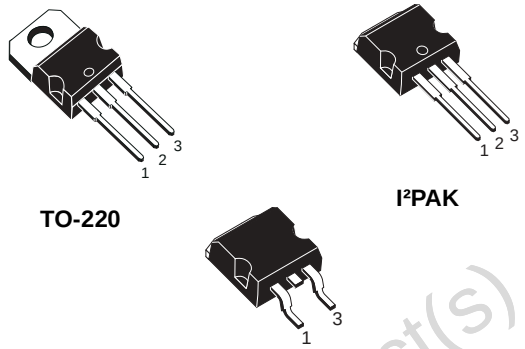
STB270N04
STB270N04-1 - STP270N04

N-CHANNEL 40V - 2.1mΩ - 160A - TO-220 - D²PAK - I²PAK
STripFET™ Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D	P_{TOT}
STB270N04-1	40V	<2.9mΩ	120A	330W
STB270N04	40V	<2.5mΩ	160A	330W
STP270N04	40V	<2.9mΩ	120A	330W

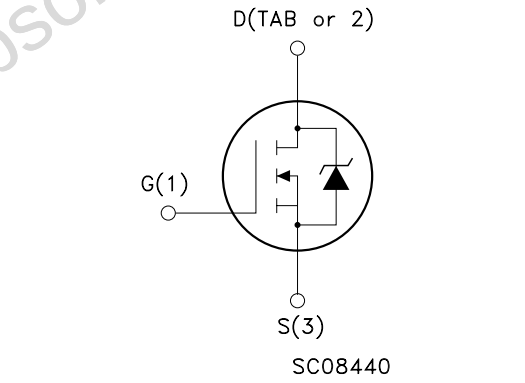
- 100% avalanche tested
- Standard threshold drive



Description

This N-Channel enhancement mode MOSFET is the latest refinement of STMicroelectronic unique “Single Feature Size™“ strip-based process with less critical aligment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

Internal schematic diagram



Applications

- High current, switching application
- Automotive

Order codes

Sales Type	Marking	Package	Packaging
STB270N04-1	B270N04	I²PAK	TUBE
STB270N04	B270N04	D²PAK	TAPE & REEL
STP270N04	P270N04	TO-220	TUBE

Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220/I²PAK	D²PAK	
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	40		V
V_{GS}	Gate-Source Voltage	± 20		V
I_D(1)	Drain Current (continuous) at T_C = 25°C	120	160	A
I_D(1)	Drain Current (continuous) at T_C=100°C	120	160	A
I_{DM}(2)	Drain Current (pulsed)	480	640	A
P_{TOT}	Total Dissipation at T_C = 25°C	330		W
	Derating Factor	2.2		W/°C
dv/dt(3)	Peak Diode Recovery voltage slope	3.5		V/ns
E_{AS}(4)	Single Pulse Avalanche Energy	1		J
T_J T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 175		°C

1. Current limited by package
2. Pulse width limited by safe operating area
3. I_{SD} ≤120A, di/dt ≤200A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ T_{JMAX}
4. Starting Tj=25°C, Id =80A, Vdd=32V

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		TO-220/I²PAK	D²PAK	
$R_{thj\text{-}case}$	Thermal resistance junction-case Max	0.45		°C/W
$R_{thj\text{-}pcb}$(1)	Thermal resistance Junction-pcb Max	--	35	°C/W
$R_{thj\text{-}a}$	Thermal resistance junction-ambient Max	62.5	--	°C/W
T_l	Maximum lead temperature for soldering purpose (for 10 sec, 1.6mm from case)	300	--	°C

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

Obsolete Product(s) - Obsolete Product(s)

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test Condictions		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250µA, V_{GS}= 0		40			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating, V_{DS} = MaxRating @125°C				10 100	µA µA
I_{GSS}	Gate Body Leakage Current (V_{DS} = 0)	V_{GS} = ±20V				±200	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D = 250µA		2		4	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS}= 10V, I_D= 80A	**TO-220** **I²PAK**		2.5	2.9	mΩ
			D²PAK		2.1	2.5	mΩ

Table 4. Dynamic

Symbol	Parameter	Test Condictions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} =15V, I_D = 80A		200		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		7400 1800 47		pF pF pF
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}=20V, I_D = 160A V_{GS} =10V (see Figure 2)		110 27 25	150	nC nC nC

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

Obsolete Product(s) - Obsolete Product(s)

Table 5. Switching times

Symbol	Parameter	Test Condictions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{DD}=20 V, I_D= 80A, R_G=4.7Ω, V_{GS}=10V (see Figure 14)		22 180		ns ns
$t_{d(off)}$ t_f	Turn-off Delay Time Fall Time	V_{DD}=20 V, I_D= 80A, R_G=4.7Ω, V_{GS}=10V (see Figure 14)		110 45		ns ns

Table 6. Source drain diode

Symbol	Parameter		Test Condictions	Min	Typ.	Max	Unit
I_{SD}	Source-drain Current	**D²PAK**				160	A
		TO-220 I²PAK				120	A
I_{SDM}(1)	Source-drain Current (pulsed)	**D²PAK**				640	A
		TO-220 I²PAK				480	A
V_{SD}(2)	Forward on Voltage		I_{SD}=80A, V_{GS}=0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current		I_{SD}=160A, di/dt = 100A/µs, V_{DD}=32V, Tj=150°C		70 225 3.2		ns nC A

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

Obsolete Product(s) - Obsolete Product(s)

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

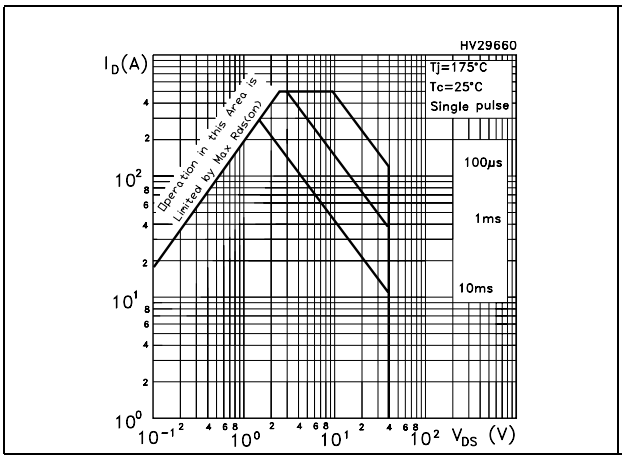


Figure 2. Thermal impedance

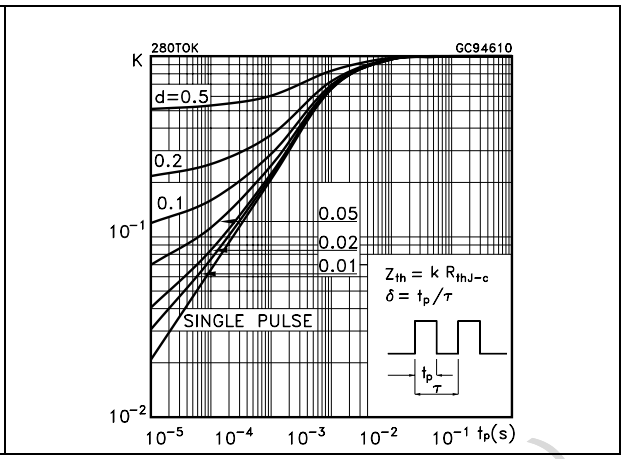


Figure 3. Output characterisics

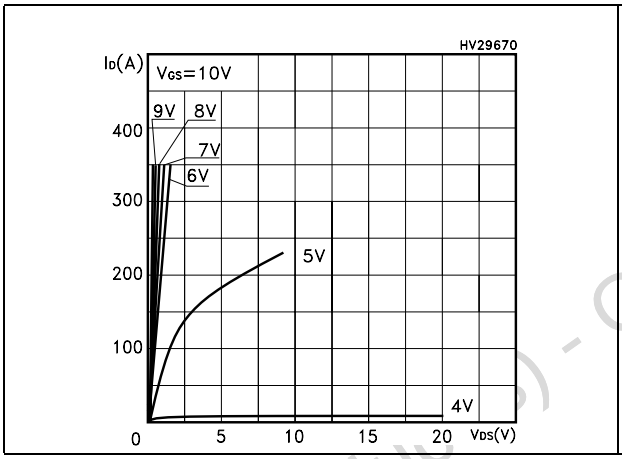


Figure 4. Transfer characteristics

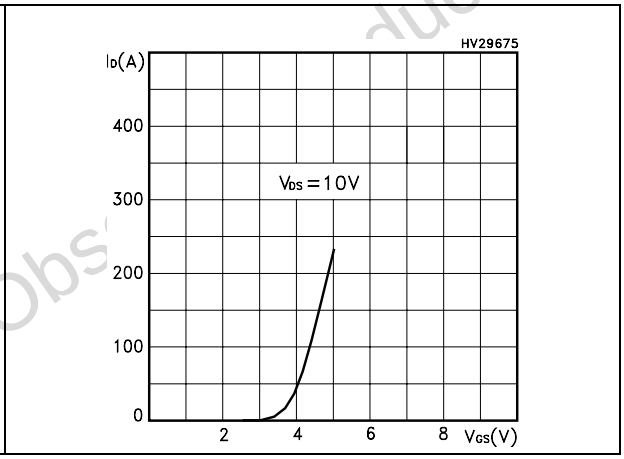


Figure 5. Static drain-source on resistance

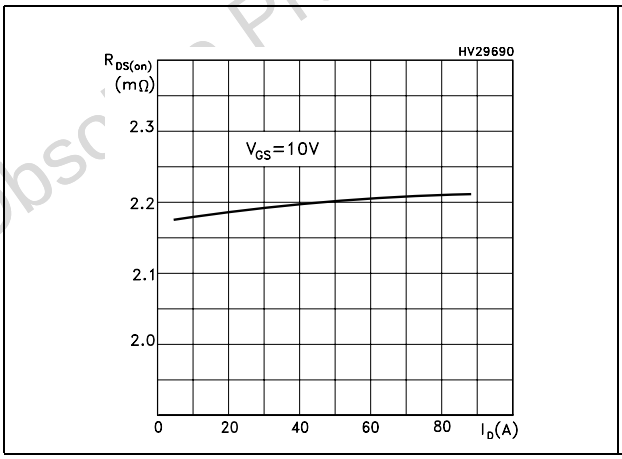
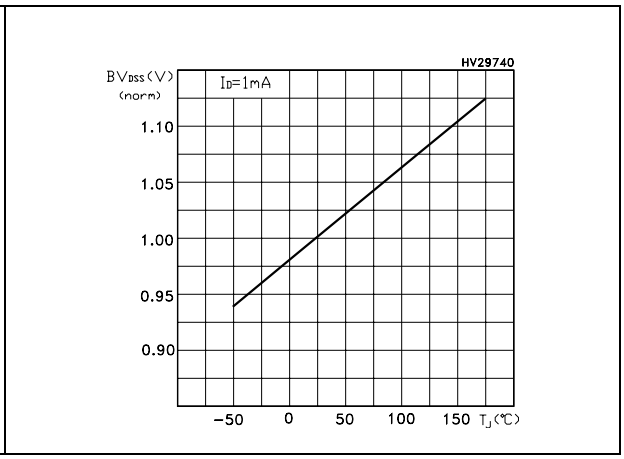


Figure 6. Normalized B_{VDSS} vs temperature



Obsolete Product(s) - Obsolete Product(s)

Figure 7. Gate charge vs gate-source voltage

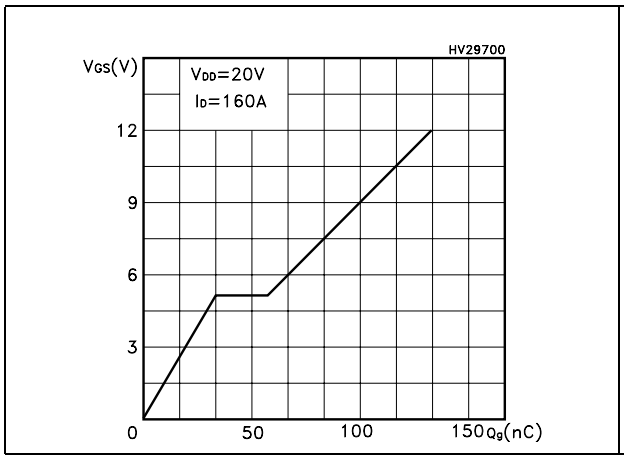


Figure 8. Capacitance variations

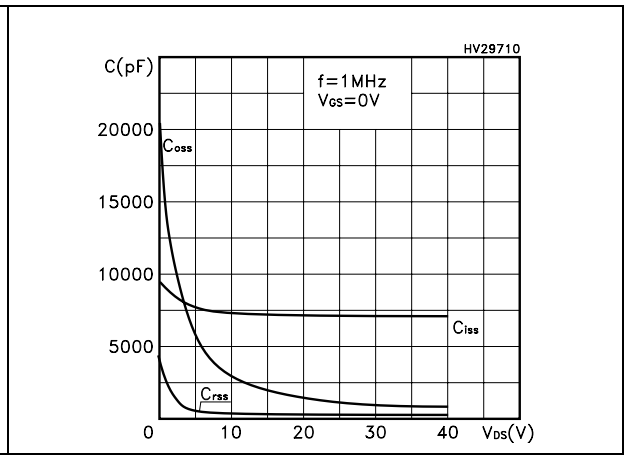


Figure 9. Normalized gate threshold voltage vs temperature

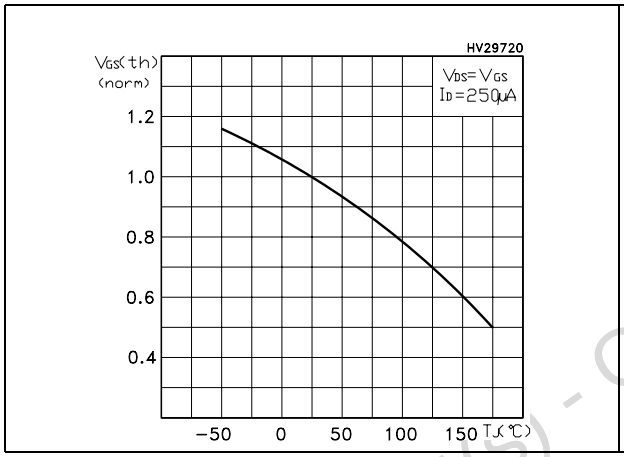


Figure 10. Normalized on resistance vs temperature

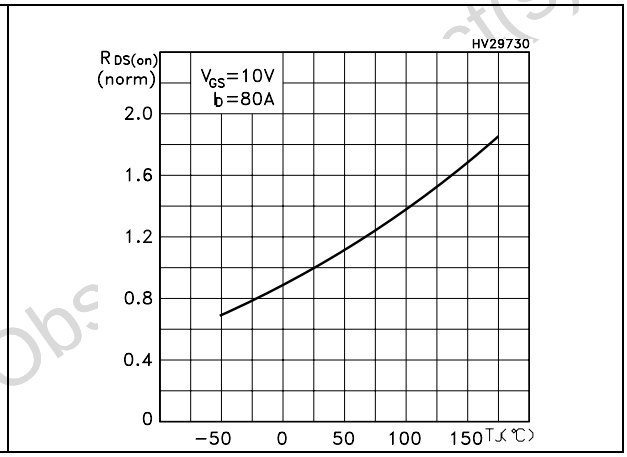
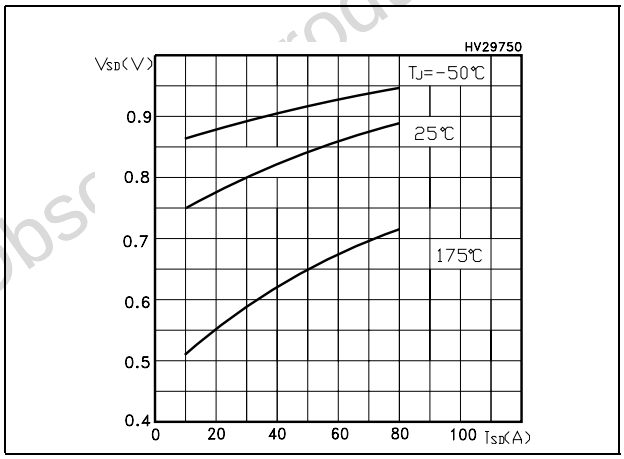


Figure 11. Source-drain diode forward characteristics



Obsolete Product(s) - Obs

3 Test circuit

Figure 12. Switching times test circuit for resistive load

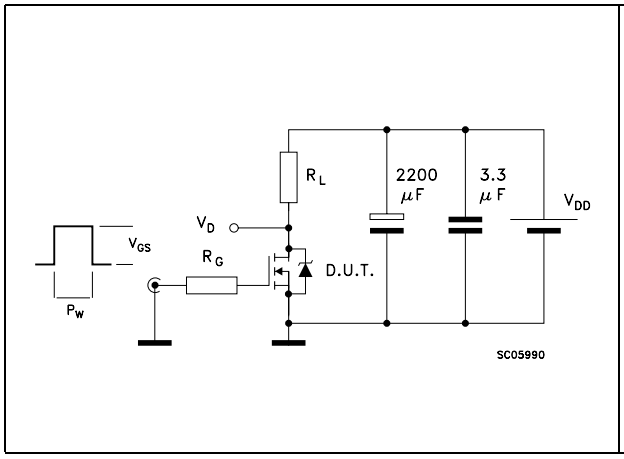


Figure 13. Gate charge test circuit

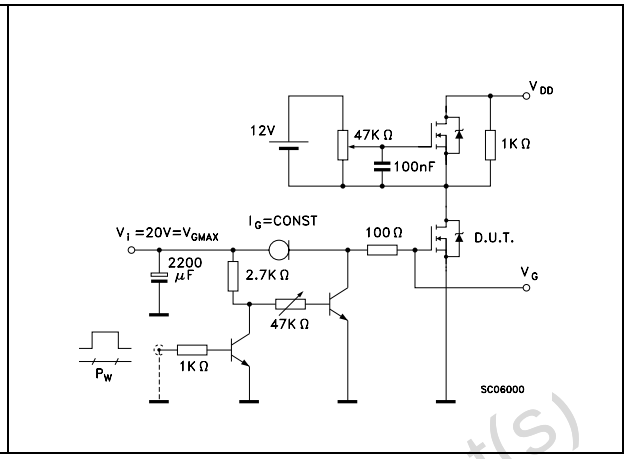


Figure 14. Test circuit for inductive load switching and diode recovery times

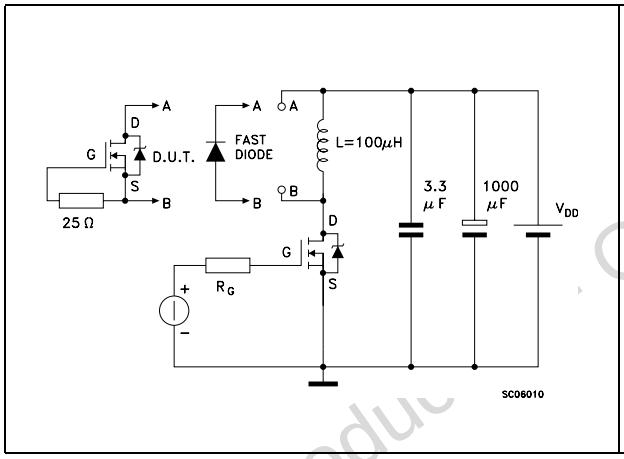


Figure 15. Unclamped Inductive load test circuit

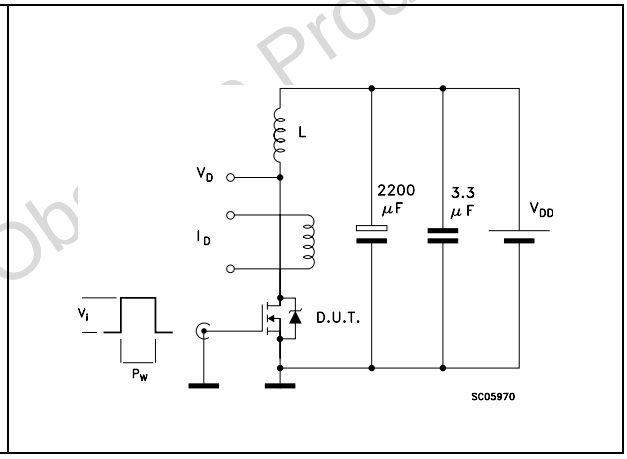


Figure 16. Unclamped inductive waveform

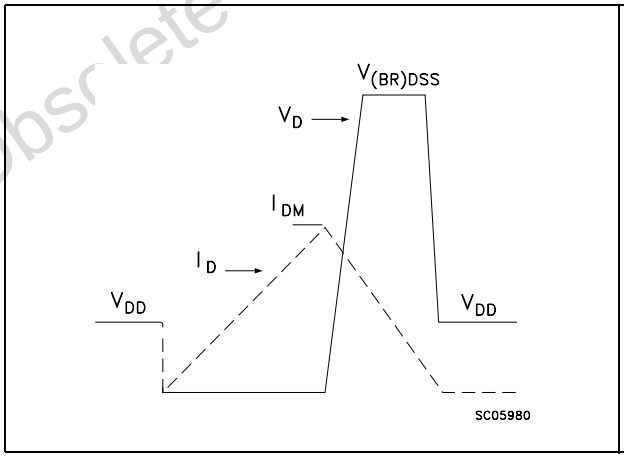
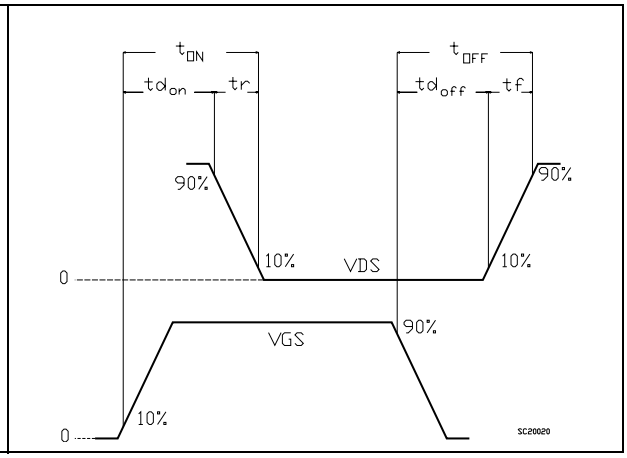


Figure 17. Switching time waveform



Obsolete Product(s)

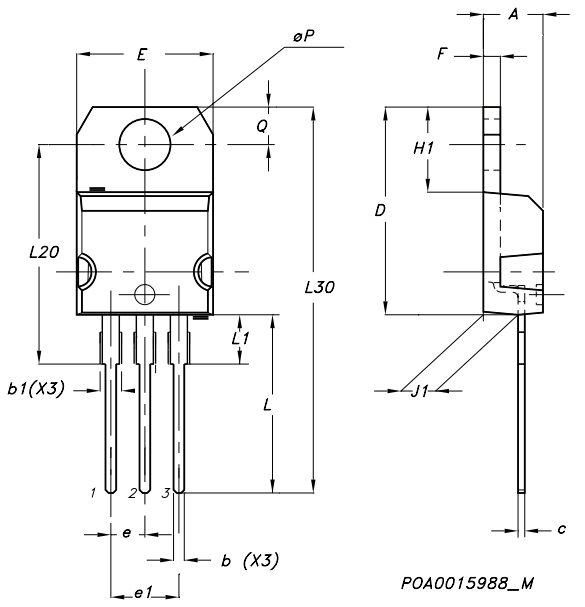
4 Package mechanical data

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

Obsolete Product(s) - Obsolete Product(s)

TO-220 MECHANICAL DATA

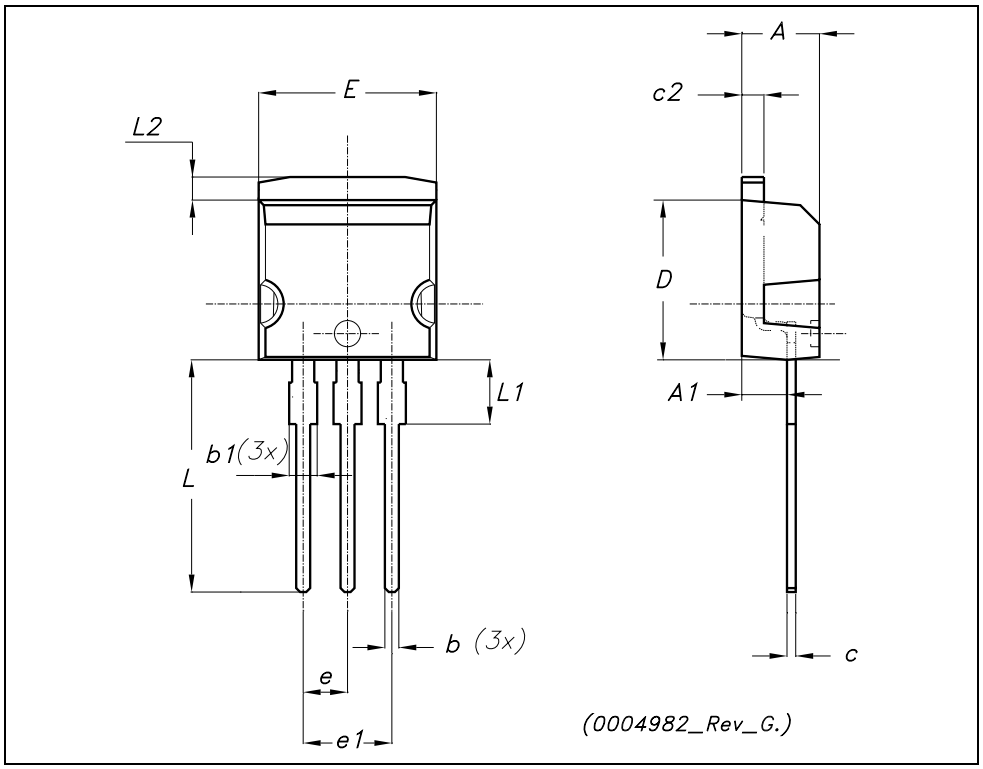
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		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



Obsole

TO-262 (I^2PAK) MECHANICAL DATA

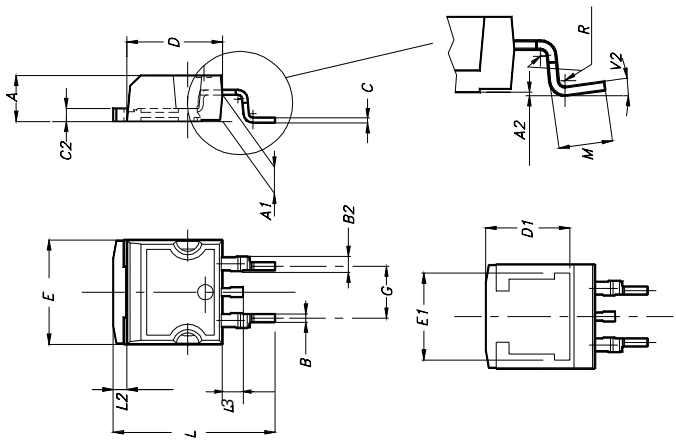
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		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



Obsole

D^2PAK MECHANICAL DATA

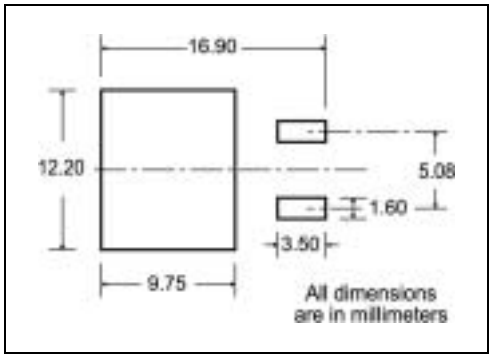
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



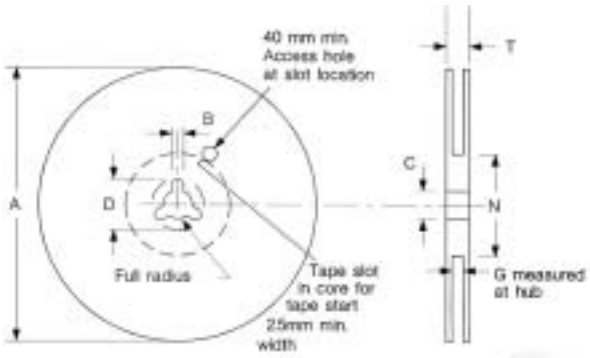
Obsole

5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



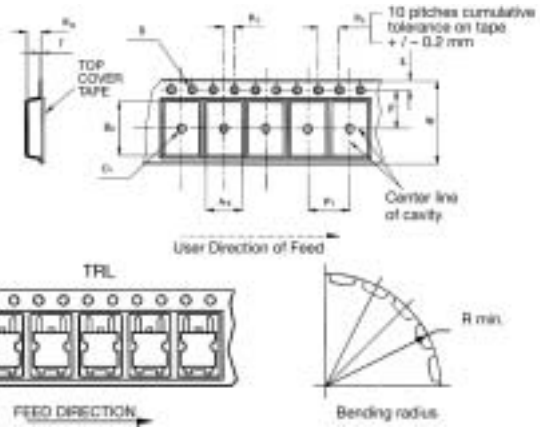
REEL MECHANICAL DATA

DIM.	mm		inch	
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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. Document revision history

Date	Revision	Changes
07-Oct-2005	1	Initial release.
10-Nov-2005	2	Preliminary version
09-Feb-2006	3	Complete datasheet

Obsolete Product(s) - Obsolete Product(s)

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