



# STB135N10 STP135N10

## N-CHANNEL 100V - 0.007 $\Omega$ - 135A D<sup>2</sup>PAK/TO-220 LOW GATE CHARGE STripFET™ POWER MOSFET

TARGET DATA

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB135N10	100 V	<0.009 $\Omega$	135 A(*)
STP135N10	100 V	<0.009 $\Omega$	135 A(*)

- TYPICAL R<sub>DS(on)</sub> = 0.007 $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263) POWER PACKAGE IN TUBE (NO SUFFIX) OR IN TAPE & REEL (SUFFIX "T4")

### DESCRIPTION

This MOSFET is the result of STMicroelectronics's well established and consolidated STripFET technology utilizing the most recent layout optimization. The device exhibits extremely low on-resistance, gate charge and diode's reverse recovery charge Q<sub>rr</sub> making it the ideal switch in a very large spectrum of applications such as Automotive, Consumer, Telecom and Industrial.

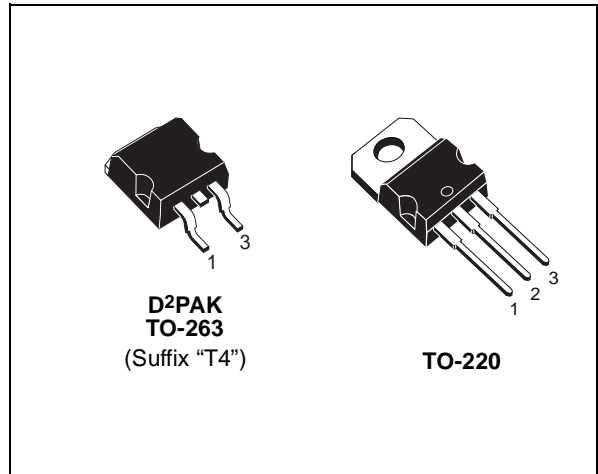
### APPLICATIONS

- PRIMARY SWITCH IN TELECOM DC-DC CONVERTER
- HIGH-EFFICIENCY DC-DC CONVERTERS
- 42V AUTOMOTIVE APPLICATIONS
- SYNCHRONOUS RECTIFICATION
- DIESEL INJECTION
- PWM UPS AND MOTOR CONTROL

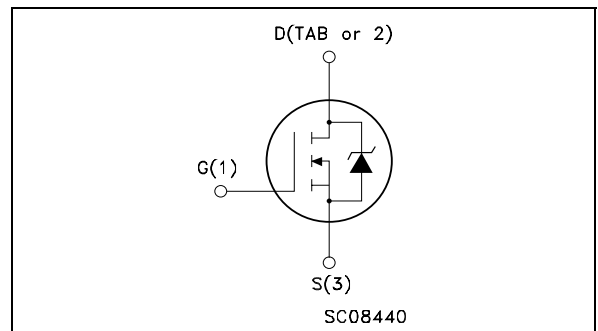
### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	100	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )	100	V
V <sub>GS</sub>	Gate- source Voltage	$\pm 20$	V
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>C</sub> = 25°C	135	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	96	A
I <sub>DM</sub> ( <sup>1</sup> )	Drain Current (pulsed)	540	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	150	W
	Derating Factor	1	W/°C
dv/dt ( <sup>2</sup> )	Peak Diode Recovery voltage slope	TBD	V/ns
E <sub>AS</sub> ( <sup>3</sup> )	Single Pulse Avalanche Energy	TBD	mJ
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	Operating Junction Temperature		

(<sup>1</sup>) Pulse width limited by safe operating area.  
(\*) Value limited by wire bonding



### INTERNAL SCHEMATIC DIAGRAM



(<sup>2</sup>) I<sub>SD</sub>  $\leq$  40A, di/dt  $\leq$  600A/ $\mu$ s, V<sub>DD</sub>  $\leq$  B<sub>V</sub>DSS, T<sub>j</sub>  $\leq$  T<sub>JMAX</sub>.  
(<sup>3</sup>) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 40A, V<sub>DD</sub> = 50V

**STB135N10 STP135N10****THERMAL DATA**

Rthj-case	Thermal Resistance Junction-case	Max	1	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	62.5	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

**ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> = 25 °C UNLESS OTHERWISE SPECIFIED)**  
OFF

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	100			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 T <sub>C</sub> = 125°C			1 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20V			±100	nA

## ON (5)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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> = 67.5 A		0.007	0.009	Ω

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (5)	Forward Transconductance	V <sub>DS</sub> = 25 V I <sub>D</sub> = 67.5 A		TBD		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V f = 1 MHz V <sub>GS</sub> = 0		6350		pF
C <sub>oss</sub>	Output Capacitance			890		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			250		pF

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### ELECTRICAL CHARACTERISTICS (continued)

#### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 50\text{ V}$ $I_D = 67.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		TBD TBD		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 50\text{ V}$ $I_D = 135\text{ A}$ $V_{GS} = 5\text{ V}$		TBD TBD TBD	95	nC nC nC

#### SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 50\text{ V}$ $I_D = 67.5\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		TBD TBD		ns ns

#### SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain Current Source-drain Current (pulsed)				135 540	A A
$V_{SD}^{(5)}$	Forward On Voltage	$I_{SD} = 135\text{ A}$ $V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 135\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 25\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		TBD TBD TBD		ns $\mu\text{C}$ A

(1) Pulse width limited by safe operating area.

(5) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

Fig. 1: Unclamped Inductive Load Test Circuit

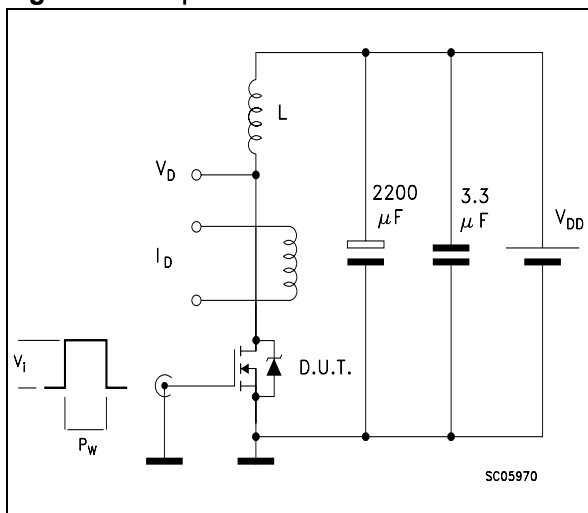


Fig. 2: Unclamped Inductive Waveform

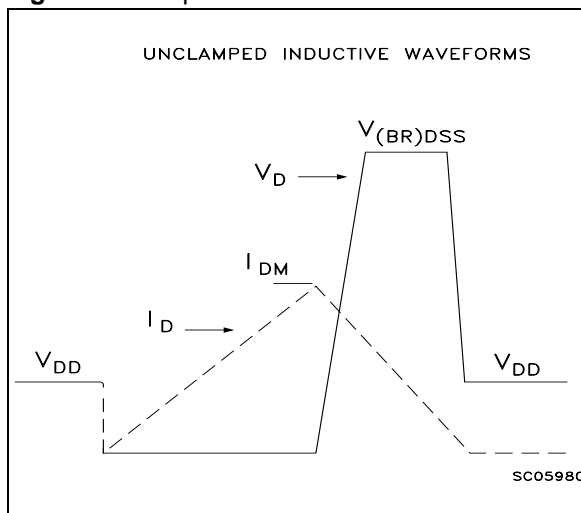


Fig. 3: Switching Times Test Circuits For Resistive Load

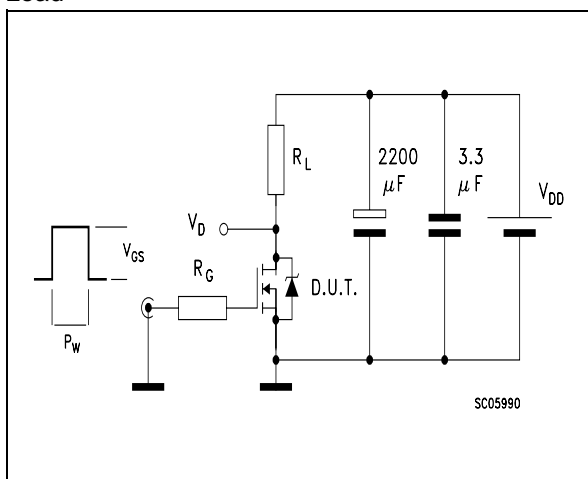


Fig. 4: Gate Charge test Circuit

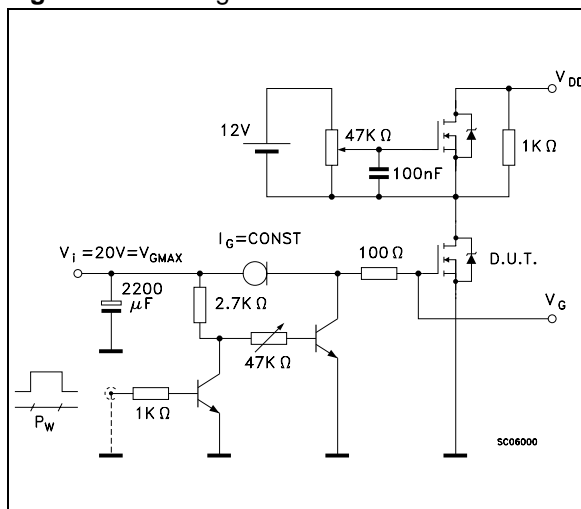
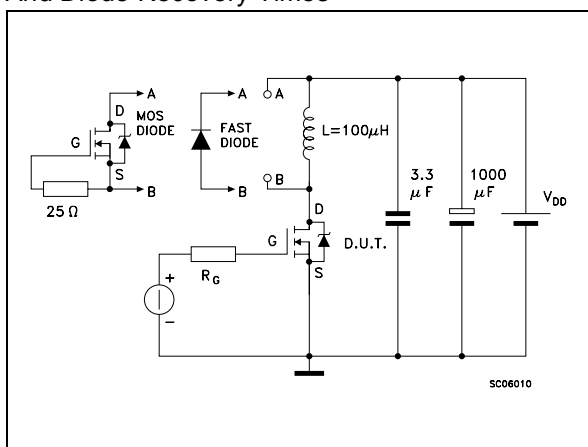
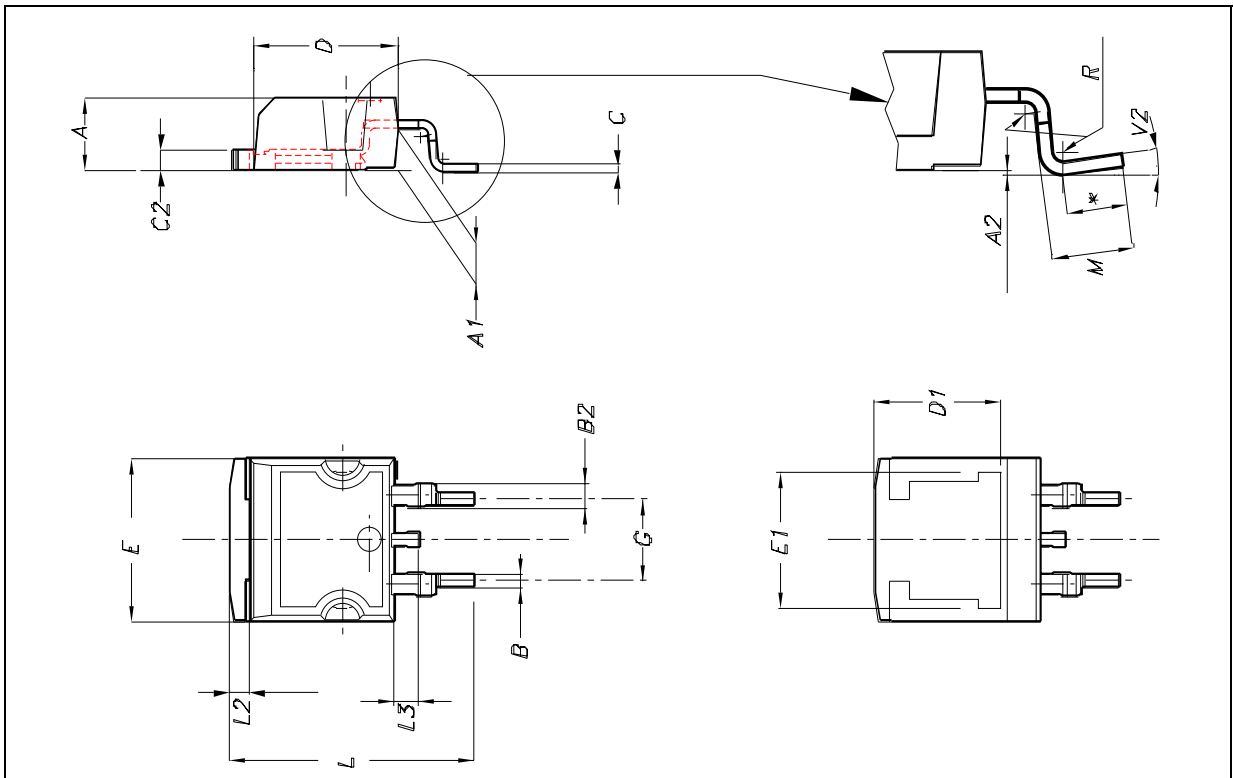


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



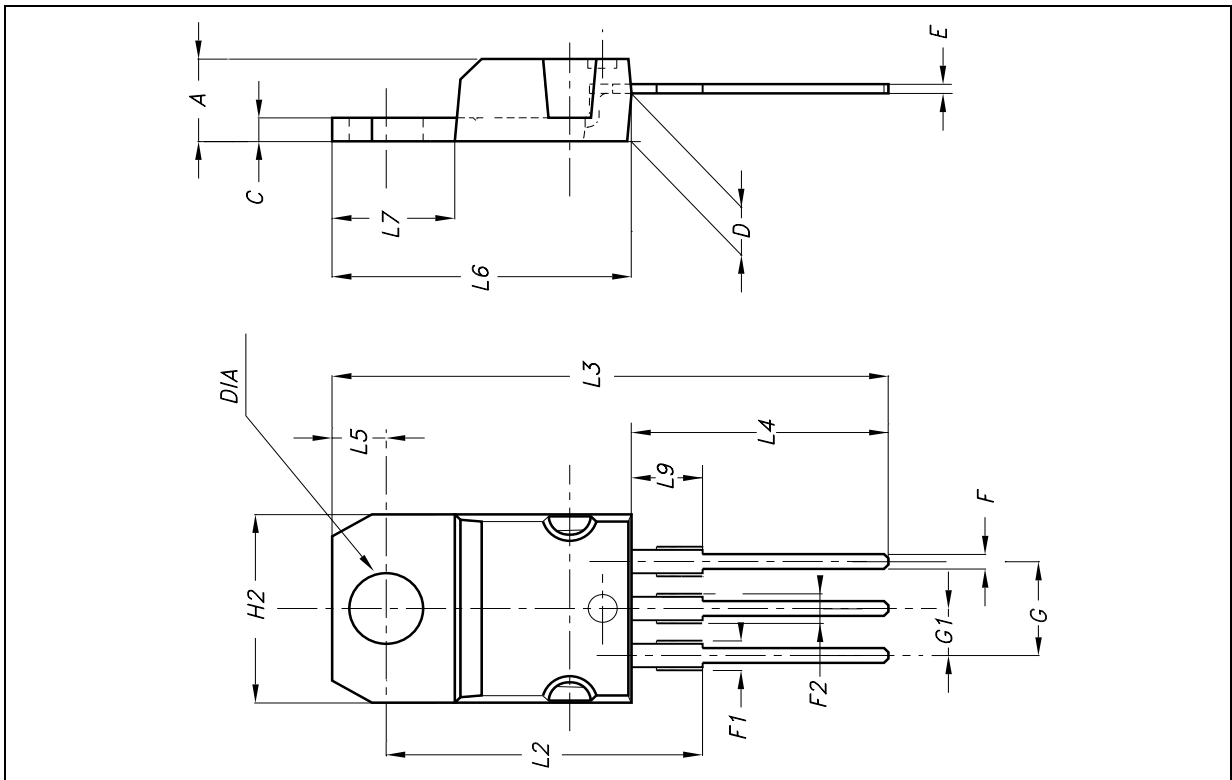
**D<sup>2</sup>PAK MECHANICAL DATA**

DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
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	0.028		0.037
B2	1.14		1.7	0.045		0.067
C	0.45		0.6	0.018		0.024
C2	1.21		1.36	0.048		0.054
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.394		0.409
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.591		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.069
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°	0°		8°

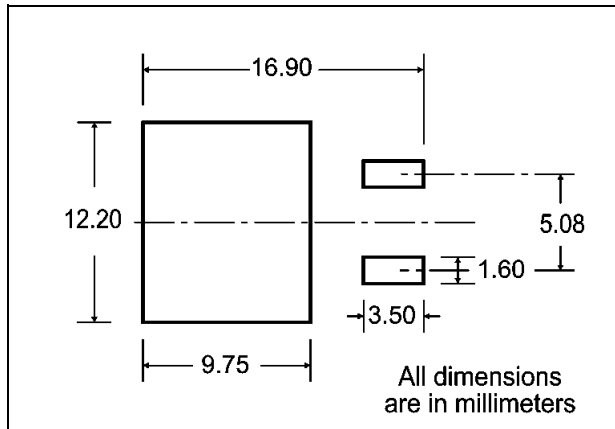


**TO-220 MECHANICAL DATA**

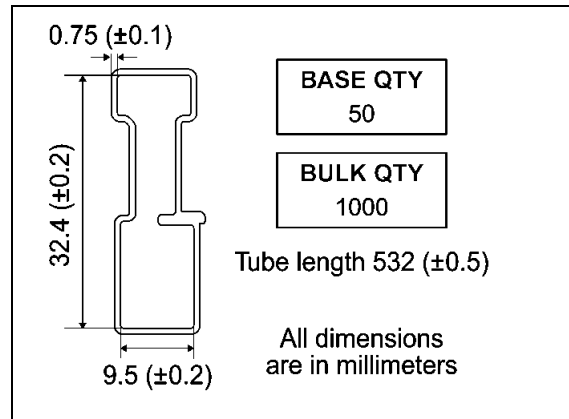
DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
A	4.4		4.6	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.40		2.70	0.094		0.106
H2	10		10.40	0.393		0.409
L2		16.40			0.645	
L3		28.90			1.137	
L4	13		14	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
DIA	3.75		3.85	0.147		0.151



**D2PAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

**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

**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

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius R min.

\* on sales type

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