



# STB200N6F3, STI200N6F3 STP200N6F3

N-channel 60 V, 3 mΩ, 120 A D<sup>2</sup>PAK, TO-220, I<sup>2</sup>PAK  
STripFET™ Power MOSFET

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Preliminary data

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>	P <sub>w</sub>
STB200N6F3	60 V	< 3.6 mΩ	120 A <sup>(1)</sup>	330 W
STI200N6F3	60 V	< 3.9 mΩ	120 A <sup>(1)</sup>	330 W
STP200N6F3	60 V	< 3.9 mΩ	120 A <sup>(1)</sup>	330 W

1. Value limited by wire bonding

- Ultra low on-resistance
- 100% avalanche tested

## Application

- Switching applications

## Description

This STripFET™ III Power MOSFET technology is among the latest improvements, which have been especially tailored to minimize on-state resistance providing superior switching performance.

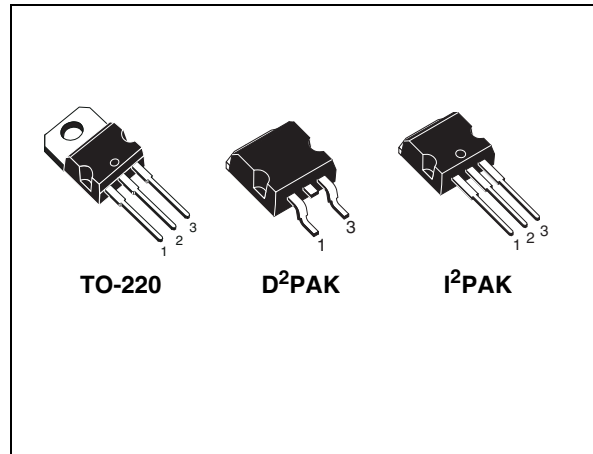


Figure 1. Internal schematic diagram

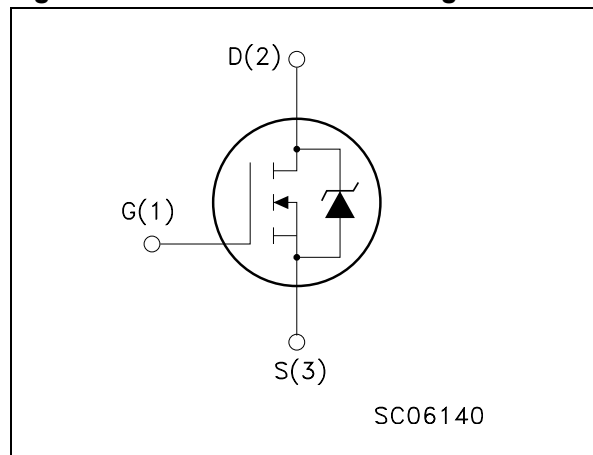


Table 1. Device summary

Order codes	Marking	Package	Packaging
STB200N6F3	200N6F3	D <sup>2</sup> PAK	Tape & reel
STI200N6F3	200N6F3	I <sup>2</sup> PAK	Tube
STP200N6F3	200N6F3	TO-220	Tube

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# 1 Electrical ratings

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**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS}=0$ )	60	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
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	330	W
	Derating factor	2.2	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	TBD	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	TBD	mJ
$T_j$ $T_{stg}$	Operating junction temperature storage temperature	-55 To 175	$^\circ\text{C}$

1. Current limited by package.
2. Pulse width limited by safe operating area.
3.  $I_{SD} \leq 120\text{ A}$ ,  $di/dt \leq \text{TBD}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$
4. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = \text{TBD}$ ,  $V_{DD} = \text{TBD}$  (see Figure 5 and Figure 6)

**Table 3. Thermal data**

Symbol	Parameter	TO-220/l <sup>2</sup> PAK	D <sup>2</sup> PAK	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.45		$^\circ\text{C}/\text{W}$
$R_{thj-a}$	Thermal resistance junction-ambient max	62.5		$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max		50	$^\circ\text{C}/\text{W}$
$T_l$	Maximum lead temperature for soldering purpose	300		$^\circ\text{C}$

1. When mounted on 1 inch<sup>2</sup> FR4 2oz Cu.

## 2 Electrical characteristics

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(T<sub>CASE</sub>=25 °C unless otherwise specified)**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	60			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = max rating, V <sub>DS</sub> = max rating, @ 125°C			10 100	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20 V			±200	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A <b>D<sup>2</sup>PAK</b> <b>TO-220, I<sup>2</sup>PAK</b>		3 3.3	3.6 3.9	mΩ mΩ

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 25 V, f = 1MHz, V <sub>GS</sub> = 0	-	6800	-	pF
C <sub>OSS</sub>	Output capacitance			1450		pF
C <sub>rss</sub>	Reverse transfer capacitance			15		pF
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 27.5 V, I <sub>D</sub> = 60 A R <sub>G</sub> = 4.7 Ω V <sub>GS</sub> = 10 V <i>(see Figure 2, Figure 7)</i>	-	TBD	-	ns
t <sub>r</sub>	Rise time			TBD		ns
t <sub>d(off)</sub>	Turn-off delay time			TBD		ns
t <sub>f</sub>	Fall time			TBD		ns
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 120 A,	-	100	-	nC
Q <sub>gs</sub>	Gate-source charge	V <sub>GS</sub> = 10 V,		30		nC
Q <sub>gd</sub>	Gate-drain charge	<i>(see Figure 3)</i>		26		nC

Table 6. Source drain diode

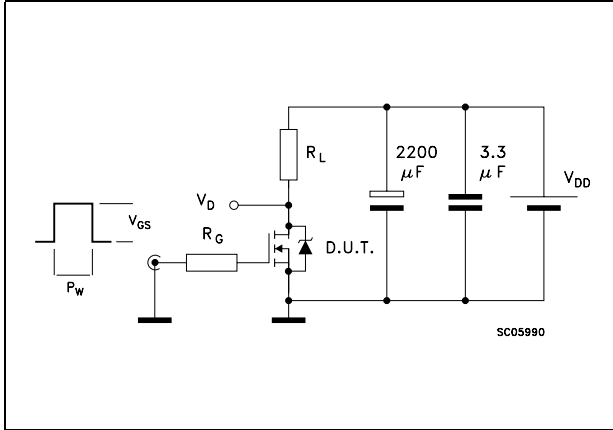
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		120 480	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=120\text{ A}$ , $V_{GS}=0$	-		1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=120\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD}=35\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$ (see <a href="#">Figure 4</a> )	-	TBD TBD TBD		ns $\mu\text{C}$ A

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

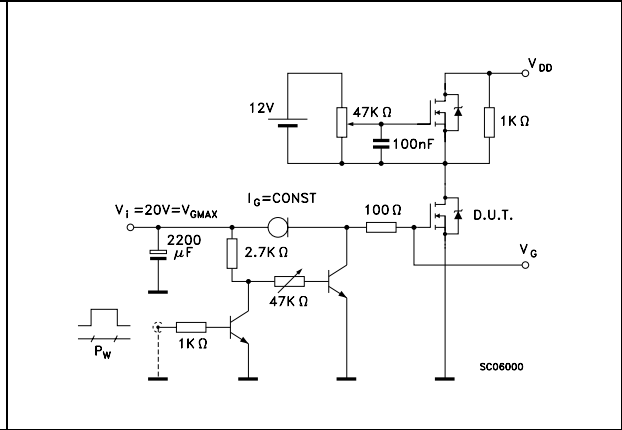
### 3 Test circuits

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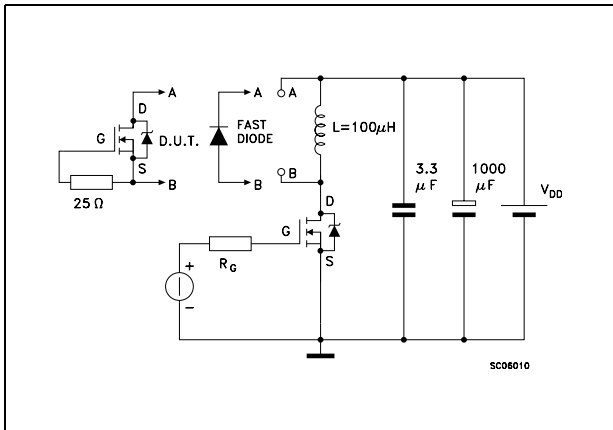
**Figure 2. Switching times test circuit for resistive load**



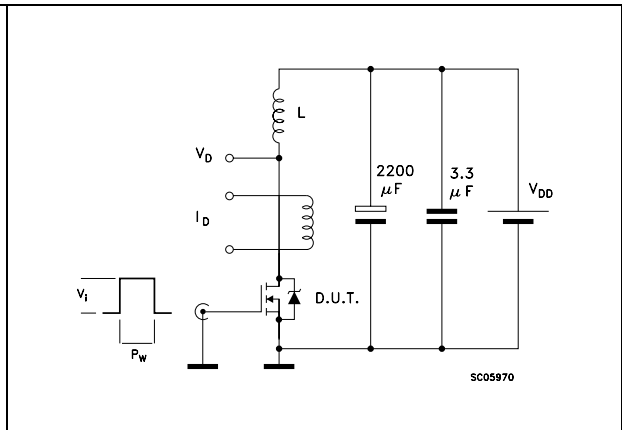
**Figure 3. Gate charge test circuit**



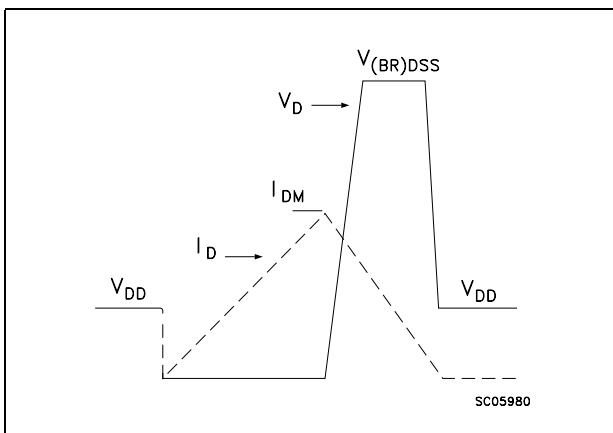
**Figure 4. Test circuit for inductive load switching and diode recovery times**



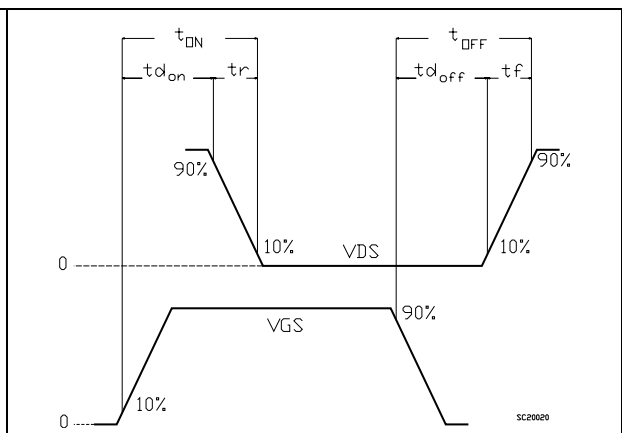
**Figure 5. Unclamped inductive load test circuit**



**Figure 6. Unclamped inductive waveform**



**Figure 7. Switching time waveform**



## 4 Package mechanical data

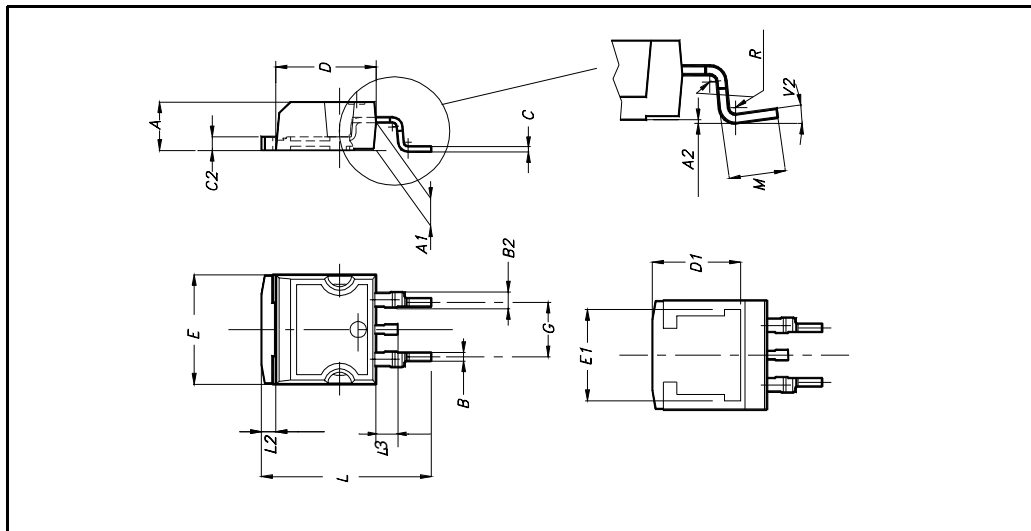
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**D<sup>2</sup>PAK mechanical data**

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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 <sup>□</sup>		4 <sup>□</sup>			

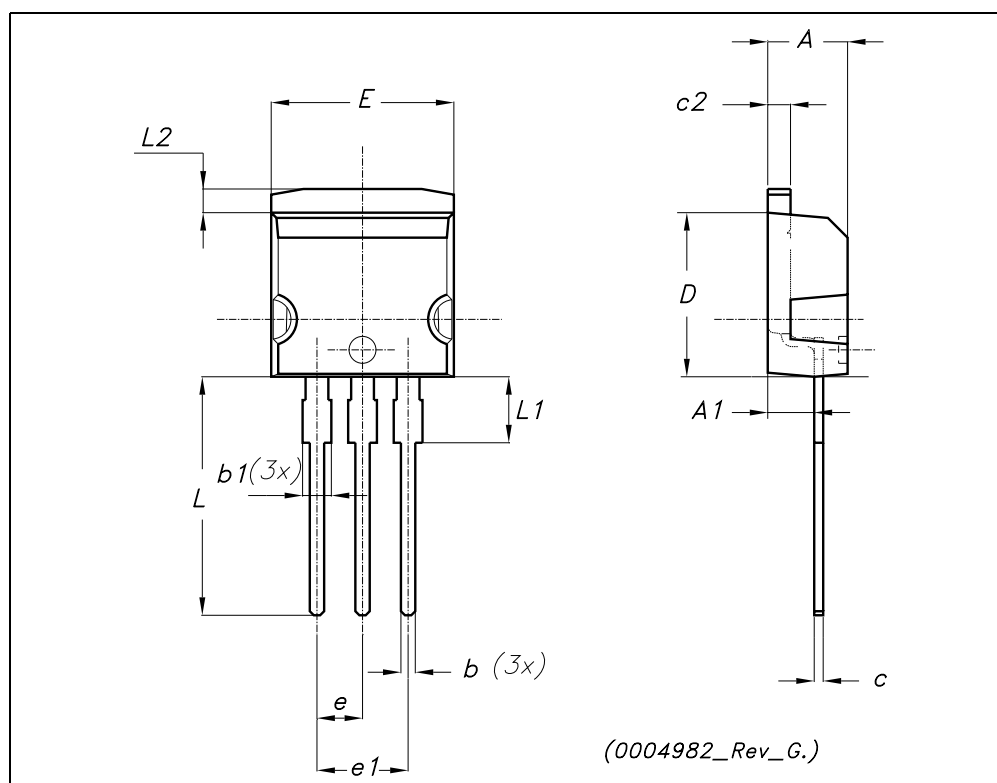




TO-262 (I<sup>2</sup>PAK) mechanical data

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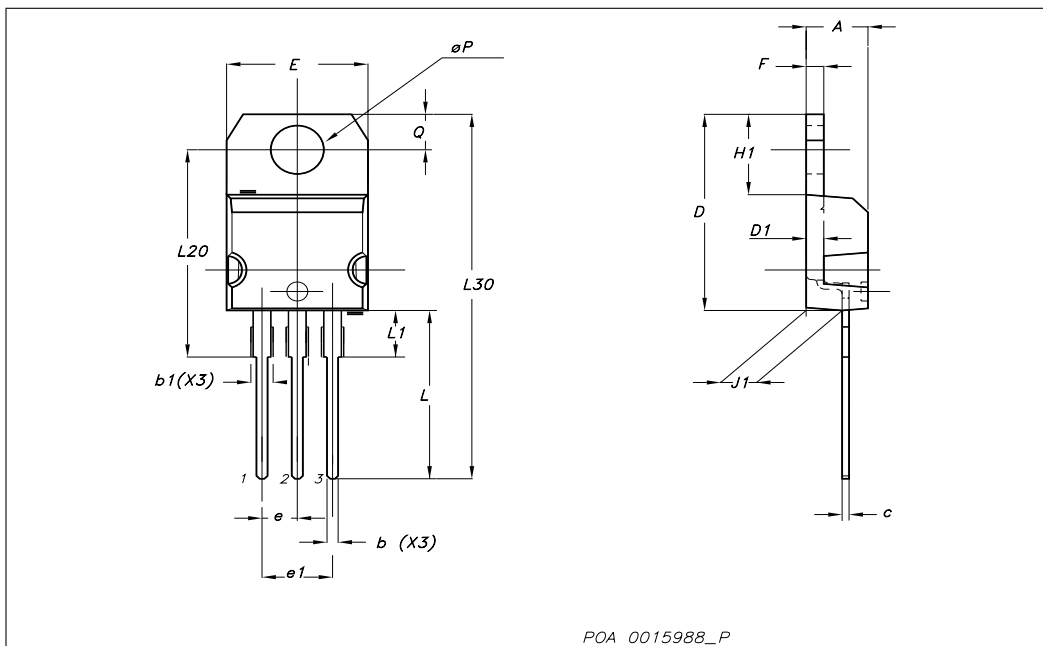
DIM.	mm.			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		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



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**TO-220 mechanical data**

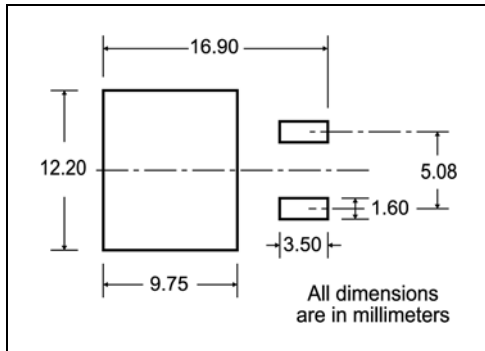
Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		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	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



# 5 Packaging mechanical data

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## 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 25mm min. width

TR

C

N

G measured at hub

**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

TOP COVER TAPE

Center line of cavity

User Direction of Feed

TRL

FEED DIRECTION

Bending radius

R min.

\* on sales type

## 6 Revision history

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**Table 7. Document revision history**

Date	Revision	Changes
20-Apr-2009	1	First version

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