STP200NF04L
STB200NF04L - STB200NF04L-1

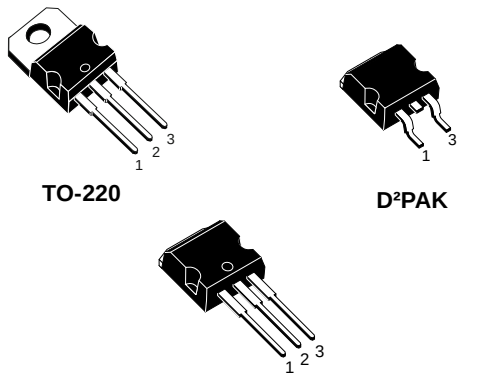
N-CHANNEL 40V - 3 mΩ - 120 A TO-220/D²PAK/I²PAK
STripFET™ II MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STB200NF04L	40 V	3.5 mΩ	120 A
STP200NF04L	40 V	3.8 mΩ	120 A
STB200NF04L-1	40 V	3.8 mΩ	120 A

- TYPICAL $R_{DS(on)}$ = 3mΩ
- 100% AVALANCHE TESTED
- LOW THERESHOLD DRIVE

Figure 1: Package



DESCRIPTION

This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" stripbased process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less-critical alignement steps therefore a remarkable manufacturing reproducibility. This new improved device has been specifically designed for Automotive applications.

APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED

Figure 2: Internal Schematic Diagram

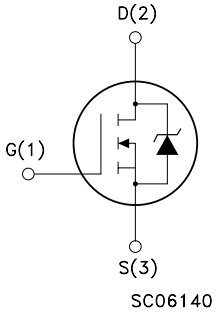


Table 2: Order Codes

PART NUMBER	MARKING	PACKAGE	PACKAGING
STP200NF04L	P200NF04L	TO-220	TUBE
STB200NF04L	B200NF04L	D²PAK	TAPE & REEL
STB200NF04L-1	B200NF04L	I²PAK	TUBE

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	40	V
V_{GDR}	Drain-gate Voltage (R_{GS}=20 KΩ)	40	V
V_{GS}	Gate- source Voltage	± 16	V
I_D (**)	Drain Current (continuous) at T_C = 25°C	120	A
I_D	Drain Current (continuous) at T_C = 100°C	120	A
I_{DM} (2)	Drain Current (pulsed)	480	A
P_{TOT}	Total Dissipation at T_C = 25°C	300	W
	Derating Factor	2	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	3.6	V/ns
E_{AS} (3)	Single Pulse Avalanche Energy	1.4	J
T_{stg}	Storage Temperature	-55 to 175	°C
T_j	Max. Operating Junction Temperature		

(1)$I_{SD} \leq 100$ A, di/dt ≤ 240 A/µs, $V_{DD} \leq 32$, $T_j \leq T_{JMAX}$
(2) Pulse width limited by safe operating area.
(3) Starting T_j = 25°C, I_{AR} = 50A, V_{DD} = 30V
(**) Current limited by Package

Table 4: Thermal Data

			TO-220/I²PAK	D²PAK	Unit
Rthj-case	Thermal Resistance Junction-case	Max	0.50		°C/W
Rthj-pcb (*)	Thermal Resistance Junction-pcb	Max		35	°C/W
Rthja	Thermal Resistance Junction-ambient	Max	62.5	--	
T_l	Maximum Lead Temperature For Soldering Purpose		300	--	°C

(*)When mounted on 1 inch² FR4 2oZ Cu

ELECTRICAL CHARACTERISTICS (T_{CASE} =25°C UNLESS OTHERWISE SPECIFIED)

Table 5: On/Off

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0		40			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS}= Max Rating V_D = Max Rating, T_C= 125 °C				1 10	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 16V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA		1		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V, I_D = 50 A V_{GS} = 5 V, I_D = 50 A	**TO-220 I²PAK**		3.3 3.8	3.8 4.6	mΩ mΩ
		V_{GS} = 10 V, I_D = 50 A V_{GS} = 5 V, I_D = 50 A	**D²PAK**		3.0 3.5	3.5 4.3	mΩ mΩ

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 6: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (4)	Forward Transconductance	V_{DS} = 15 V, I_D = 20 A		60		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		6400 1300 190		pF pF pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 20 V, I_D = 50 A, R_G= 4.7 Ω V_{GS} = 4.5 V (see Figure 16)		37 270 90 80		ns ns ns ns
$t_{f(Voff)}$ t_f t_c	Turn-off Delay Time Fall Time Cross-over Time	V_{clamp} = 32 V, I_D = 100 A, R_G= 4.7 Ω V_{GS} = 4.5 V (see Figure 17)		85 125 160		ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 32 V, I_D = 100 A, V_{GS} = 4.5 V (see Figure 19)		72 20 28.5	90	nC nC nC

Table 7: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				100	A
I_{SDM} (1)	Source-drain Current (pulsed)				400	A
V_{SD} (4)	Forward On Voltage	I_{SD} = 160 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 100 A, di/dt = 100 A/µs, V_{DD} = 20 V, T_j = 150°C (see Figure 16)		88 240 5.5		ns nC A

(1) Pulse width limited by safe operating area
(4). Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.

Figure 3: Safe Operating Area

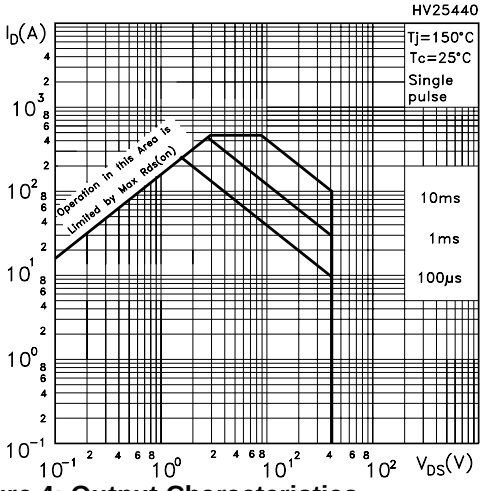


Figure 4: Output Characteristics

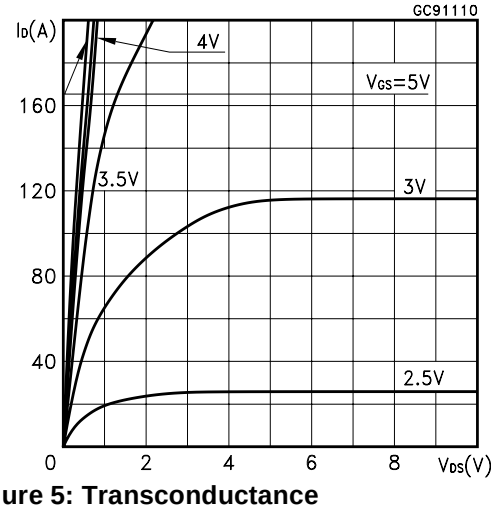


Figure 5: Transconductance

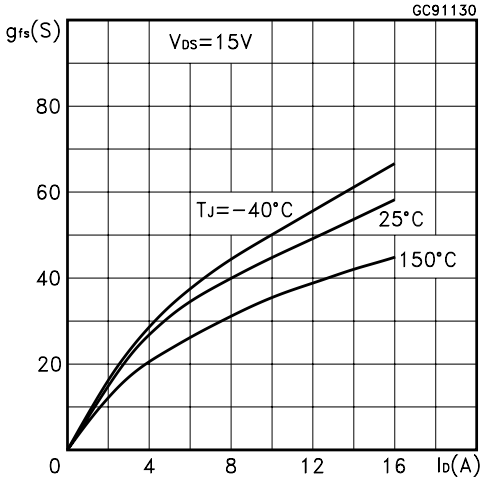


Figure 6: Thermal Impedance

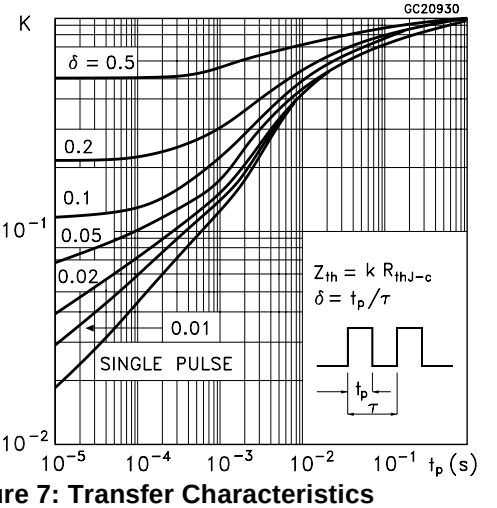


Figure 7: Transfer Characteristics

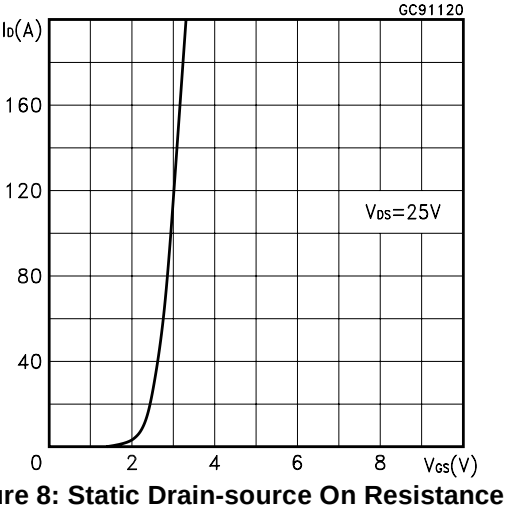


Figure 8: Static Drain-source On Resistance

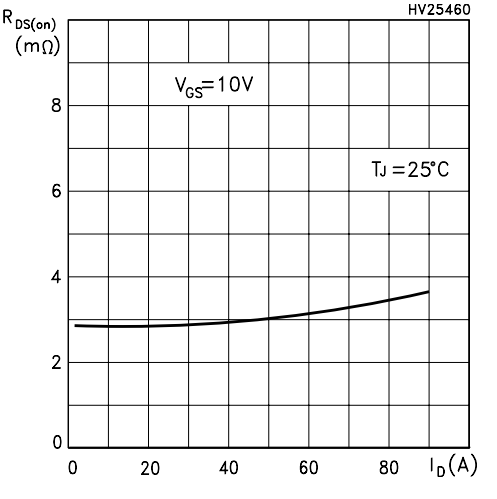


Figure 9: Gate Charge vs Gate-source Voltage

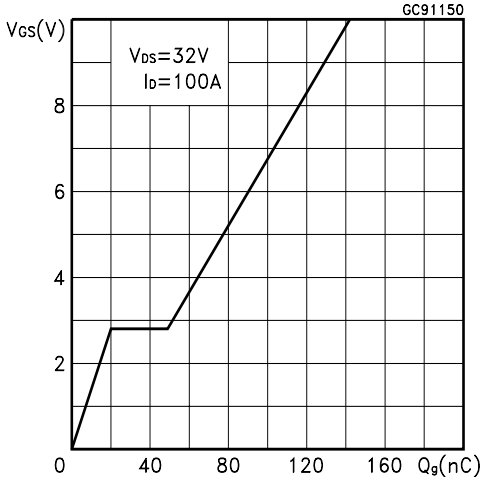


Figure 10: Normalized Gate Thereshold Voltage vs Temperature

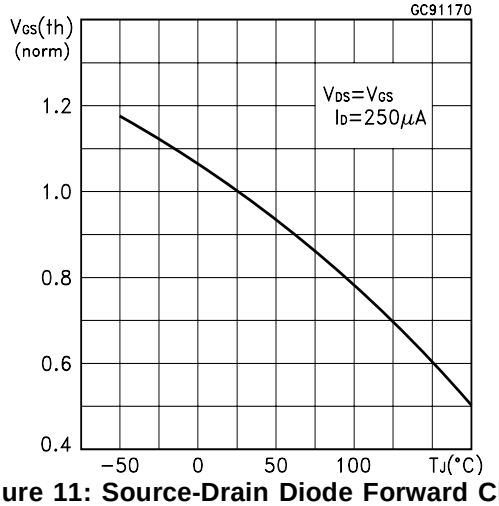


Figure 11: Source-Drain Diode Forward Characteristics

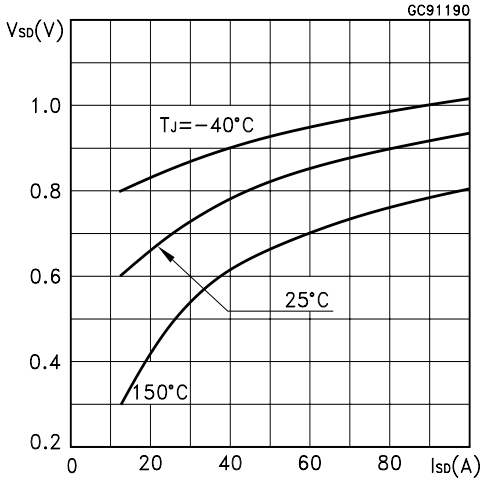


Figure 12: Capacitance Variations

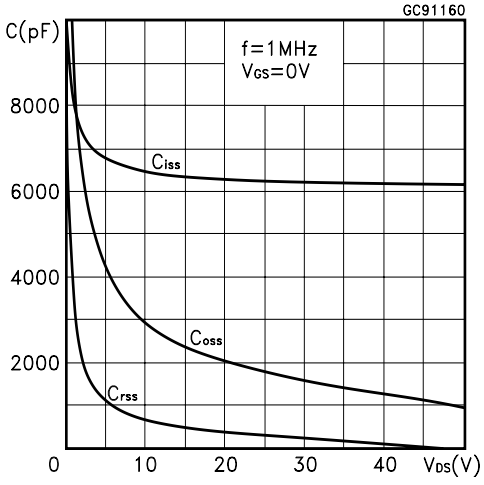


Figure 13: Normalized On Resistance vs Temperature

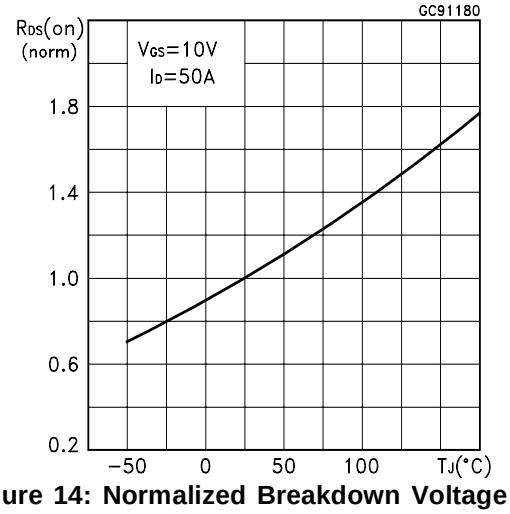


Figure 14: Normalized Breakdown Voltage vs Temperature

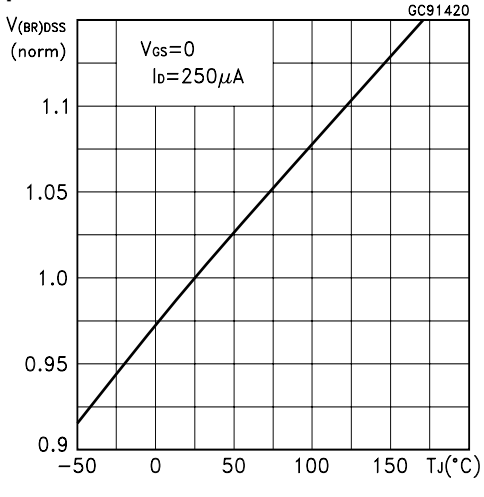


Figure 15: Unclamped Inductive Load Test Circuit

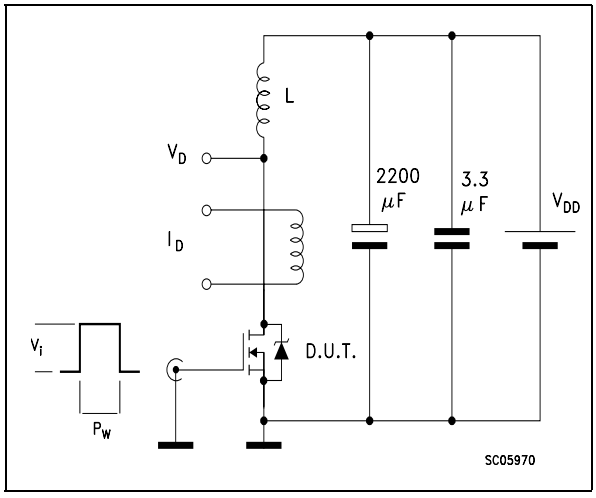


Figure 16: Switching Times Test Circuit For Resistive Load

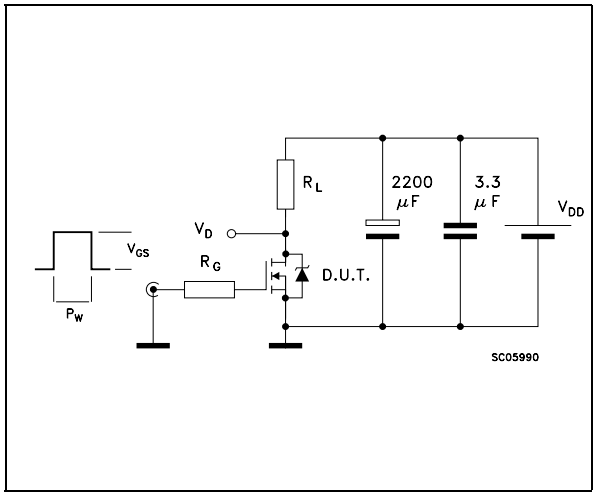


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

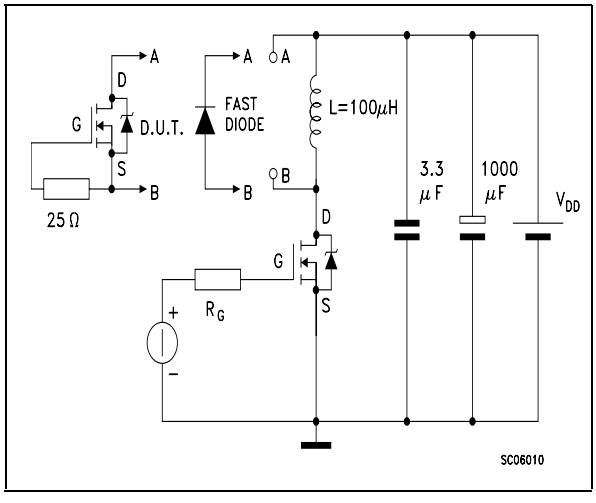


Figure 18: Unclamped Inductive Wafeform

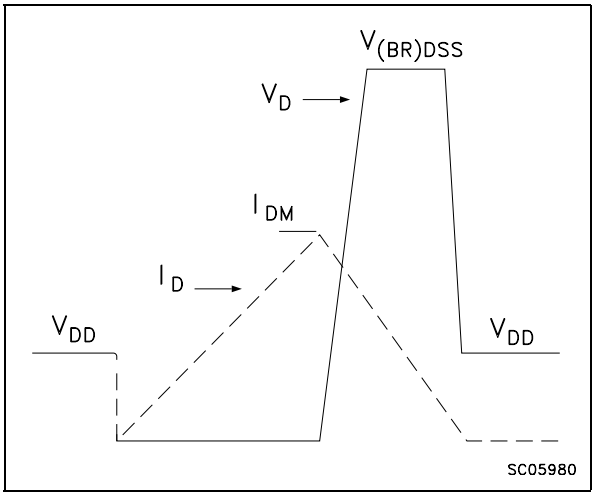
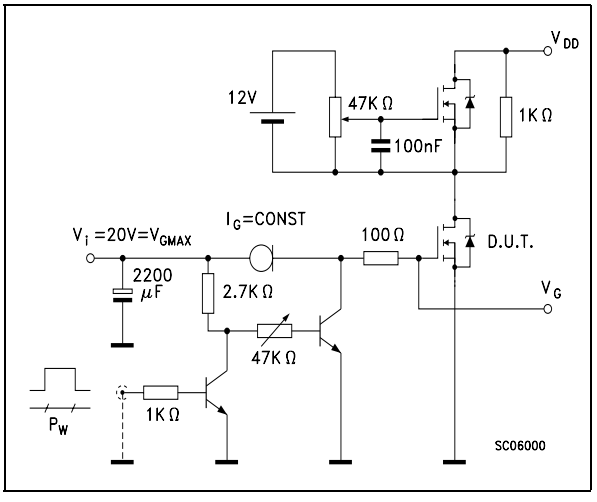
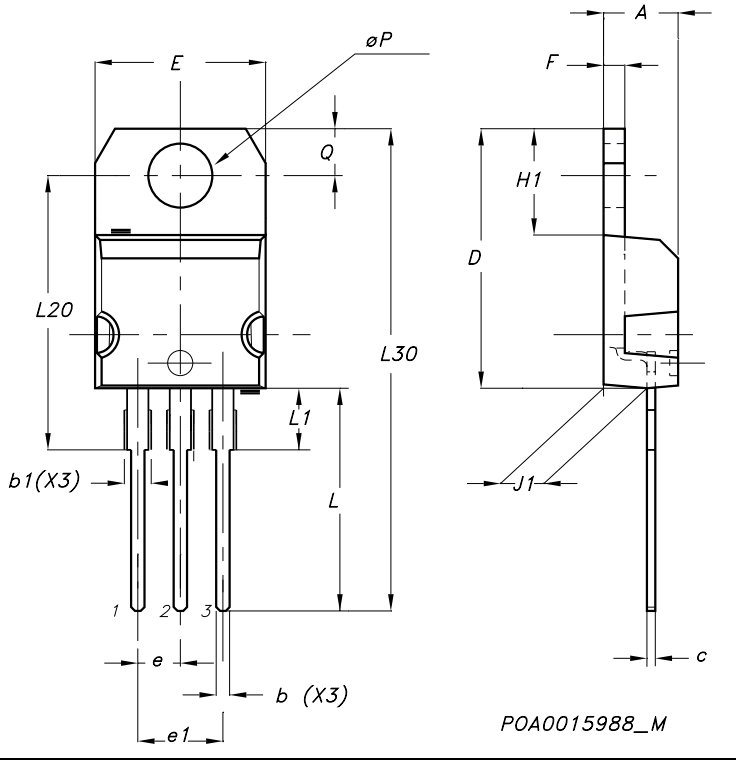


Figure 19: Gate Charge Test Circuit



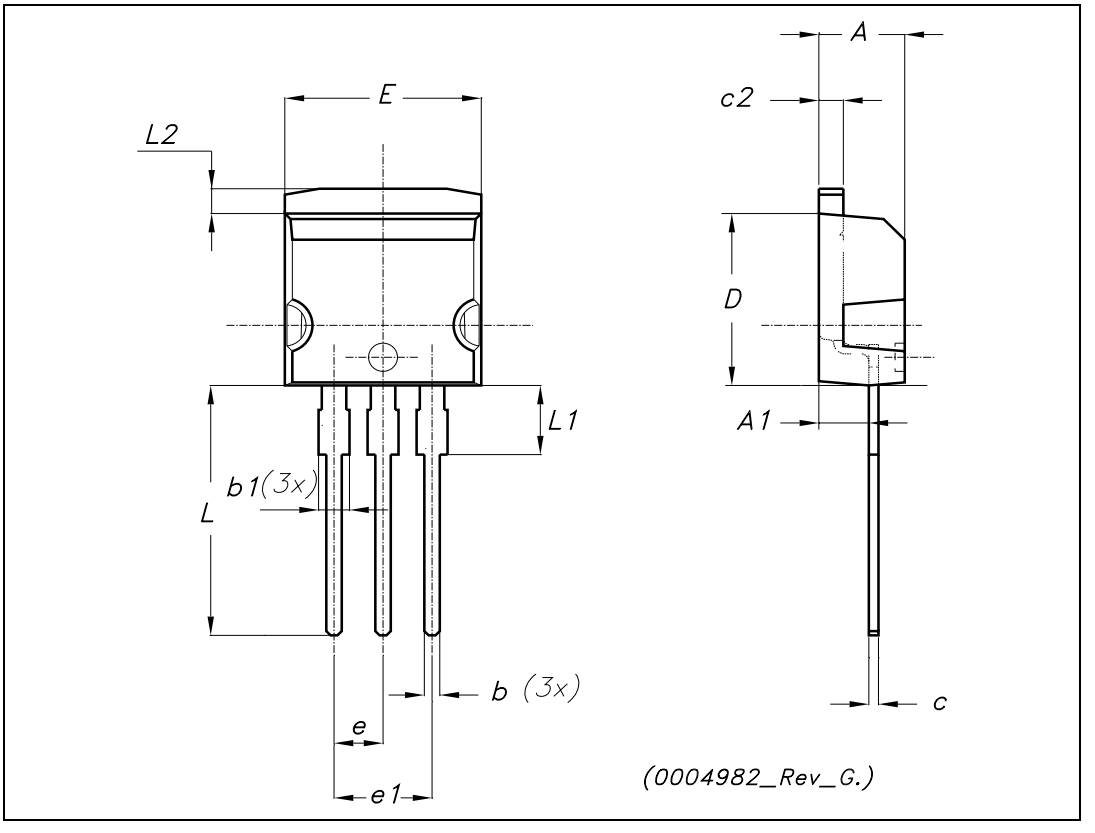
TO-220 MECHANICAL DATA

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	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
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		0.052
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	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



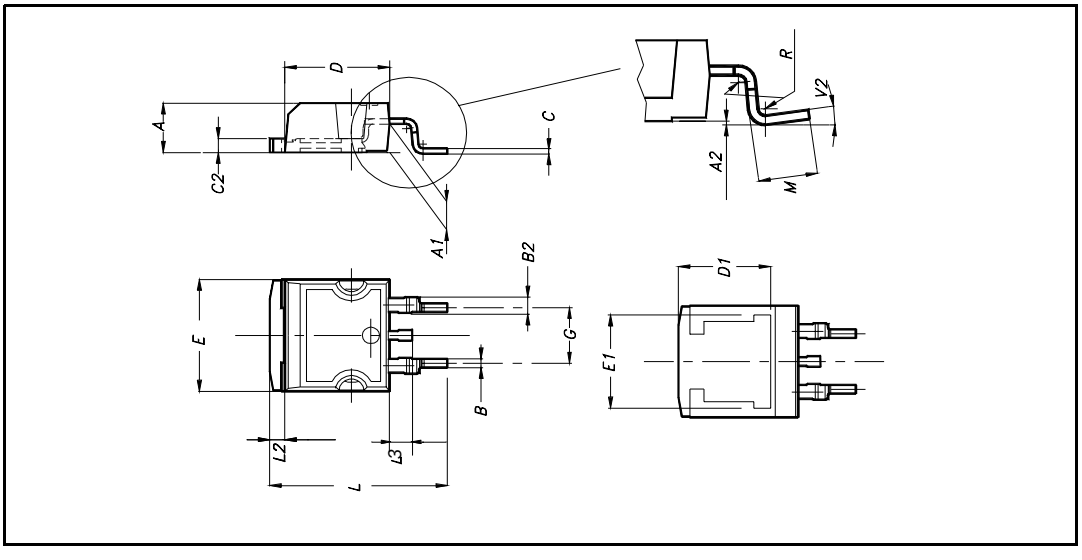
TO-262 (I^2PAK) MECHANICAL DATA

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

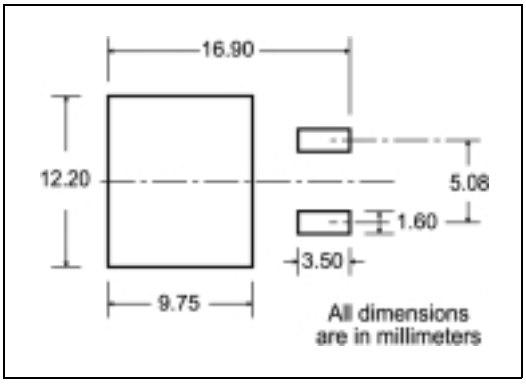


D²PAK MECHANICAL DATA

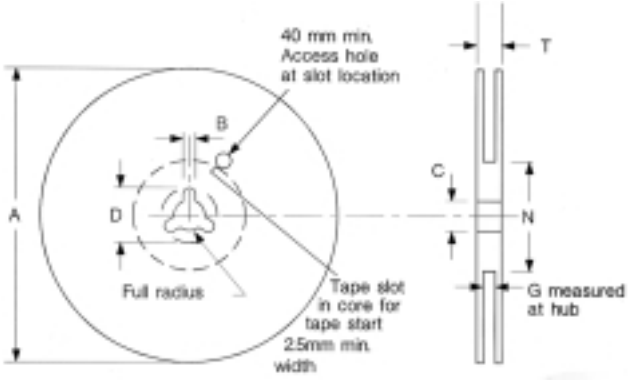
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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	0º		4º			



D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



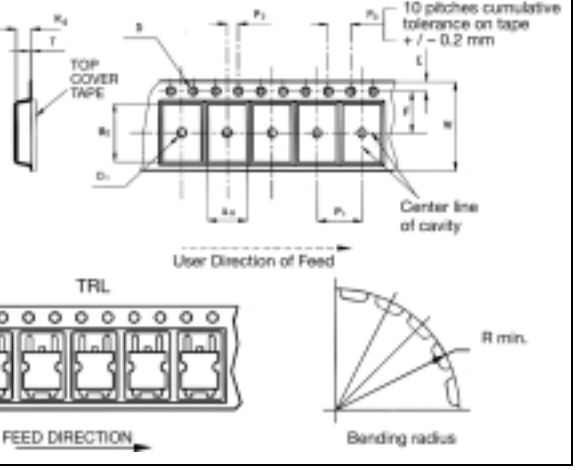
REEL MECHANICAL DATA

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		0795	
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



* on sales type

Table 8: Revision History

Date	Revision	Description of Changes
11/Apr/2005	1	First Release.