STB140NF55 - STB140NF55-1
STP140NF55

N-channel 55V - 0.0065Ω - 80A - D²PAK - I²PAK - TO-220
STripFET™ II Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D (1)
STB140NF55	55V	<0.008Ω	80A
STB140NF55-1	55V	<0.008Ω	80A
STP140NF55	55V	<0.008Ω	80A

1. Current limited by package



TO-220 D²PAK I²PAK

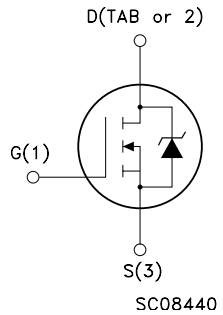
Description

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 avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Applications

- Motor control
- High current, switching application

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB140NF55	B140NF55	D²PAK	Tape & reel
STB140NF55-1	B140NF55	I²PAK	Tube
STP140NF55	P140NF55	TO-220	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)	55	V
V_{GS}	Gate- source voltage	±20	V
I_D (1)	Drain current (continuous) at T_C = 25°C	80	A
I_D (1)	Drain current (continuous) at T_C = 100°C	80	A
I_{DM} (2)	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at T_C = 25°C	300	W
	Derating factor	2	W/°C
dv/dt (3)	Peak diode recovery voltage slope	10	V/ns
E_{AS} (4)	Single pulse avalance energy	1.3	J
T_{stg}	Storage temperature	–55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80A$, di/dt ≤ 300A/µs, V_{DD}=80%$V_{(BR)DSS}$
4. Starting Tj = 25°C, I_D = 40A, V_{DD} = 30V

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		TO-220 - I²PAK	D²PAK	
Rthj-case	Thermal resistance junction-case max	0.5		°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5	--	°C/W
Rthj-pcb (1)	Thermal resistance junction-pcb max	--	35	°C/W
T_l	Maximum lead temperature for soldering purpose (for 10 sec, 1.6mm from case)	300		°C

1. When mounted on 1 inch², FR4 board, 2 oz Cu

2 Electrical characteristics

(T_{CASE}=25°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 µA, V_{GS} = 0	55			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0) V_{DS} = Max rating V_{DS} = Max rating, T_C = 125 °C				1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±20V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 40 A		0.0065	0.008	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15V, I_D= 40 A		100		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1 MHz V_{GS} = 0		5300 1000 290		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 44V, I_D= 80A V_{GS} =10V *(see Figure 14)*		142 27 55		nC nC nC

1. Pulsed: pulse duration = 300µs, 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} = 27.5 V, I_D = 40A R_G = 4.7Ω , V_{GS} = 10V *(see Figure 13)*		30 150		ns ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time	V_{DD} = 27.5V, I_D = 40A, R_G = 4.7Ω, V_{GS} = 10V *(see Figure 13)*		125 45		ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				80 320	A 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} = 80A, di/dt = 100 A/µs, V_{DD} = 20V, T_j = 150°C *(see Figure 15)*		90 275 6.5		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

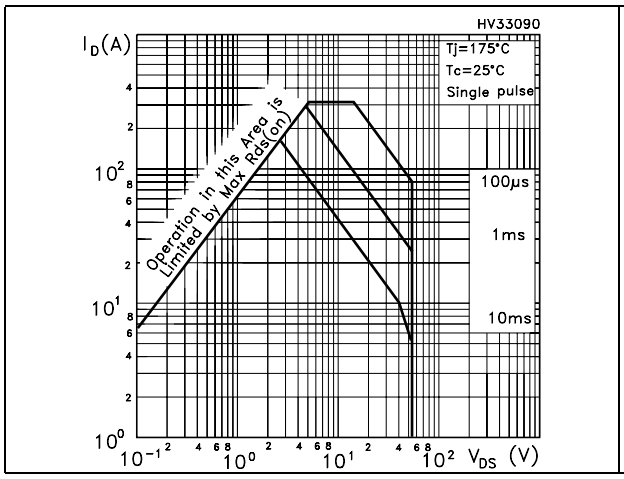


Figure 2. Thermal impedance

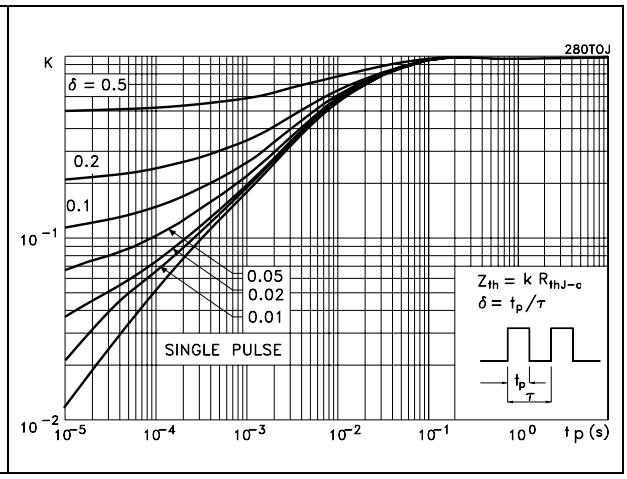


Figure 3. Output characteristics

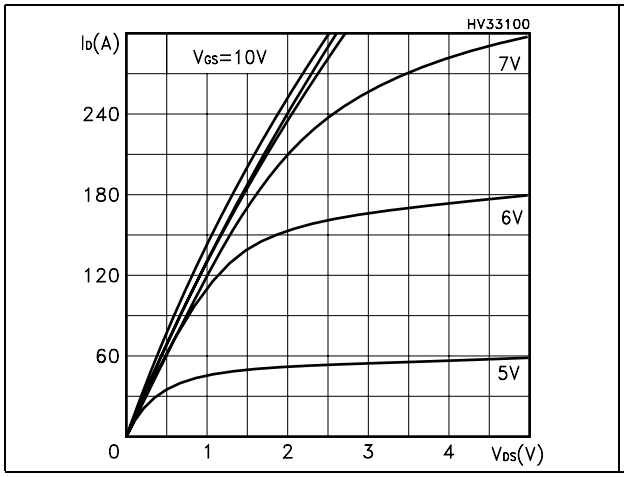


Figure 4. Transfer characteristics

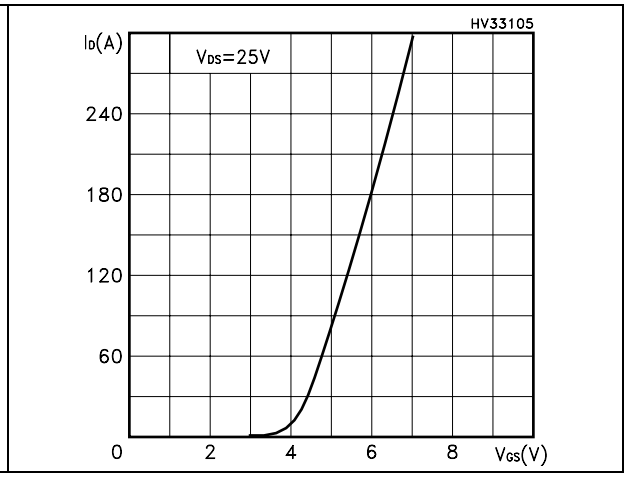


Figure 5. Transconductance

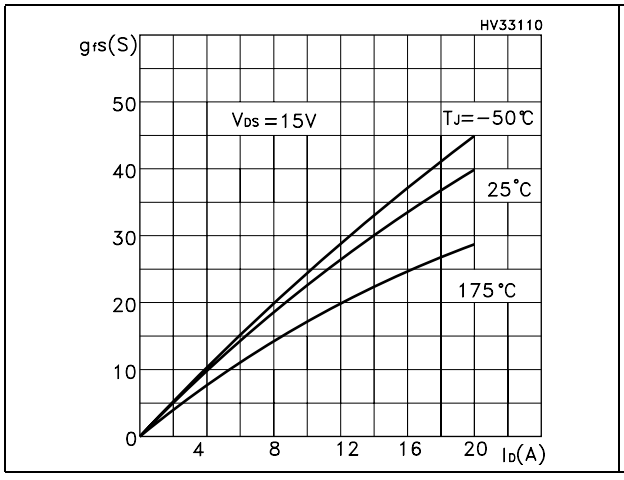


Figure 6. Static drain-source on resistance

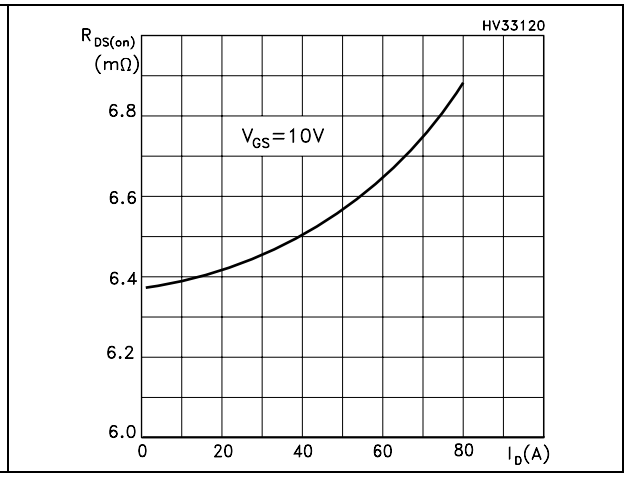


Figure 7. Gate charge vs gate-source voltage

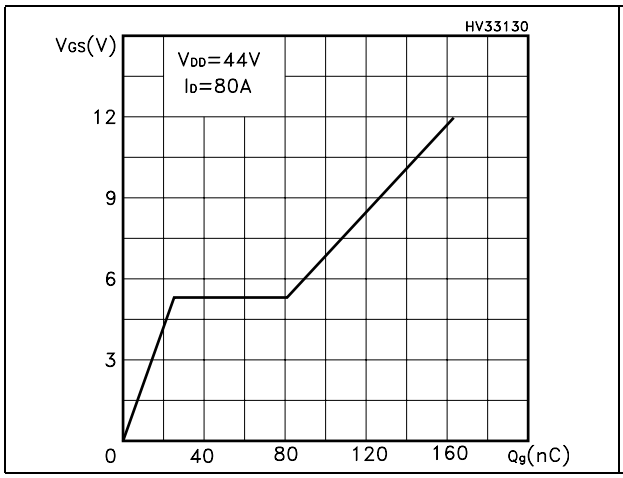


Figure 8. Capacitance variations

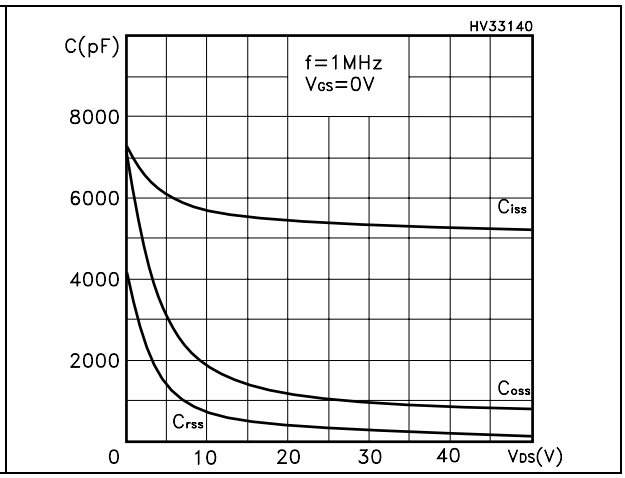


Figure 9. Normalized gate threshold voltage vs temperature

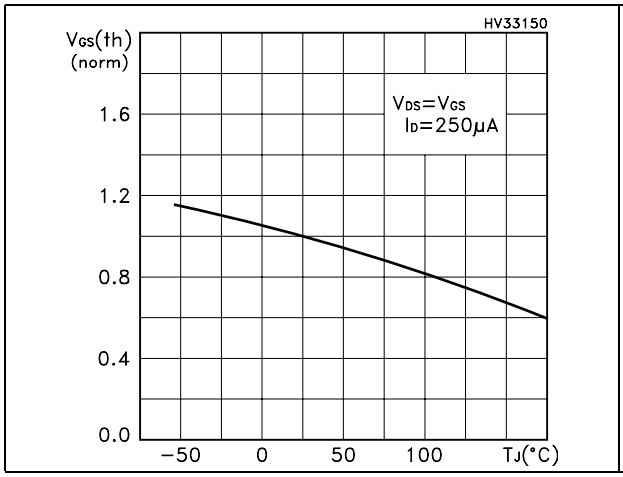


Figure 10. Normalized on resistance vs temperature

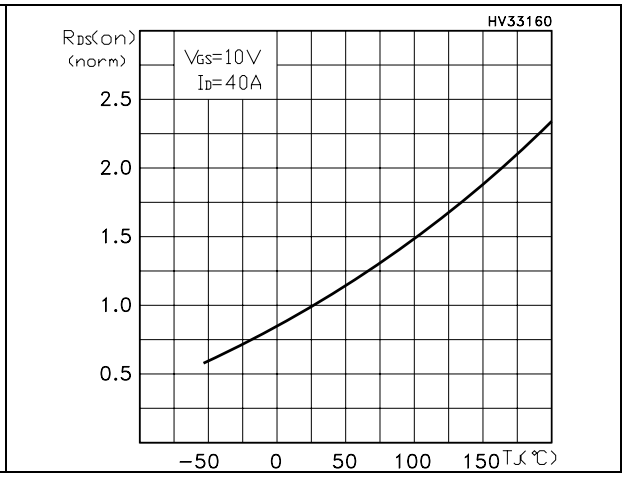


Figure 11. Source-drain diode forward characteristics

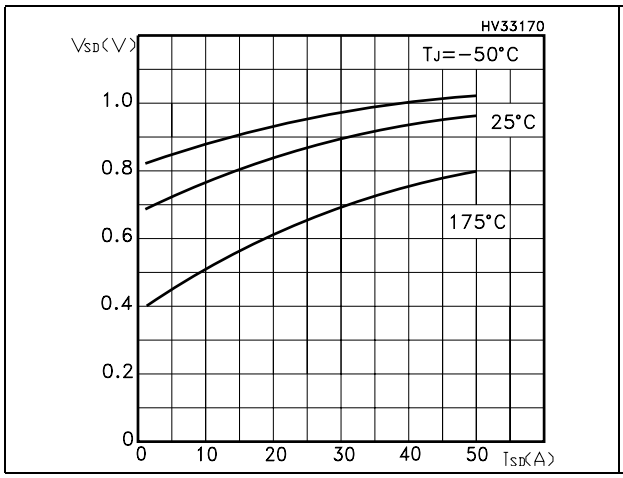
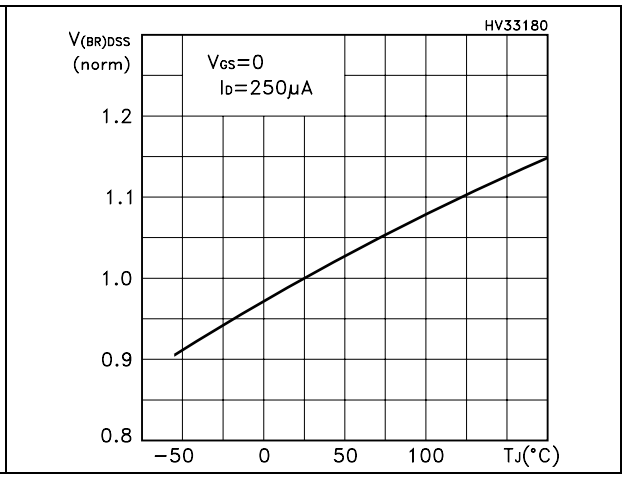


Figure 12. Normalized B_{VDSS} vs temperature



3 Test circuit

Figure 13. Switching times test circuit for resistive load

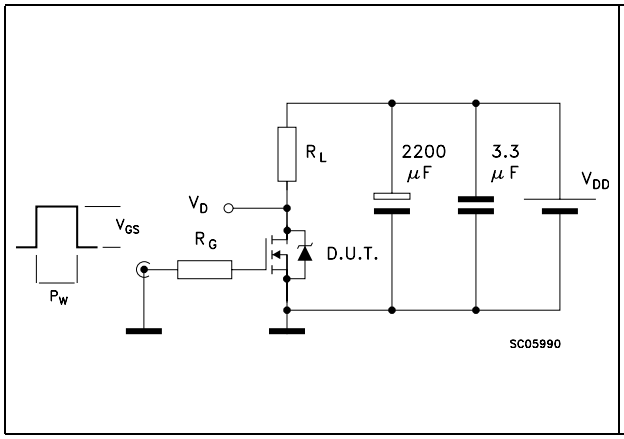


Figure 14. Gate charge test circuit

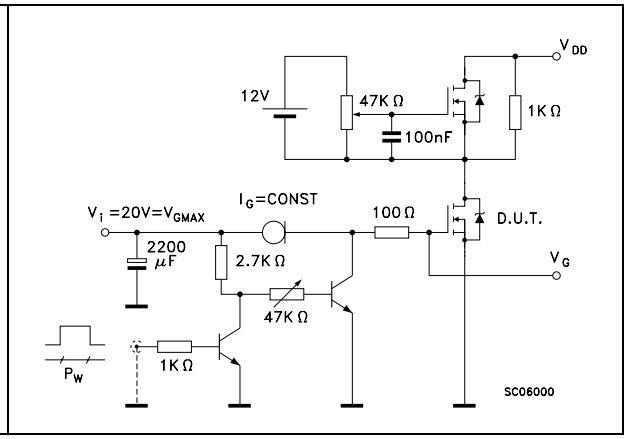


Figure 15. Test circuit for inductive load switching and diode recovery times

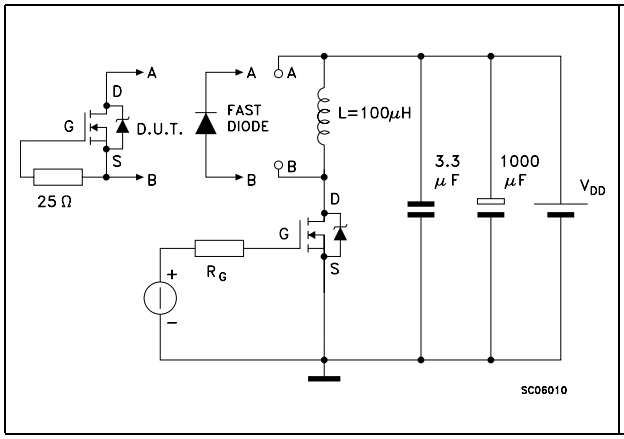


Figure 16. Unclamped inductive load test circuit

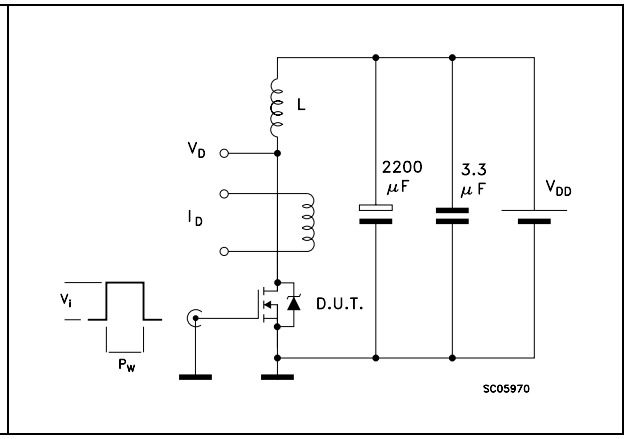


Figure 17. Unclamped inductive waveform

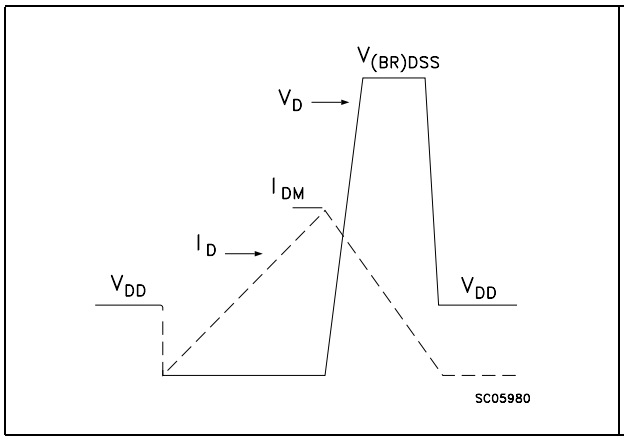
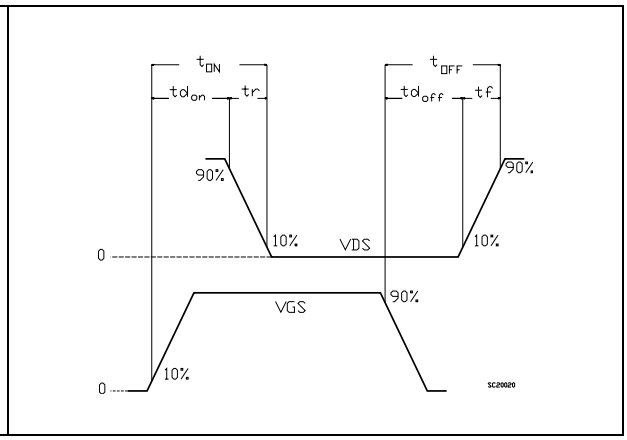


Figure 18. Switching time waveform

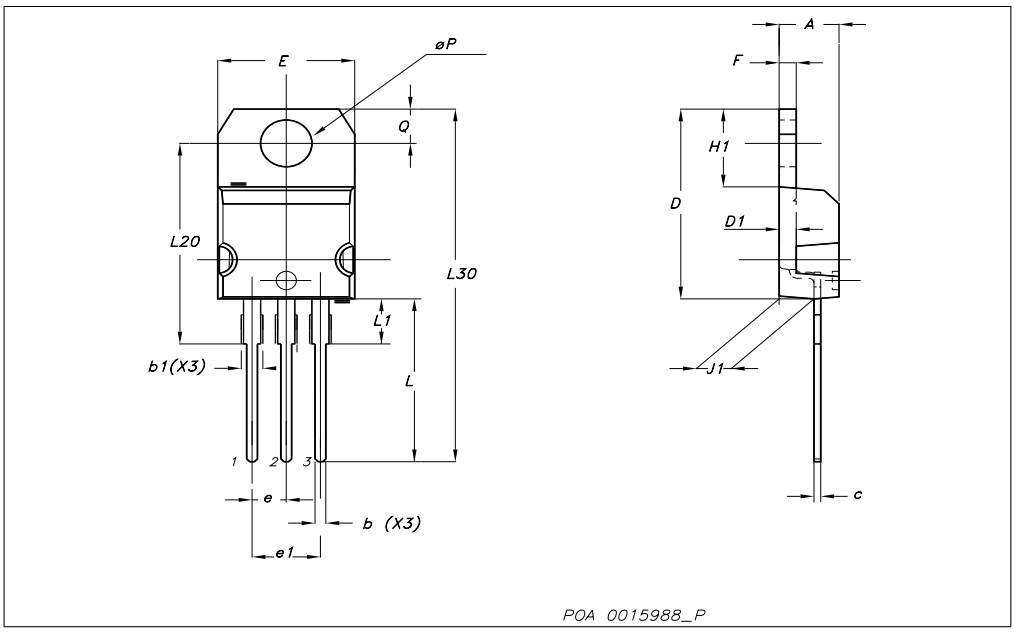


4 Package mechanical data

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*

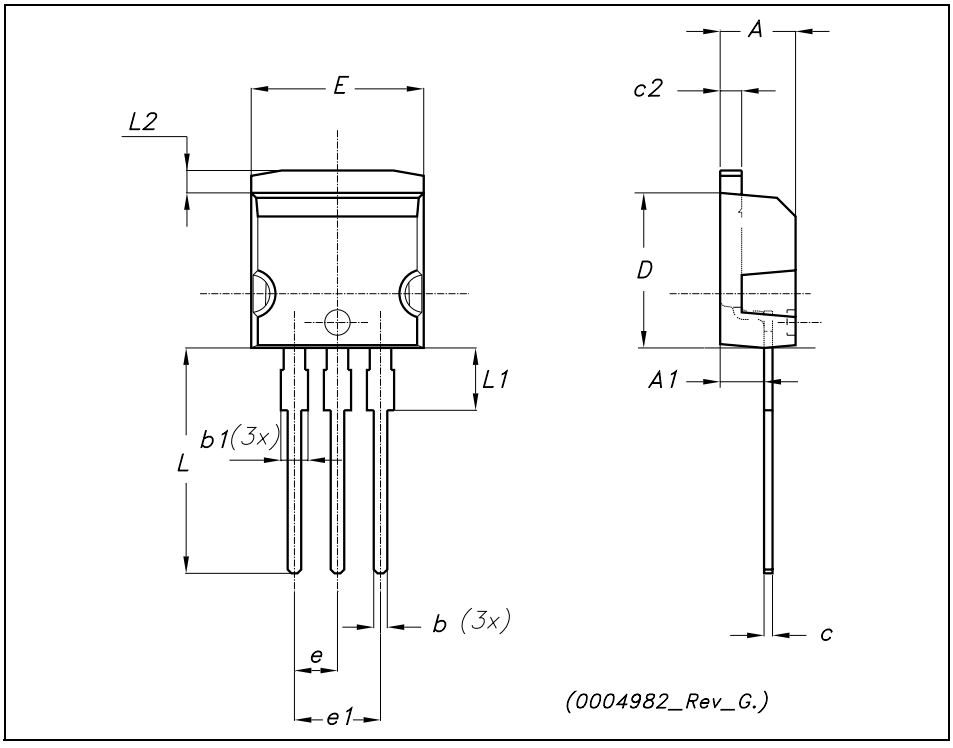
TO-220 mechanical data

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	
θP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



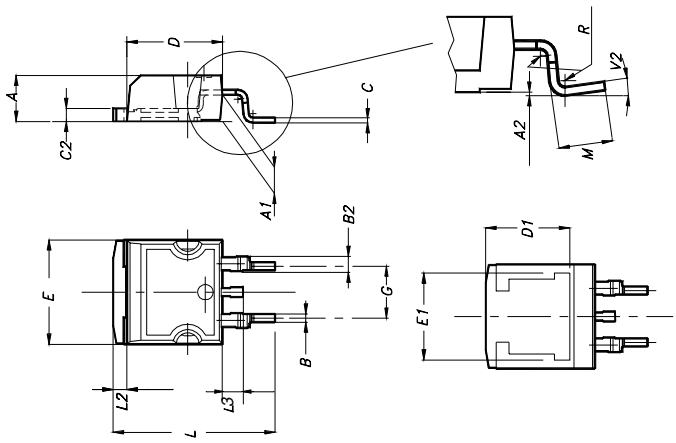
TO-262 (I^2PAK) MECHANICAL DATA

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



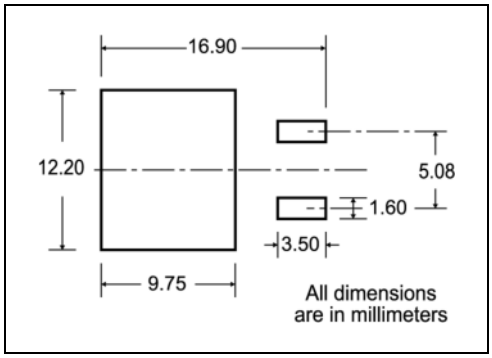
D^2PAK MECHANICAL DATA

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	0º		4º			

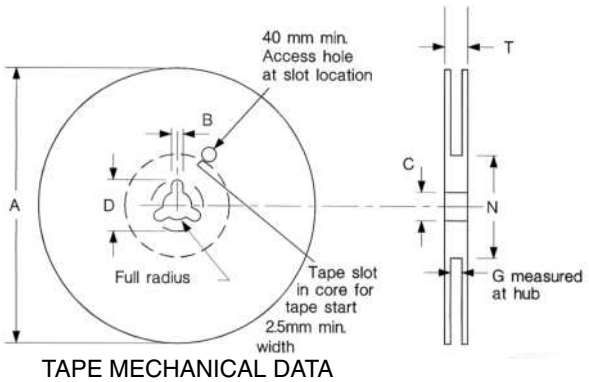


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



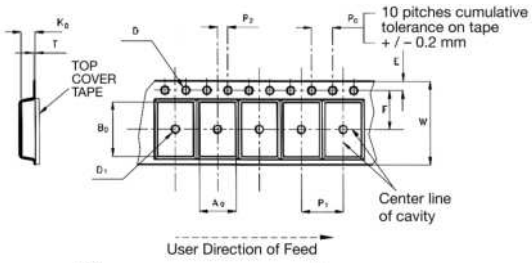
REEL MECHANICAL DATA

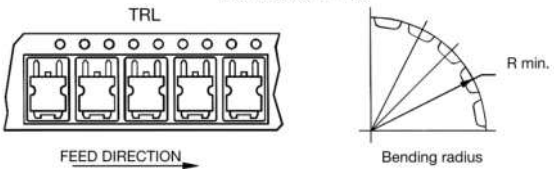
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

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 7. Revision history

Date	Revision	Changes
07-Dec-2004	1	Initial release.
07-Apr-2006	2	Updated *Figure 8*
04-Aug-2006	3	New template, modified *Figure 1*
02-Mar-2007	4	Applications have been updated

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