



# STB300NH02L STP300NH02L

N-channel 24V - 120A - TO-220 / D<sup>2</sup>PAK  
STripFET™ Power MOSFET

PRELIMINARY DATA

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB300NH02L	24V	< 1.8mΩ	120A
STP300NH02L	24V	< 2.2mΩ	120A

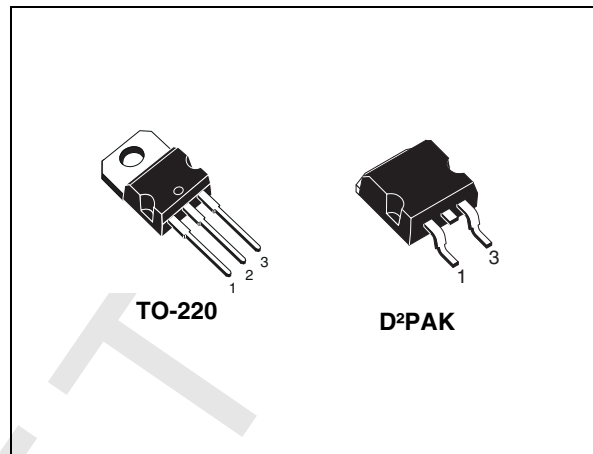
- R<sub>DS(on)</sub>\*Q<sub>g</sub> industry's benchmark
- Conduction losses reduced
- Switching losses reduced
- Low profile, very low parasitic inductance

## Description

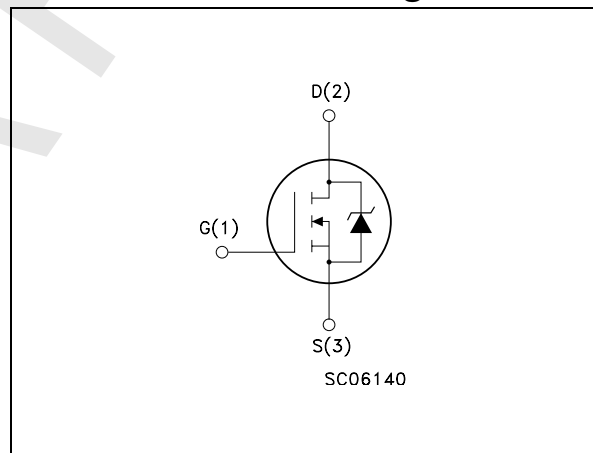
This product utilizes the latest advanced design rules of ST's proprietary STripFET™ technology. This is suitable for high current OR-ing application.

## Applications

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



## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STP300NH02L	P300NH02L	TO-220	Tube
STB300NH02L	B300NH02L	D <sup>2</sup> PAK	Tape & reel

# Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

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

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

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

**Table 3. Avalanche characteristics**

Symbol	Parameter	Max value	Unit
$I_{AV}$	Not-repetitive avalanche current (pulse width limited by $T_j$ max)	60	A
$E_{AS}^{(1)}$	Single pulse avalanche energy	2296	J

1. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = I_{AV}$ ,  $V_{DD} = 20\text{V}$

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified)

**Table 4. On/off states**

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

**Table 5. 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 13)		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		$\Omega$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 10V, I_D = 60A$ $R_G = 4.7\Omega, V_{GS} = 10V,$ (see Figure 12)		18 275		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 10V, I_D = 60A$ $R_G = 4.7\Omega, V_{GS} = 10V,$ (see Figure 12)		138 94.4		ns ns

**Table 7. 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	$I_{SD} = 120A, V_{DD} = 20V,$ $di/dt = 100A/\mu s$ $T_j = 25^\circ C$ (see Figure 17)		63 85 2.7		ns nC A
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 120A, V_{DD} = 20V$ $di/dt = 100A/\mu s$ $T_j = 150^\circ C$ (see Figure 17)		63.2 88 2.8		ns nC A

1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

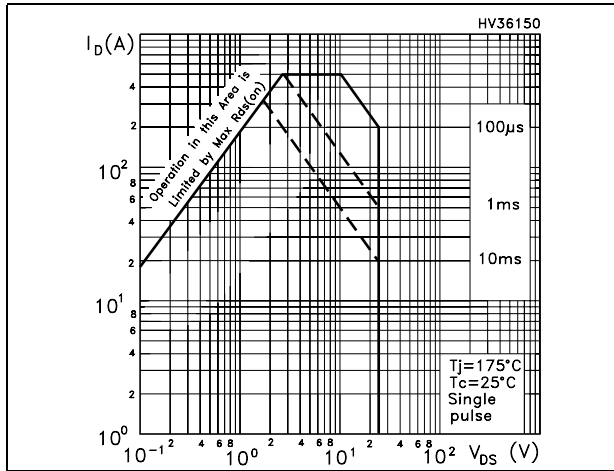


Figure 2. Thermal impedance

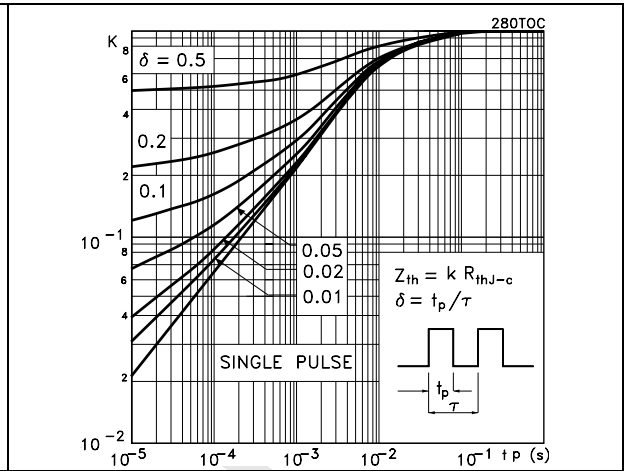


Figure 3. Output characteristics

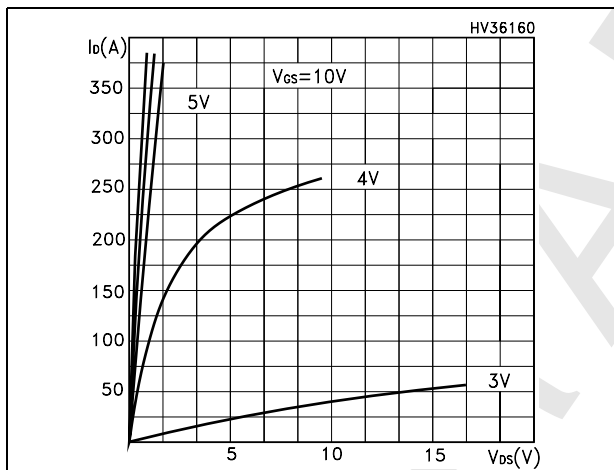


Figure 4. Transfer characteristics

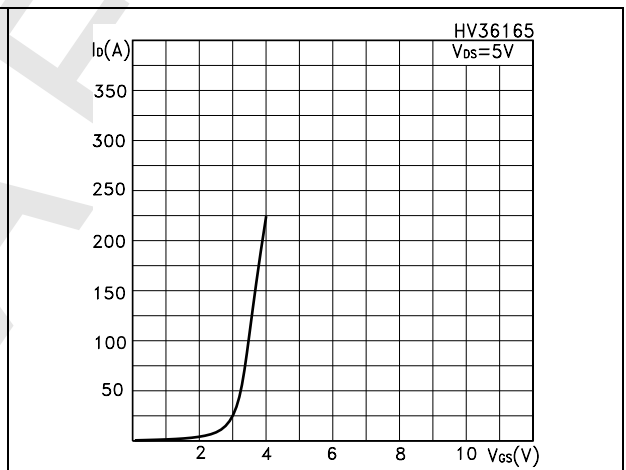


Figure 5. Static drain-source on resistance

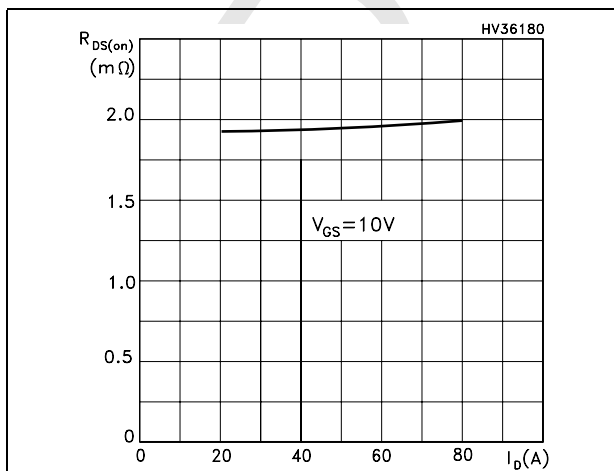


Figure 6. Normalized  $BV_{DSS}$  vs temperature

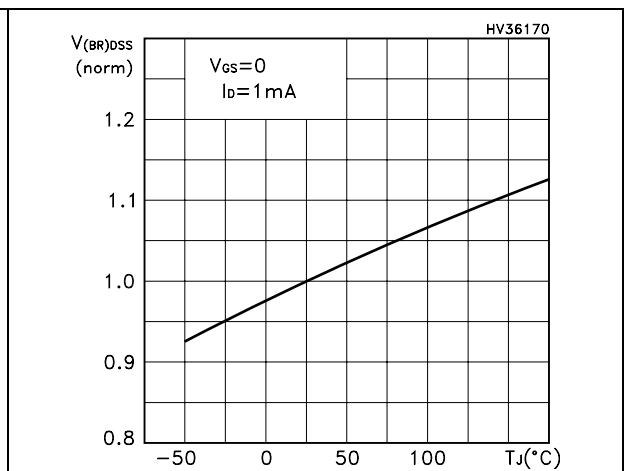


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

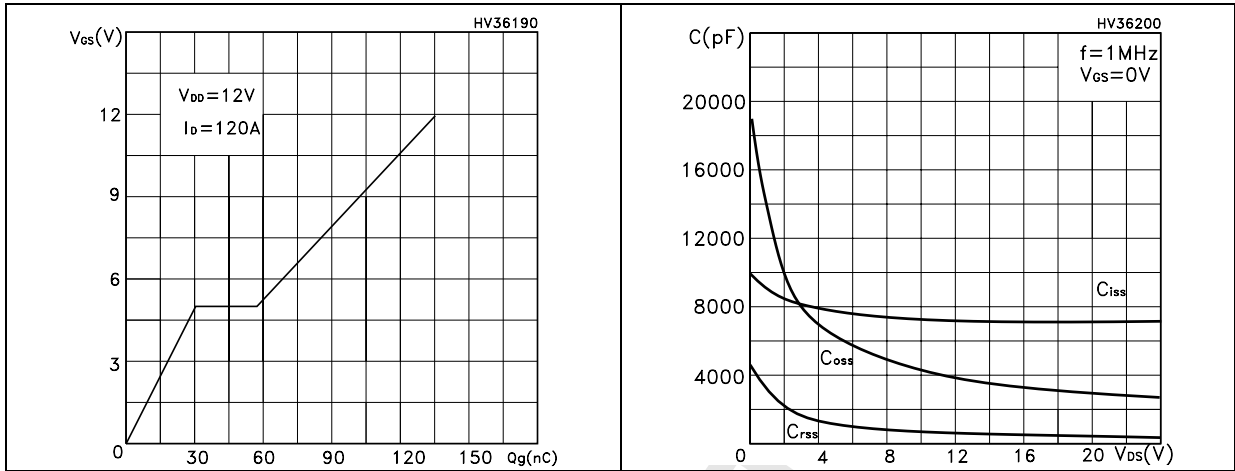


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

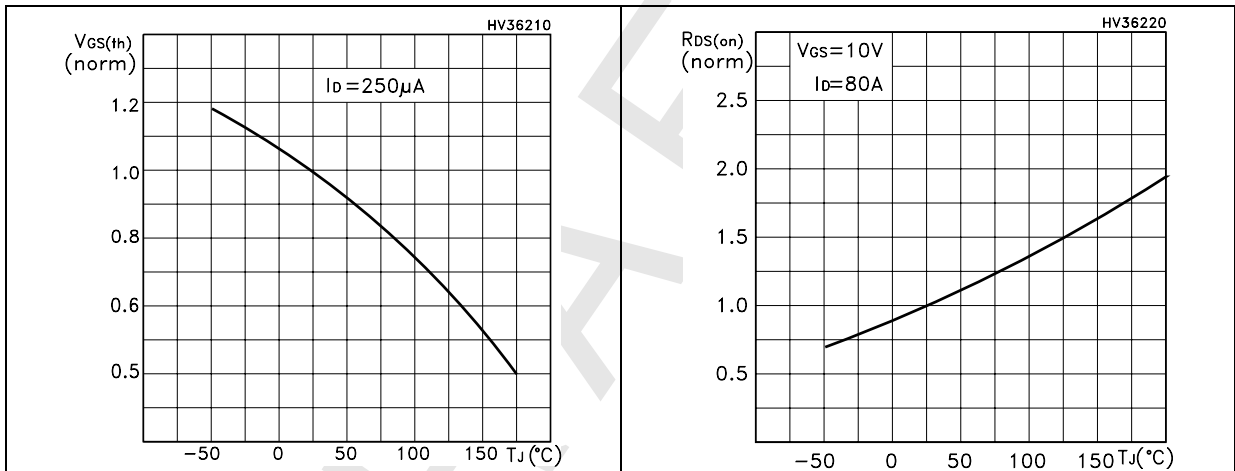
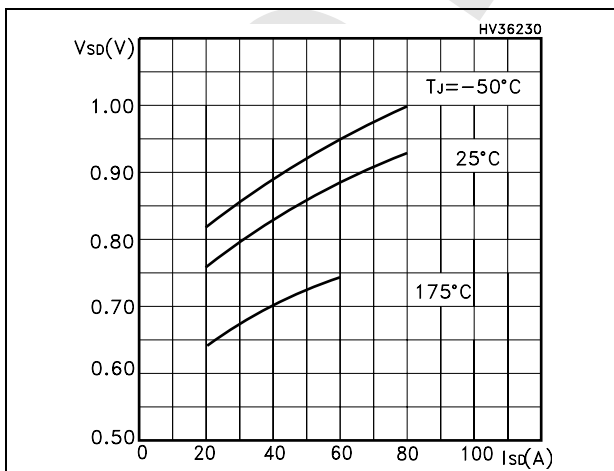


Figure 11. Source-drain diode forward characteristics



### 3 Test circuit

Figure 12. Switching times test circuit for resistive load

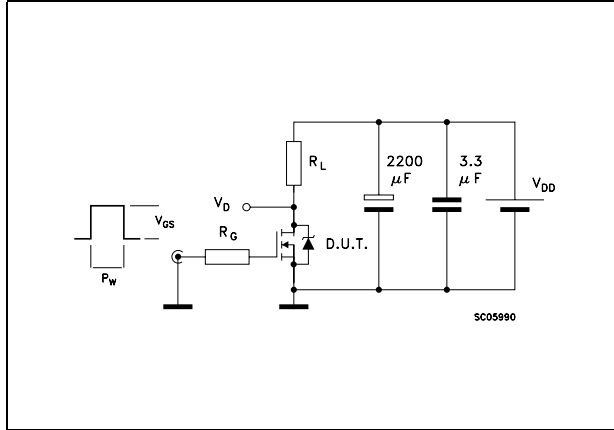


Figure 13. Gate charge test circuit

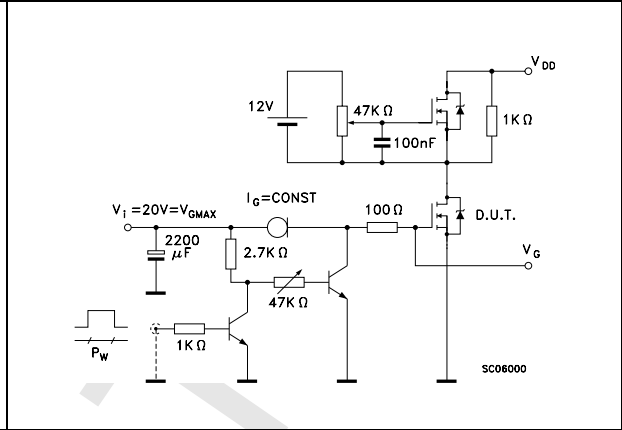


Figure 14. Test circuit for inductive load switching and diode recovery times

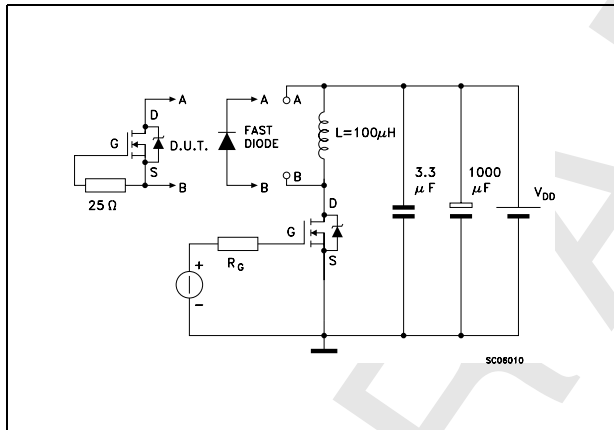


Figure 15. Unclamped inductive load test circuit

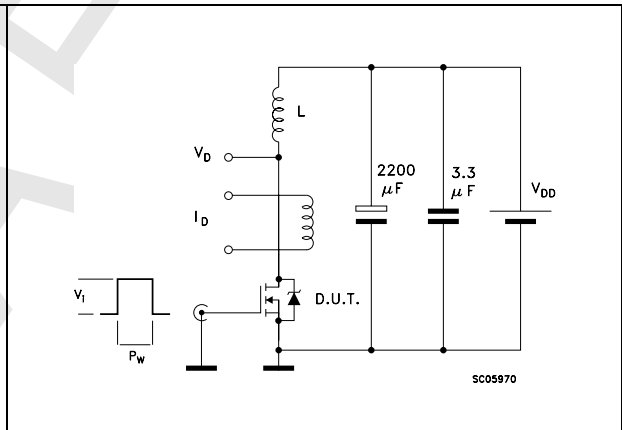


Figure 16. Unclamped inductive waveform

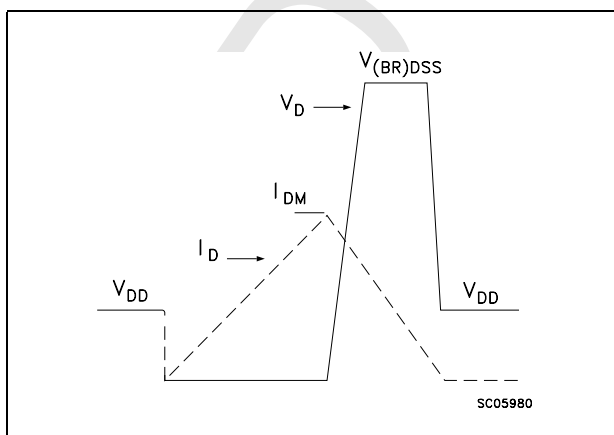
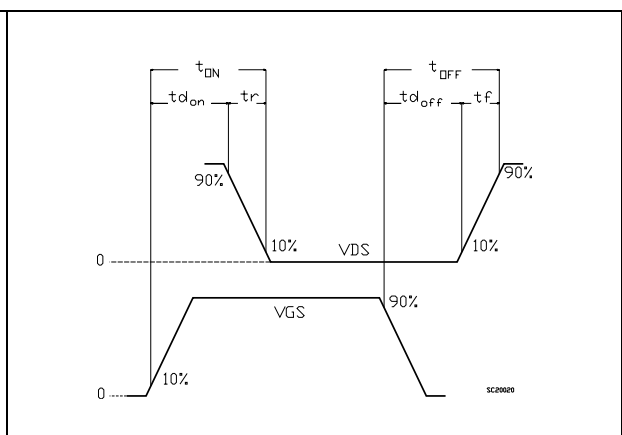


Figure 17. Switching time waveform





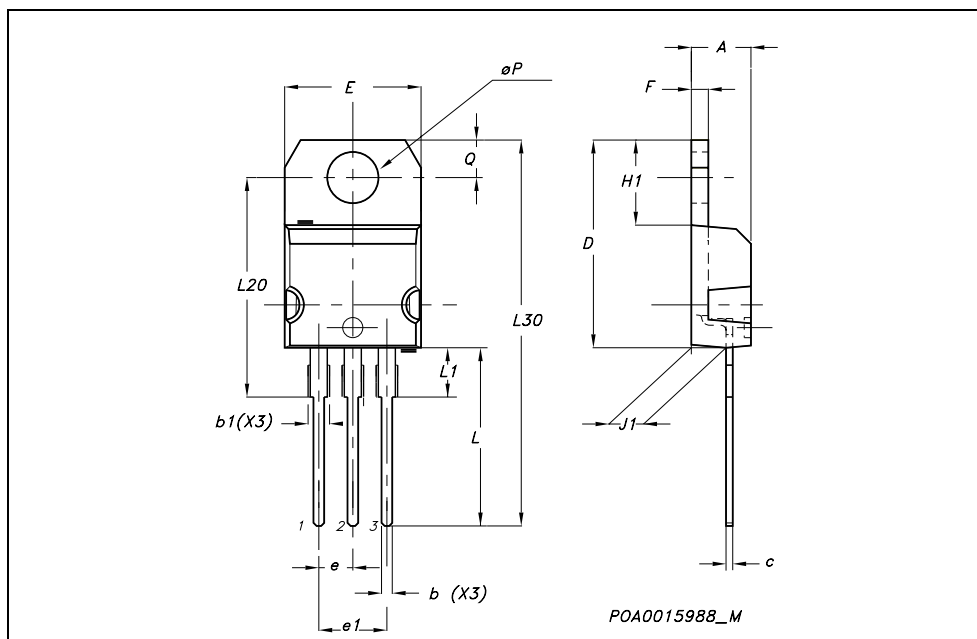
## 4 Package mechanical data

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](http://www.st.com)

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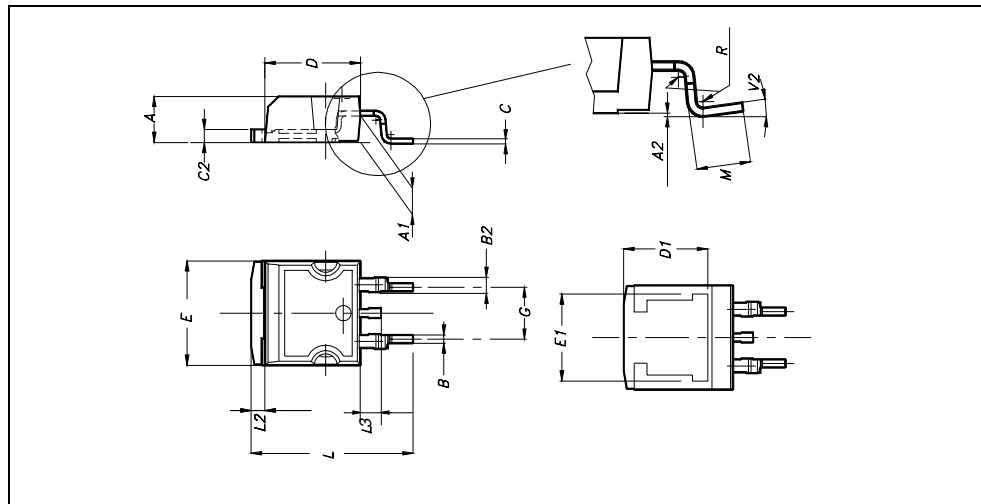
**TO-220 MECHANICAL DATA**

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	1.15		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



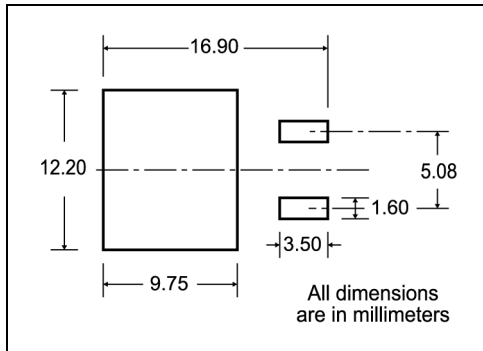
**D<sup>2</sup>PAK MECHANICAL DATA**

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

## D<sup>2</sup>PAK FOOTPRINT



## TAPE AND REEL SHIPMENT

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

### 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	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

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius

R min.

\* on sales type

## 6 Revision history

Table 8. Revision history

Date	Revision	Changes
21-Feb-2007	1	First release

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