



STP55NF06L STB55NF06L - STB55NF06L-1

N-channel 60V - 0.014Ω - 55A TO-220/D²PAK/I²PAK
STripFET™ II Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D
STP55NF06L	60V	<0.018Ω	55A
STB55NF06L	60V	<0.018Ω	55A
STB55NF06L-1	60V	<0.018Ω	55A

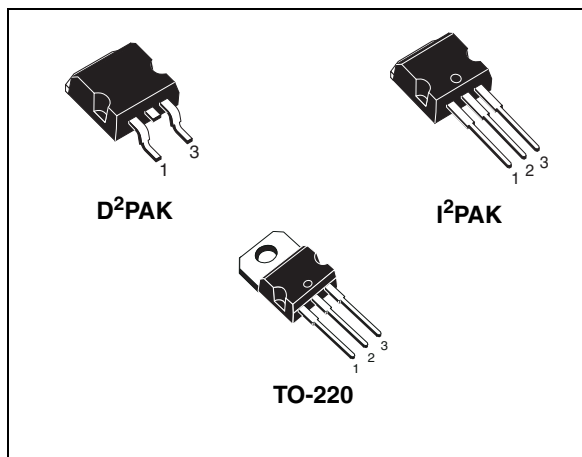
- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

Description

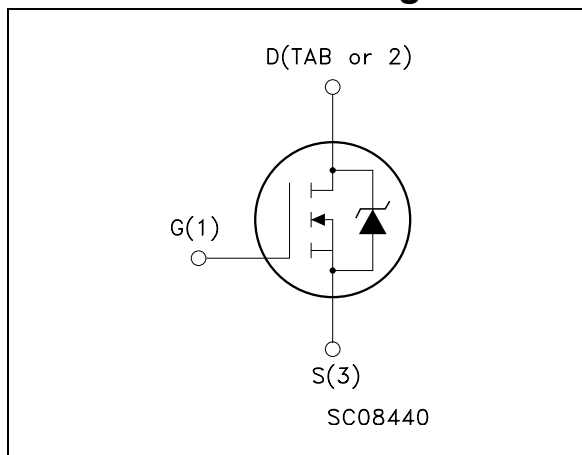
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STP55NF06L	P55NF06L	TO-220	Tube
STB55NF06LT4	B55NF06L	D ² PAK	Tape & reel
STB55NF06L-1	B55NF06L	I ² PAK	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	60	V
V_{GS}	Gate-source voltage	± 16	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	55	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	39	A
$I_{DM}^{(1)}$	Drain current (pulsed)	220	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	95	W
	Derating factor	0.63	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	20	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	300	mJ
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 55\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$.
3. Starting $T_j = 25^\circ\text{C}$, $I_D = 27.5\text{A}$, $V_{DD} = 30\text{V}$.

Table 2. Thermal data

$R_{thj-case}$	Thermal resistance junction-case max	1.58	$^\circ\text{C}/\text{W}$
R_{thj-a}	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$
T_I	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating @ } 125^{\circ}C$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 16V$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.7		V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 5V, I_D = 27.5A$ $V_{GS} = 10V, I_D = 27.5A$		0.016 0.014	0.020 0.018	Ω Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15V, I_D = 27.5A$		30		S
C_{iss}	Input capacitance	$V_{DS} = 25V, f = 1 \text{ MHz},$ $V_{GS} = 0$		1700		pF
C_{oss}	Output capacitance			300		pF
C_{rss}	Reverse transfer capacitance			105		pF
Q_g	Total gate charge	$V_{DD} = 48V, I_D = 55A$ $V_{GS} = 4.5V$		27	37	nC
Q_{gs}	Gate-source charge			7		nC
Q_{gd}	Gate-drain charge			10		nC

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

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=30\text{ V}$, $I_D=27.5\text{ A}$, $R_G=4.7\Omega$, $V_{GS}=4.5\text{ V}$ (see Figure 12)		20 100		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=30\text{ V}$, $I_D=27.5\text{ A}$, $R_G=4.7\Omega$, $V_{GS}=4.5\text{ V}$ (see Figure 12)		40 20		ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				12	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				48	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 55\text{ A}$, $V_{GS}=0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 55\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 30\text{ V}$, $T_j = 150^\circ\text{C}$ (see Figure 14)		80 200 5		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

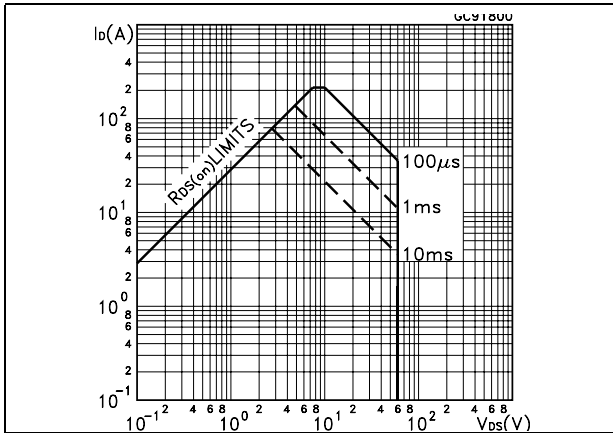


Figure 2. Thermal impedance

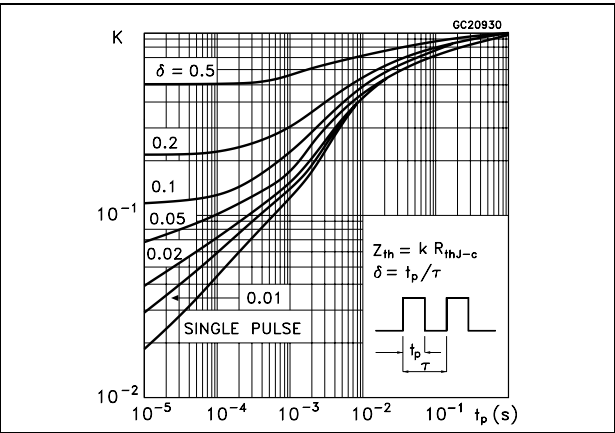


Figure 3. Output characteristics

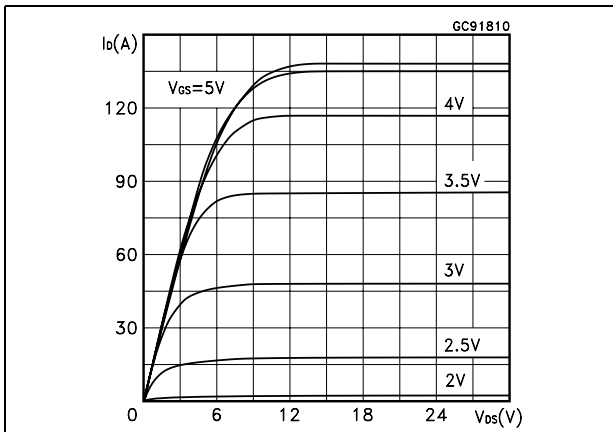


Figure 4. Transfer characteristics

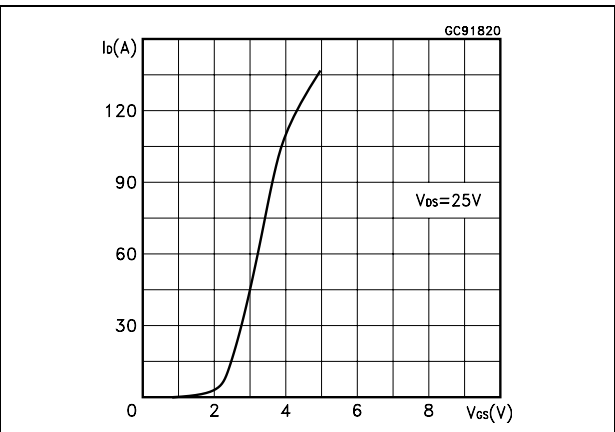


Figure 5. Transconductance

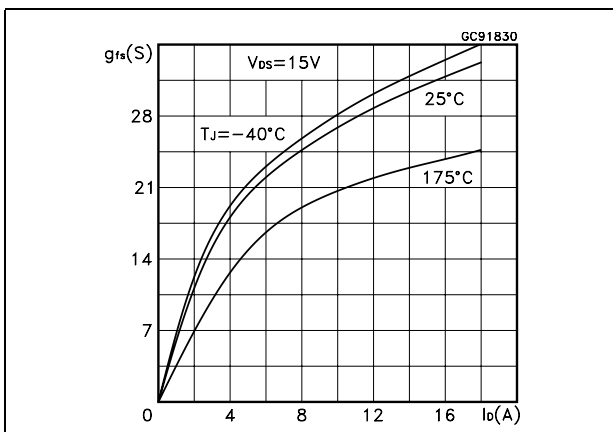


Figure 6. Static drain-source on resistance

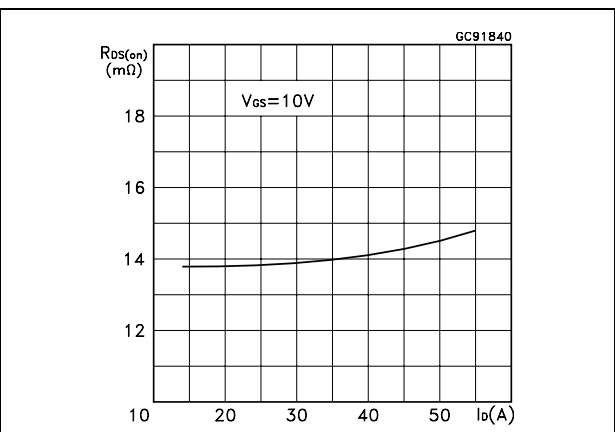


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

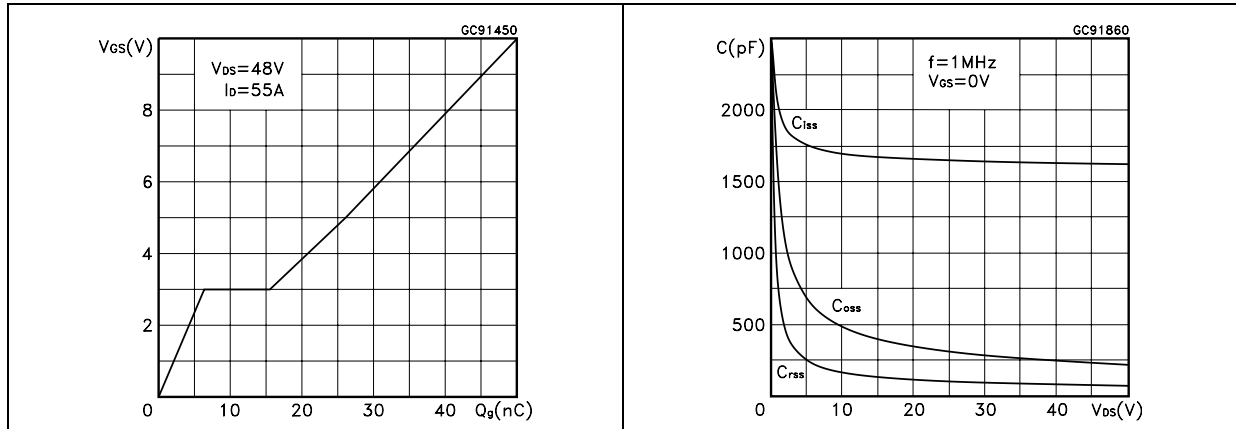


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

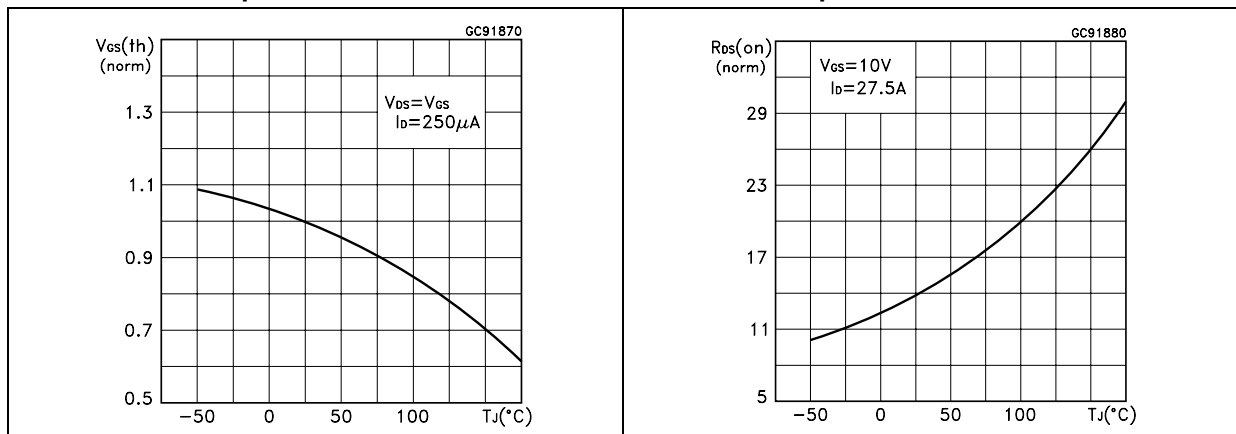
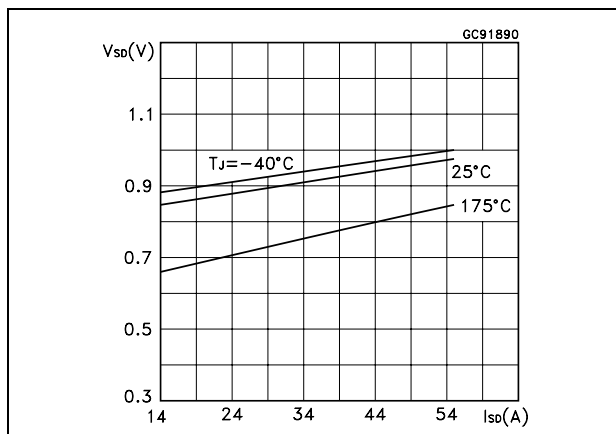


Figure 11. Source-drain diode forward characteristics



3 Test circuit

Figure 12. Switching times test circuit for resistive load

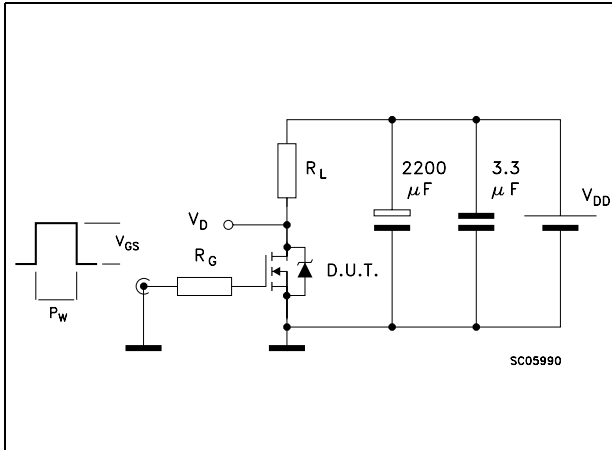


Figure 13. Gate charge test circuit

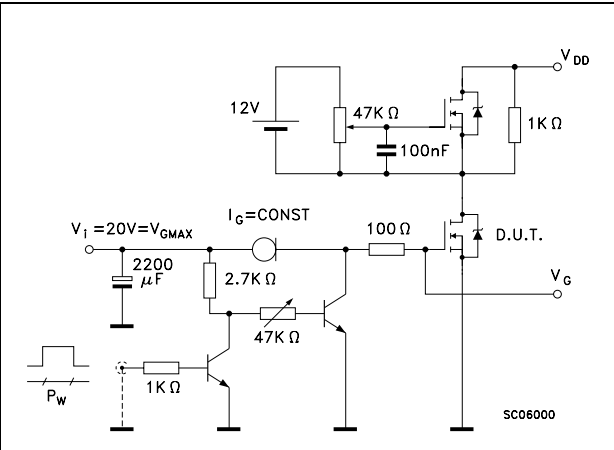


Figure 14. Test circuit for inductive load switching and diode recovery times

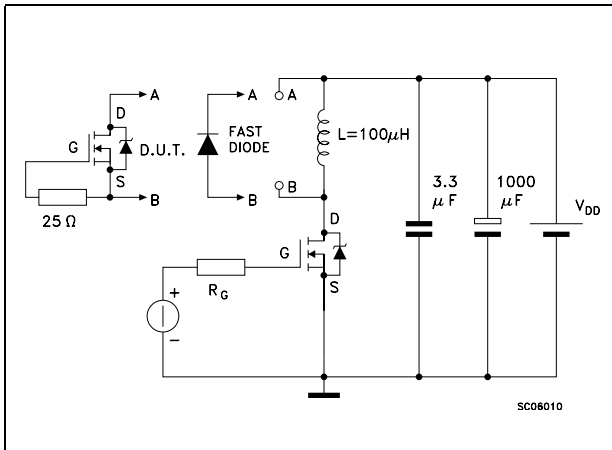


Figure 15. Unclamped Inductive load test circuit

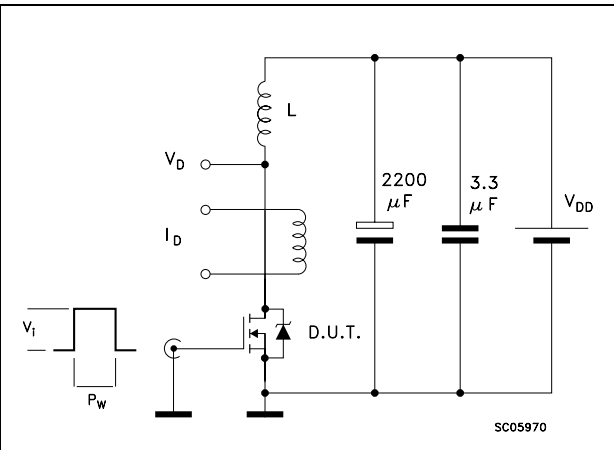


Figure 16. Unclamped inductive waveform

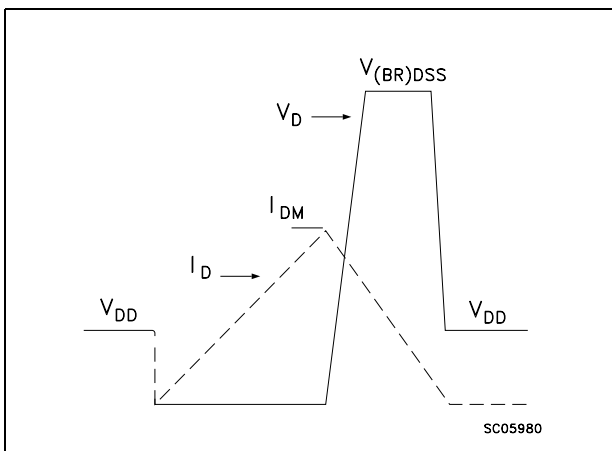
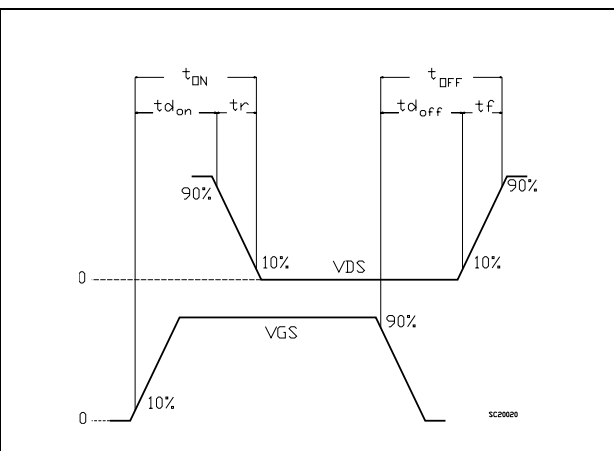


Figure 17. Switching time waveform

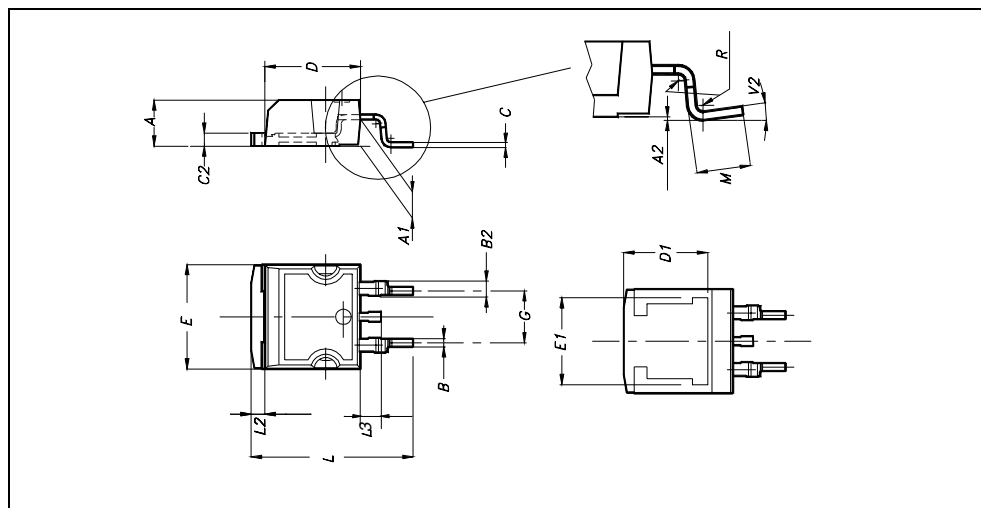


4 Package mechanical data

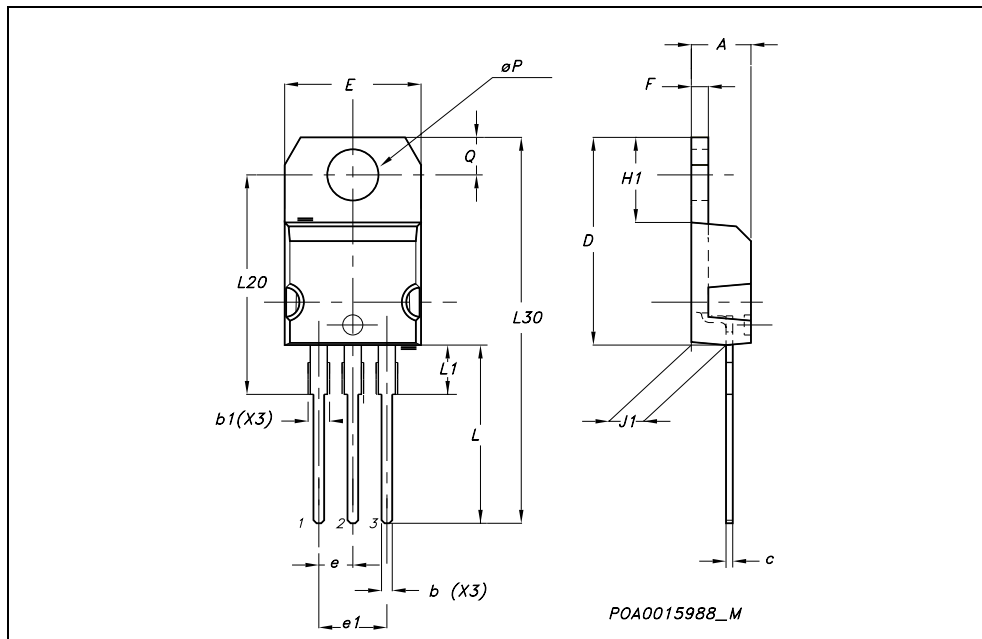
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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

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		
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°			

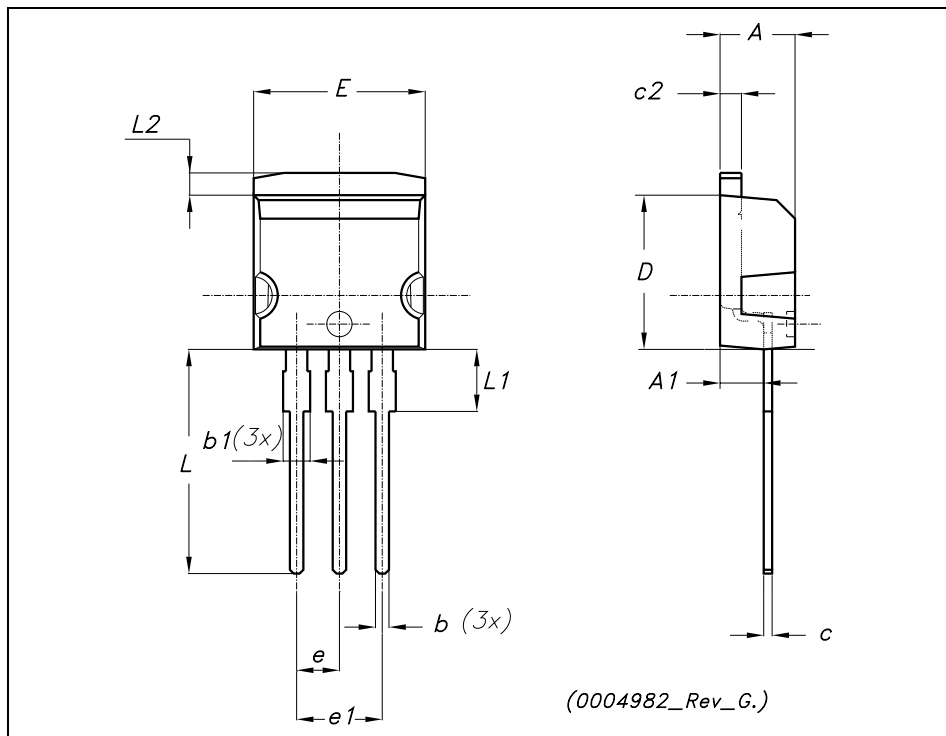


TO-220 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	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



TO-262 (I²PAK) 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



5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

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

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

10 pitches cumulative tolerance on tape +/- 0.2 mm

User Direction of Feed

FEED DIRECTION

Bending radius

R min.

* on sales type

6 Revision history

Table 7. Revision history

Date	Revision	Changes
09-Sep-2004	3	Complete document
27-Nov-2006	4	The document has been reformatted

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