



# STD60NF3LL

## N-CHANNEL 30V - 0.0075Ω - 60A DPAK STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD60NF3LL	30V	<0.0095Ω	60A

- TYPICAL R<sub>DS(on)</sub> = 0.0075Ω
- OPTIMAL RDS(ON) x Qg TRADE-OFF @ 4.5V
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL

### DESCRIPTION

This application specific Power Mosfet is the third generation of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

### APPLICATIONS

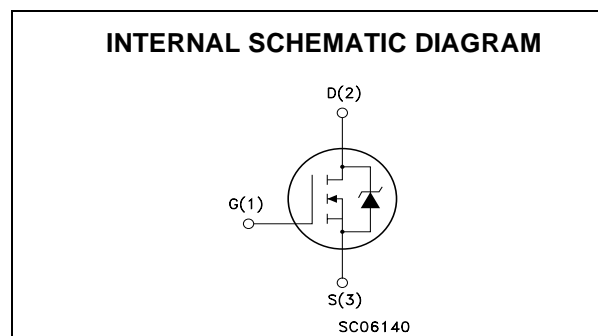
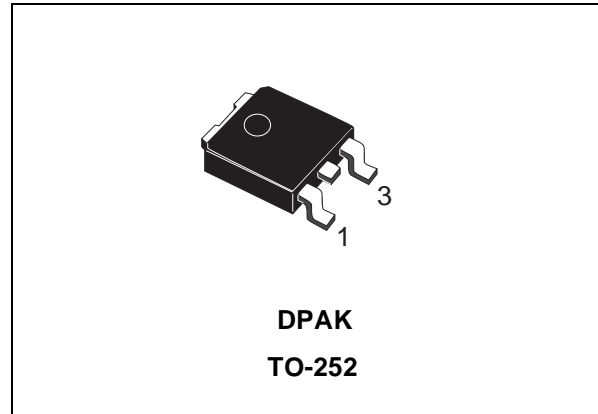
- SPECIFICALLY DESIGNED AND OPTIMISED FOR HIGH EFFICIENCY DC/DC CONVERTERS

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate- source Voltage	± 16	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	60	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	43	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	240	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	100	W
	Derating Factor	0.67	W/°C
E <sub>AS</sub> (1)	Single Pulse Avalanche Energy	700	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

(1) Starting T<sub>j</sub>=25°C, I<sub>D</sub>=30A, V<sub>DD</sub>=27.5V



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### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

### ELECTRICAL CHARACTERISTICS (TCASE = 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	30			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> = ± 16V			±100	nA

ON (1)

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> = 250µA	1			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A		0.0075 0.0085	0.0095 0.0105	Ω Ω

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A		30		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		2210		pF
C <sub>oss</sub>	Output Capacitance			635		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			138		pF

**ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15V$ , $I_D = 30A$		22		ns
$t_r$	Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 4.5V$ (see test circuit, Figure 3)		130		ns
$Q_g$	Total Gate Charge	$V_{DD} = 24V$ , $I_D = 60A$ , $V_{GS} = 4.5V$		30	40	nC
$Q_{gs}$	Gate-Source Charge			9		nC
$Q_{gd}$	Gate-Drain Charge			12.5		nC

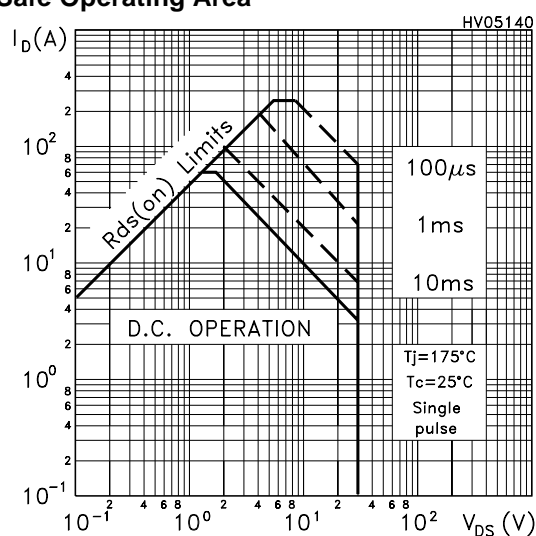
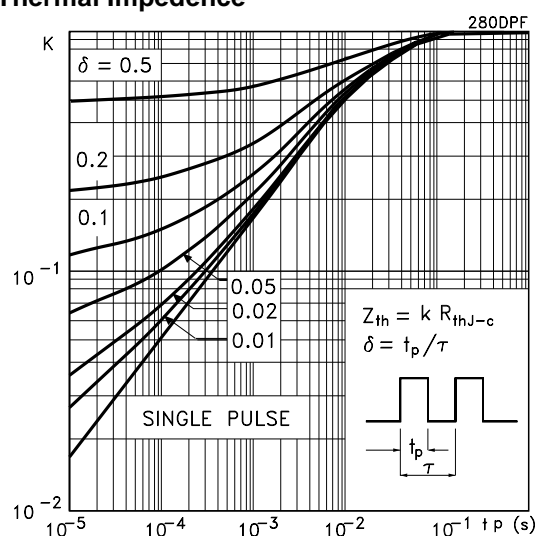
**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 15V$ , $I_D = 30A$		36.5		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 4.5V$ (see test circuit, Figure 3)		36.5		ns
$t_{d(off)}$	Off-voltage Rise Time	$V_{clamp} = 24V$ , $I_D = 30A$		32		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 4.5V$		23		ns
$t_c$	Cross-over Time	(see test circuit, Figure 5)		40		ns

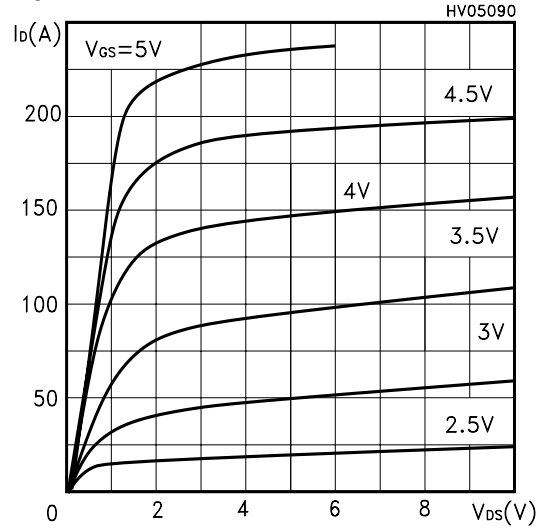
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				60	A
$I_{SDM} (1)$	Source-drain Current (pulsed)				240	A
$V_{SD} (2)$	Forward On Voltage	$I_{SD} = 60A$ , $V_{GS} = 0$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 60A$ , $di/dt = 100A/\mu s$ , $V_{DD} = 15V$ , $T_j = 150^\circ C$		65		ns
$Q_{rr}$	Reverse Recovery Charge			105		nC
$I_{RRM}$	Reverse Recovery Current	(see test circuit, Figure 5)		3.4		A

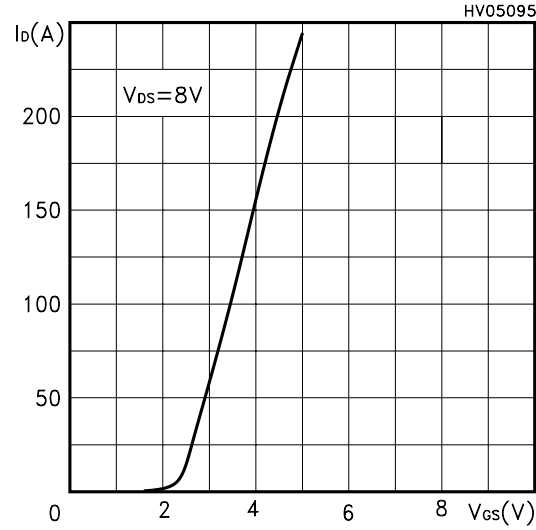
Note: 1. Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.  
2. Pulse width limited by safe operating area.

**Safe Operating Area****Thermal Impedance**

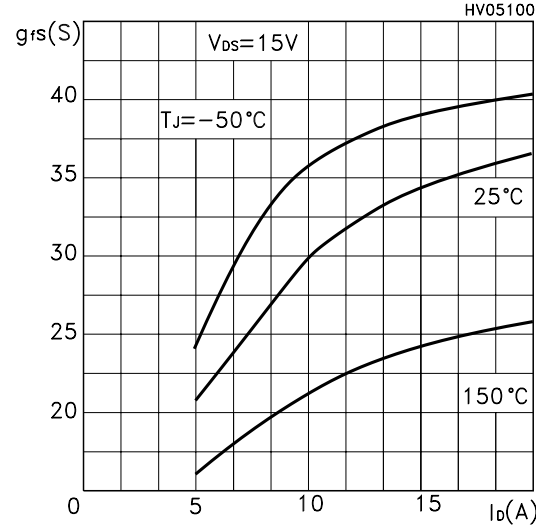
Output Characteristics



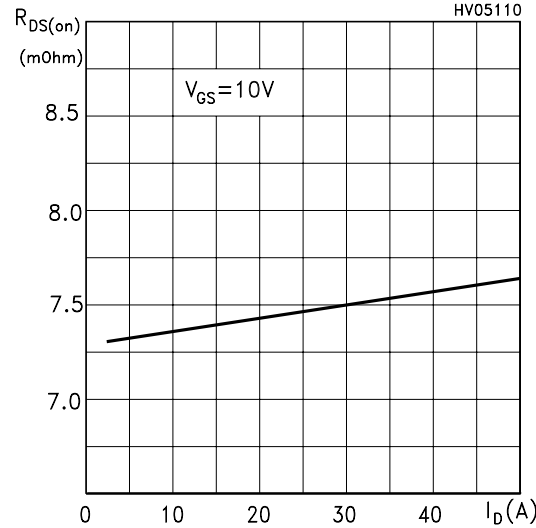
Transfer Characteristics



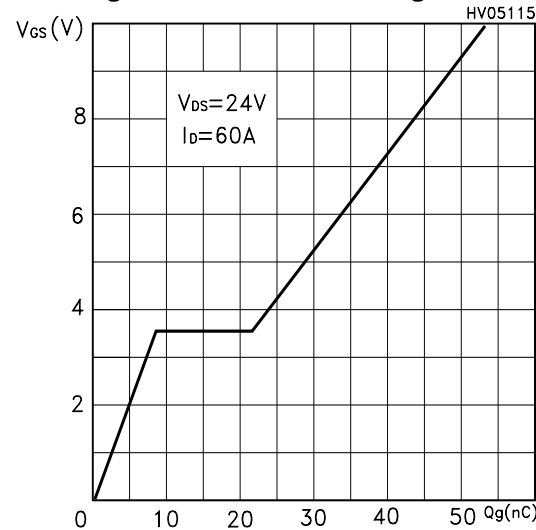
Transconductance



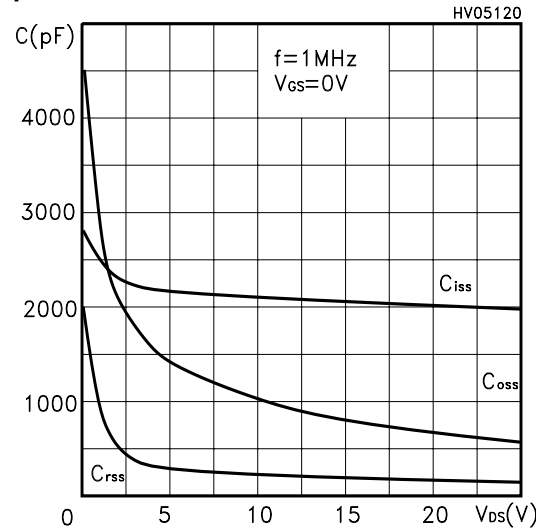
Static Drain-source On Resistance



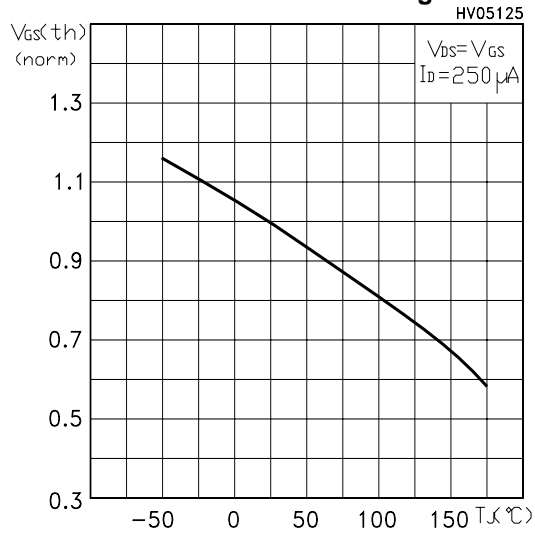
Gate Charge vs Gate-source Voltage



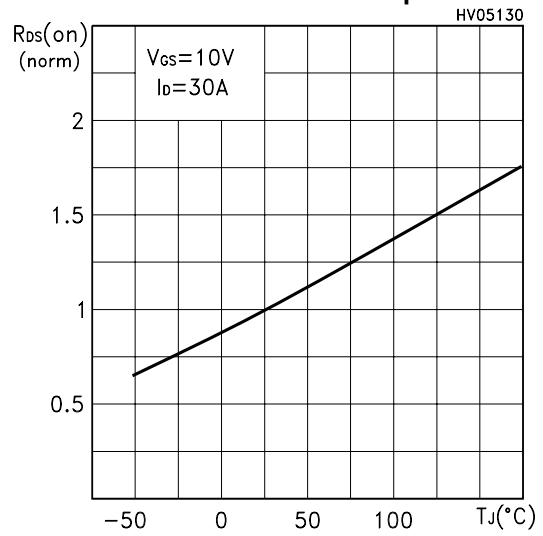
Capacitance Variations



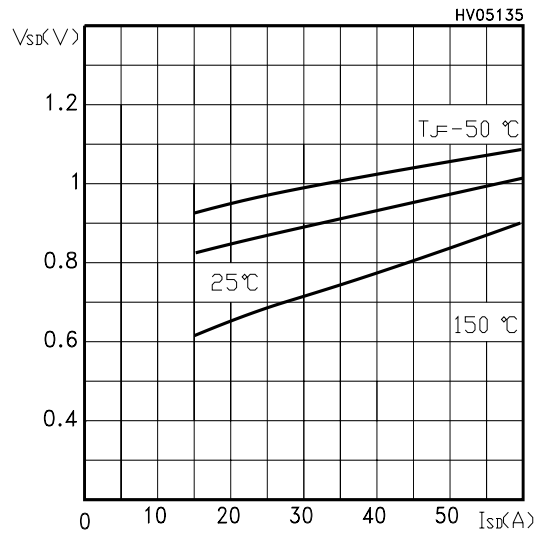
Normalized Gate Threshold Voltage vs Temp.



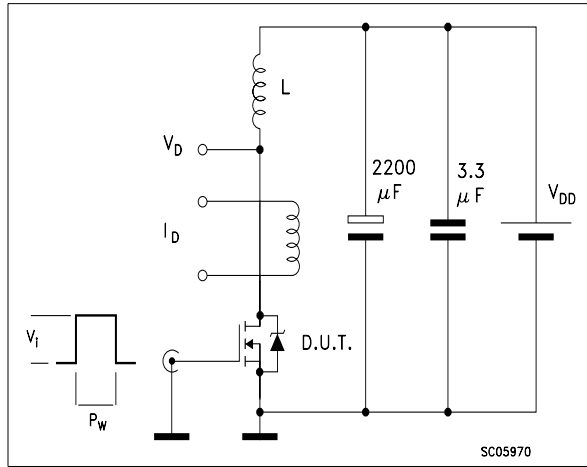
Normalized On Resistance vs Temperature



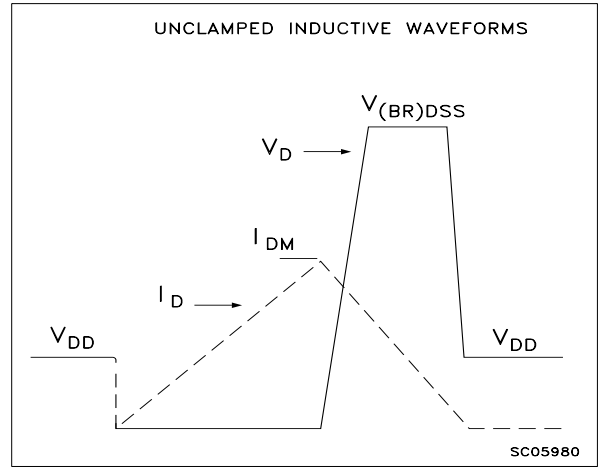
Source-drain Diode Forward Characteristics



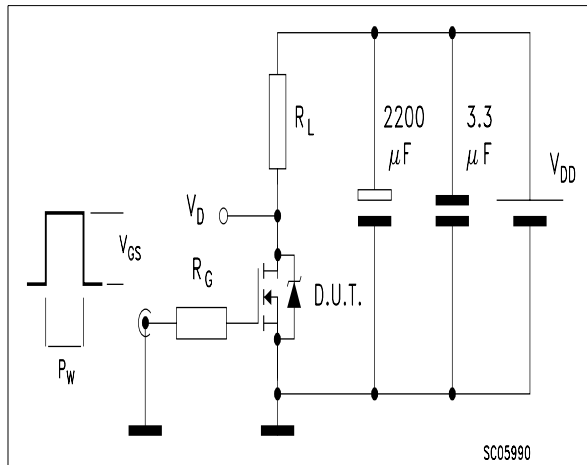
**Fig. 1: Unclamped Inductive Load Test Circuit**



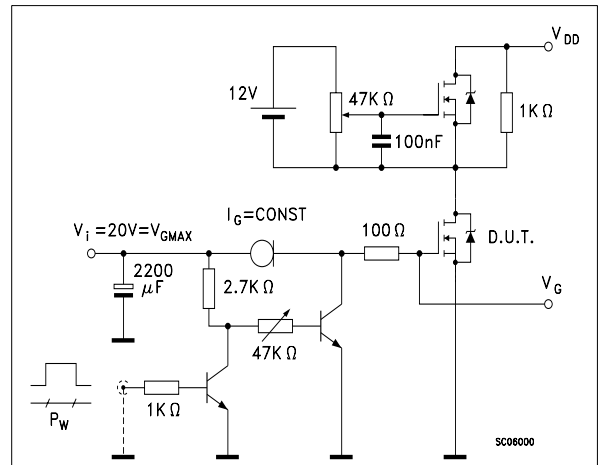
**Fig. 2: Unclamped Inductive Waveform**



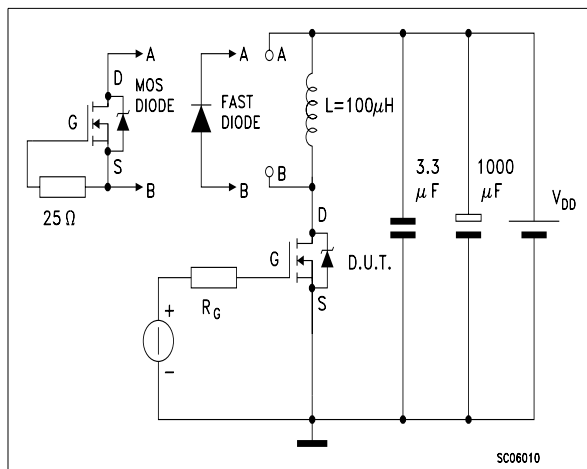
**Fig. 3: Switching Times Test Circuit For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

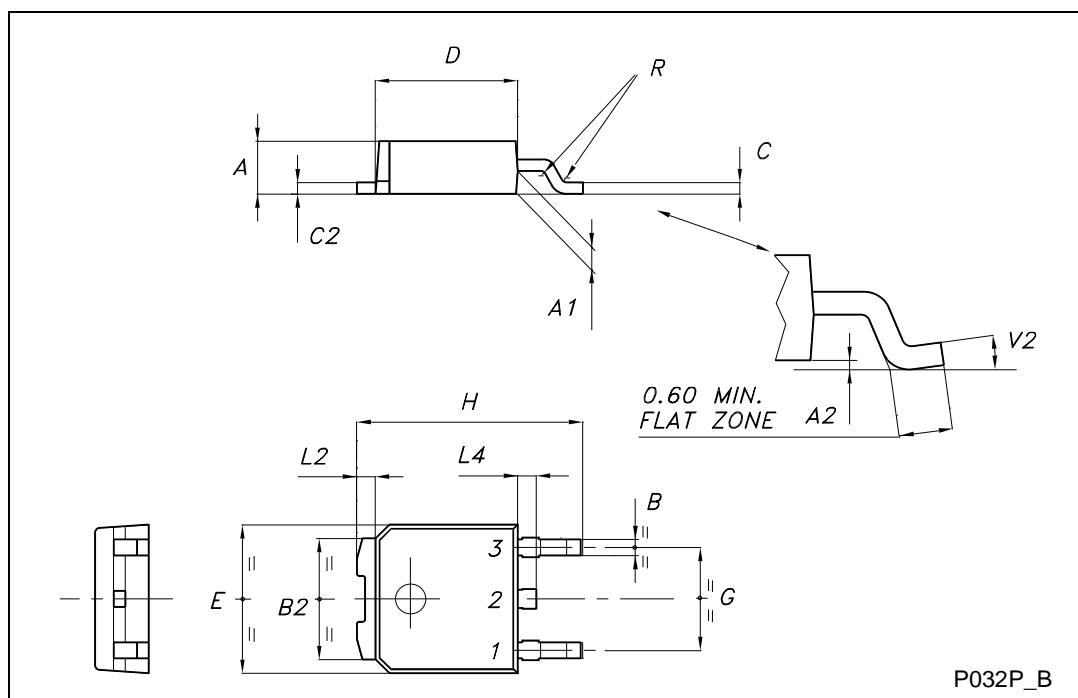


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

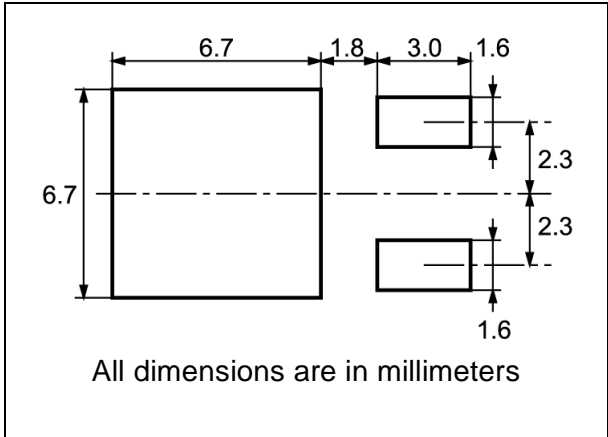


## TO-252 (DPAK) MECHANICAL DATA

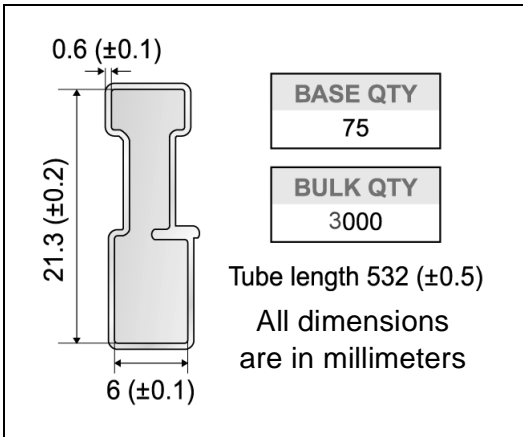
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



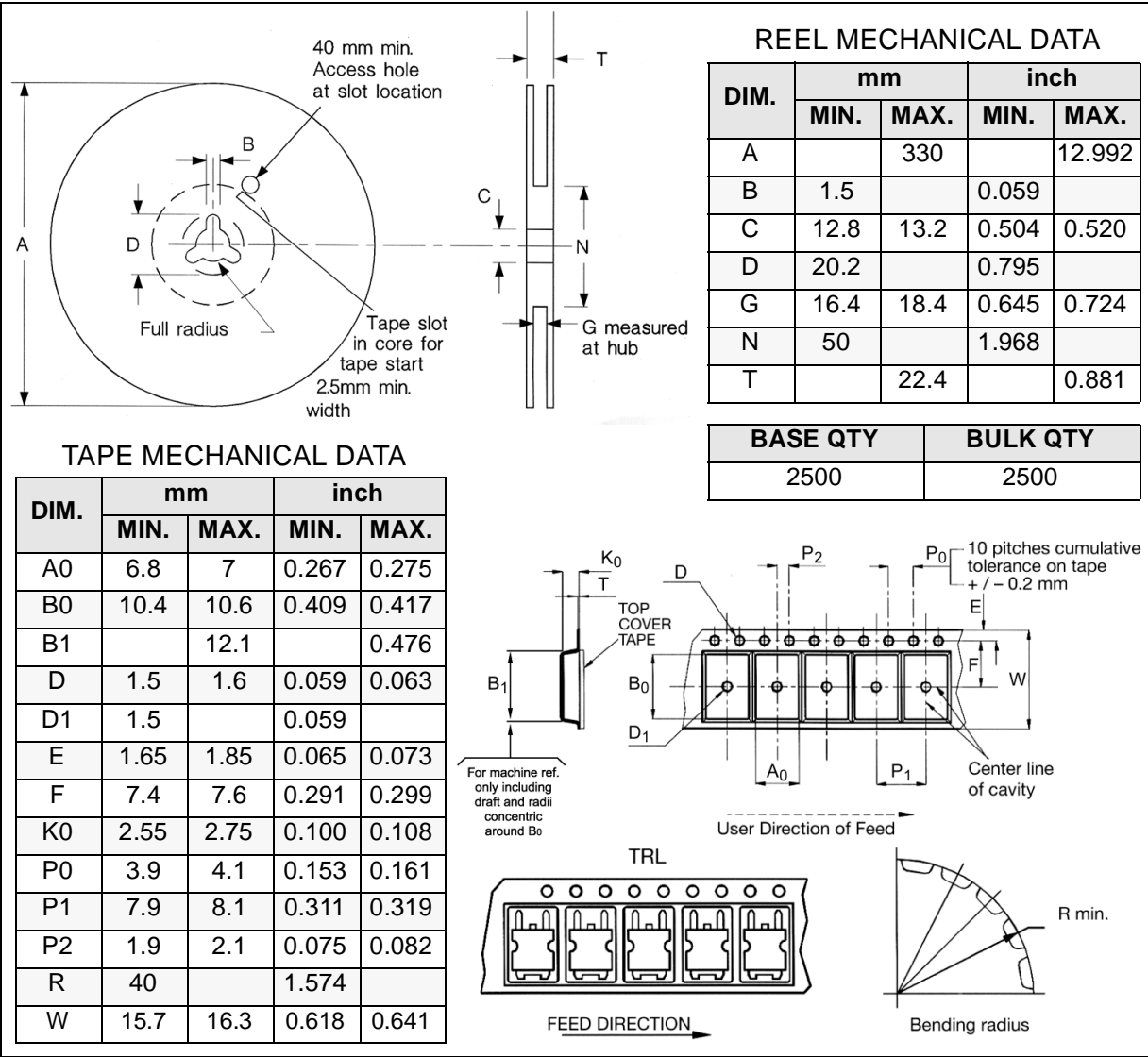
DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)\*



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



\* on sales type



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