



STD100N03L STD100N03L-1

N-channel 30V - 0.0045Ω - 80A - DPAK - IPAK
Planar STripFET™ II Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D	P _w
STD100N03L	30 V	<0.0055 Ω	80 A ⁽¹⁾	110 W
STD100N03L-1	30 V	<0.0055 Ω	80 A ⁽¹⁾	110 W

1. Current limited by package

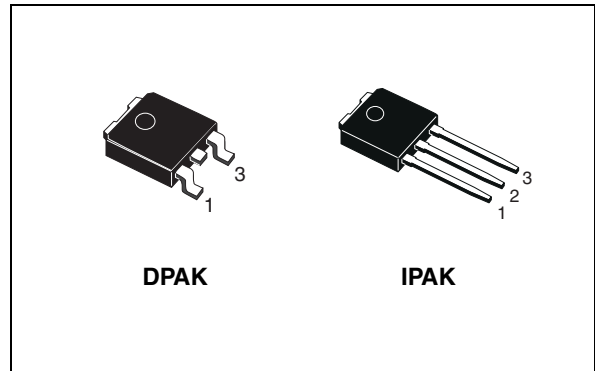
- 100% avalanche tested
- Logic level threshold

Description

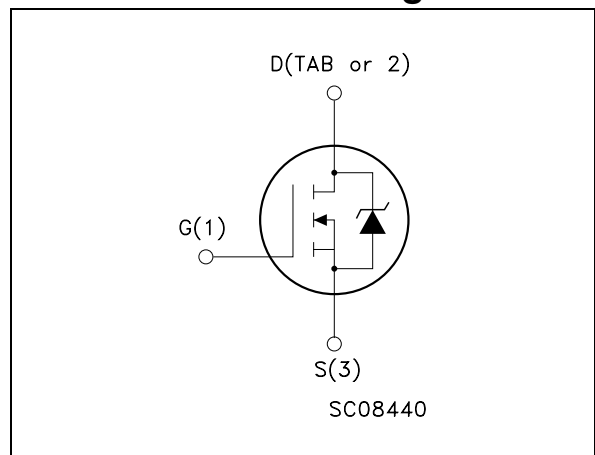
This MOSFET is the latest refinement of STMicroelectronic unique “Single Feature Size™” strippbased process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics, low gate charge and less critical alignment steps therefore a remarkable manufacturing reproducibility. This new improved device has been specifically designed for Automotive application and DC-DC converters.

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STD100N03LT4	D100N03L	DPAK	Tape & reel
STD100N03L-1	D100N03L-1	IPAK	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	30	V
V_{DGR}	Drain-gate voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	80	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	70	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	110	W
	Derating factor	0.73	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	3.9	V/ns
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_J	Max. operating junction temperature		

1. Current limited by package.
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80\text{A}$, $di/dt \leq 360\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case Max	1.36	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient Max	100	$^\circ\text{C}/\text{W}$
T_I	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Not-repetitive avalanche current (pulse width limited by T_J max)	40	A
E_{AS}	Single pulsed avalanche energy (starting $T_J = 25^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 24\text{V}$)	500	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$, $V_{DS} = \text{Max rating @ } 125^{\circ}\text{C}$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{V}$, $I_D = 40\text{A}$		0.0045	0.0055	Ω
		$V_{GS} = 5\text{V}$, $I_D = 20\text{A}$		0.008	0.01	Ω
		$V_{GS} = 10\text{V}$, $I_D = 40\text{A @ } 125^{\circ}\text{C}$		0.0068		Ω
		$V_{GS} = 5\text{V}$, $I_D = 20\text{A @ } 125^{\circ}\text{C}$		0.0146		Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 10\text{V}$, $I_D = 15\text{A}$		31		S
C_{iss}	Input capacitance	$V_{DS} = 25\text{V}$, $f = 1\text{MHz}$, $V_{GS} = 0$		2060		pF
C_{oss}	Output capacitance			728		pF
C_{rss}	Reverse transfer capacitance			67		pF
Q_g	Total gate charge	$V_{DD} = 24\text{V}$, $I_D = 80\text{A}$		20	27	nC
Q_{gs}	Gate-source charge	$V_{GS} = 5\text{V}$		7		nC
Q_{gd}	Gate-drain charge	Figure 15 on page 9		7.5		nC
R_G	Gate input resistance	$f = 1\text{MHz}$ gate DC Bias = 0 Test signal level = 20mV Open drain		1.9		Ω

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

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15V, I_D = 40A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ <i>Figure 14 on page 9</i>		9		ns
t_r	Rise time			205		ns
$t_{d(off)}$	Turn-off delay time			31		ns
t_f	Fall time			35		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40A, V_{GS} = 0$			1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 80A,$ $di/dt = 100A/\mu s,$ $V_{DD} = 25V, T_J = 150^\circ C$ <i>Figure 16 on page 9</i>		40		ns
Q_{rr}	Reverse recovery charge			40		μC
I_{RRM}	Reverse recovery current			2		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

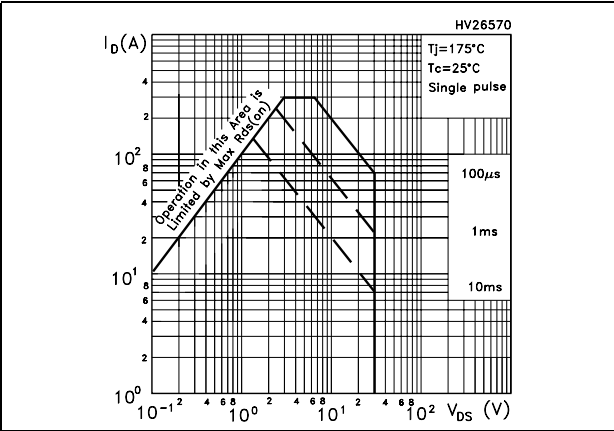


Figure 2. Thermal impedance

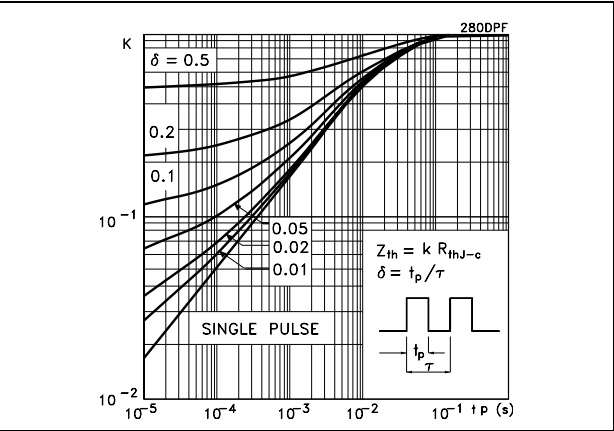


Figure 3. Output characteristics

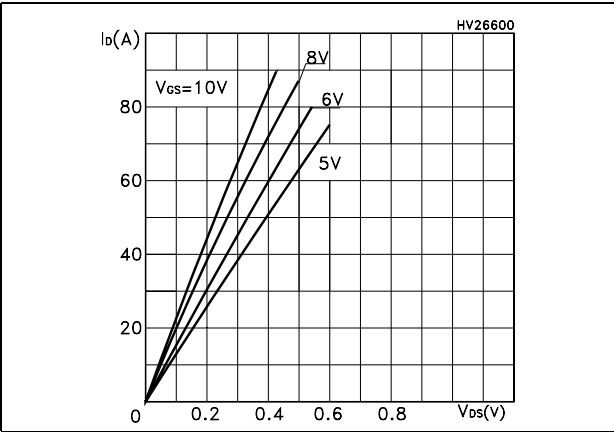


Figure 4. Transfer characteristics

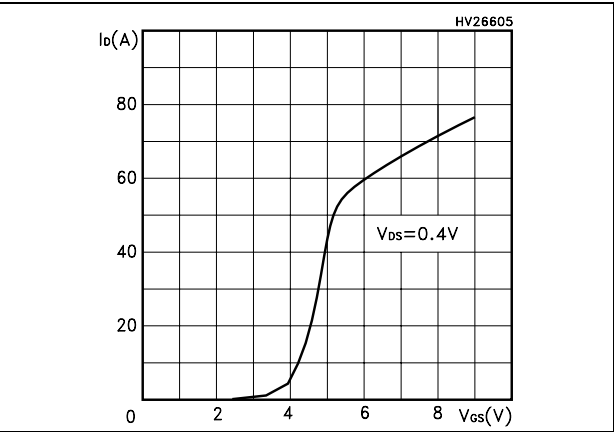


Figure 5. Transconductance

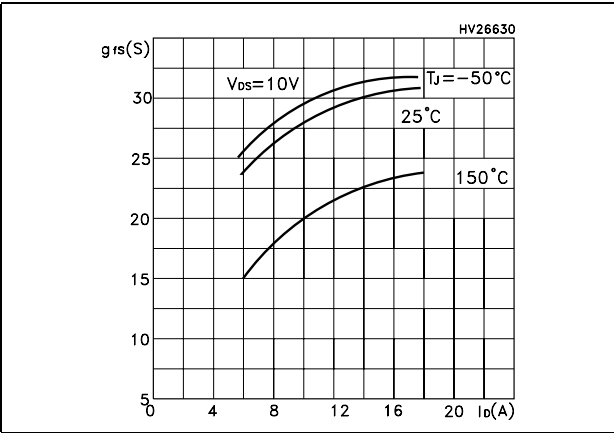


Figure 6. Static drain-source on resistance

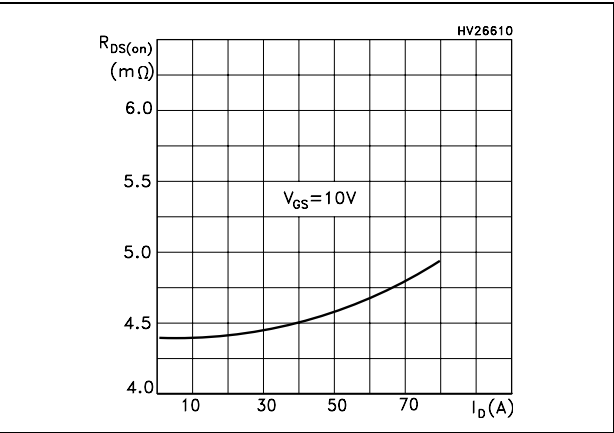


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

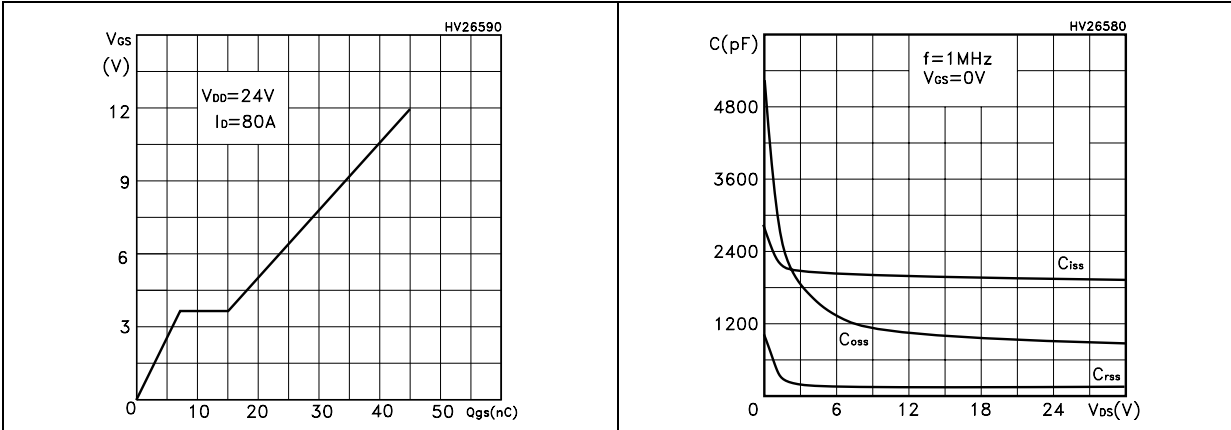


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized BVDSS vs temperature

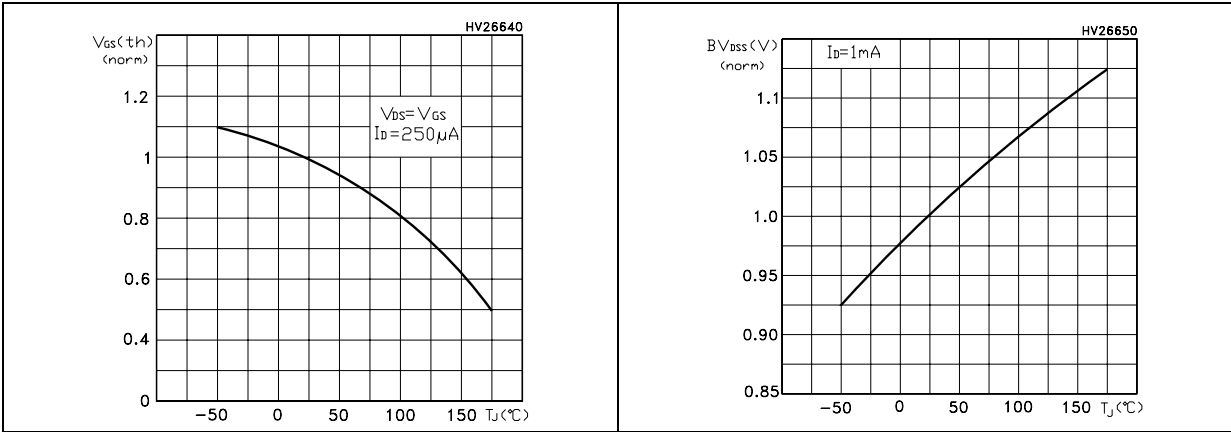


Figure 11. Normalized on resistance vs temperature Figure 12. Source-drain diode forward characteristics

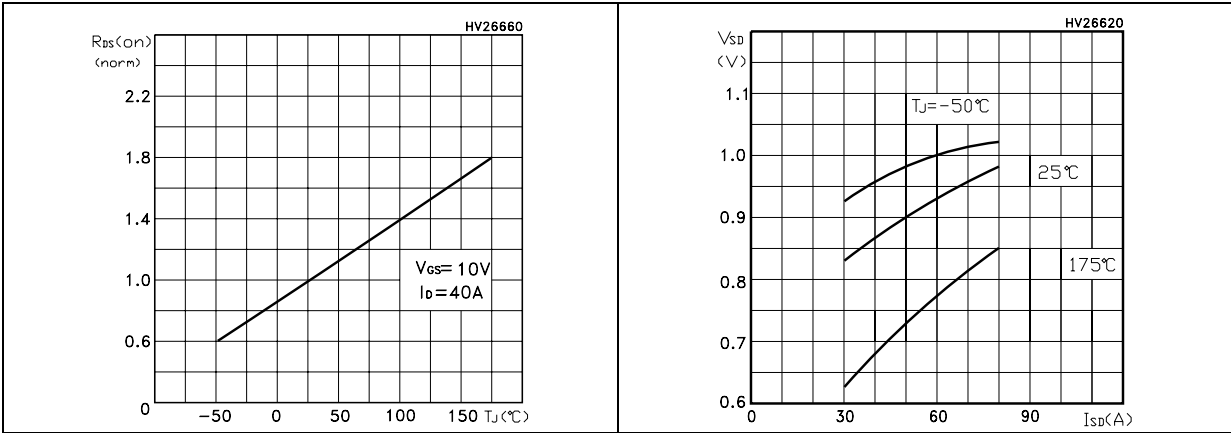
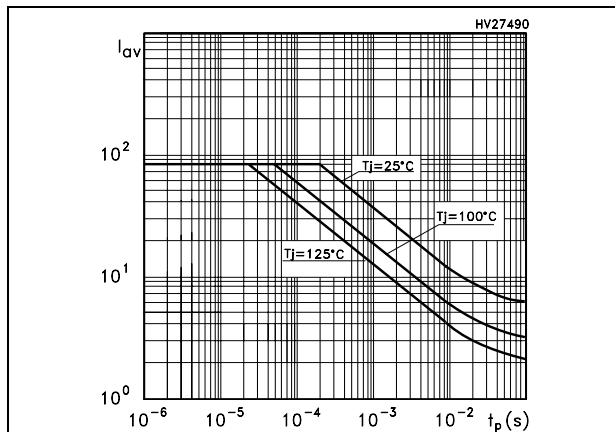


Figure 13. Allowable I_{AV} vs time in avalanche

The previous curve gives the single pulse safe operating area for unclamped inductive loads, under the following conditions:

$$P_{D(AVE)} = 0.5 * (1.3 * BV_{DSS} * I_{AV})$$

$$E_{AS(AR)} = P_{D(AVE)} * t_{AV}$$

Where:

I_{AV} is the Allowable Current in Avalanche

$P_{D(AVE)}$ is the Average Power Dissipation in Avalanche (Single Pulse)

t_{AV} is the Time in Avalanche

3 Test circuit

Figure 14. Switching times test circuit for resistive load

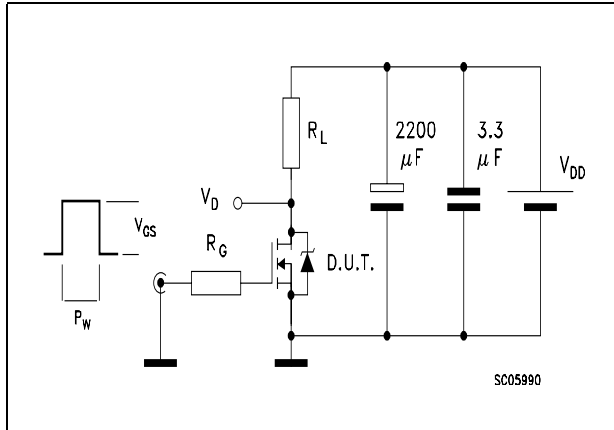


Figure 15. Gate charge test circuit

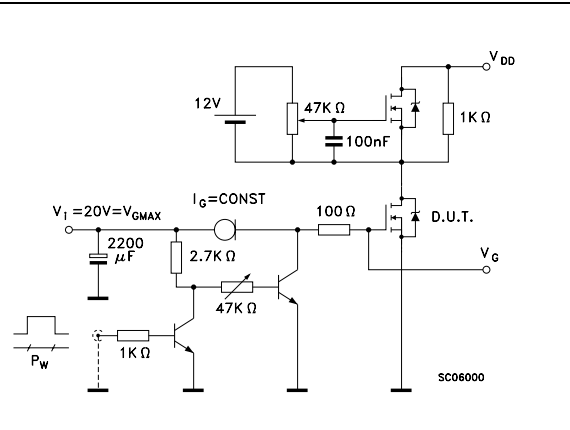
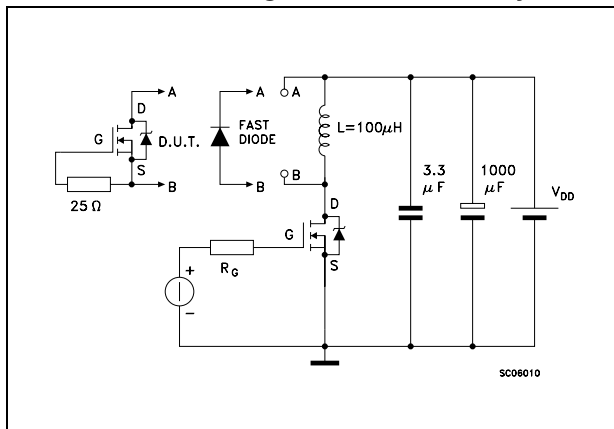


Figure 16. Test circuit for inductive load switching and diode recovery times

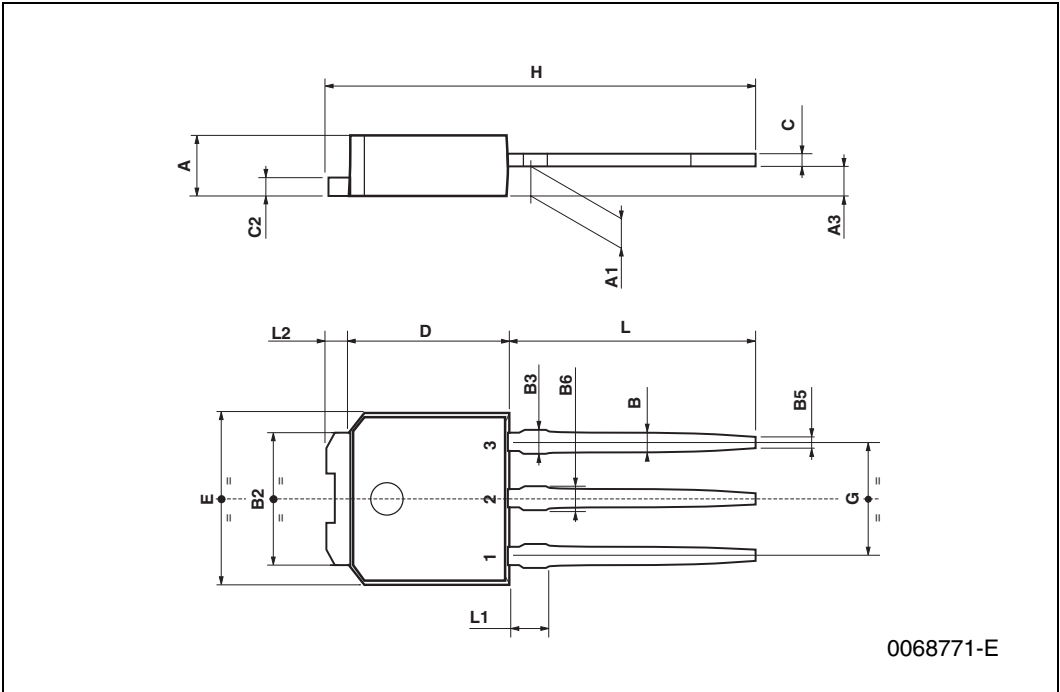


4 Package mechanical data

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-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



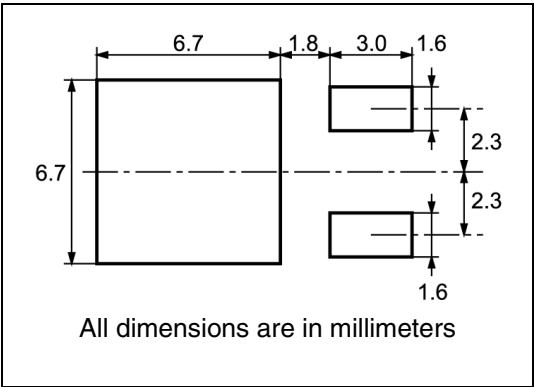
DPAK MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°

The mechanical drawing illustrates the DPAK package geometry. The top view shows dimensions E (total width), b4 (lead width), and e (pitch). The side view shows dimensions A (total height), A1 (lead height), A2 (lead thickness), B (lead thickness), C (lead thickness), C2 (lead thickness), D (total height), D1 (lead height), E1 (lead height), and H (total height). The detail view shows dimensions L (lead length), L1 (lead length), L2 (lead length), L4 (lead length), and V2 (lead angle). The thermal pad is shown with dimensions E1 and D1. The seating plane and gauge plane are indicated.

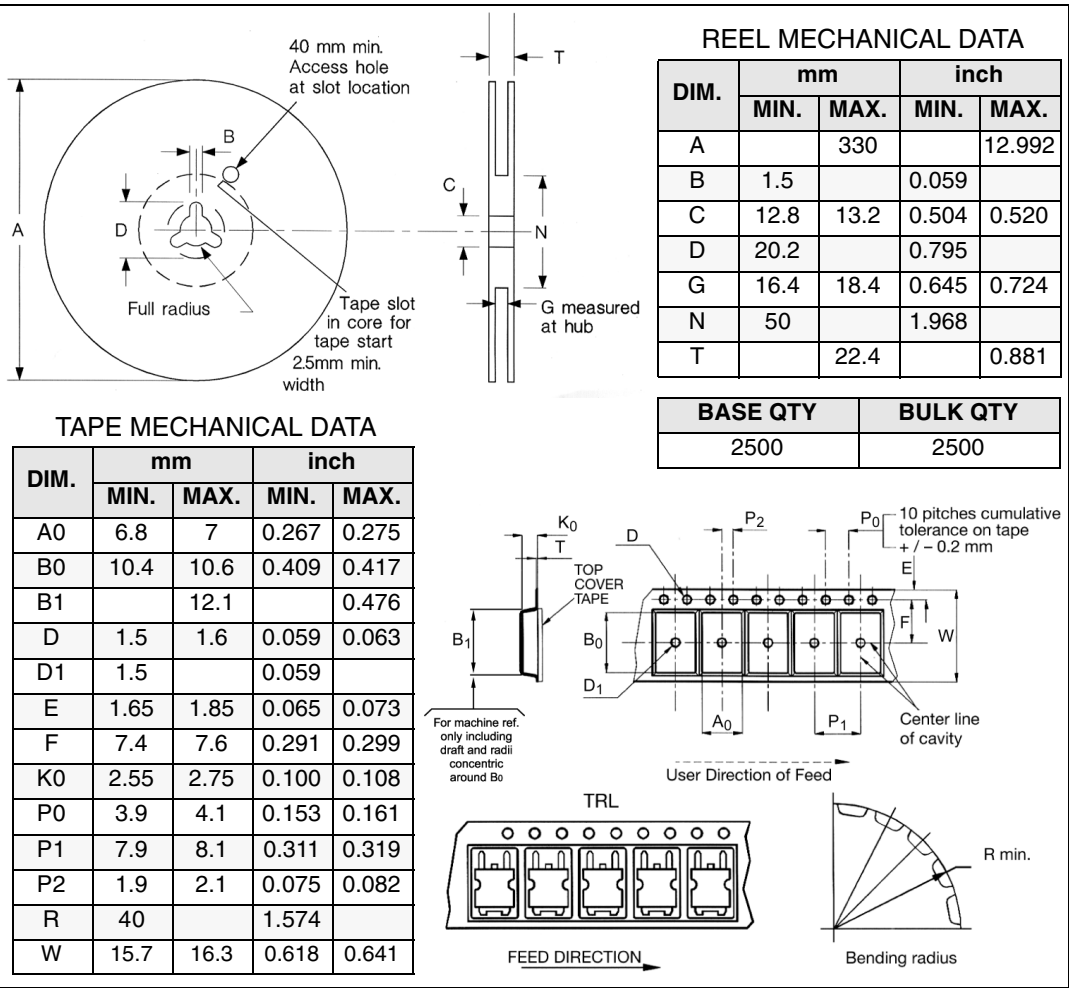
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5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT



6 Revision history

Table 8. Revision history

Date	Revision	Changes
15-Sep-2005	1	Initial release.
14-Sep-2005	2	Value changed on <i>Figure 1</i>
08-Aug-2006	3	New template, no content change

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