



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

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 alignment steps therefore a remarkable manufacturing reproducibility. This new improved device has been specifically designed for Automotive applications.

APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED

Figure 1: Package

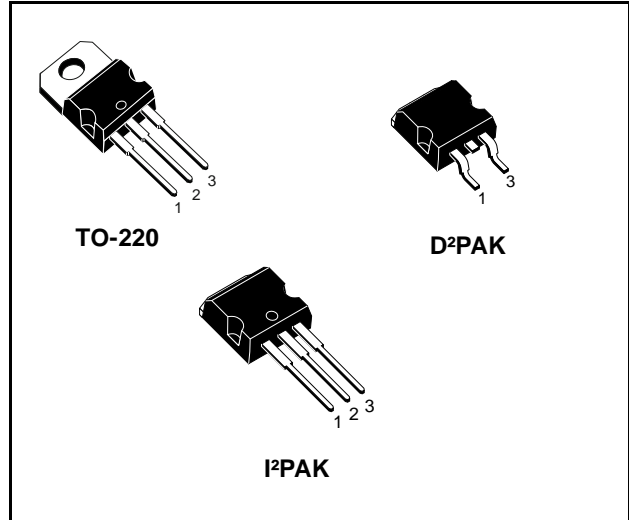


Figure 2: Internal Schematic Diagram

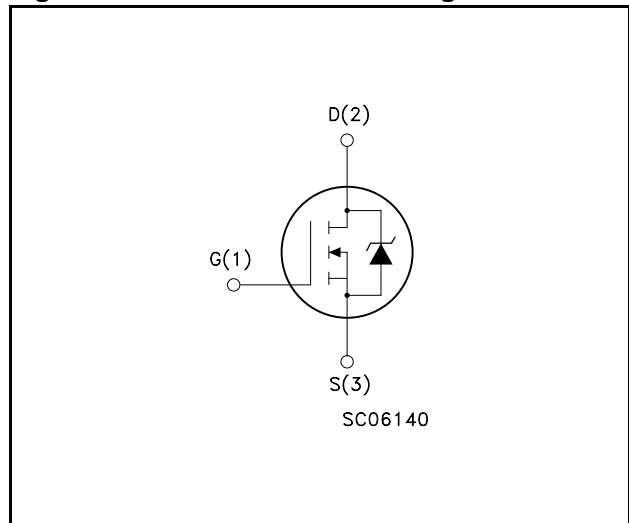


Table 2: Order Codes

PART NUMBER	MARKING	PACKAGE	PACKAGING
STP200NF04L	P200NF04L	TO-220	TUBE
STB200NF04L	B200NF04L	D ² PAK	TAPE & REEL
STB200NF04L-1	B200NF04L	I ² PAK	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} ≤ 100 A, di/dt ≤ 240 A/μs, V_{DD} ≤ 32, T_j ≤ 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/I ² PAK	D ² PAK	Unit
R _{thj-case}	Thermal Resistance Junction-case	Max	0.50		°C/W
R _{thj-pcb} (*)	Thermal Resistance Junction-pcb	Max		35	°C/W
R _{thja}	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	TO-220 I²PAK			3.3	mΩ
		V _{GS} = 5 V, I _D = 50 A				3.8	
		V _{GS} = 10 V, I _D = 50 A	D²PAK			3.0	mΩ
		V _{GS} = 5 V, I _D = 50 A				3.5	

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 6: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (4)	Forward Transconductance	$V_{DS} = 15\text{ V}$, $I_D = 20\text{ A}$		60		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		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	$V_{DD} = 20\text{ V}$, $I_D = 50\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (see Figure 16)		37 270 90 80		ns ns ns ns
$t_{r(voff)}$ t_f t_c	Turn-off Delay Time Fall Time Cross-over Time	$V_{clamp} = 32\text{ V}$, $I_D = 100\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (see Figure 17)		85 125 160		ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 32\text{ V}$, $I_D = 100\text{ A}$, $V_{GS} = 4.5\text{ V}$ (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	$I_{SD} = 160\text{ A}$, $V_{GS} = 0$			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 100\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j = 150^\circ\text{C}$ (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

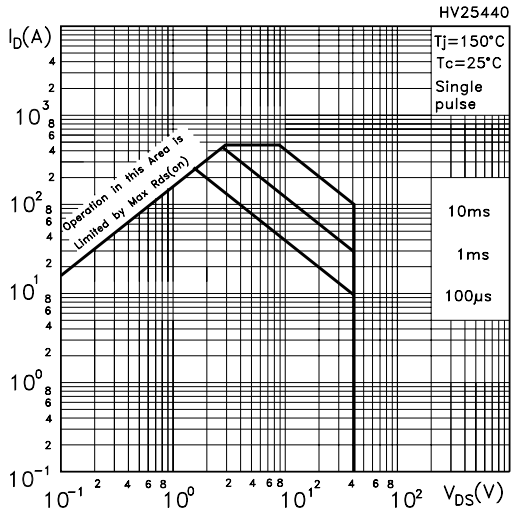


Figure 4: Output Characteristics

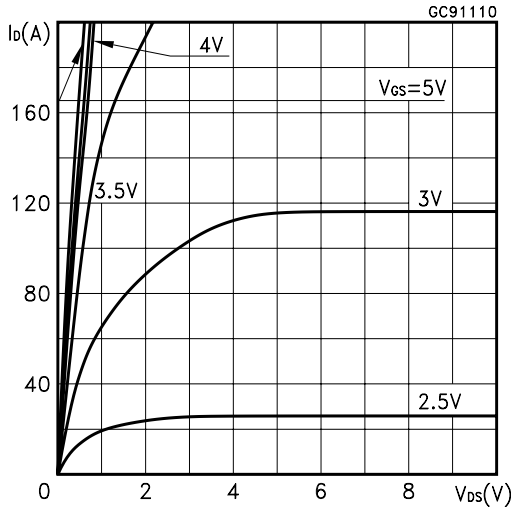


Figure 5: Transconductance

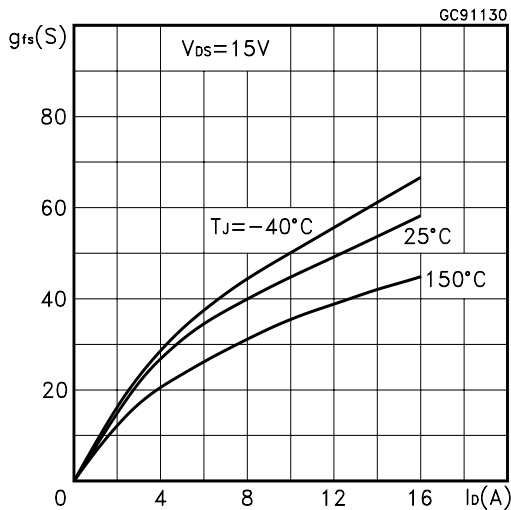


Figure 6: Thermal Impedance

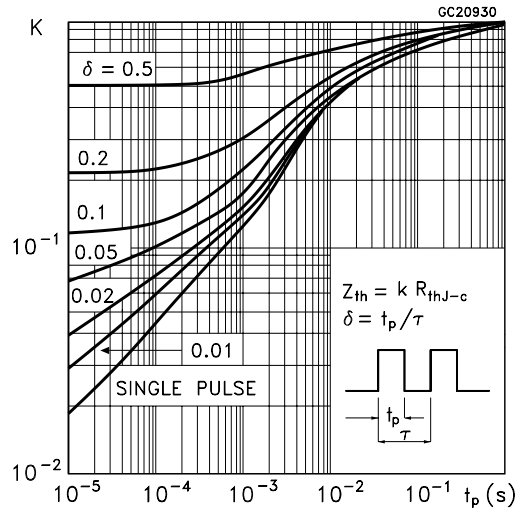


Figure 7: Transfer Characteristics

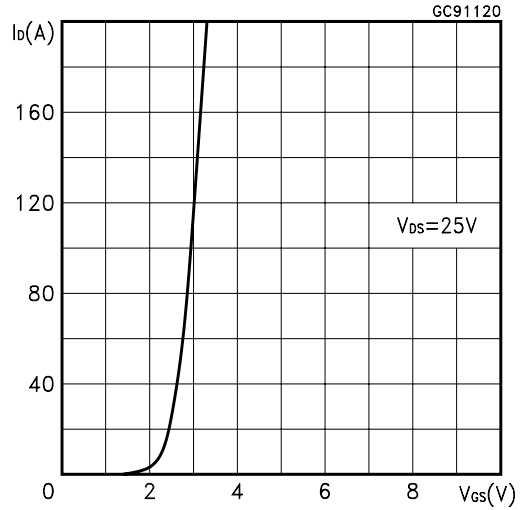


Figure 8: Static Drain-source On Resistance

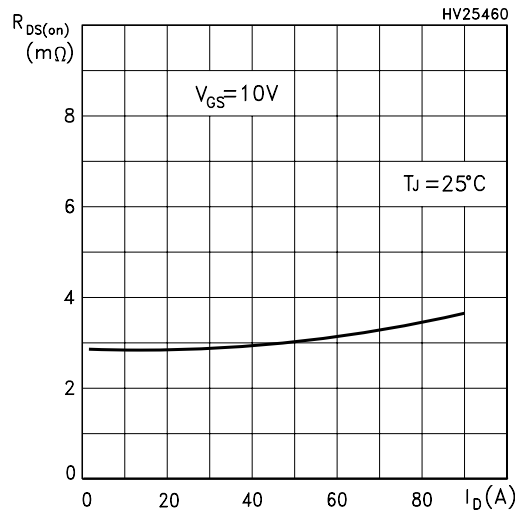


Figure 9: Gate Charge vs Gate-source Voltage

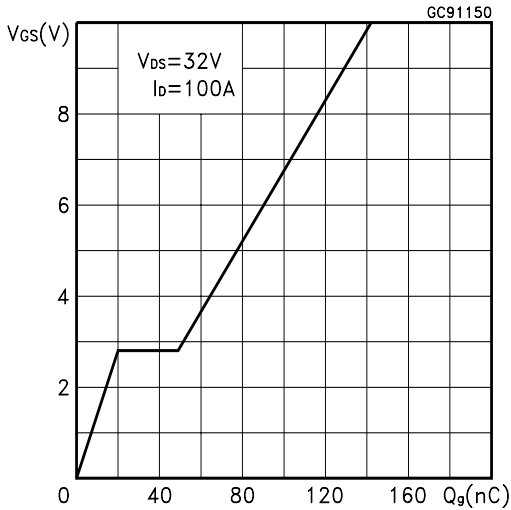


Figure 10: Normalized Gate Threshold Voltage vs Temperature

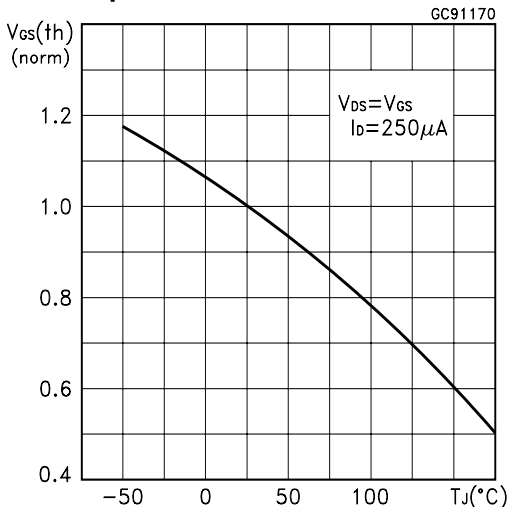


Figure 11: Source-Drain Diode Forward Characteristics

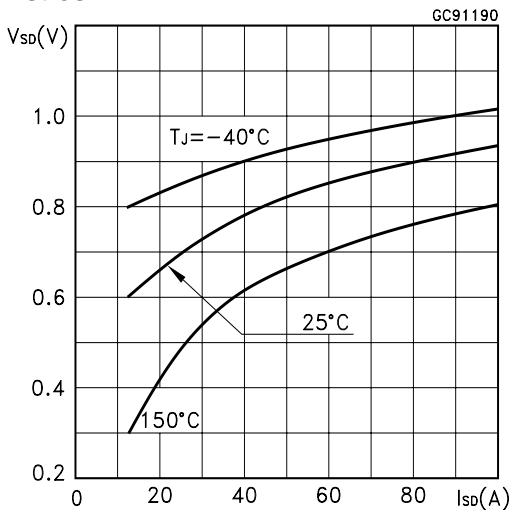


Figure 12: Capacitance Variations

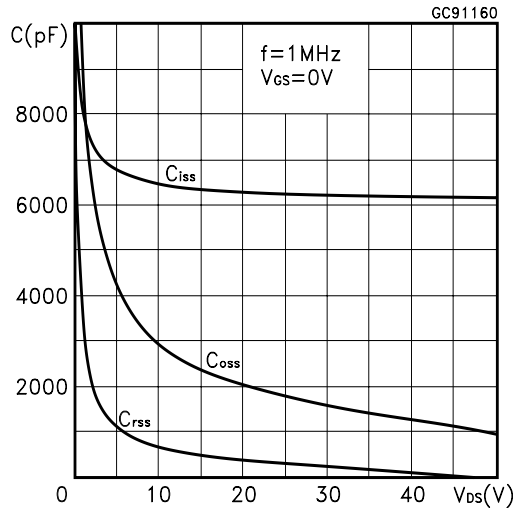


Figure 13: Normalized On Resistance vs Temperature

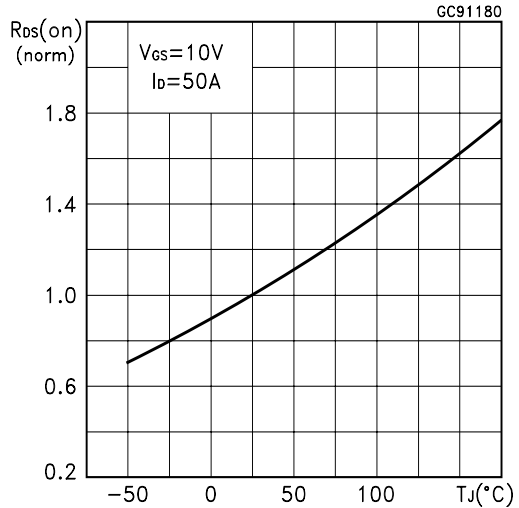


Figure 14: Normalized Breakdown Voltage vs Temperature

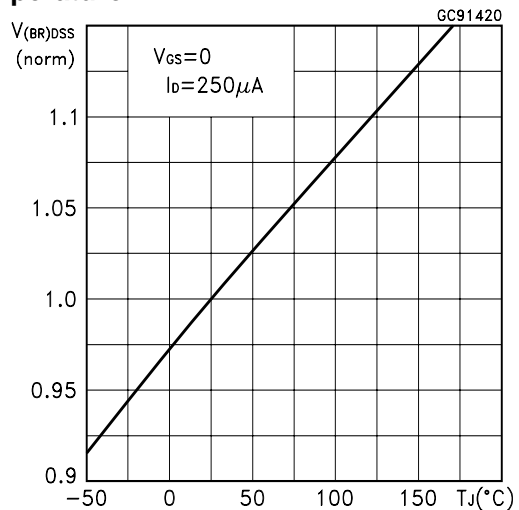


Figure 15: Unclamped Inductive Load Test Circuit

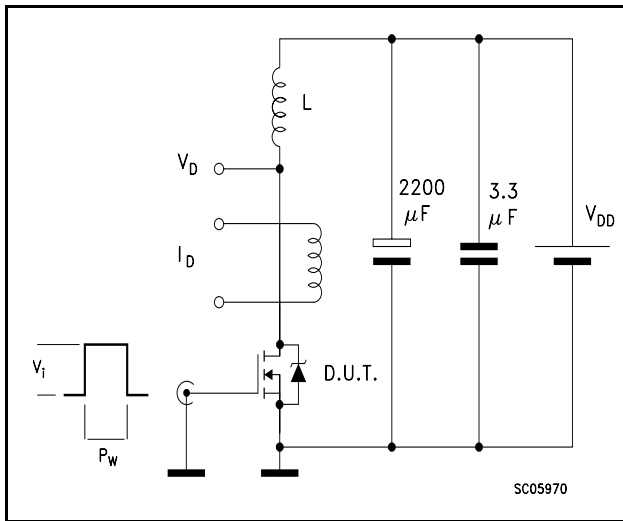


Figure 16: Switching Times Test Circuit For Resistive Load

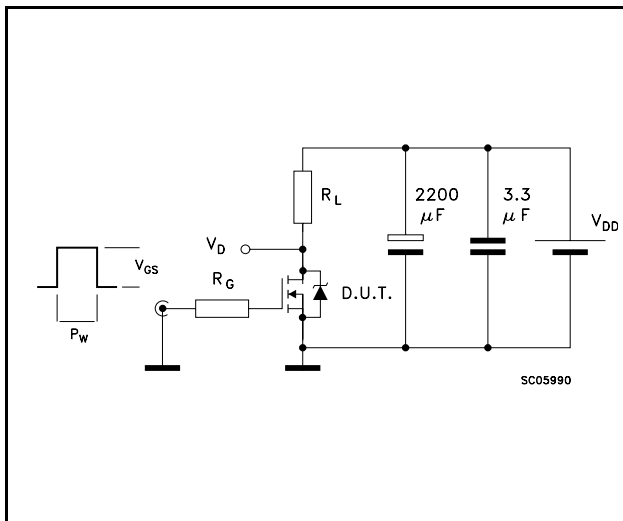


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

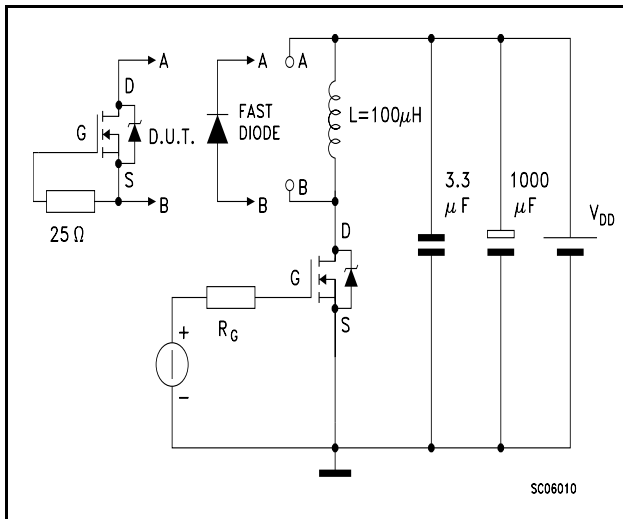


Figure 18: Unclamped Inductive Waferform

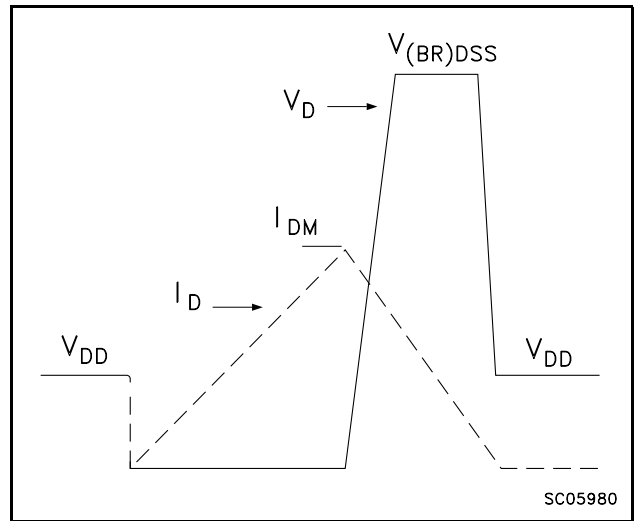
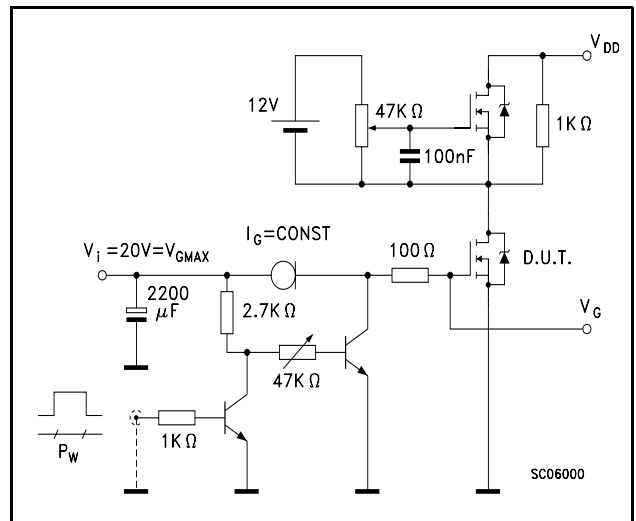
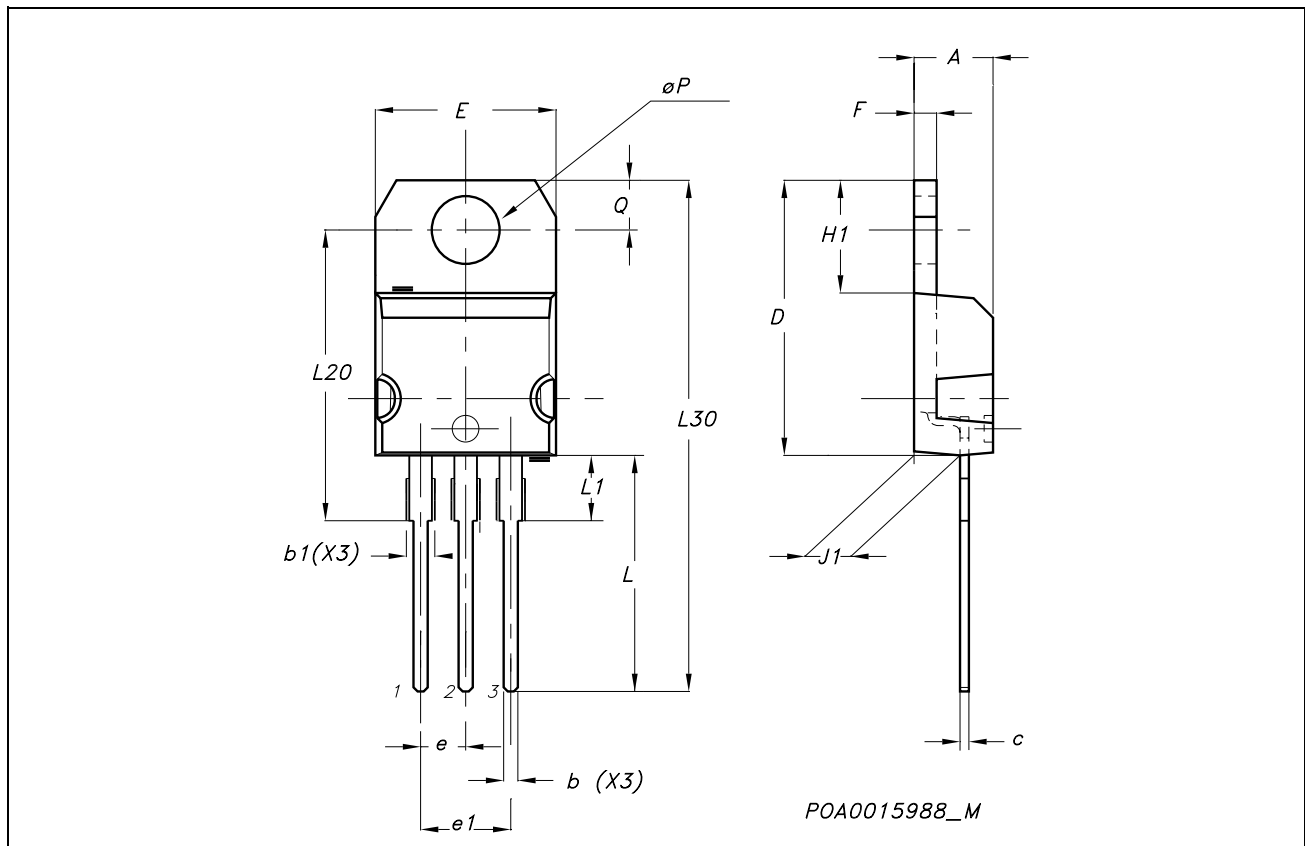


Figure 19: Gate Charge Test Circuit



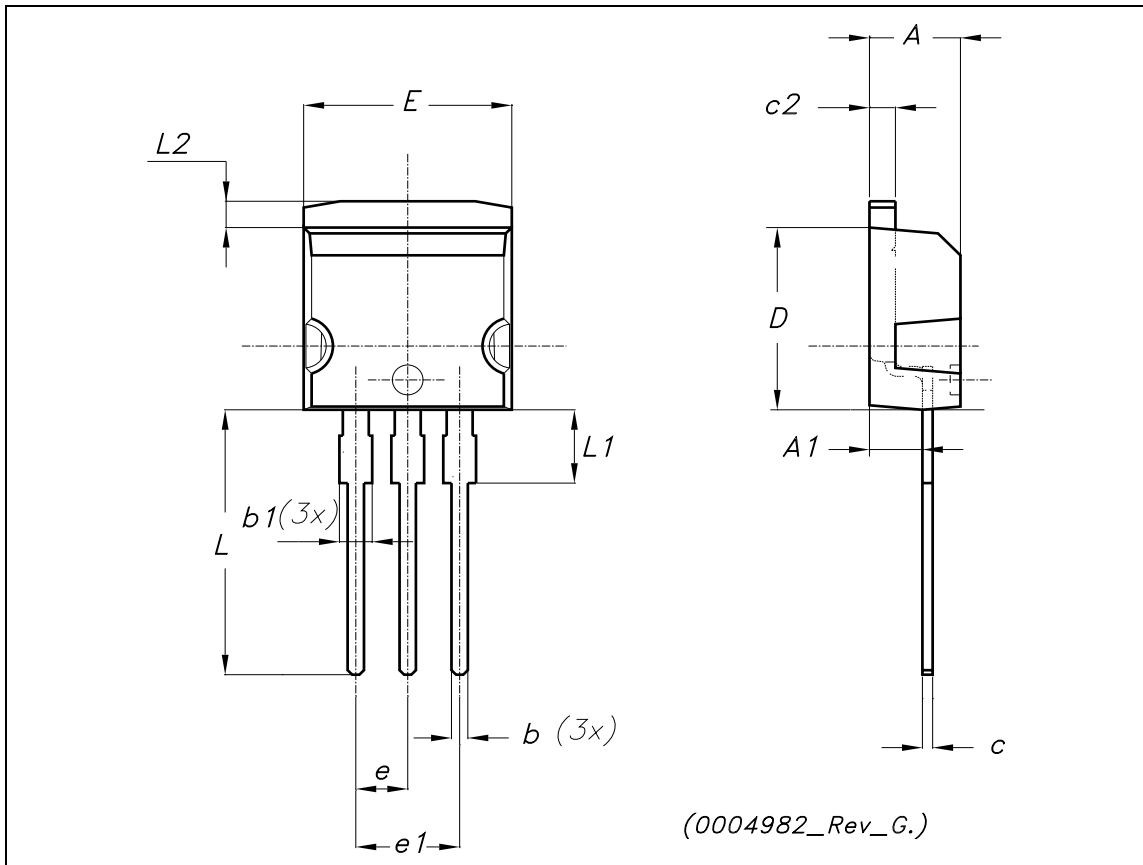
TO-220 MECHANICAL DATA

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



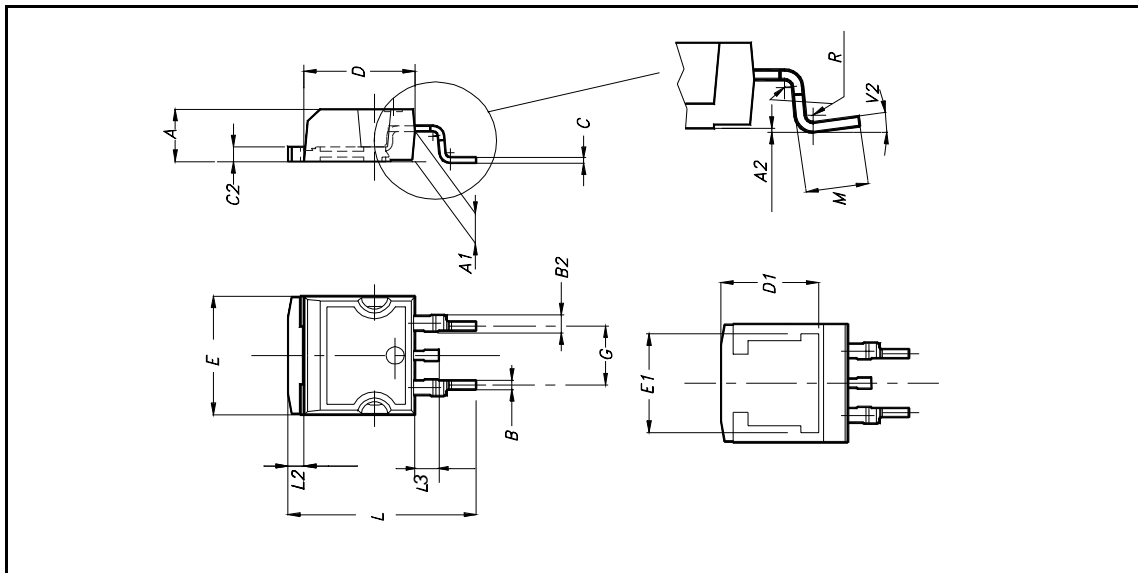
TO-262 (I²PAK) MECHANICAL DATA

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

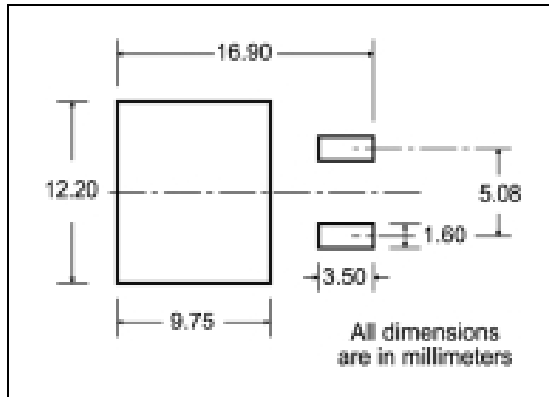


D²PAK MECHANICAL DATA

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	0°		4°			



D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

Diagram showing the tape mechanical data. Dimensions include A (total width), B (width of the tape slot), C (width of the carrier), D (width of the carrier), G (width of the carrier), N (width of the carrier), and T (width of the carrier). A 40 mm min. access hole is shown at the slot location. The tape slot in the core for tape start is 2.5 mm min. width. The full radius is also indicated.

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

Diagram showing the carrier and reel mechanical data. Dimensions include A₀, B₀, D₁, E, F, K₀, P₀, P₁, P₂, R, T, and W. The carrier is shown with a top cover tape and a center line of cavity. The reel is shown with a user direction of feed and a bending radius R min. The carrier is labeled with TOP COVER TAPE and FEED DIRECTION. The reel is labeled with User Direction of Feed and Bending radius. The carrier is also labeled with TRL and FEED DIRECTION.

* on sales type

Table 8: Revision History

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

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