STB300NH02L
STP300NH02L

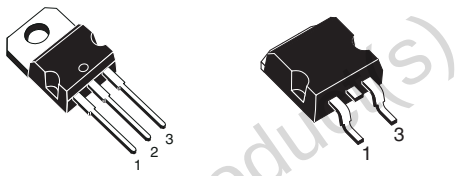
N-channel 24V - 120A - TO-220 / D²PAK
STripFET™ Power MOSFET

Preliminary Data

Features

Type	V_{DSS}	$R_{DS(on)}$ Max	I_D
STB300NH02L	24V	< 1.8mΩ	120A
STP300NH02L	24V	< 2.2mΩ	120A

- $R_{DS(on)}$*Q_g industry's benchmark
- Conduction losses reduced
- Switching losses reduced
- Low profile, very low parasitic inductance

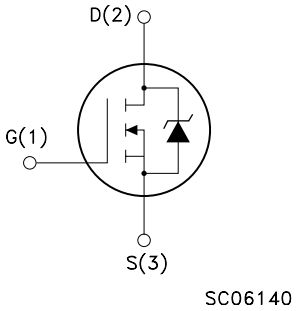


TO-220 D²PAK

Description

This product utilizes the latest advanced design rules of ST's proprietary STripFET™ technology. This is suitable for high current OR-ing application.

Figure 1. Internal schematic diagram



Applications

- Switching application
  - Specifically designed and optimized for high efficiency DC/DC converters
  - OR-ing

Obsolete Product(s) - Obsolete Product(s)

Table 1. Device summary

Order codes	Marking	Package	Packaging
STP300NH02L	P300NH02L	TO-220	Tube
STB300NH02L	B300NH02L	D²PAK	Tape & reel

This is preliminary information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

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Contents

1 Electrical ratings 3

2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 6

3 Test circuit 8

4 Package mechanical data 9

5 Packaging mechanical data 12

6 Revision history 13

Obsolete Product(s) - Obsolete Product(s)

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	24	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25°C	120	A
I_D (1)	Drain current (continuous) at T_C = 100°C	120	A
I_{DM} (2)	Drain current (pulsed)	480	A
P_{TOT} (3)	Total dissipation at T_C = 25°C	300	W
	Derating factor	2	W/°C
T_j	Operating junction temperature	-55 to 175	°C

1. This value is silicon limited
2. Pulse width limited by safe operating area
3. This value is rated according Rthj-case

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.5	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5	°C/W

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AV}	Not-repetitive avalanche current (pulse width limited by Tj max)	60	A
E_{AS} (1)	Single pulse avalanche energy	1.6	J

1. Starting Tj = 25°C, $I_D = I_{AV}$, V_{DD} = 20V

Obsolete Product(s) - Obsolete Product(s)

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1mA, V_{GS}= 0		24			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 20V, V_{DS} = 20V, T_c=125°C				1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{DS} = ±20V				±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250µA		1		2	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10V, I_D= 80A	TO-220 D²PAK		1.8 1.4	2.2 1.8	mΩ mΩ
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10V, I_D= 80A @100°C	TO-220 D²PAK		2.7 2.1		mΩ mΩ

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 15V, f = 1 MHz, V_{GS} =0		7055 3251 307		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}= 12V,I_D= 120A, V_{GS}= 10V *(see Figure 14)*		109.4 30.2 26.4		nC nC nC
R_G	Gate input resistance	f=1 MHz Gate DC Bias = 0 Test signal level = 20mV open drain		4.4		Ω

Obsolete Product(s) - Obsolete Product(s)

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 10V, I_D = 60A R_G= 4.7Ω, V_{GS}= 10V, *(see Figure 13)*		18 275		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD} = 10V, I_D = 60A R_G= 4.7Ω, V_{GS}= 10V, *(see Figure 13)*		138 94.4		ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD} I_{SD}	Source-drain current Source-drain current (pulsed)				120 640	A A
V_{SD} (1)	Forward on voltage	I_{SD} = 120 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 120A, V_{DD} = 20V, di/dt = 100A/µs T_j = 25°C *(see Figure 18)*		63 85 2.7		ns nC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} =120A, V_{DD} = 20V di/dt = 100A/µs T_j = 150°C *(see Figure 18)*		63.2 88 2.8		ns nC A

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

Obsolete Product(s) - Obsolete Product(s)

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

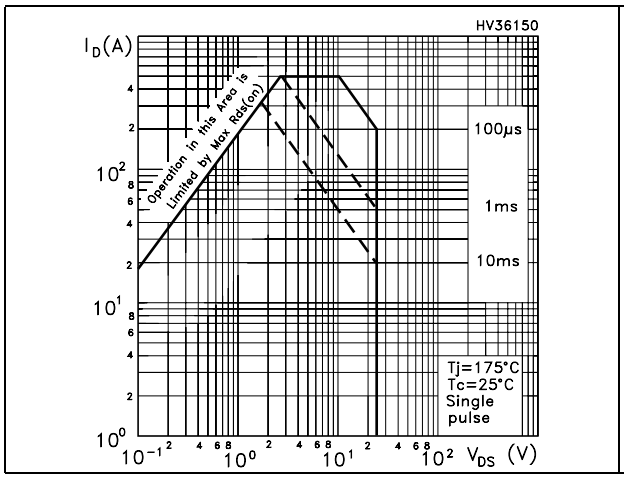


Figure 3. Thermal impedance

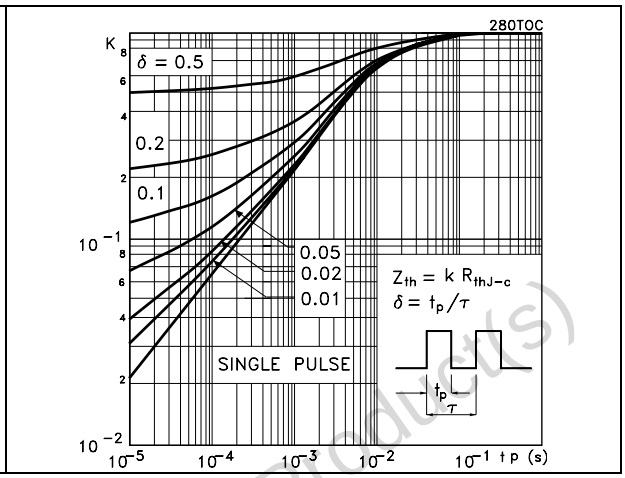


Figure 4. Output characteristics

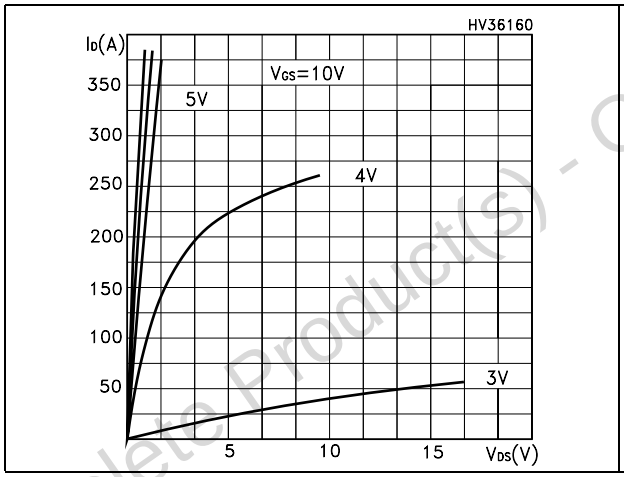


Figure 5. Transfer characteristics

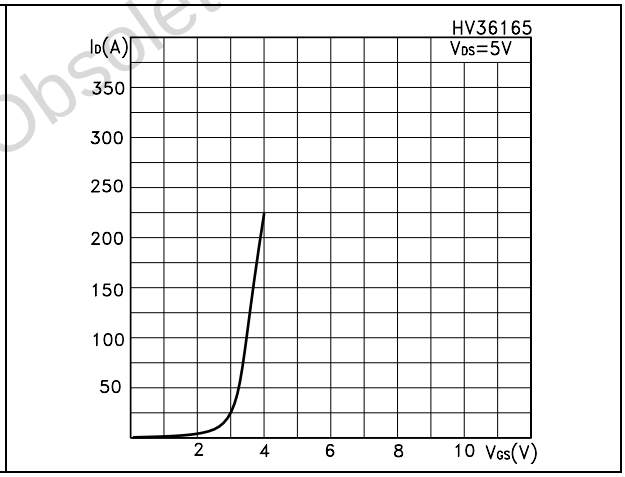


Figure 6. Static drain-source on resistance

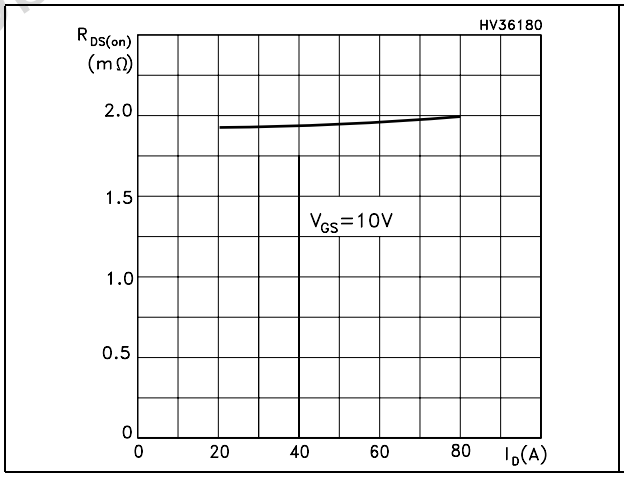
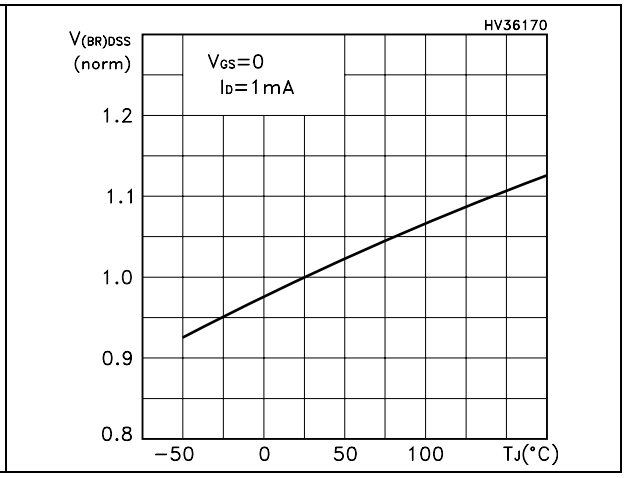


Figure 7. Normalized BV_{DSS} vs temperature



Obsolete Product(s) - Obsolete Product(s)

Figure 8. Gate charge vs gate-source voltage

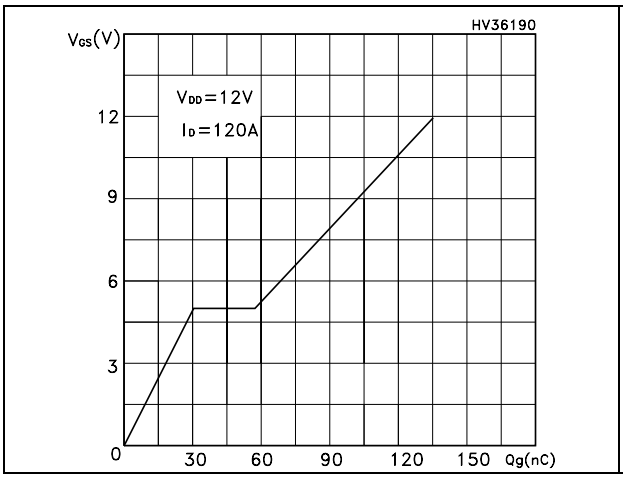


Figure 9. Capacitance variations

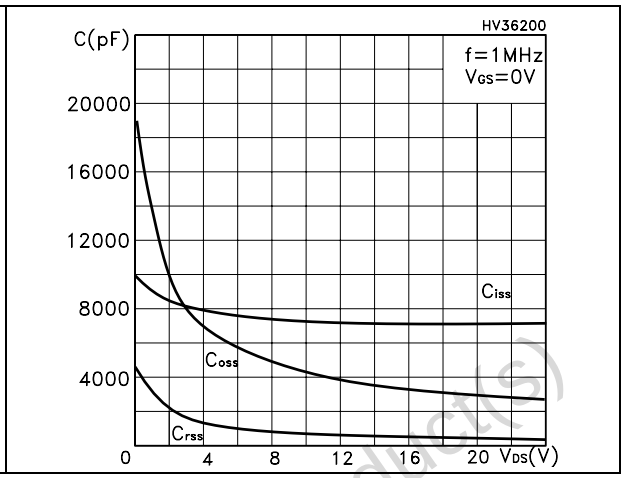


Figure 10. Normalized gate threshold voltage vs temperature

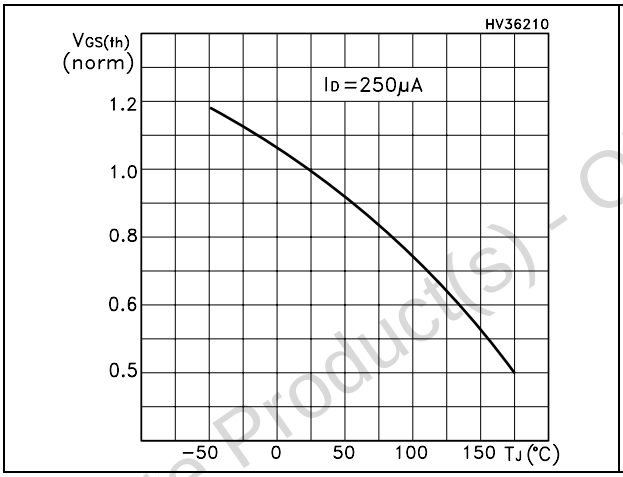


Figure 11. Normalized on resistance vs temperature

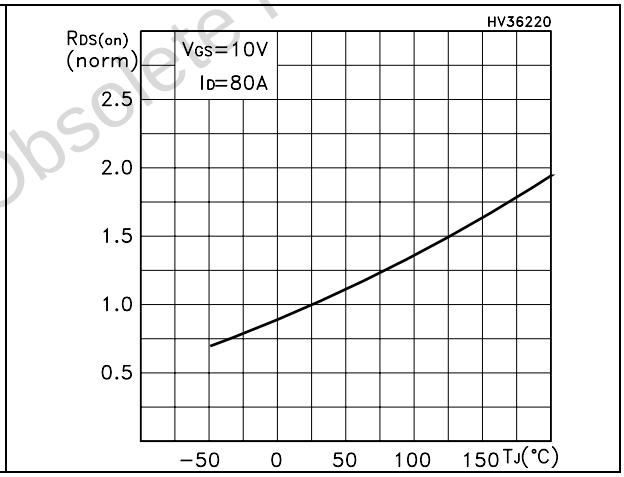
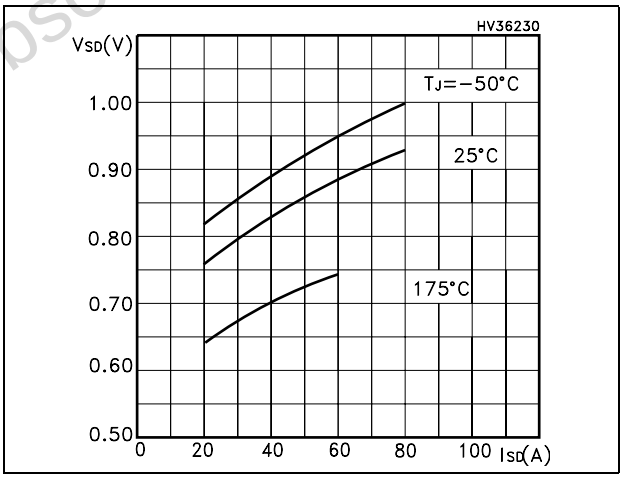


Figure 12. Source-drain diode forward characteristics



Obsolete Product(s) - Obsolete Product(s)

3 Test circuit

Figure 13. Switching times test circuit for resistive load

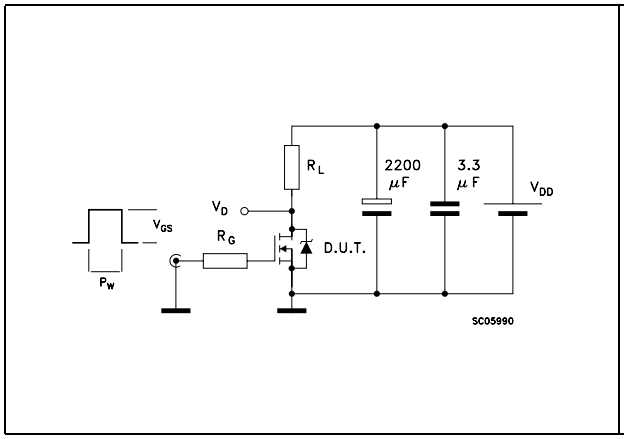


Figure 14. Gate charge test circuit

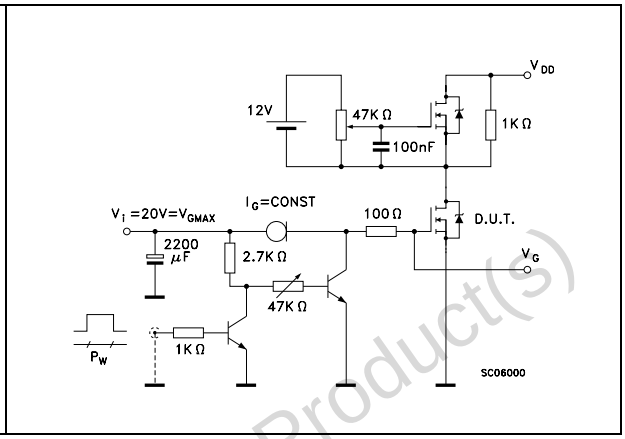


Figure 15. Test circuit for inductive load switching and diode recovery times

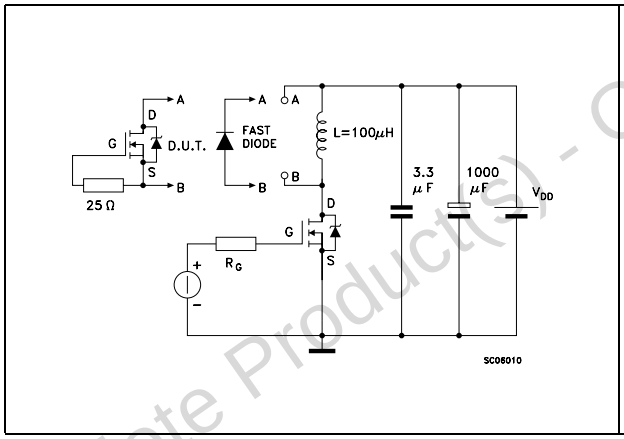


Figure 16. Unclamped inductive load test circuit

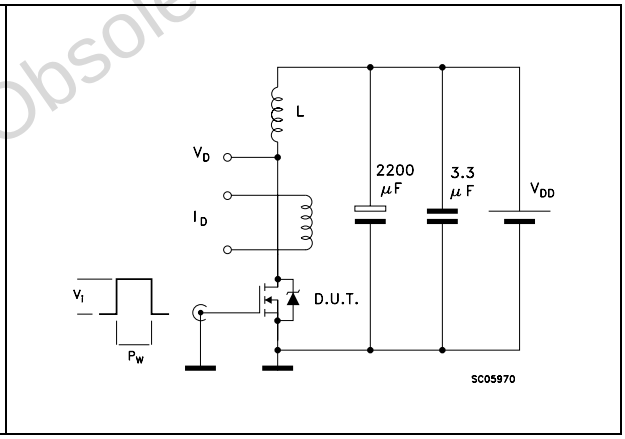


Figure 17. Unclamped inductive waveform

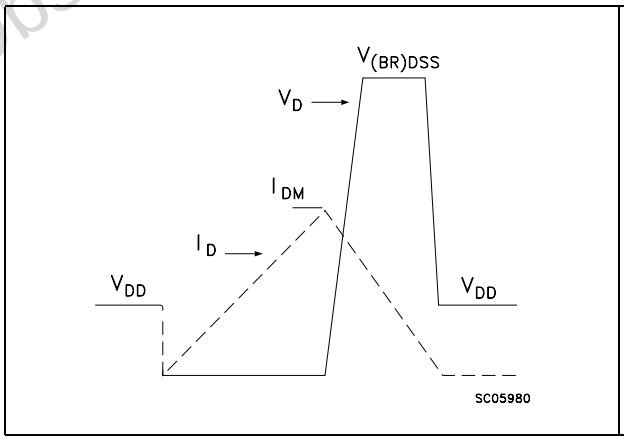
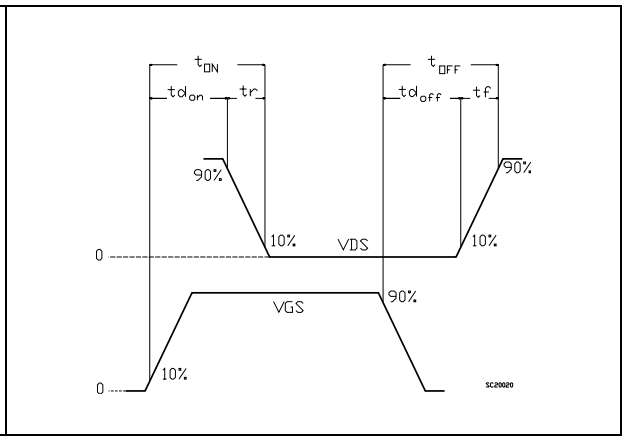


Figure 18. Switching time waveform



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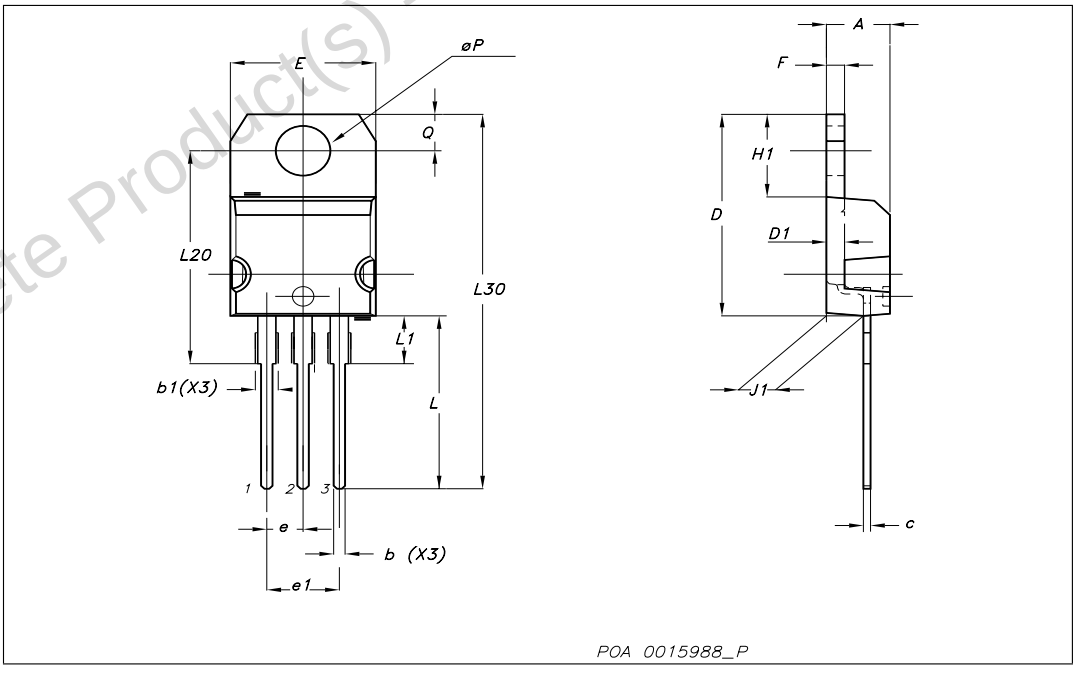
4 Package mechanical data

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*

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TO-220 mechanical data

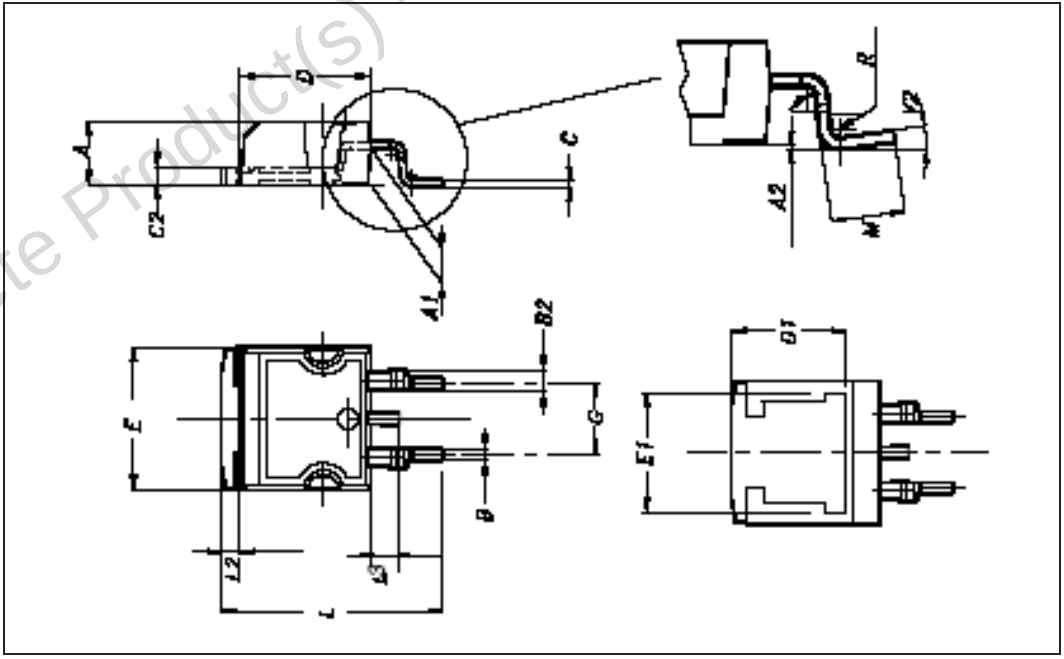
Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		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	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



Obsolete Product(s) - Obsolete Product(s)

D²PAK mechanical data

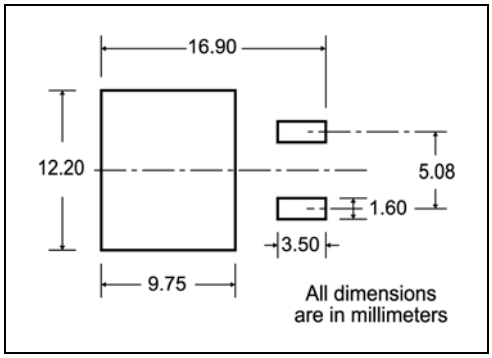
Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		0.409
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.50		0.55
L3	1.4		1.75	0.055		0.68
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		4°			



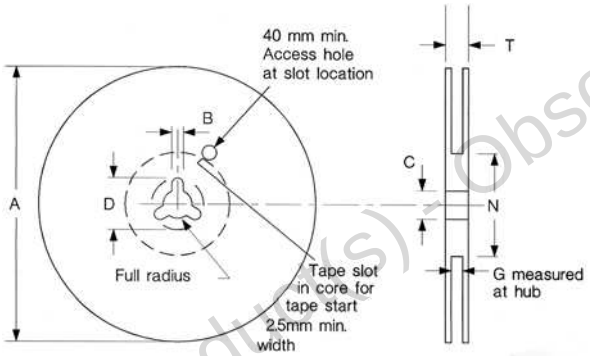
Obsolete Product(s) - Obsolete Product(s)

5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



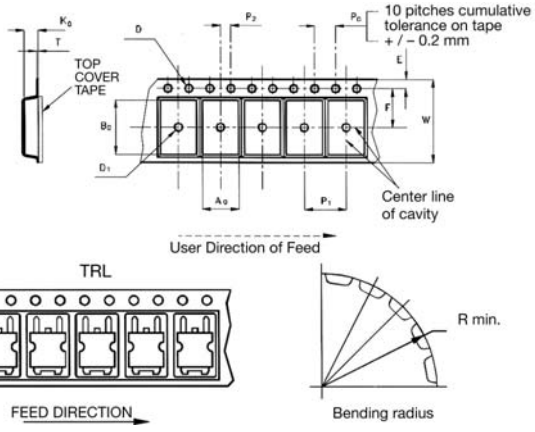
REEL MECHANICAL DATA

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

Obsolete Product(s) - Obsolete Product(s)

6 Revision history

Table 9. Document revision history

Date	Revision	Changes
21-Feb-2007	1	First release
25-Sep-2007	2	Corrected value on *Avalanche characteristics*

Obsolete Product(s) - Obsolete Product(s)

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