



# STB16NF06L

N-channel 60V - 0.07Ω - 16A - D<sup>2</sup>PAK  
STripFET™ Power MOSFET

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB16NF06L	60V	<0.09Ω	16A

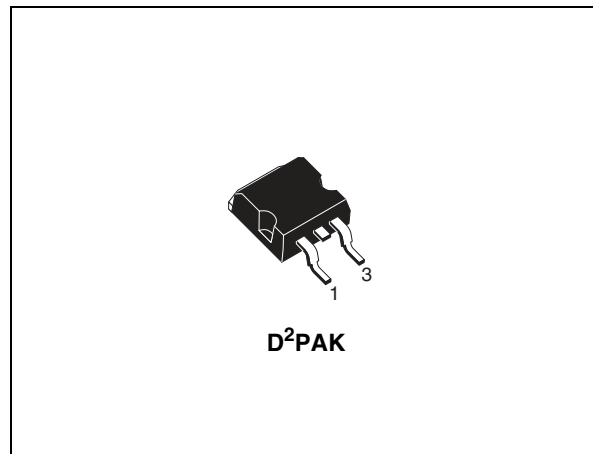
- Exceptional dv/dt capability
- Low gate charge at 100°C
- Logic level device
- Low threshold drive

## Description

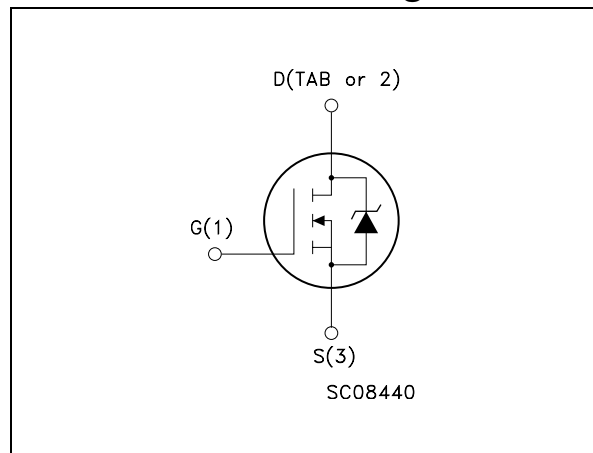
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

## Applications

- Switching application



## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STB16NF06L	B16NF06L	D <sup>2</sup> PAK	Tape & reel

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuit</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Packing mechanical data</b> .....	<b>11</b>
<b>6</b>	<b>Revision history</b> .....	<b>12</b>

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	60	V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )	60	V
$V_{GS}$	Gate- source voltage	$\pm 16$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	16	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	11	A
$I_{DM}^{(1)}$	Drain current (pulsed)	64	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	45	W
	Derating Factor	0.3	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery avalanche energy	23	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	127	mJ
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		

1. Pulse width limited by safe operating area.
2.  $I_{SD} \leq 6\text{A}$ ,  $di/dt \leq 10\text{A}/\mu\text{s}$ ,  $V_{DD} = V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$
3. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = 8\text{A}$ ,  $V_{DD} = 30\text{V}$

**Table 2. Thermal data**

$R_{thj-case}$	Thermal resistance junction-case max	3.33	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$
$T_J$	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 ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating},$ $T_C = 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 5V, I_D = 8A$ $V_{GS} = 10V, I_D = 8A$		0.08 0.07	0.10 0.09	$\Omega$ $\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_D = 80A$		17		S
$C_{iss}$	Input capacitance	$V_{DS} = 25V, f = 1MHz,$ $V_{GS} = 0$		345		pF
$C_{oss}$	Output capacitance			72		pF
$C_{rss}$	Reverse transfer capacitance			29		pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30V, I_D = 8A$ $R_G = 4.7\Omega, V_{GS} = 4.5V$ (see <a href="#">Figure 12</a> )		10		ns
$t_r$	Rise time			37		ns
$t_{d(off)}$	Turn-off delay time			20		ns
$t_f$	Fall time			12.5		ns
$Q_g$	Total gate charge	$V_{DD} = 48V, I_D = 16A,$ $V_{GS} = 4.5V, R_G = 4.7\Omega$ (see <a href="#">Figure 13</a> )		7.3	10	nC
$Q_{gs}$	Gate-source charge			2.1		nC
$Q_{gd}$	Gate-drain charge			3.1		nC

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

**Table 5. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				16 64	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16A, V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 16A, di/dt = 100A/\mu s,$ $V_{DD} = 16V, T_j = 150^\circ C$ (see <a href="#">Figure 14</a> )		50 67.5 2.7		ns nC A

1. Pulse width limited by safe operating area.
2. Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

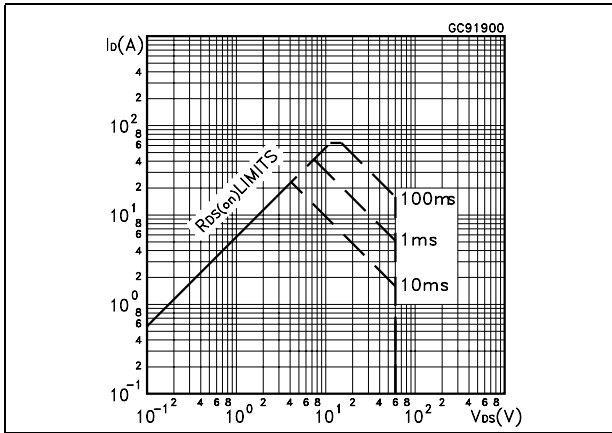


Figure 2. Thermal impedance

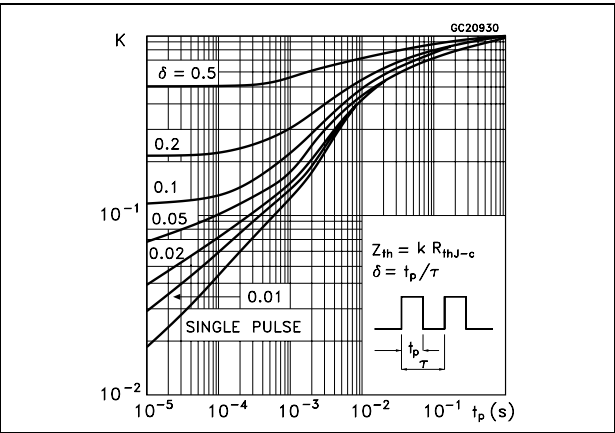


Figure 3. Output characteristics

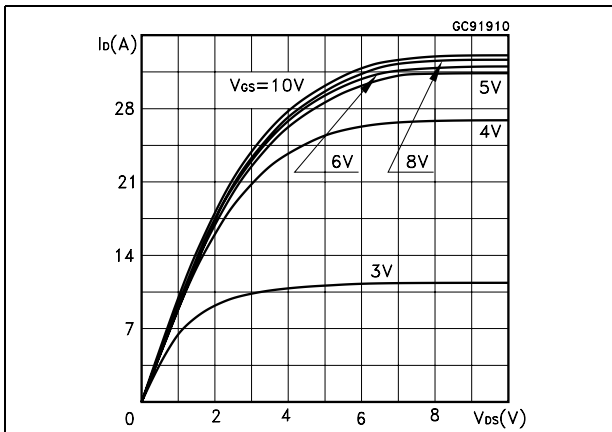


Figure 4. Transfer characteristics

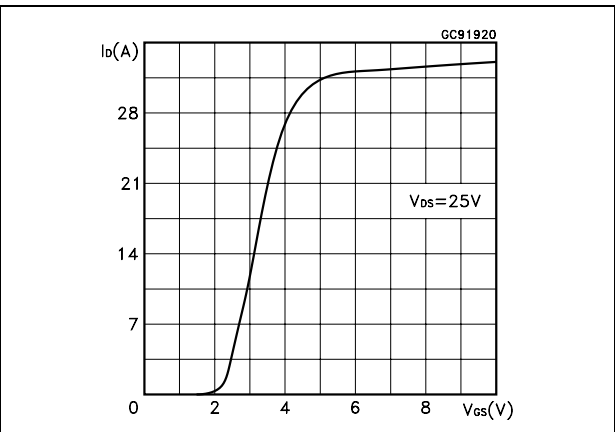


Figure 5. Transconductance

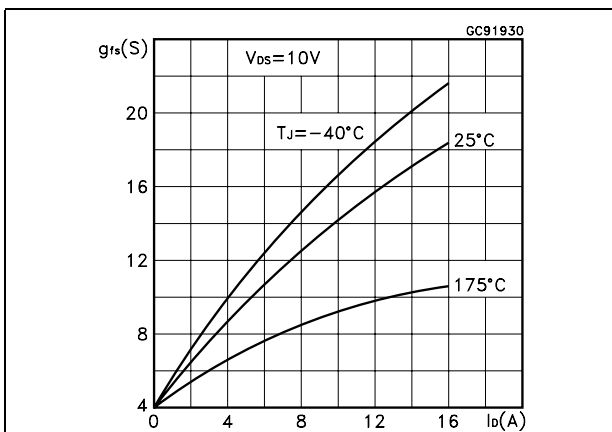


Figure 6. Static drain-source on resistance

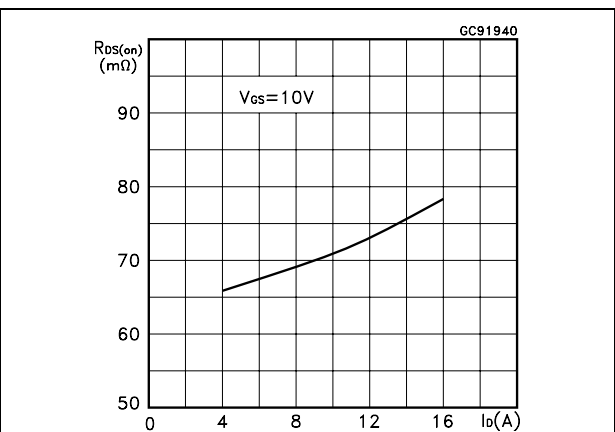


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

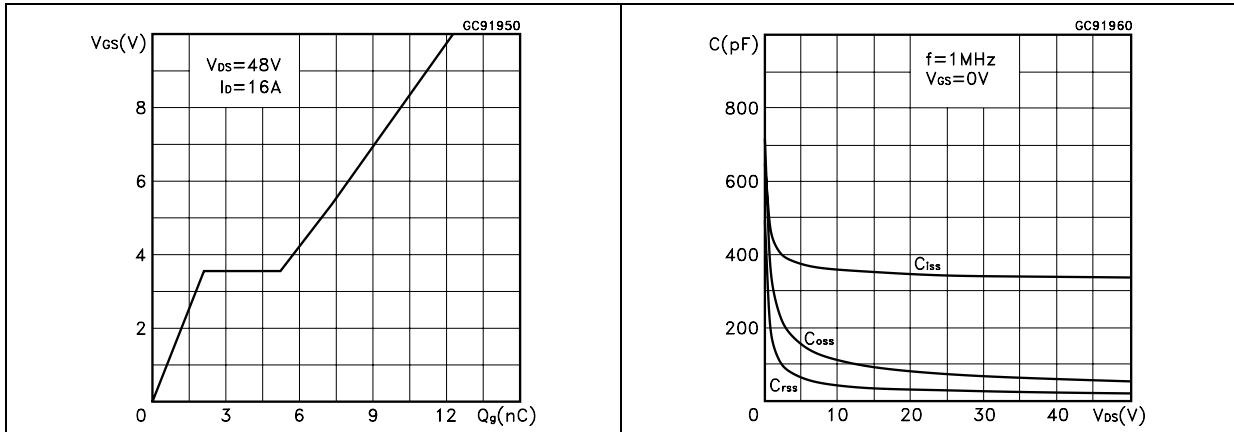


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

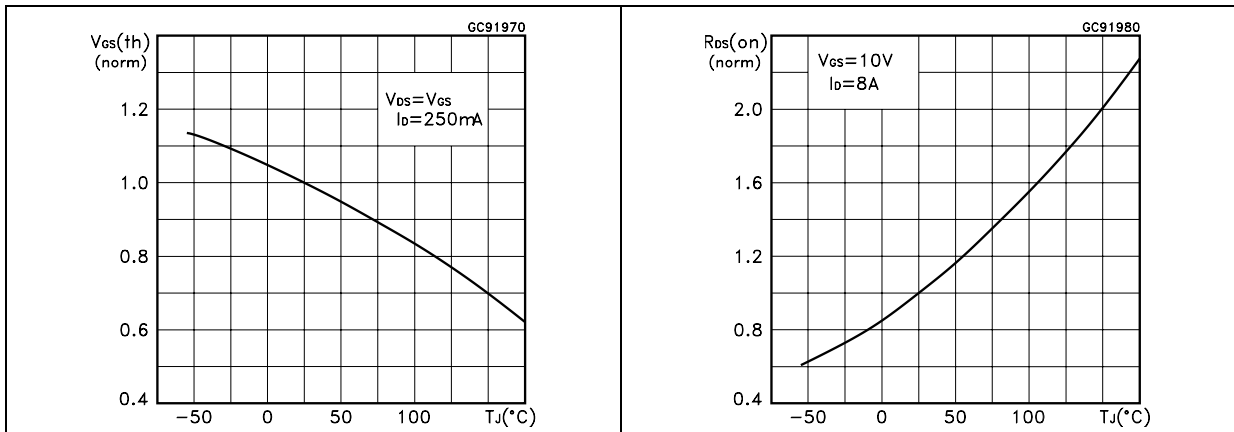
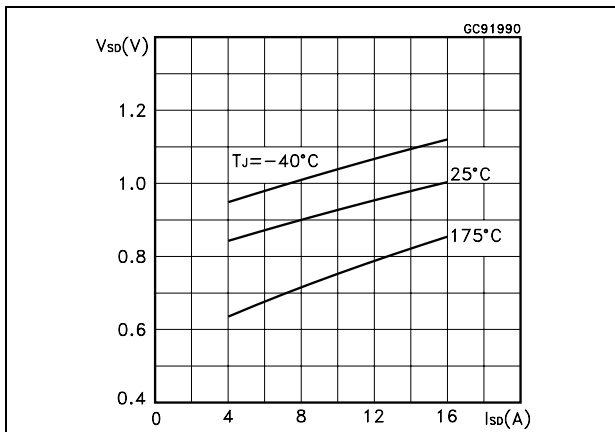


Figure 11. Source-drain diode forward characteristics



### 3 Test circuit

Figure 12. Switching times test circuit for resistive load

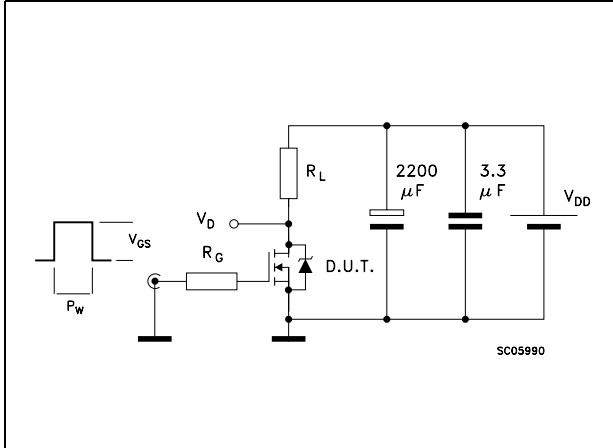


Figure 13. Gate charge test circuit

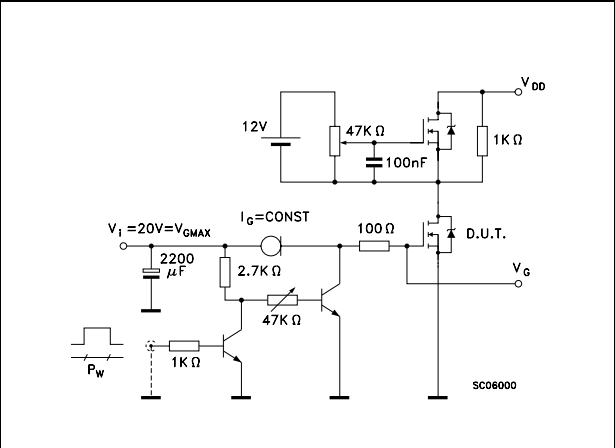


Figure 14. Test circuit for inductive load switching and diode recovery times

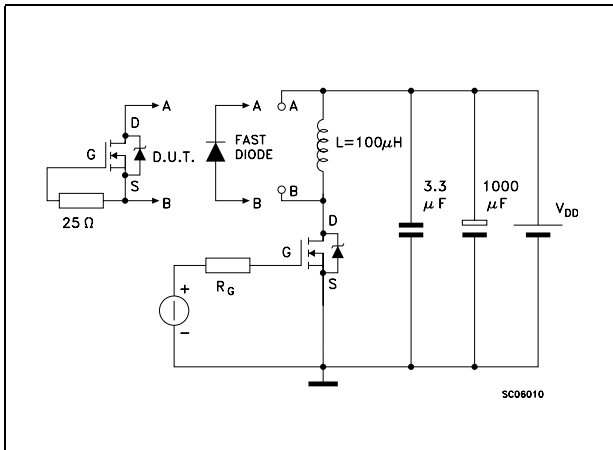


Figure 15. Unclamped Inductive load test circuit

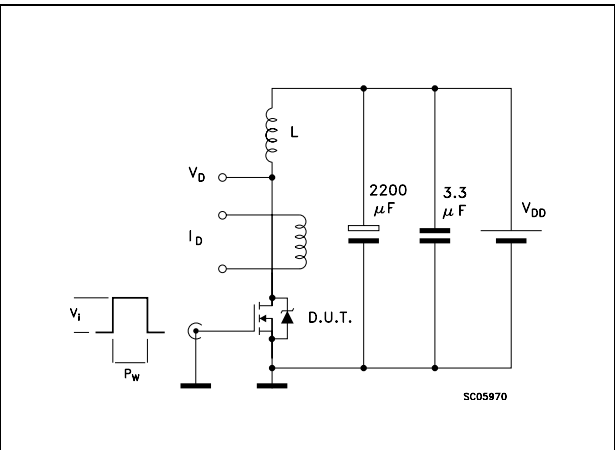


Figure 16. Unclamped inductive waveform

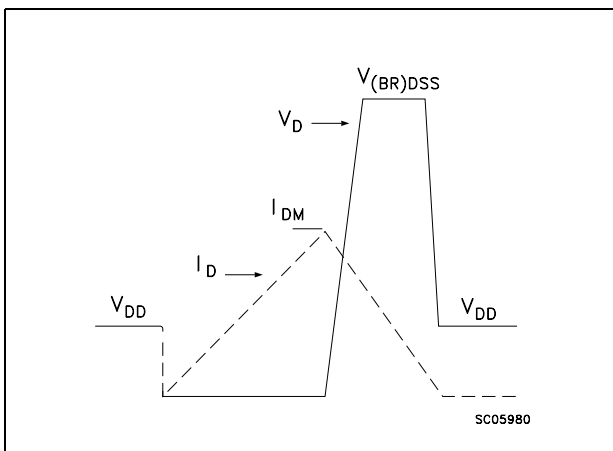
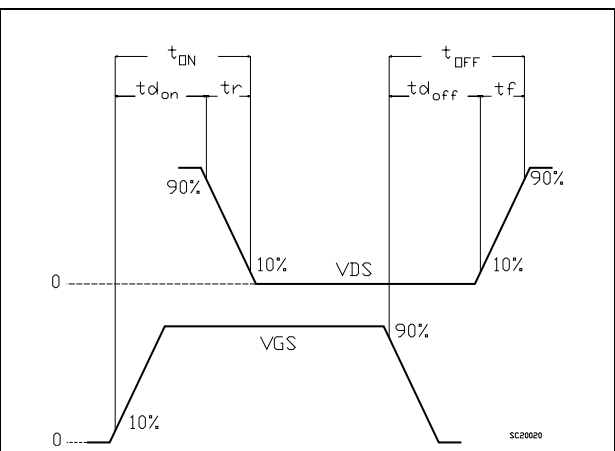


Figure 17. Switching time waveform



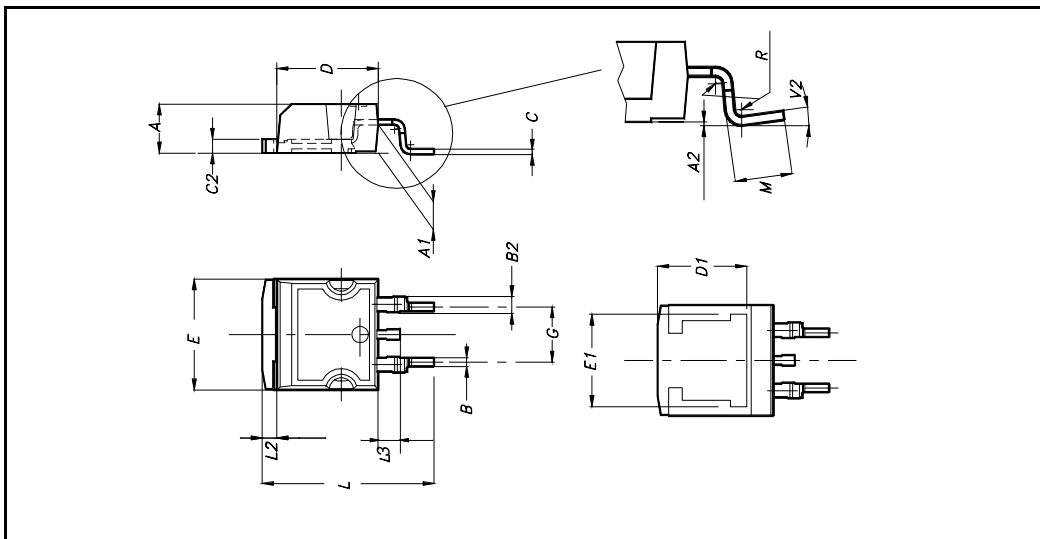


## 4 Package mechanical data

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

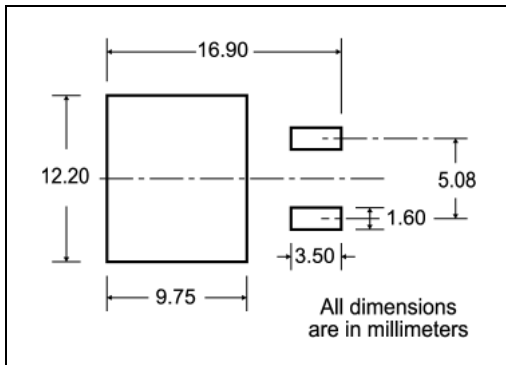
**D<sup>2</sup>PAK MECHANICAL DATA**

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 Packing mechanical data

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

\* on sales type

## 6 Revision history

**Table 6. Revision history**

Date	Revision	Changes
21-Jun-2004	1	First version
26-Jun-2006	2	New template, no content change

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