



# STB16PF06L

P-CHANNEL 60V - 0.11Ω - 16A D<sup>2</sup>PAK

STripFET™ MOSFET

Table 1: General Features

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>	P <sub>w</sub>
STB16PF06L	60 V	< 0.125 Ω	16 A	70 W

- TYPICAL R<sub>DS(on)</sub> = 0.11 Ω
- LOW THRESHOLD DEVICE
- LOW GATE CHARGE

## DESCRIPTION

This MOSFET is the latest development of STMicroelectronics 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

- MOTOR CONTROL
- DC-DC CONVERTERS

Figure 1: Package

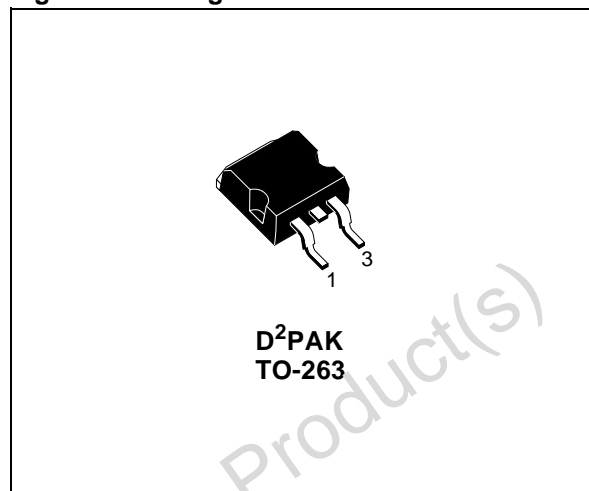


Figure 2: Internal Schematic Diagram

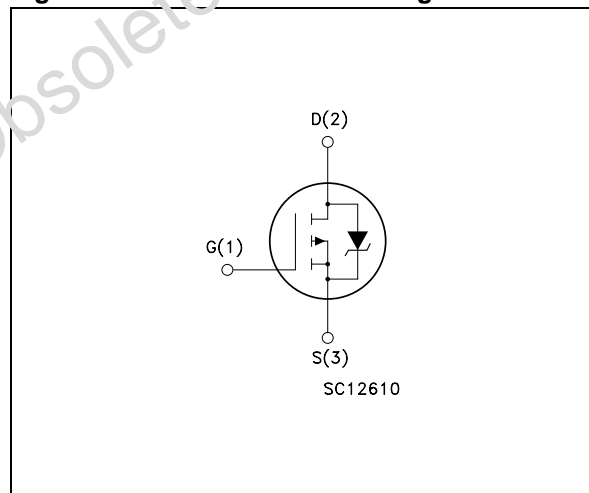


Table 2: Order Codes

PART NUMBER	MARKING	PACKAGE	PACKAGING
STB16PF06LT4	B16PF06L	D <sup>2</sup> PAK	TAPE & REEL

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source Voltage ( $V_{GS} = 0$ )	60	V
$V_{DGR}$	Drain-gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	60	V
$V_{GS}$	Gate-source Voltage	$\pm 16$	V
$I_D$	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	16	A
$I_D$	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	11.4	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	64	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	70	W
	Derating Factor	0.4	W/ $^\circ\text{C}$
dv/dt (1)	Peak Diode Recovery voltage slope	20	V/ns
$E_{AS}$ (2)	Single Pulse Avalanche Energy	250	mJ
$T_j$ $T_{stg}$	Operating Junction Temperature Storage Temperature	- 55 to 175	$^\circ\text{C}$

( $\bullet$ ) Pulse width limited by safe operating area

(1)  $I_{SD} \leq 16\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$ .

(2) Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = 8 \text{ A}$ ,  $V_{DD} = 30 \text{ V}$

Note: For the P-CHANNEL MOSFET actual polarity of voltages and current has to be reverse

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	2.14	$^\circ\text{C}/\text{W}$
Rthj-PCB(#)	Thermal Resistance Junction-PCB Max	34	$^\circ\text{C}/\text{W}$
$T_l$	Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10sec)	300	$^\circ\text{C}$

(#) When Mounted on 1 inch<sup>2</sup> FR-4 board, 2 oz of Cu

## ELECTRICAL CHARACTERISTICS ( $T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

Table 5: On/Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0$	60			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ , $T_C = 125^\circ\text{C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 100\mu\text{A}$	1.5			V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 8 \text{ A}$ $V_{GS} = 5\text{V}$ , $I_D = 8 \text{ A}$		0.11 0.130	0.125 0.165	$\Omega$ $\Omega$

## ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 6: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 3\text{ A}$		7.2		S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$		630 121 49		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	$V_{DD} = 30\text{ V}$ , $I_D = 8\text{ A}$ , $R_G = 4.7\Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1)		129 90 25.5 19.5		ns ns ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 48\text{ V}$ , $I_D = 16\text{ A}$ , $V_{GS} = 4.5\text{ V}$ (See test circuit, Figure 2)		11.4 5.2 4.7	15.5	nC nC nC

Table 7: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM(2)}$	Source-drain Current Source-drain Current (pulsed)				16 64	A A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 8\text{ A}$ , $V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 16\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ , $T_j = 150^\circ\text{C}$ (see test circuit, Figure 3)		48.5 87.3 3.6		ns nC A

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

Figure 3: Safe Operating Area

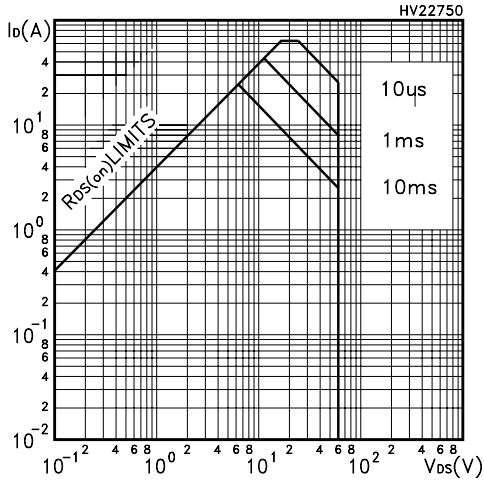


Figure 4: Output Characteristics

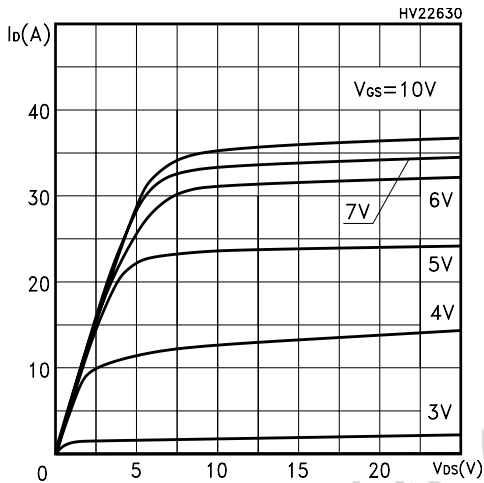


Figure 5: Transconductance

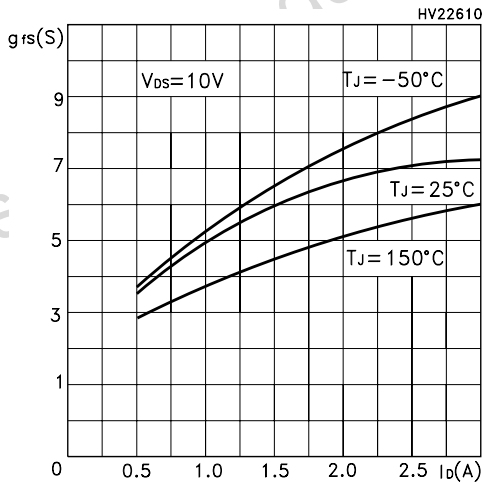


Figure 6: Thermal Impedance

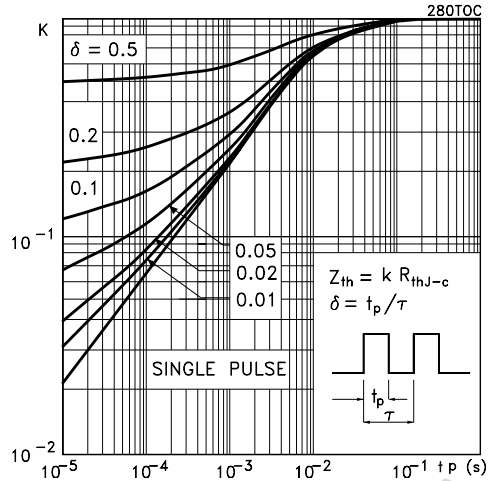


Figure 7: Transfer Characteristics

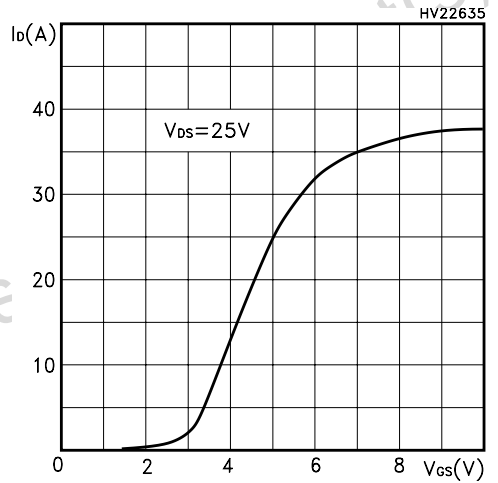


Figure 8: Static Drain-source On Resistance

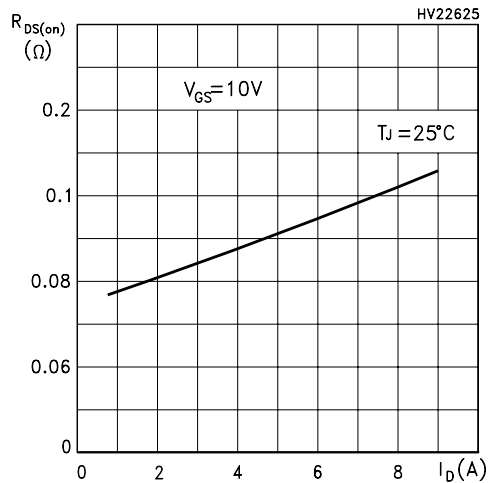


Figure 9: Gate Charge vs Gate-source Voltage

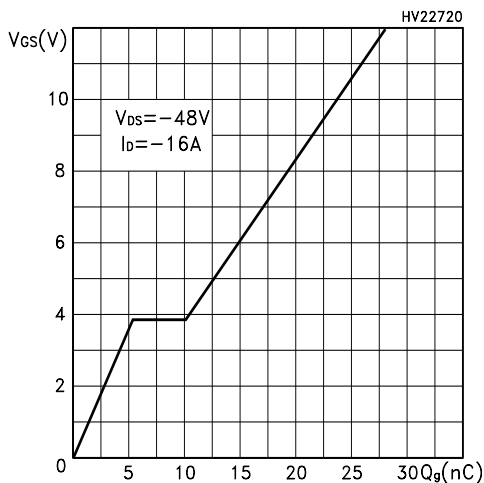


Figure 10: Normalized Gate Threshold Voltage vs Temperature

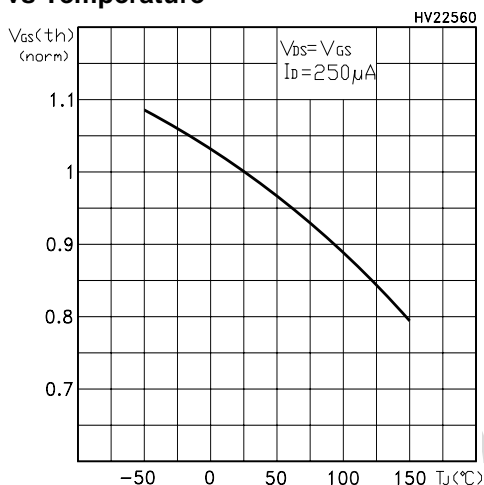


Figure 11: Dource-Drain Diode Forward Characteristics

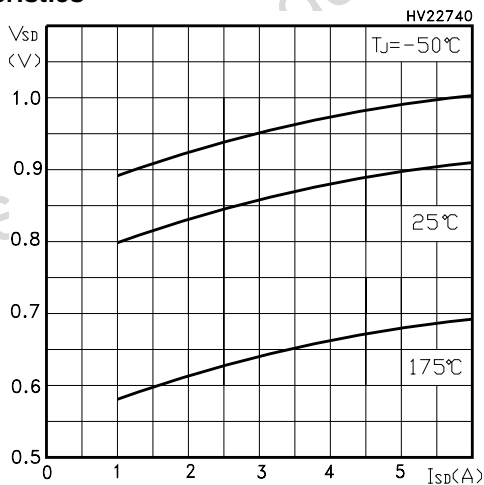


Figure 12: Capacitance Variations

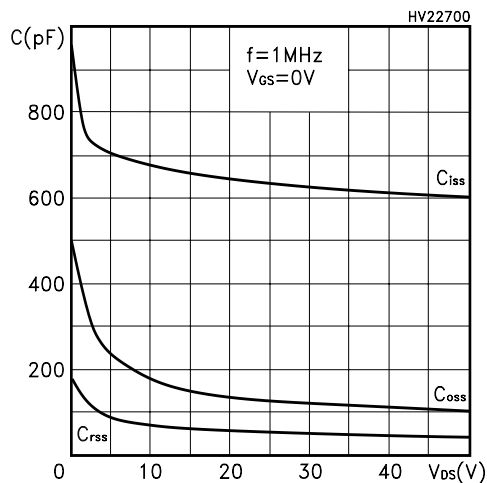


Figure 13: Normalized On Resistance vs Temperature

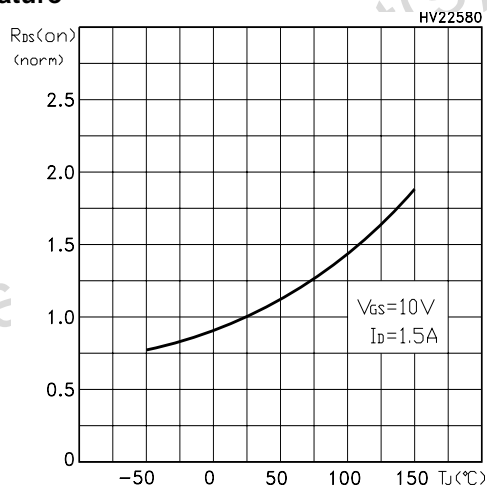


Figure 14: Normalized Breakdown Voltage vs Temperature

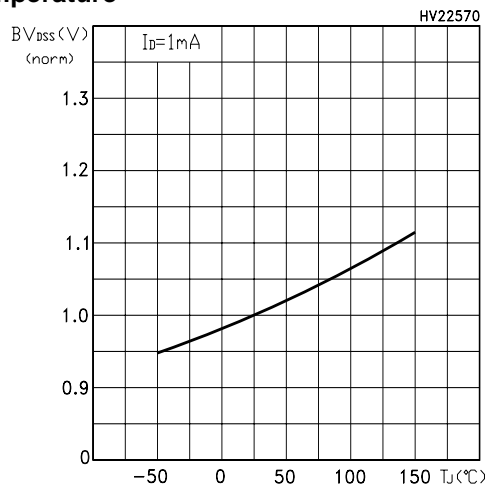


Figure 15: Unclamped Inductive Load Test Circuit

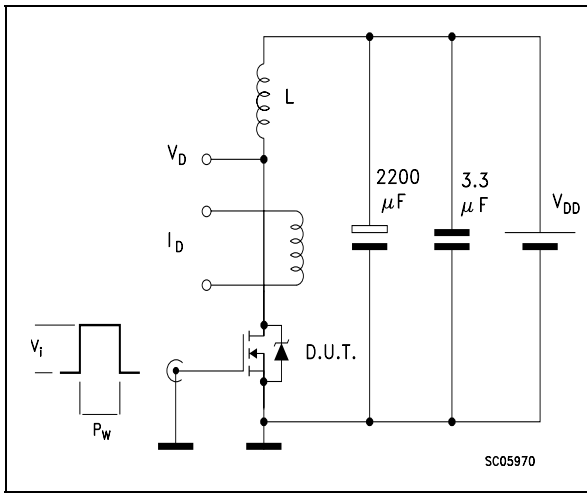


Figure 16: Switching Times Test Circuit For Resistive Load

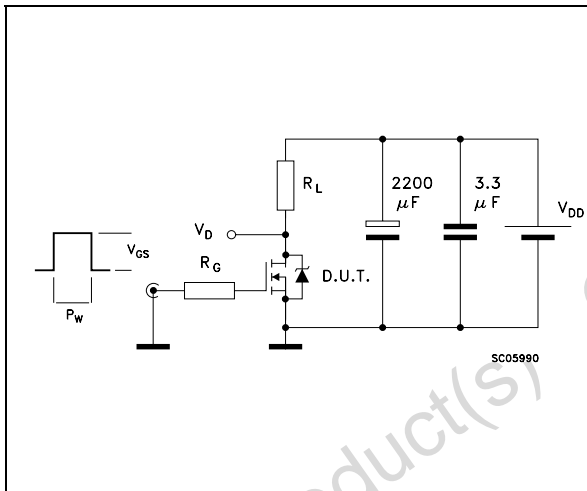


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

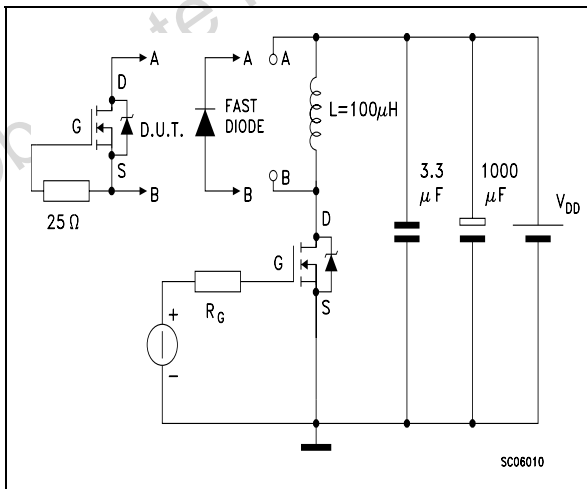


Figure 18: Unclamped Inductive Waferform

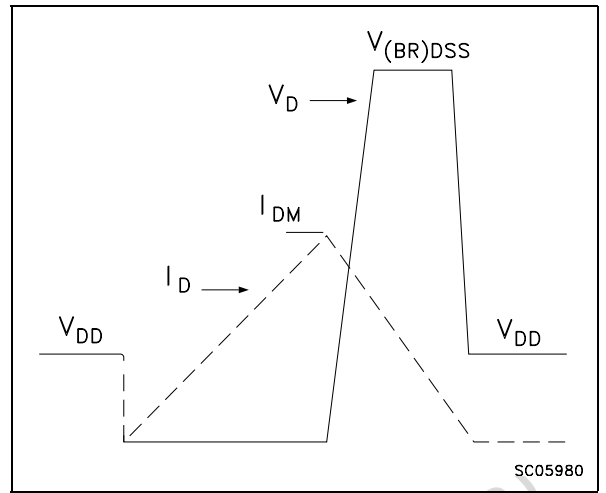
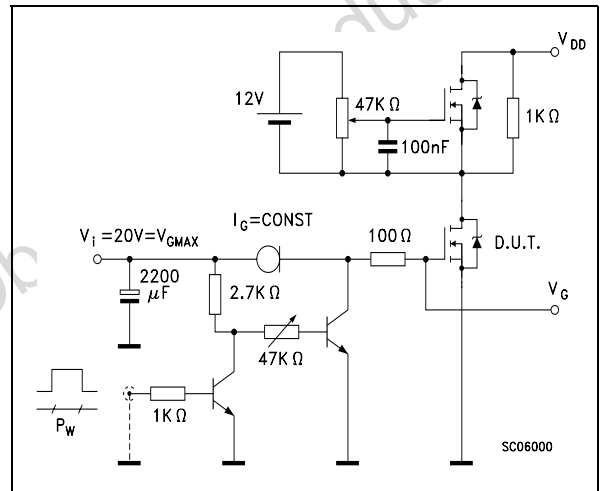
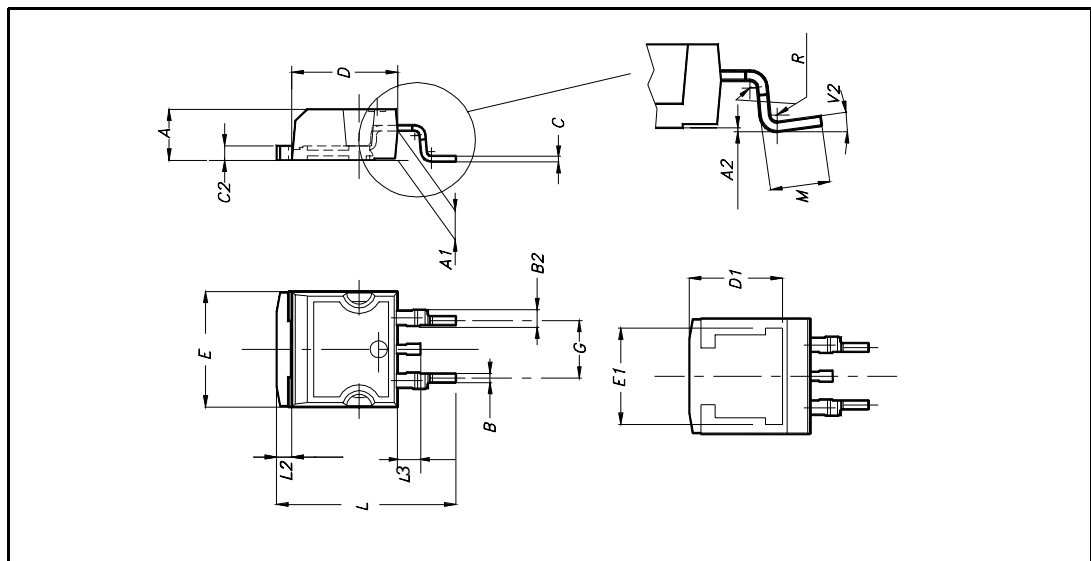


Figure 19: Gate Charge Test Circuit

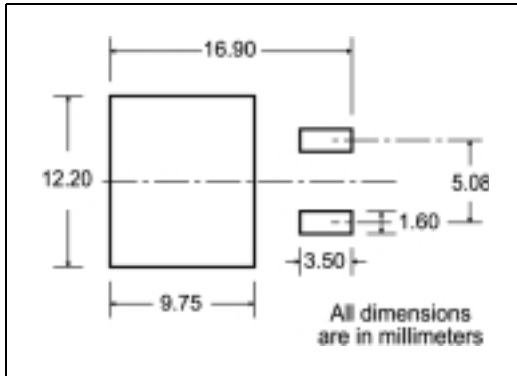


D<sup>2</sup>PAK MECHANICAL DATA

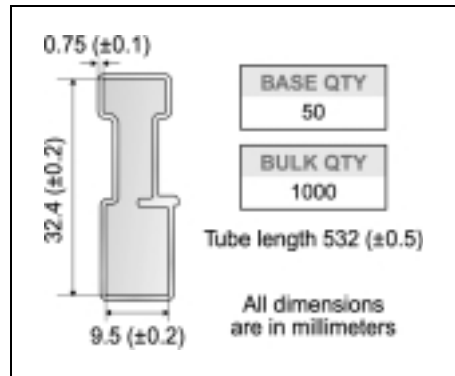
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



**D<sup>2</sup>PAK FOOTPRINT**



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



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

**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

\* on sales type



**Table 8: Revision History**

Date	Revision	Description of Changes
13/Sep/2004	1	First Release.

Obsolete Product(s) - Obsolete Product(s)

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