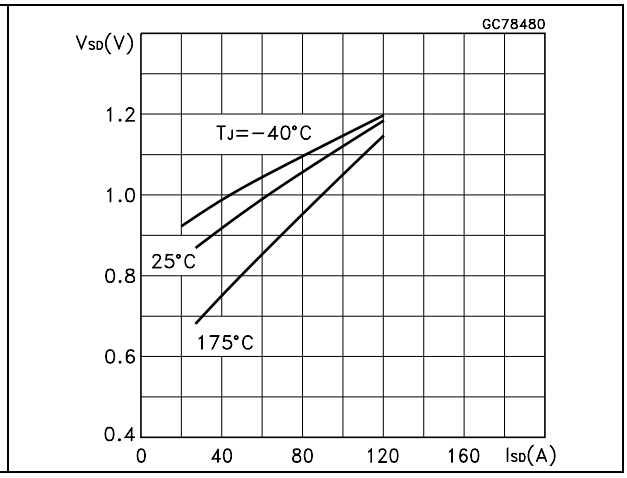


Figure 12. Source-drain diode forward characteristics



3 Test circuit

Figure 13. Switching times test circuit for resistive load

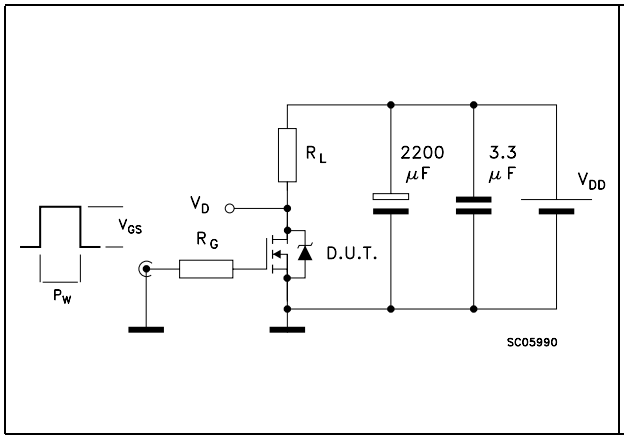


Figure 14. Gate charge test circuit

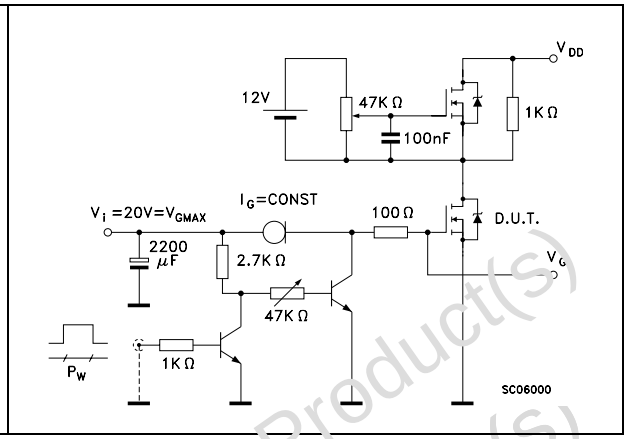


Figure 15. Test circuit for inductive load switching and diode recovery times

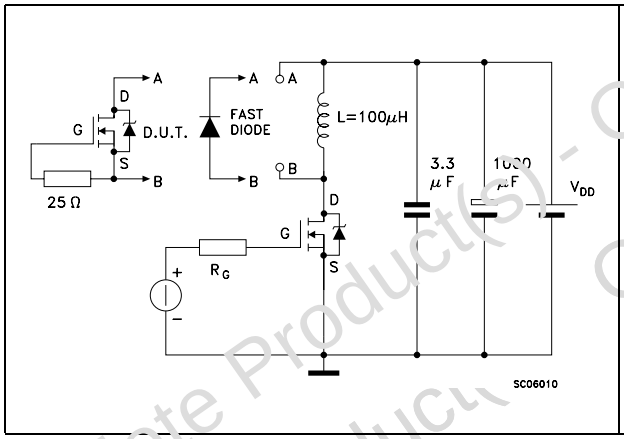


Figure 16. Unclamped inductive load test circuit

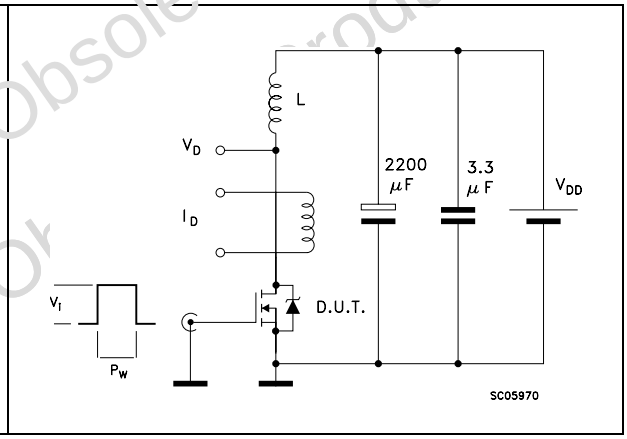


Figure 17. Unclamped inductive waveform

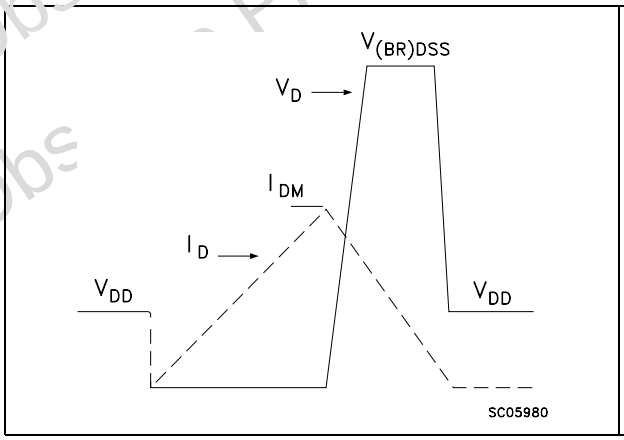
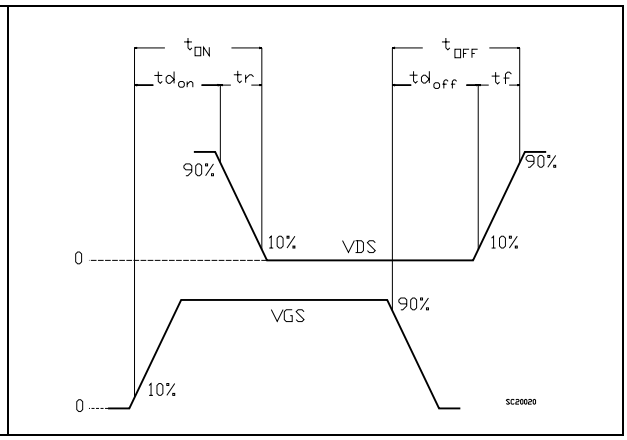


Figure 18. Switching time waveform

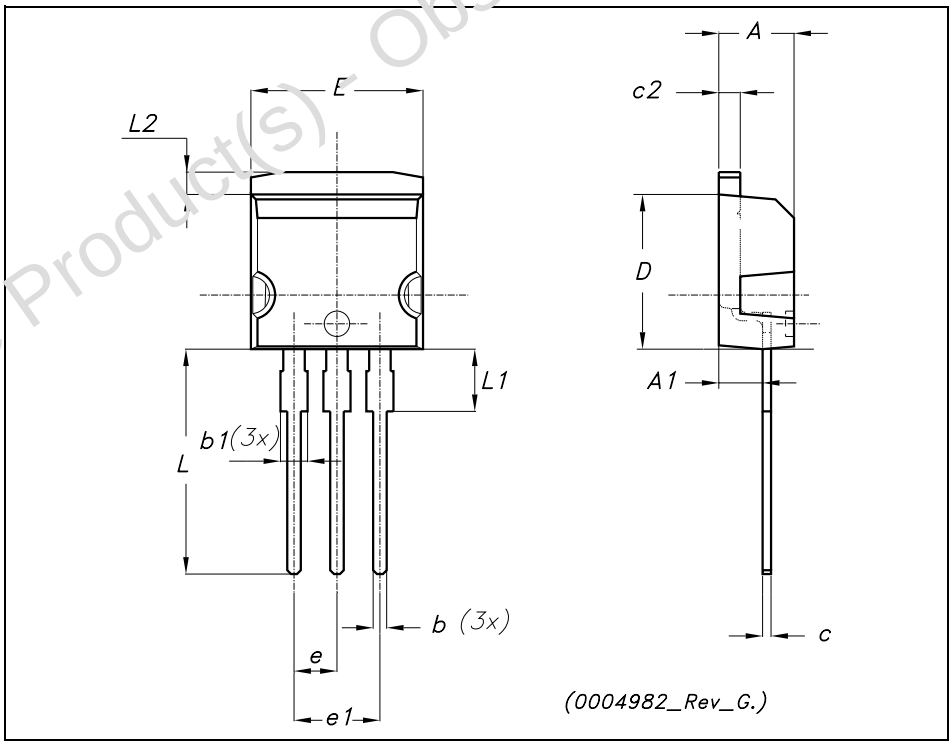


4 Package mechanical data

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*

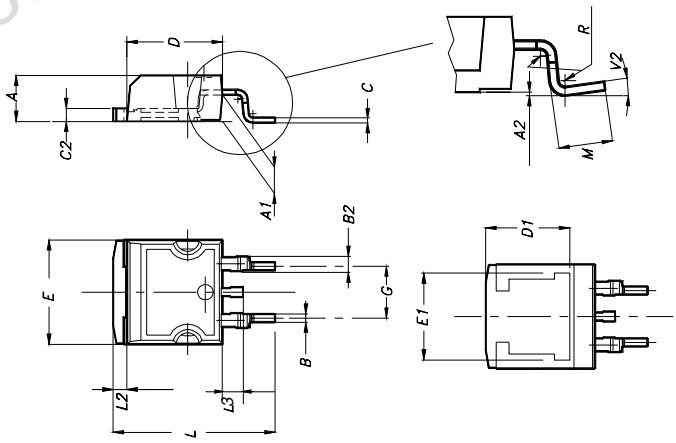
TO-262 (I^2PAK) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



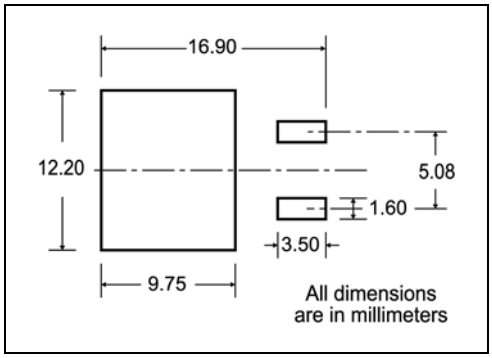
D^2PAK MECHANICAL DATA

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	0°		4°			

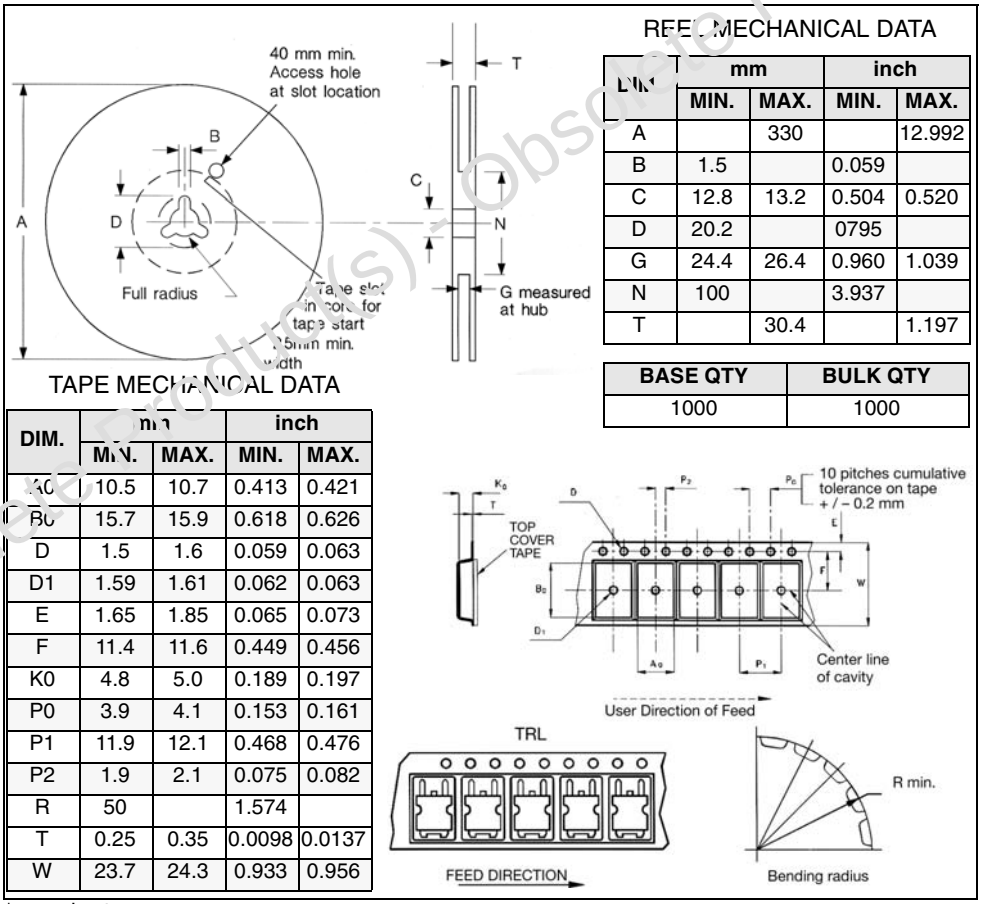


5 Packaging mechanical data

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. Revision history

Date	Revision	Changes
25-Sep-2006	1	First release

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