



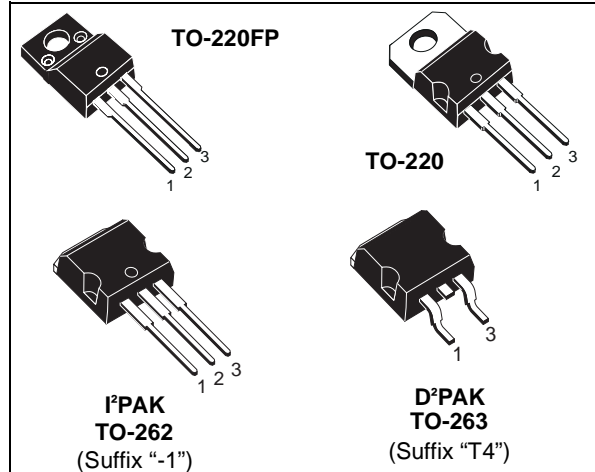
# STB55NF06 STB55NF06-1 STP55NF06 STP55NF06FP

N-CHANNEL 60V - 0.015 Ω - 50A TO-220/TO-220FP/I<sup>2</sup>PAK/D<sup>2</sup>PAK  
STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP55NF06	60 V	<0.018 Ω	50 A
STB55NF06-1	60 V	<0.018 Ω	50 A
STB55NF06	60 V	<0.018 Ω	50 A
STP55NF06FP	60 V	<0.018 Ω	50 A(*)

- TYPICAL R<sub>DS(on)</sub> = 0.015 Ω
- 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")
- THROUGH-HOLE I<sup>2</sup>PAK (TO-262) POWER PACKAGE IN TUBE (SUFFIX "-1")

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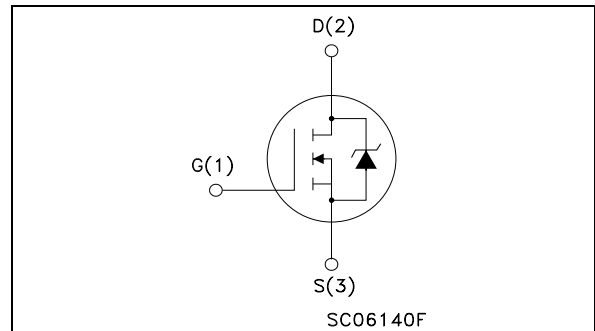
## DESCRIPTION

This Power MOSFET is the latest development of ST-Microelectronics 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

- HIGH CURRENT, HIGH SWITCHING SPEED
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE

## INTERNAL SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP_B55NF06(-1)	STP55NF06FP	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	60		V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	60		V
V <sub>GS</sub>	Gate- source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	50	50(*)	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	35	35(*)	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	200	200(*)	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	110	30	W
	Derating Factor	0.73	0.2	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	7		V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	350		mJ
T <sub>stg</sub>	Storage Temperature	-55 to 175		°C
T <sub>j</sub>	Operating Junction Temperature			

(●) Pulse width limited by safe operating area  
 (\*) Refer to soa for the max allowable current value on FP-type due to R<sub>th</sub> value

(1) I<sub>SD</sub> ≤ 50A, di/dt ≤ 400A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>  
 (2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 25A, V<sub>DD</sub> = 30V

**STB50NF06 STB55NF06-1 STP55NF06 STP55NF06FP**

**THERMAL DATA**

			I <sup>2</sup> PAK D <sup>2</sup> PAK TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case	Max	1.36	5	°C/W
Rthj-amb T <sub>I</sub>	Thermal Resistance Junction-ambient Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec)	Max	62.5 300		°C/W °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	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 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> = ± 20 V			±100	nA

ON (\*)

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	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 27.5 A		0.015	0.018	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 15 V I <sub>D</sub> = 27.5 A		18		S
C <sub>iSS</sub> C <sub>oSS</sub> C <sub>rSS</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		1530 300 105		pF pF pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 30\text{ V}$ $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		16 8		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 48\text{ V}$ $I_D = 55\text{ A}$ $V_{GS} = 10\text{ V}$		44.5 10.5 17.5	60	nC nC nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		36 15		ns ns

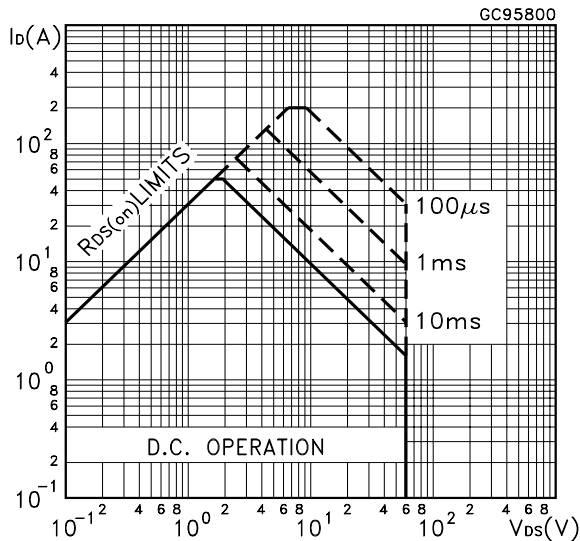
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**SOURCE DRAIN DIODE**

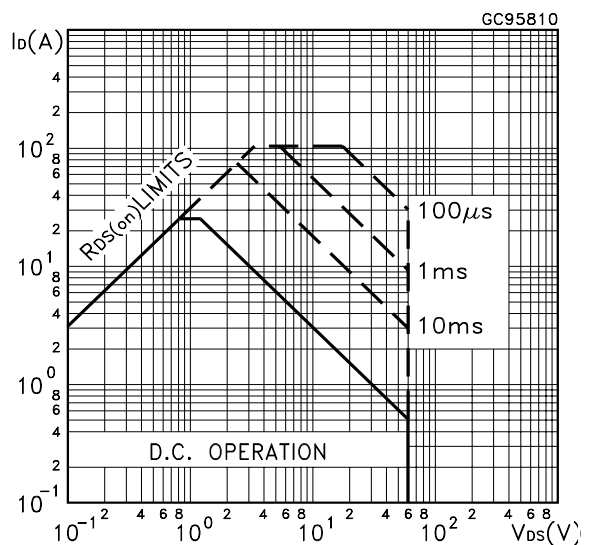
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				50 200	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 55\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 55\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		75 170 4.5		ns nC A

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 (•) Pulse width limited by safe operating area.

Safe Operating Area for

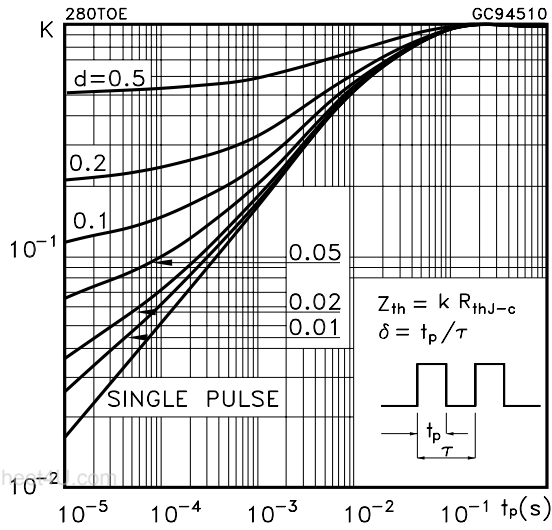


Safe Operating Area for TO-220FP

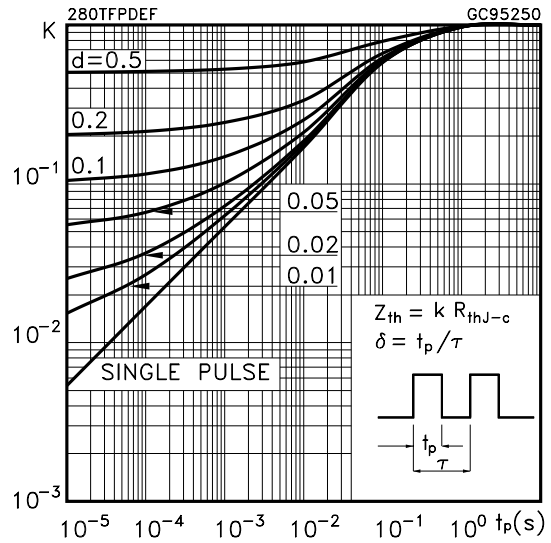


**STB50NF06 STB55NF06-1 STP55NF06 STP55NF06FP**

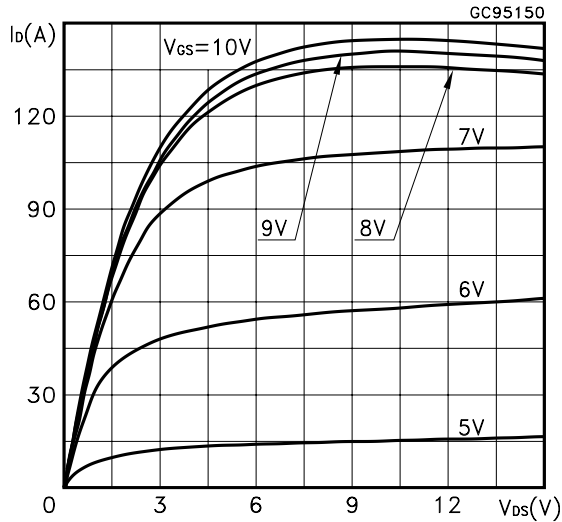
Thermal Impedance



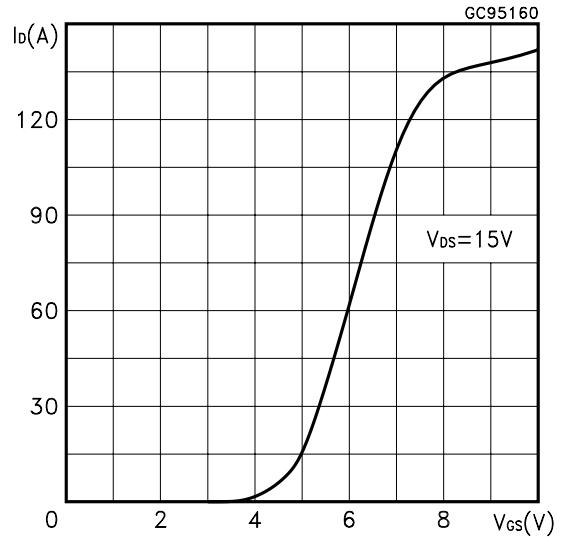
Thermal Impedance for TO-220FP



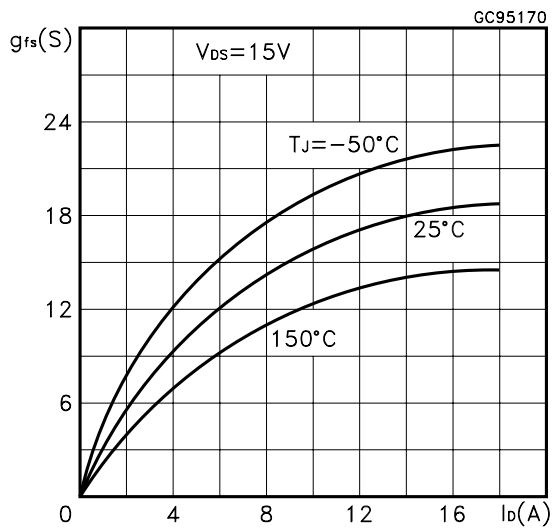
Output Characteristics



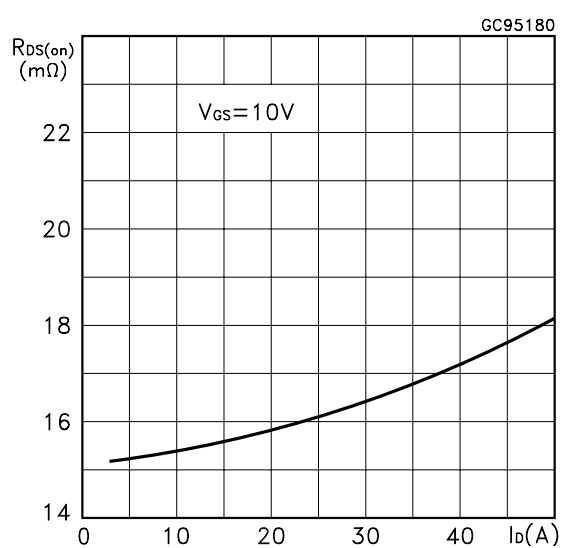
Transfer Characteristics



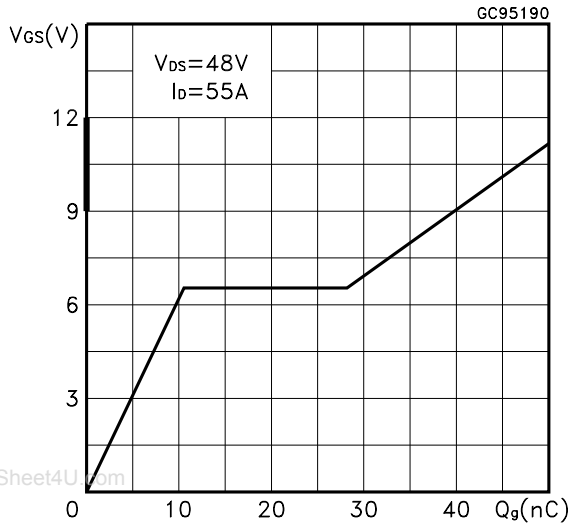
Transconductance



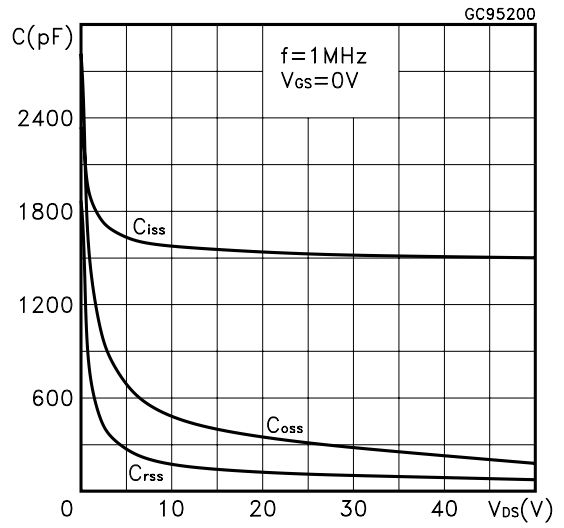
Static Drain-source On Resistance



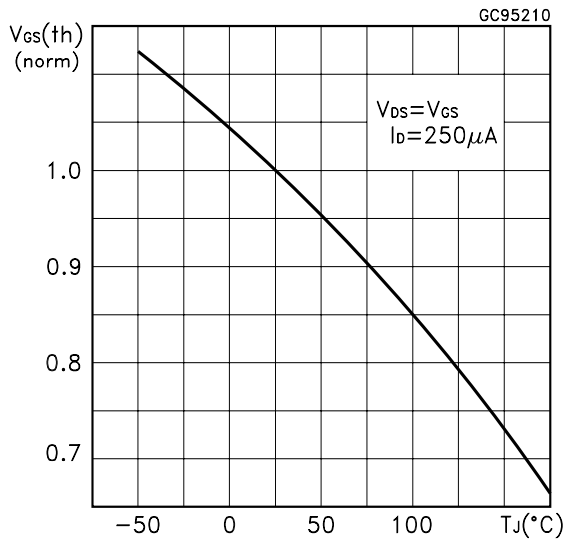
Gate Charge vs Gate-source Voltage



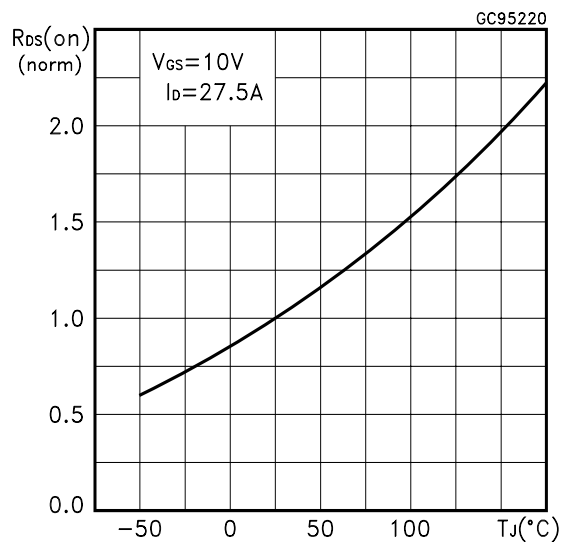
Capacitance Variations



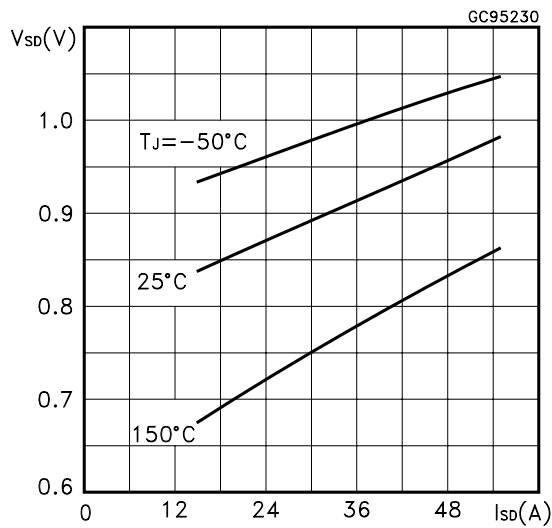
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage Temperature

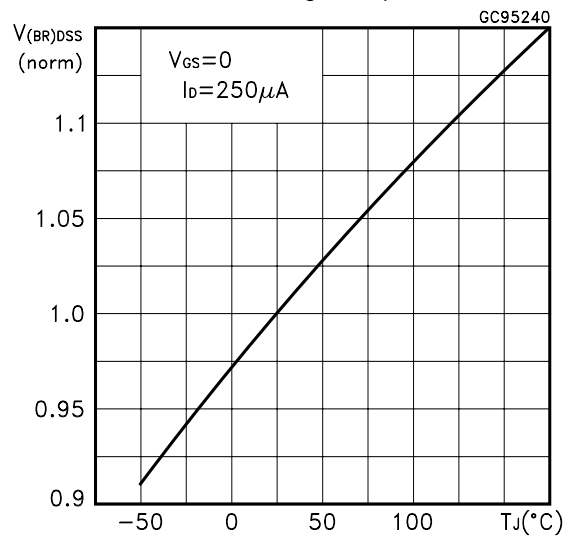


Fig. 1: Unclamped Inductive Load Test Circuit

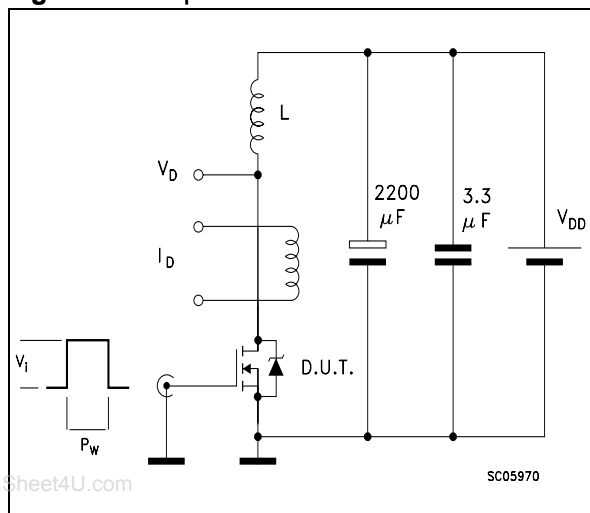


Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load

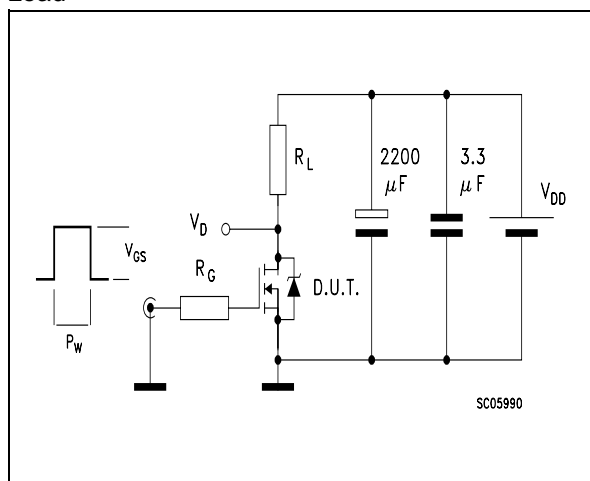


Fig. 4: Gate Charge test Circuit

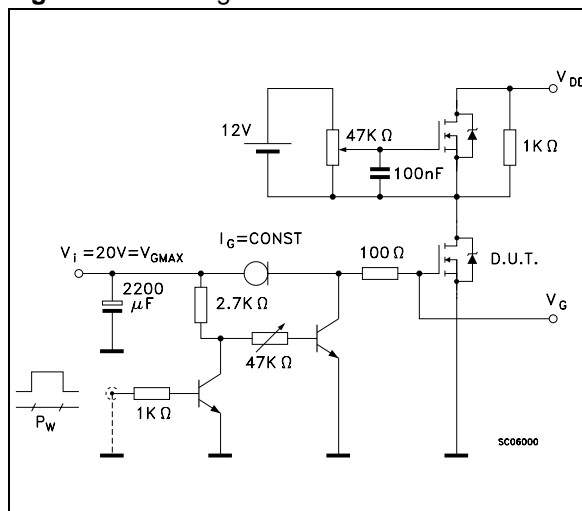
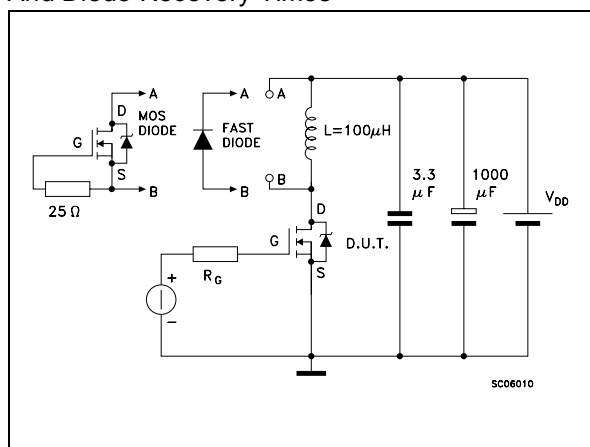


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

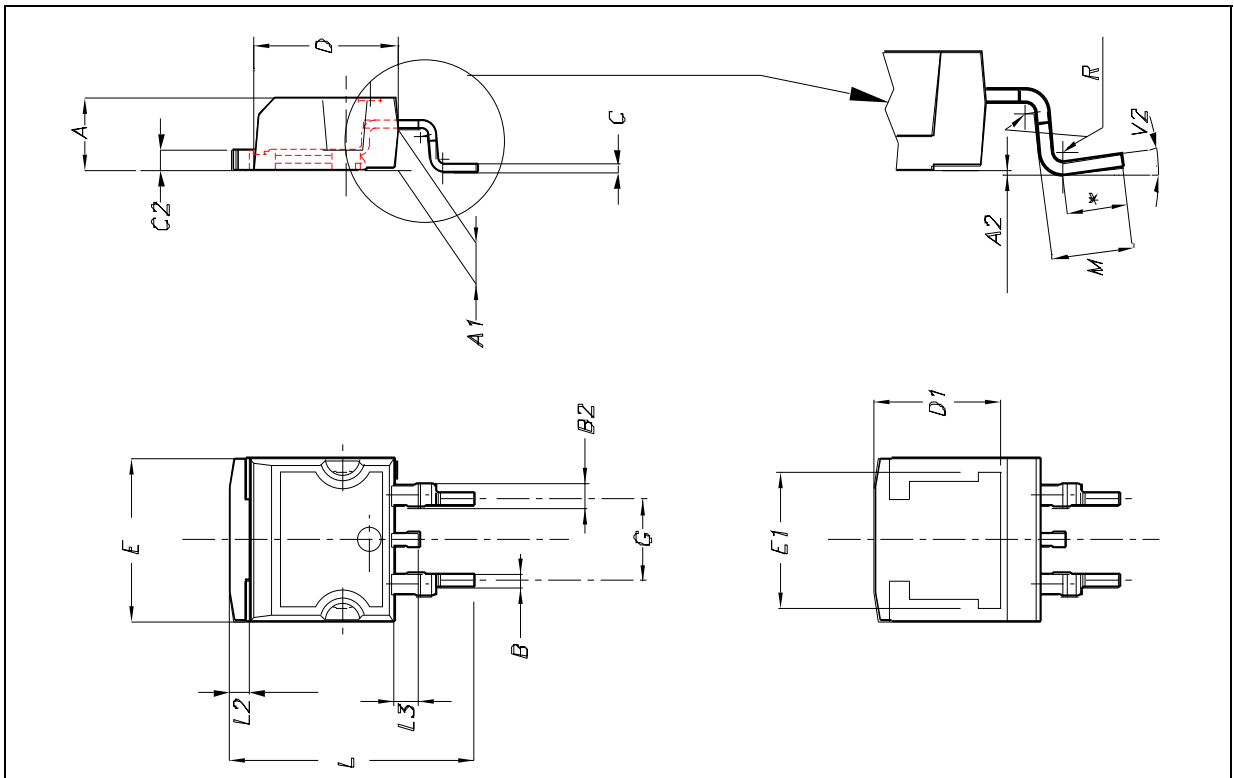


STB50NF06 STB55NF06-1 STP55NF06 STP55NF06FP

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°

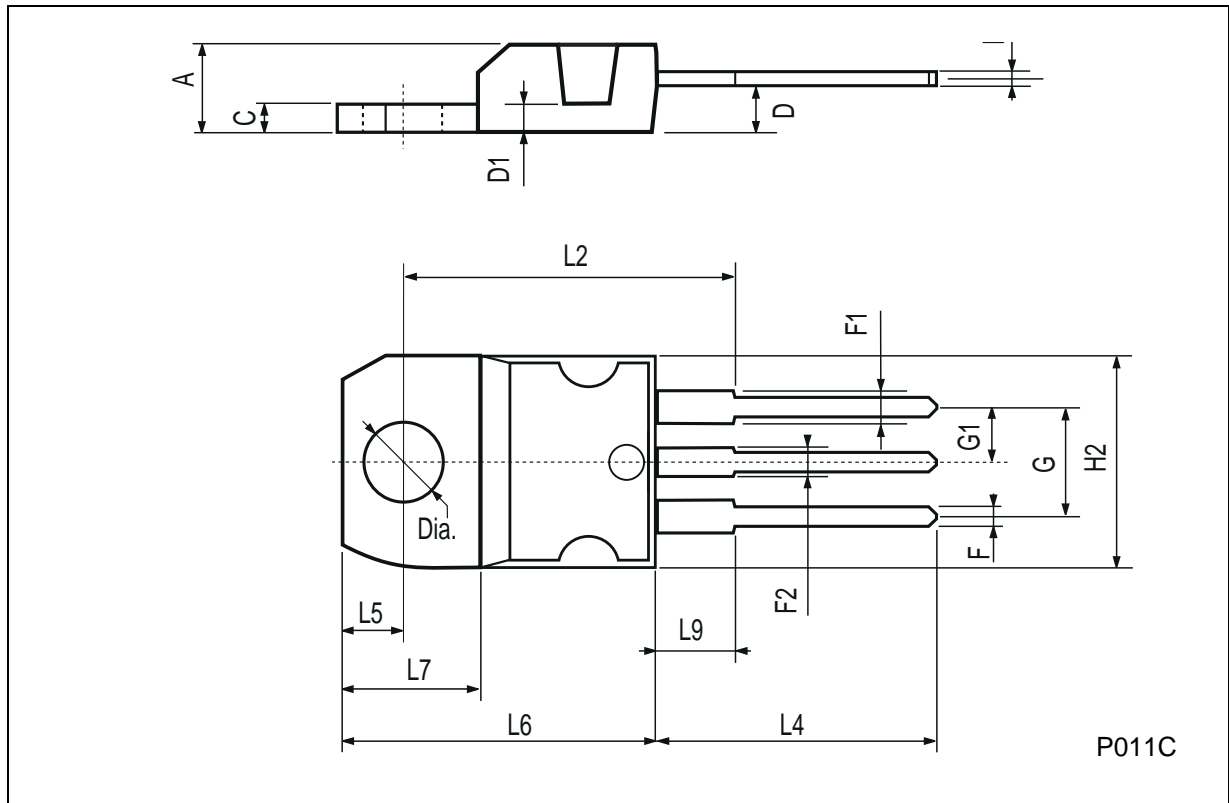
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**TO-220 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
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	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151

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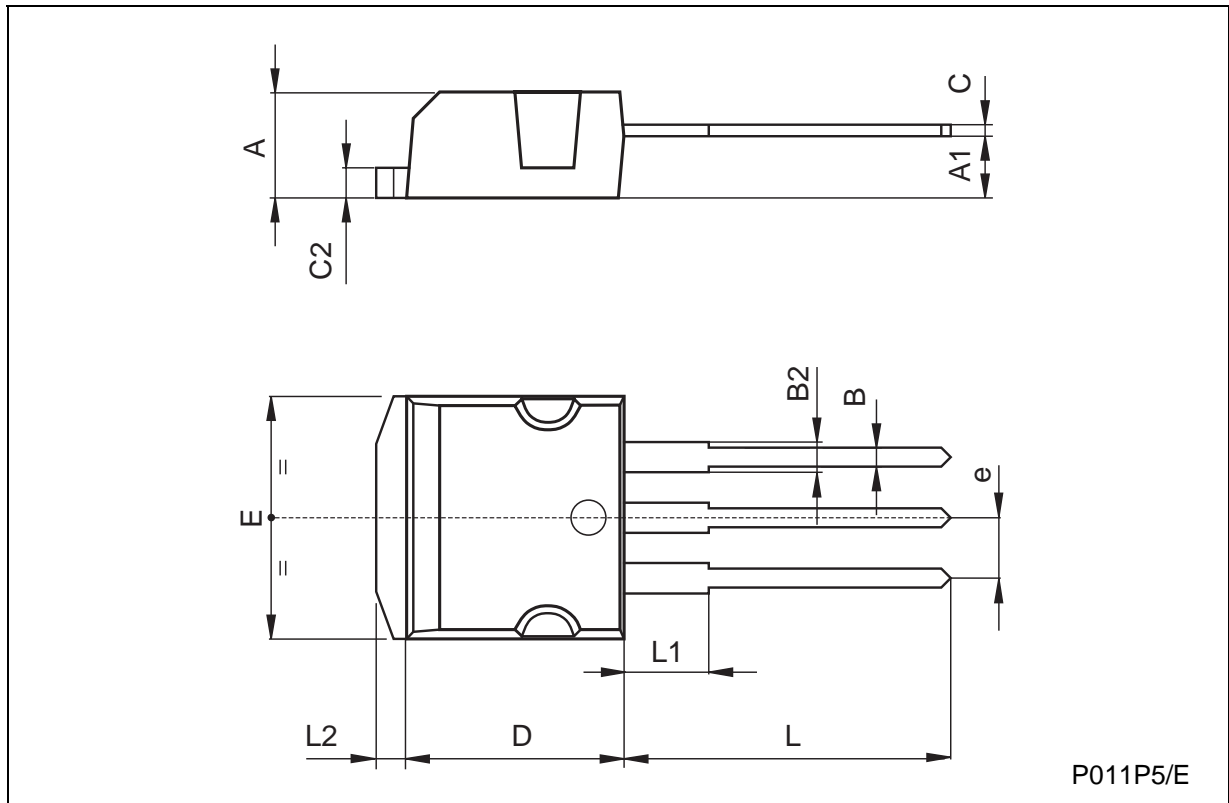




TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA

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
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
e	2.4		2.7	0.094		0.106
E	10		10.4	0.393		0.409
L	13.1		13.6	0.515		0.531
L1	3.48		3.78	0.137		0.149
L2	1.27		1.4	0.050		0.055

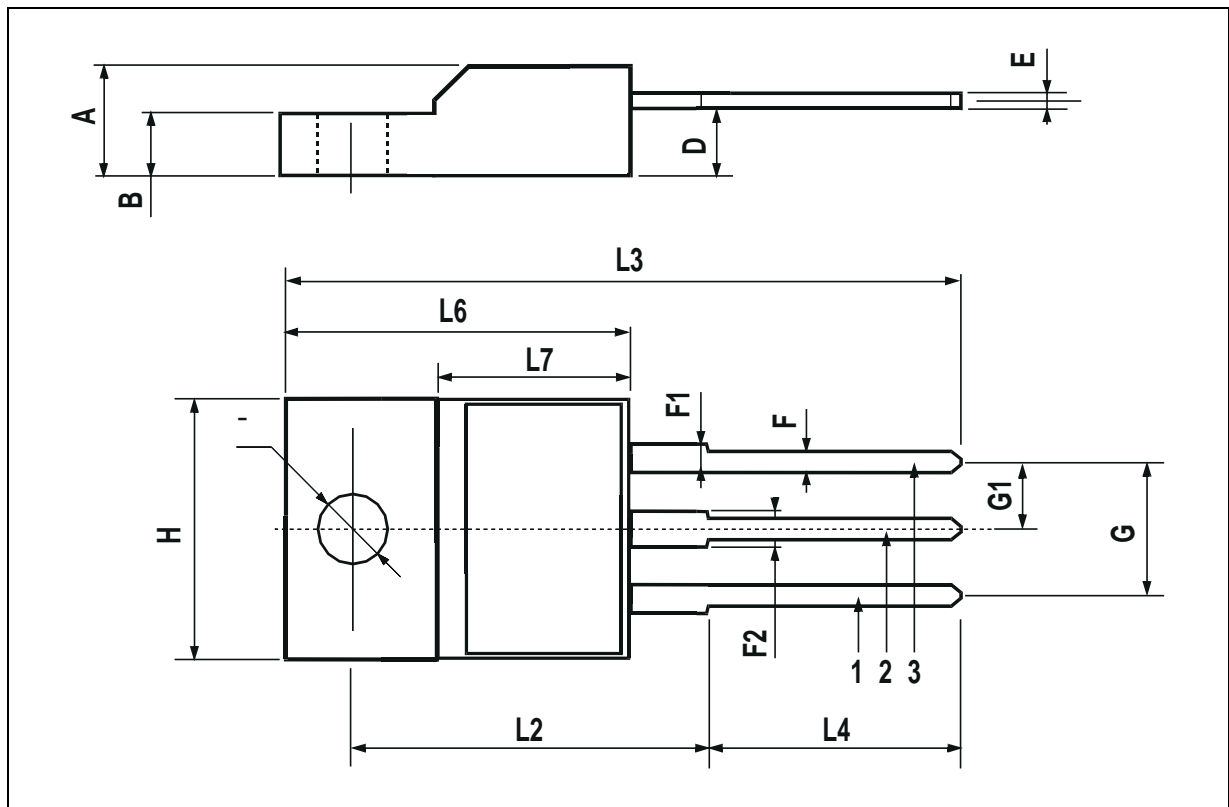
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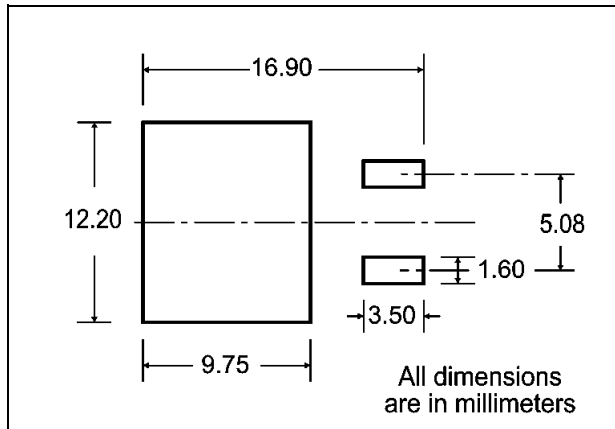
**TO-220FP MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126

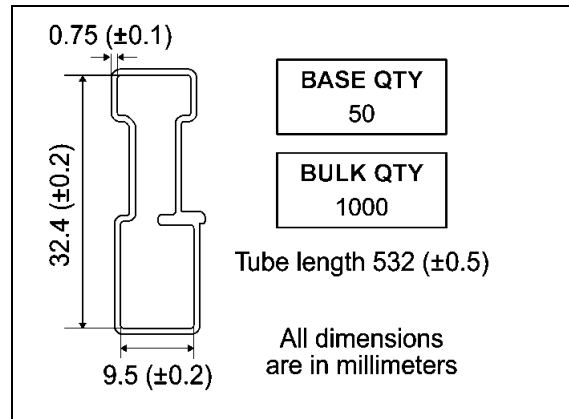
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**D2PAK FOOTPRINT**



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



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

Diagram showing the tape and reel shipment details. The reel has a diameter of A. The tape has a width of B. The distance from the center of the reel to the center of the tape is C. The distance from the center of the reel to the center of the tape slot is D. The distance from the center of the reel to the center of the tape slot is N. The distance from the center of the reel to the center of the tape slot is G. The distance from the center of the reel to the center of the tape slot is T. The distance from the center of the reel to the center of the tape slot is G measured at hub. The distance from the center of the reel to the center of the tape slot is 40 mm min. Access hole at slot location. The distance from the center of the reel to the center of the tape slot is Full radius. The distance from the center of the reel to the center of the tape slot is Tape slot in core for tape start 2.5mm min. width.

**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

Diagram showing the tape mechanical data. The tape has a width of W. The distance from the center of the tape to the center of the cavity is A0. The distance from the center of the tape to the center of the cavity is B0. The distance from the center of the tape to the center of the cavity is D. The distance from the center of the tape to the center of the cavity is D1. The distance from the center of the tape to the center of the cavity is E. The distance from the center of the tape to the center of the cavity is F. The distance from the center of the tape to the center of the cavity is K0. The distance from the center of the tape to the center of the cavity is P0. The distance from the center of the tape to the center of the cavity is P1. The distance from the center of the tape to the center of the cavity is P2. The distance from the center of the tape to the center of the cavity is R. The distance from the center of the tape to the center of the cavity is T. The distance from the center of the tape to the center of the cavity is W. The distance from the center of the tape to the center of the cavity is 10 pitches cumulative tolerance on tape +/- 0.2 mm. The distance from the center of the tape to the center of the cavity is Center line of cavity. The distance from the center of the tape to the center of the cavity is User Direction of Feed. The distance from the center of the tape to the center of the cavity is Bending radius R min. The distance from the center of the tape to the center of the cavity is FEED DIRECTION.

\* on sales type



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