



STD16NF06L

N-CHANNEL 60V - 0.060 Ω - 24A DPAK/IPAK STripFET™ II POWER MOSFET

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D
STD16NF06L	60 V	< 0.070 Ω	24 A

- TYPICAL R_{DS(on)} = 0.060 Ω
- LOGIC LEVEL DEVICE
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX "-1")
- SURFACE-MOUNTING DPAK (TO-252) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

DESCRIPTION

This Power 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

- SWITCHING APPLICATIONS

Figure 1: Package

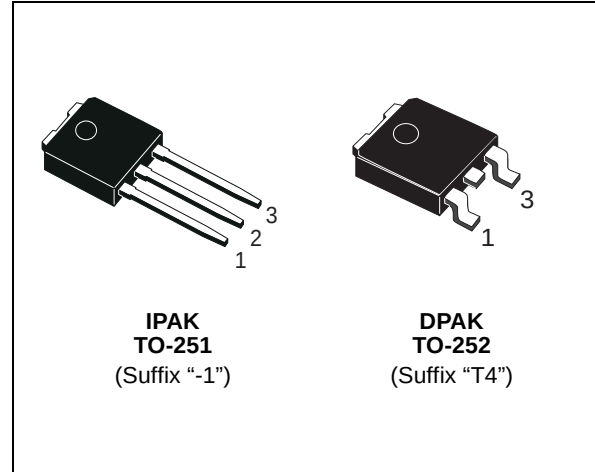


Figure 2: Internal Schematic Diagram

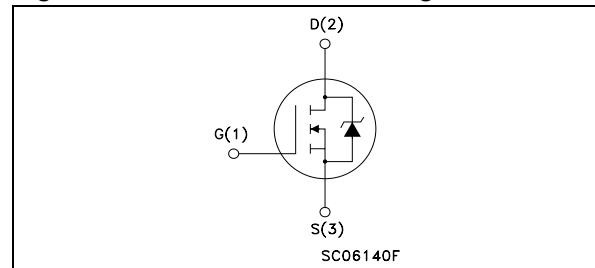


Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STD16NF06LT4	D16NF06L	TO-252	TAPE & REEL
STD16NF06L-1	D16NF06L	TO-251	TUBE

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 k Ω)	60	V
V _{GS}	Gate- source Voltage	± 18	V
I _D	Drain Current (continuous) at T _C = 25°C	24	A
I _D	Drain Current (continuous) at T _C = 100°C	17	A
I _{DM} (•)	Drain Current (pulsed)	96	A
P _{tot}	Total Dissipation at T _C = 25°C	40	W
	Derating Factor	0.27	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	11.5	V/ns
E _{AS} (2)	Single Pulse Avalanche Energy	200	mJ
T _{stg}	Storage Temperature	-55 to 175	°C
T _j	Operating Junction Temperature		

(•) Pulse width limited by safe operating area.

(1) I_{SD} ≤ 16A, di/dt ≤ 200A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

(2) Starting T_j = 25 °C, I_D = 20A, V_{DD} = 48V

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Table 4: THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	3.75	°C/W
Rthj-pcb	(*)Thermal Resistance Junction-PCB	Max	62	°C/W
T _I	Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec)		275	°C

(*) When Mounted on 1 inch² FR-4 board, 2 oz of Cu

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

Table 5: OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 µA, V _{GS} = 0	60			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating T _C = 125°C			1 10	µA µA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 18V			±100	nA

Table 6: ON ⁽⁵⁾

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 µA	1			V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 8 A V _{GS} = 5 V I _D = 8 A		0.060 0.070	0.070 0.085	Ω Ω

Table 7: DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} = 15 V I _D = 12 A		12		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25V f = 1 MHz V _{GS} = 0		370 69 30		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

Table 8: SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 30\text{ V}$ $I_D = 8\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 17)		12 30		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 30\text{ V}$ $I_D = 16\text{ A}$ $V_{GS} = 5\text{ V}$		7.5 2.5 4.2		nC nC nC

Table 9: SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 8\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 17)		20 6		ns ns

Table 10: SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD}^*	Forward On Voltage	$I_{SD} = 64\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 16\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 25\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 19)		53 85 3.2		ns μC A

(1) Pulse width limited by safe operating area.

(2) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

Figure 3: Safe Operating Area

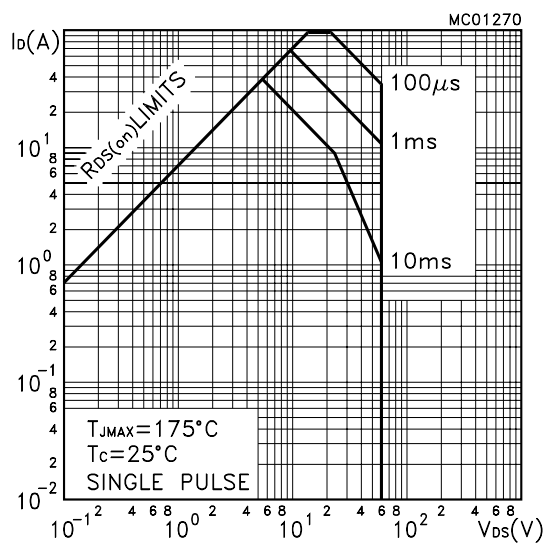


Figure 4: Thermal Impedance

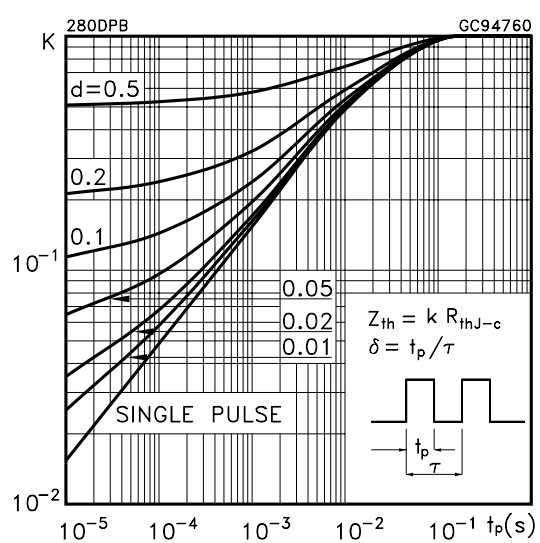


Figure 5: Output Characteristics

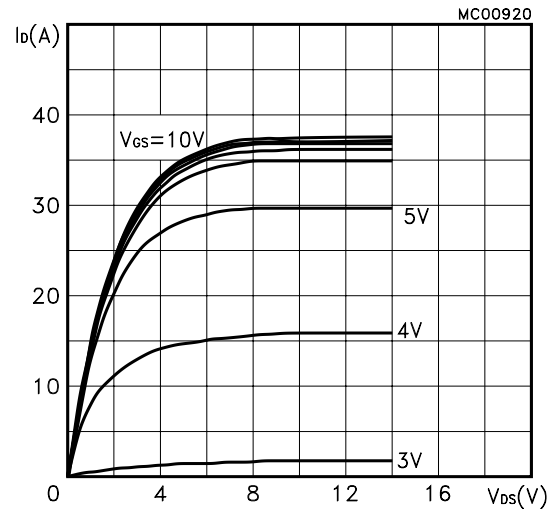


Figure 6: Transfer Characteristics

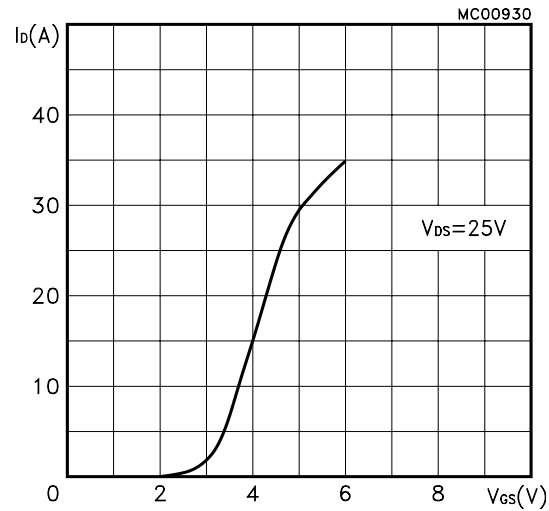


Figure 7: Transconductance

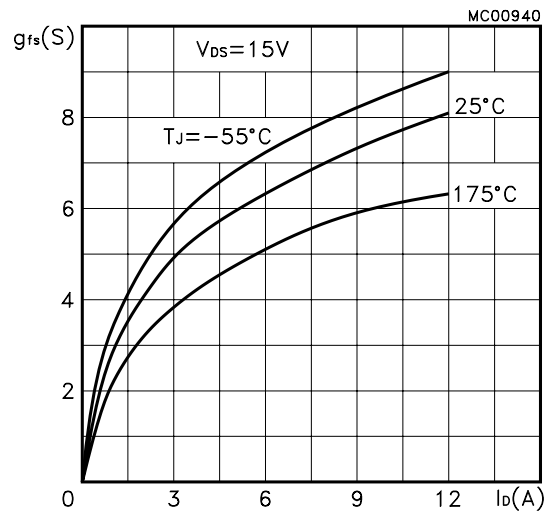


Figure 8: Static Drain-source On Resistance

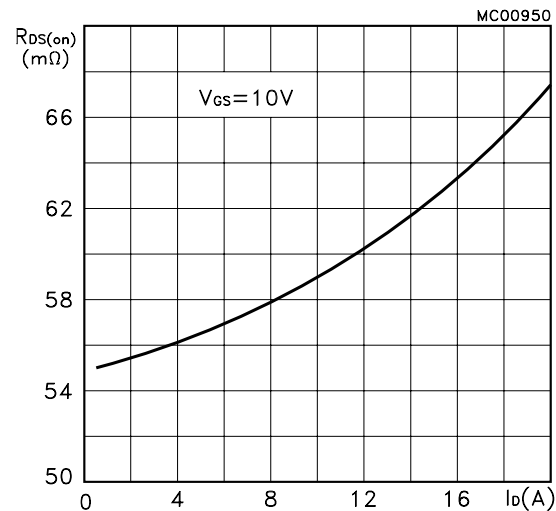


Figure 9: Gate Charge vs Gate-source Voltage

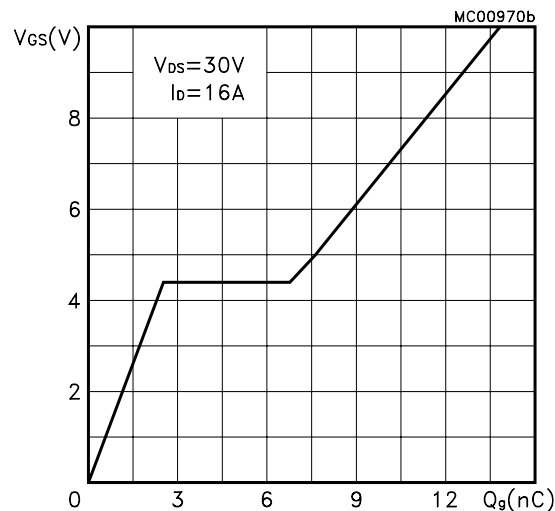


Figure 10: Capacitance Variations

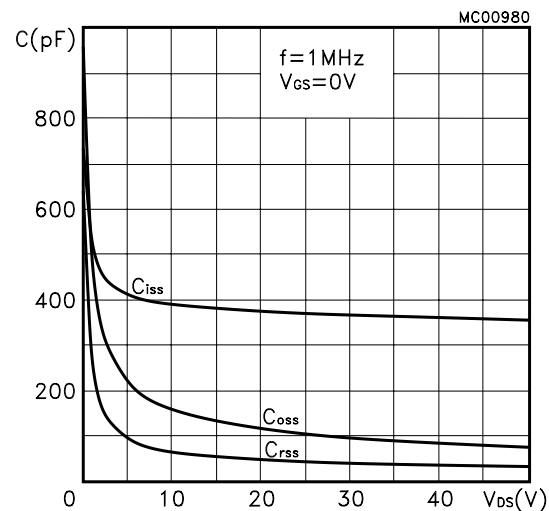


Figure 11: Normalized Gate Threshold Voltage vs Temperature

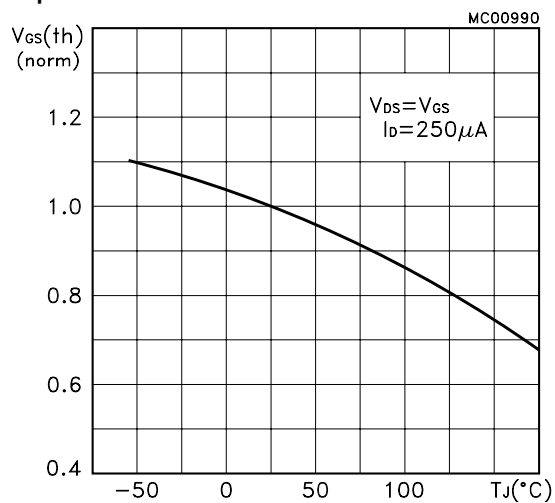


Figure 13: Source-drain Diode Forward Characteristics

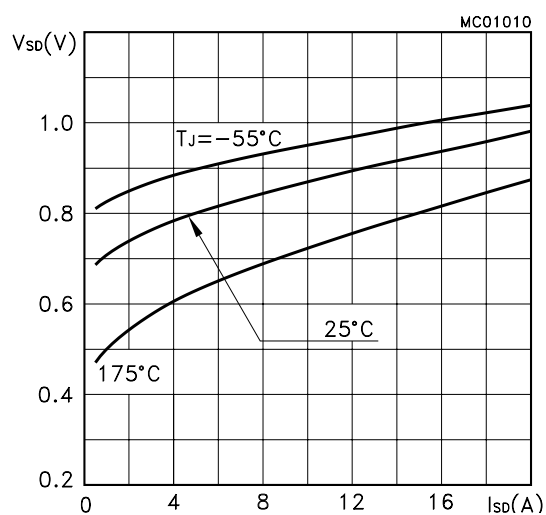


Figure 12: Normalized on Resistance vs Temperature

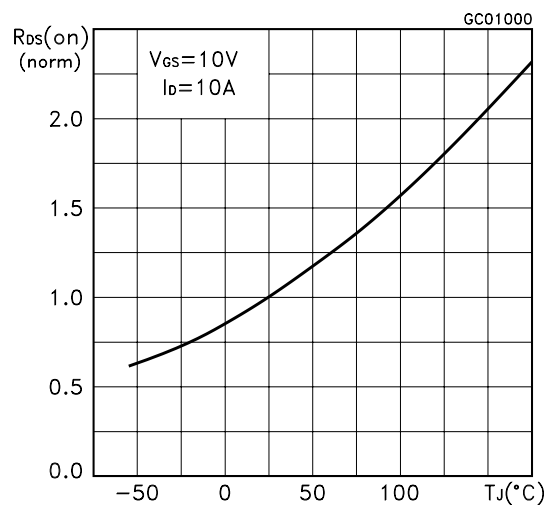


Figure 14: Normalized Breakdown Voltage vs Temperature.

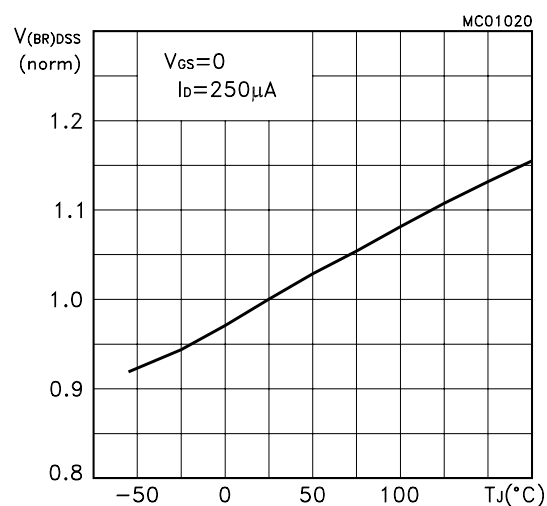


Figure 15: Unclamped Inductive Load Test Circuit

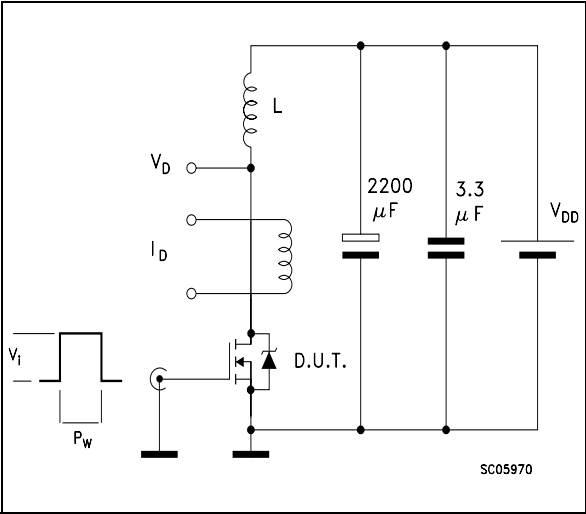


Figure 16: Unclamped Inductive Waveform

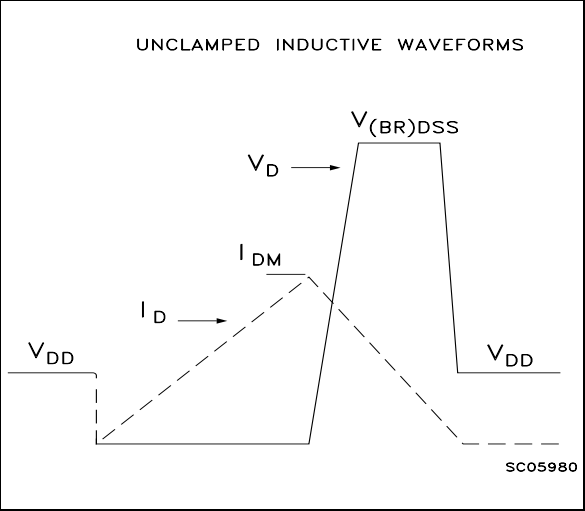


Figure 17: Switching Times Test Circuits For Resistive Load

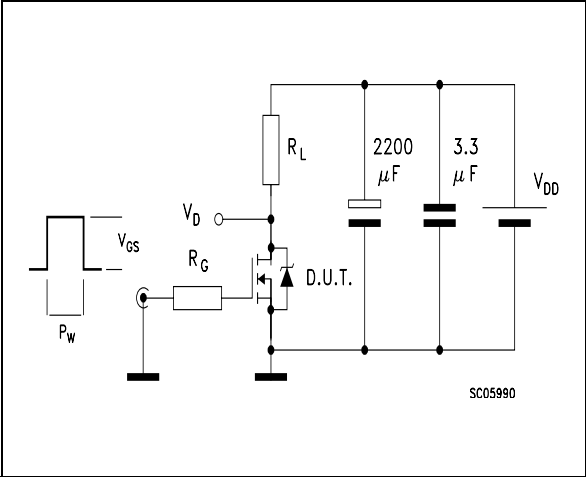


Figure 18: Gate Charge test Circuit

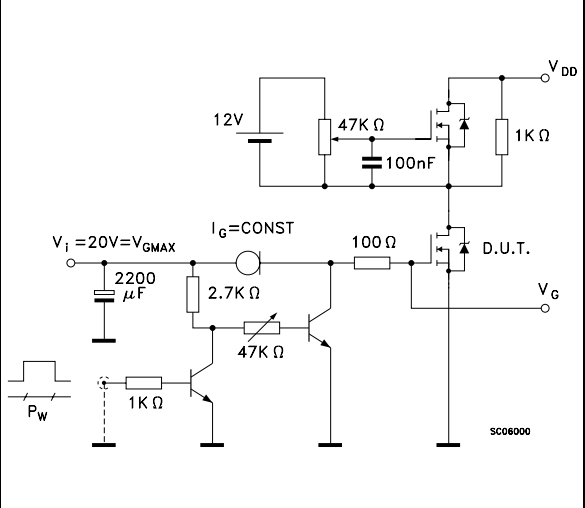
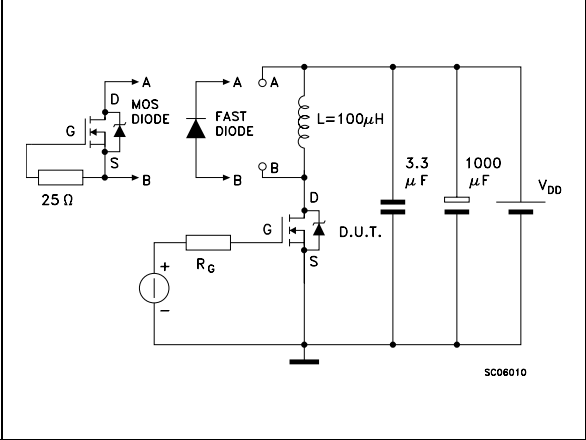
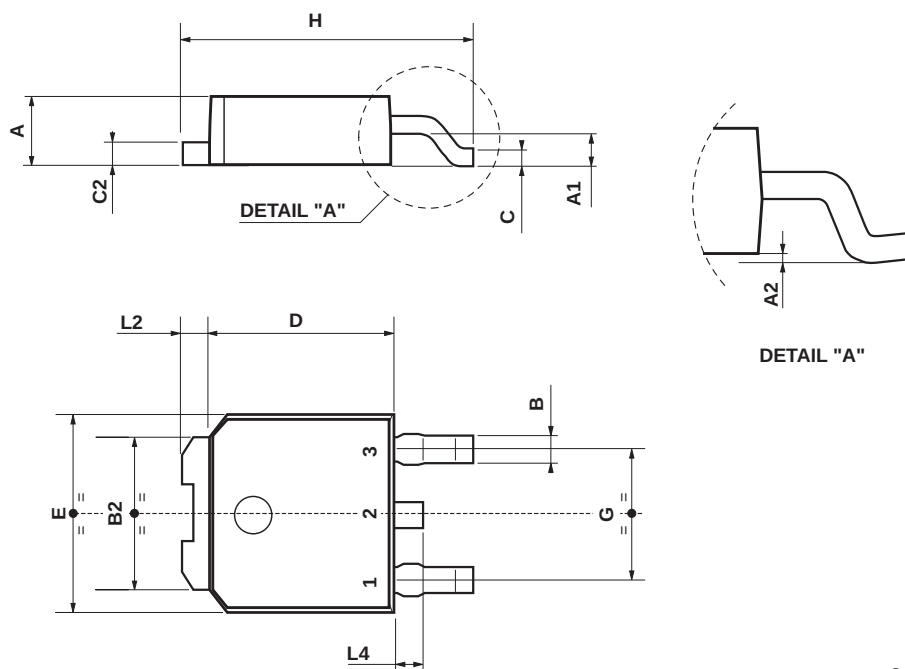


Figure 19: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-252 (DPAK) MECHANICAL DATA

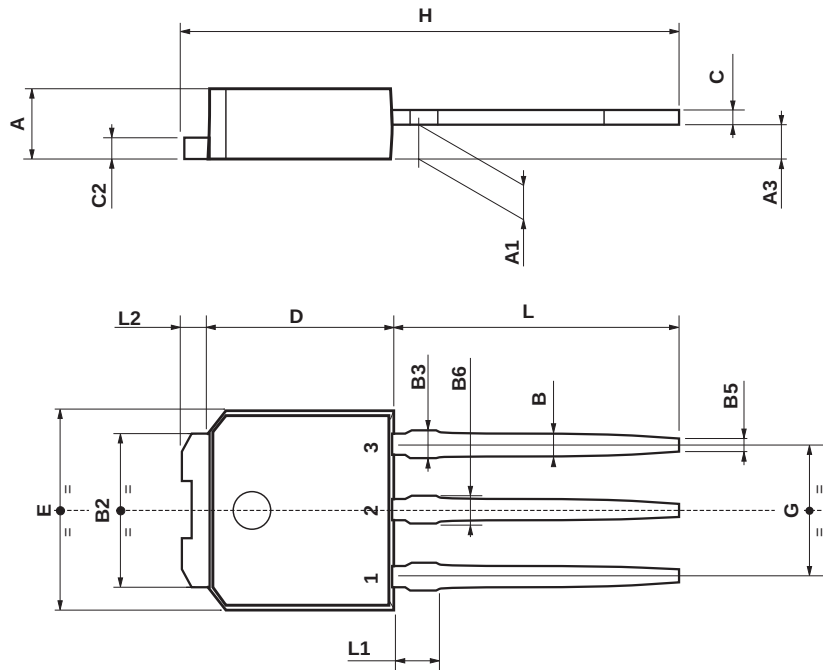
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



0068772-B

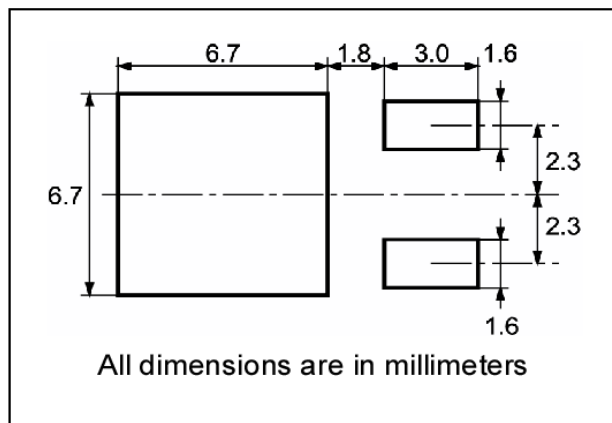
TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039

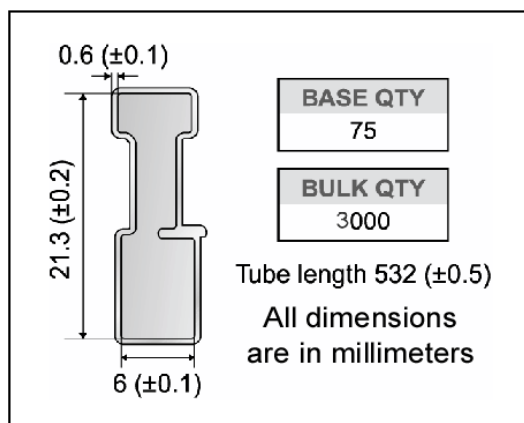


0068771-E

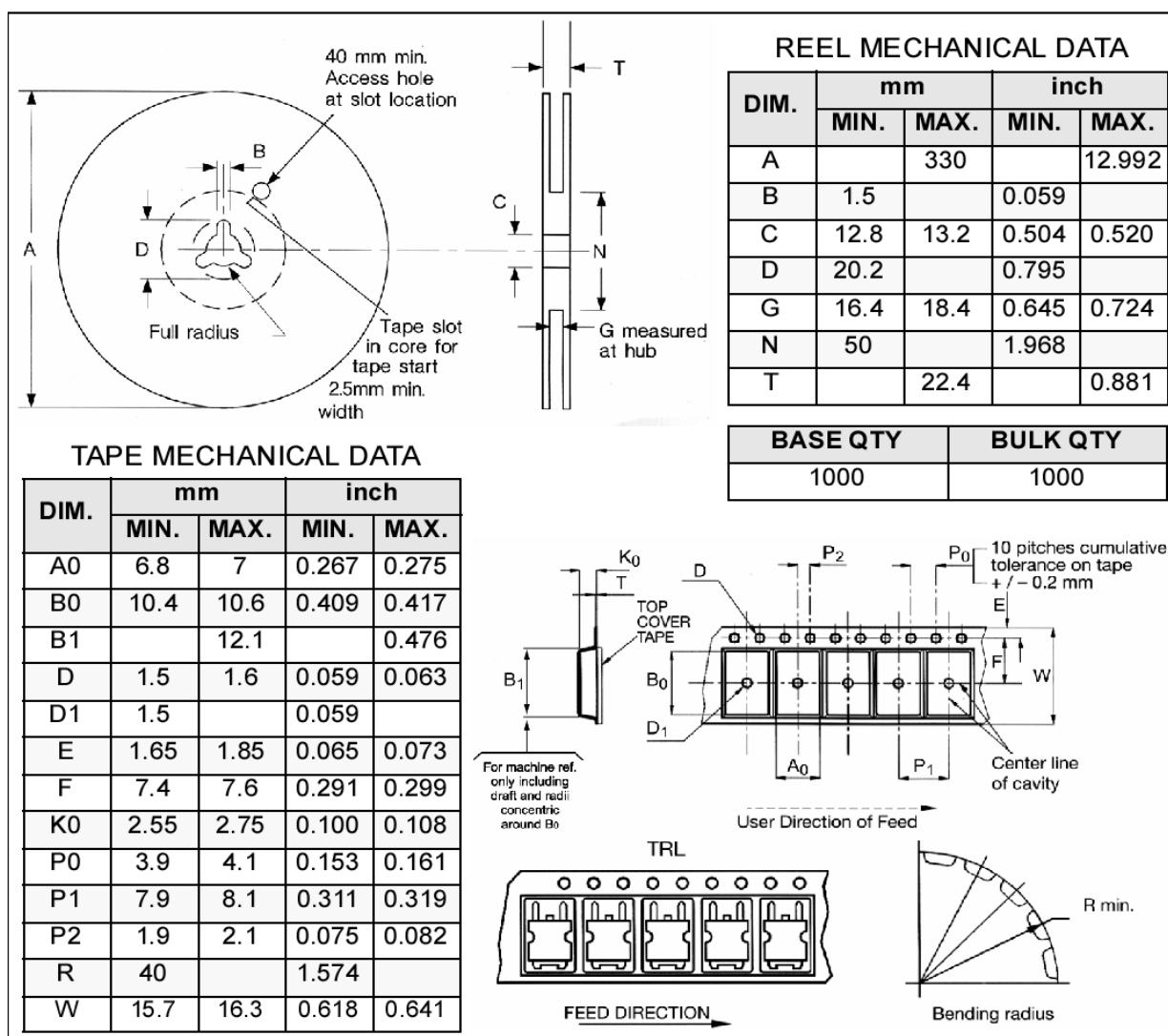
DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



*on sales type

STD16NF06L

Table 11:Revision History

Date	Revision	Description of Changes
March 2005	3.0	ADDED PACKAGE TO-251

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