



STB160NF03L

N-CHANNEL 30V - 0.0021Ω - 160A D2PAK STripFET™ POWER MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STB160NF03L	30 V	< 0.0030 Ω	160 A

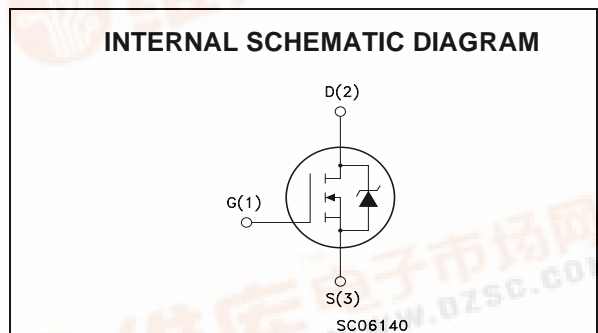
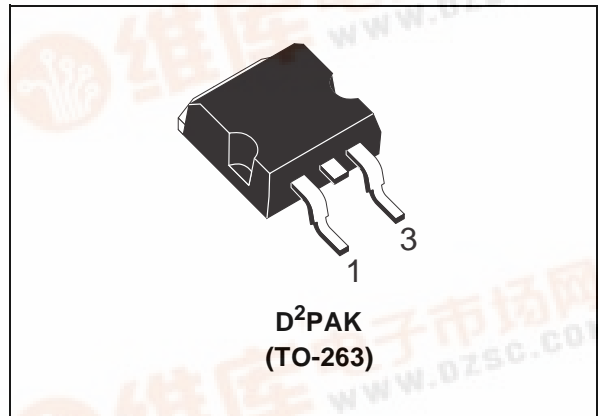
- TYPICAL R_{DS(on)} = 0.0021Ω
- LOW THRESHOLD DRIVE
- ULTRA LOW ON-RESISTANCE
- VERY LOW GATE CHARGE
- 100% AVALANCHE TESTED

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 with ultra low on-resistance, superior switching characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility. This device is particularly suitable for high current, low voltage switching application where efficiency is crucial.

APPLICATIONS

- BUCK CONVERTERS IN HIGH PERFORMANCE TELECOM AND VRMs
- DC-DC CONVERTERS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	30	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	30	V
V _{GS}	Gate- source Voltage	±15	V
I _{D(1)}	Drain Current (continuous) at T _C = 25°C	160	A
I _D	Drain Current (continuous) at T _C = 100°C	113	A
I _{DM} (●)	Drain Current (pulsed)	640	A
P _{TOT}	Total Dissipation at T _C = 25°C	300	W
	Derating Factor	2	W/°C
E _{AS} (2)	Single Pulse Avalanche Energy	2	J
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area

(1) Limited by Package

(2) I_{SD} ≤ 100A, di/dt ≤ 300A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

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THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
T _l	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 _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	30			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} = ±15V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1			V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V, I _D = 80 A V _{GS} = 5 V, I _D = 80 A		0.0021 0.0042	0.0030 0.0070	Ω Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{DS(on)max} , V _{GS} = 10V	160			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} , I _D = 80 A		210		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		5600		pF
C _{oss}	Output Capacitance			1720		pF
C _{rss}	Reverse Transfer Capacitance			310		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15V, I_D = 80A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3)		28		ns
t_r	Rise Time			285		ns
Q_g	Total Gate Charge	$V_{DD} = 24V, I_D = 160A,$ $V_{GS} = 10V$		123		nC
Q_{gs}	Gate-Source Charge			21		nC
Q_{gd}	Gate-Drain Charge			40		nC

SWITCHING OFF

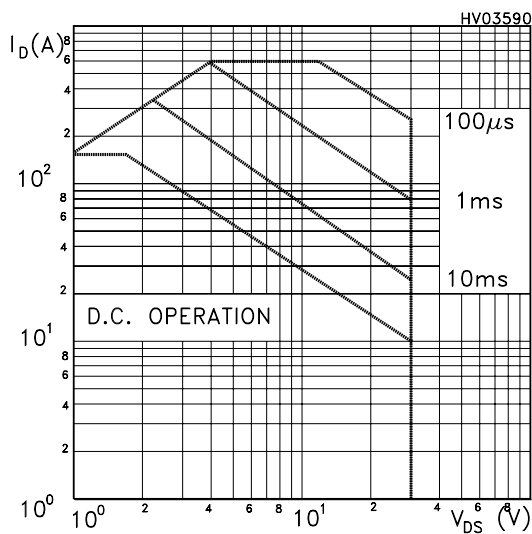
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 15V, I_D = 80A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 5)		110		ns
t_f	Fall Time			65		ns
$t_{d(off)}$	Off-voltage Rise Time	$V_{clamp} = 24V, I_D = 40A$ $R_G = 4.7\Omega, V_{GS} = 10V$		110		ns
t_f	Fall Time			35		ns
t_c	Cross-over Time			70		ns

SOURCE DRAIN DIODE

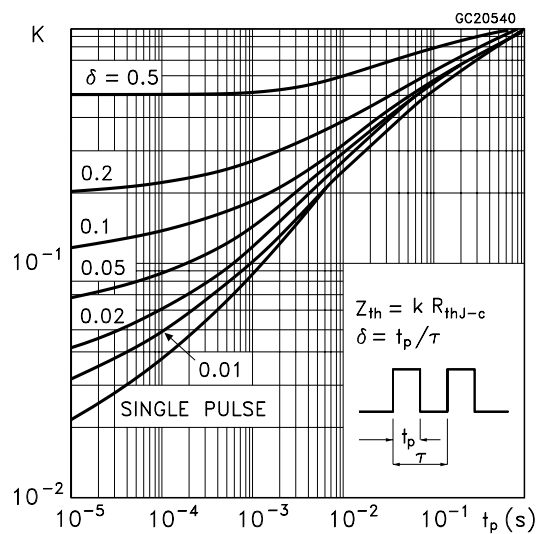
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				160	A
$I_{SDM} (1)$	Source-drain Current (pulsed)				640	A
$V_{SD} (2)$	Forward On Voltage	$I_{SD} = 160A, V_{GS} = 0$			1.3	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 80A, di/dt = 100A/\mu s,$ $V_{DD} = 15V, T_J = 25^\circ C$ (see test circuit, Figure 5)		80		ns
Q_{rr}	Reverse Recovery Charge			180		nC
I_{RRM}	Reverse Recovery Current			4.5		A

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

Safe Operating Area

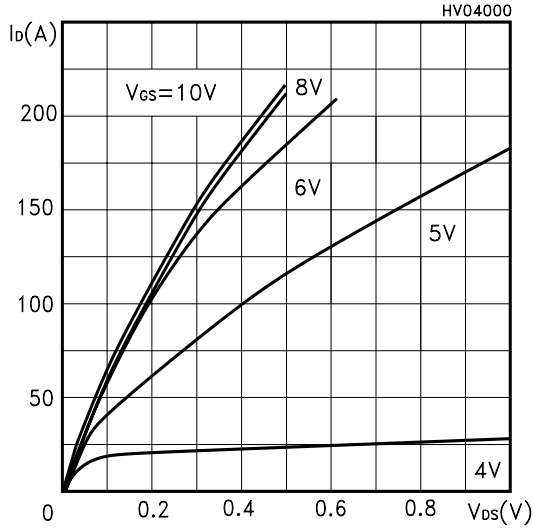


Thermal Impedance

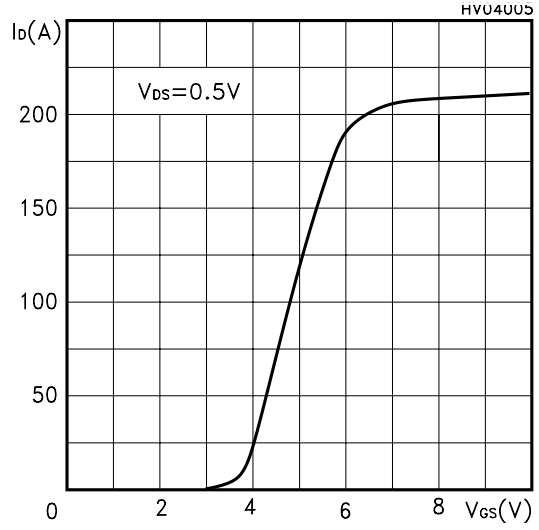


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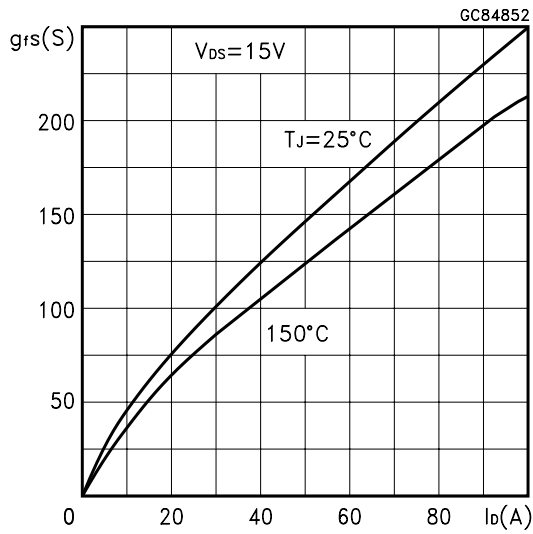
Output Characteristics



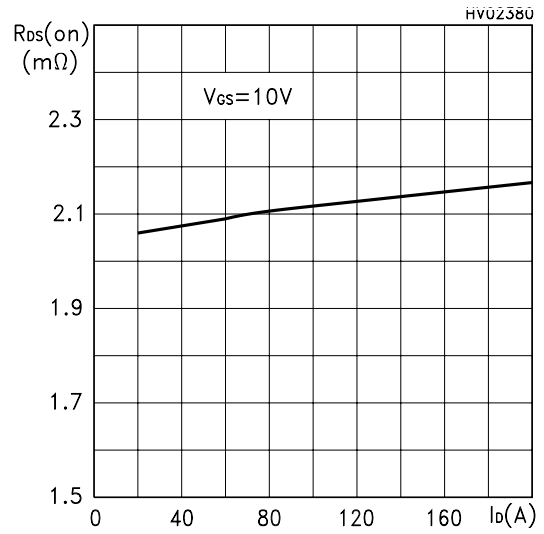
Transfer Characteristics



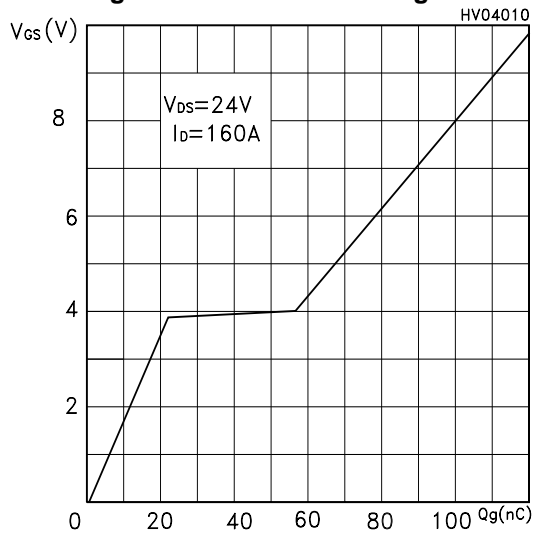
Transconductance



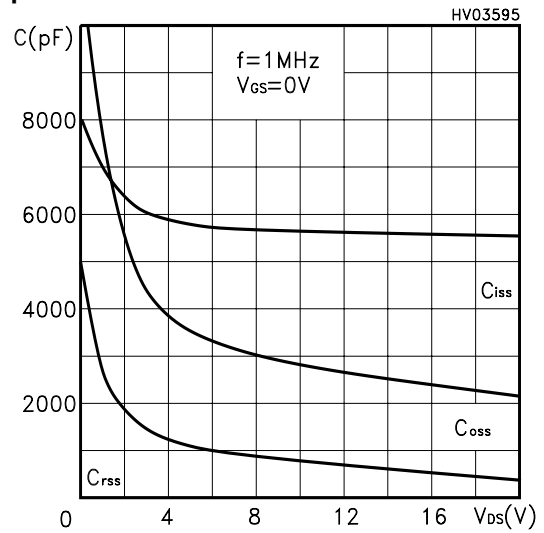
Static Drain-Source On Resistance



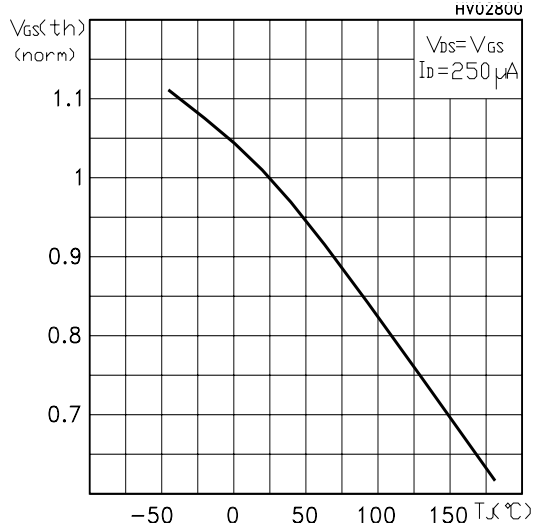
Gate Charge vs Gate-source Voltage



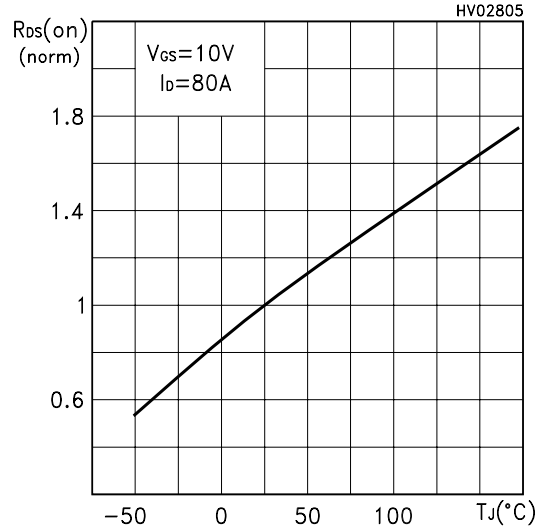
Capacitance Variations



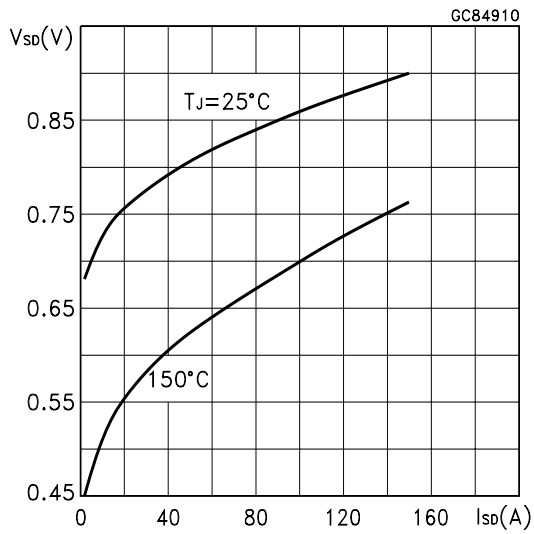
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



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Fig. 1: Unclamped Inductive Load Test Circuit

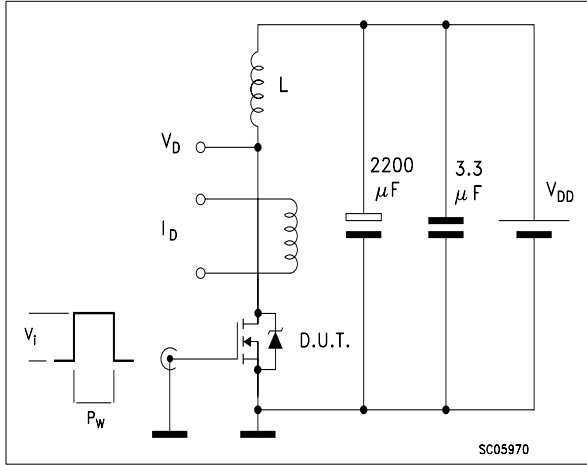


Fig. 2: Unclamped Inductive Waveform

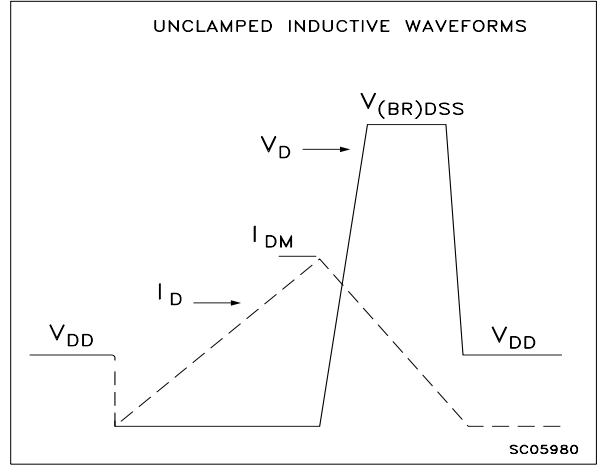


Fig. 3: Switching Times Test Circuit For Resistive Load

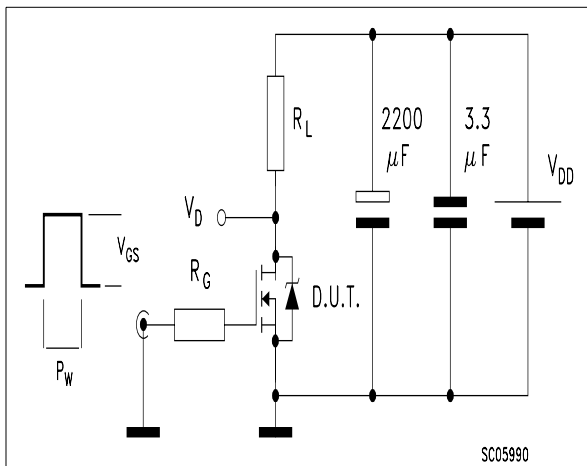


Fig. 4: Gate Charge test Circuit

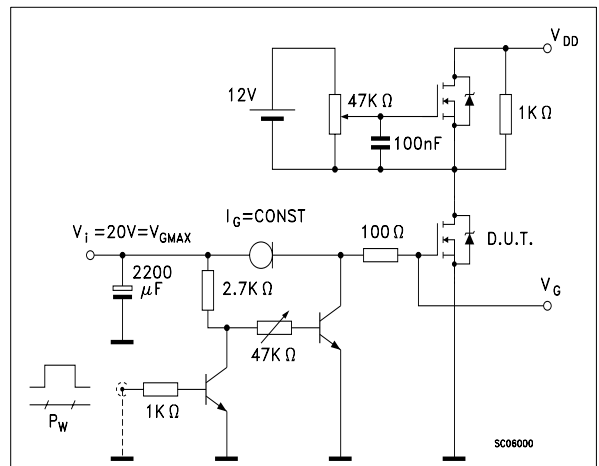
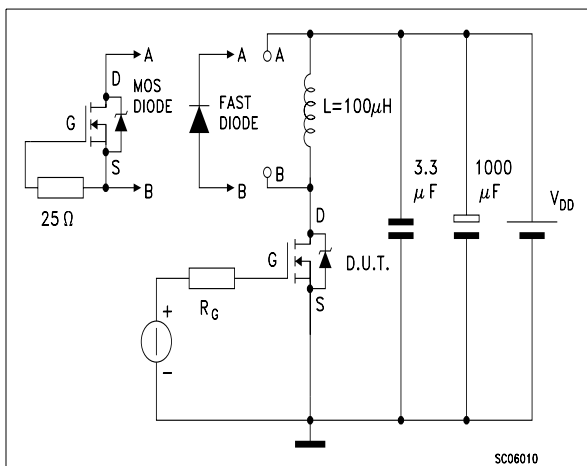
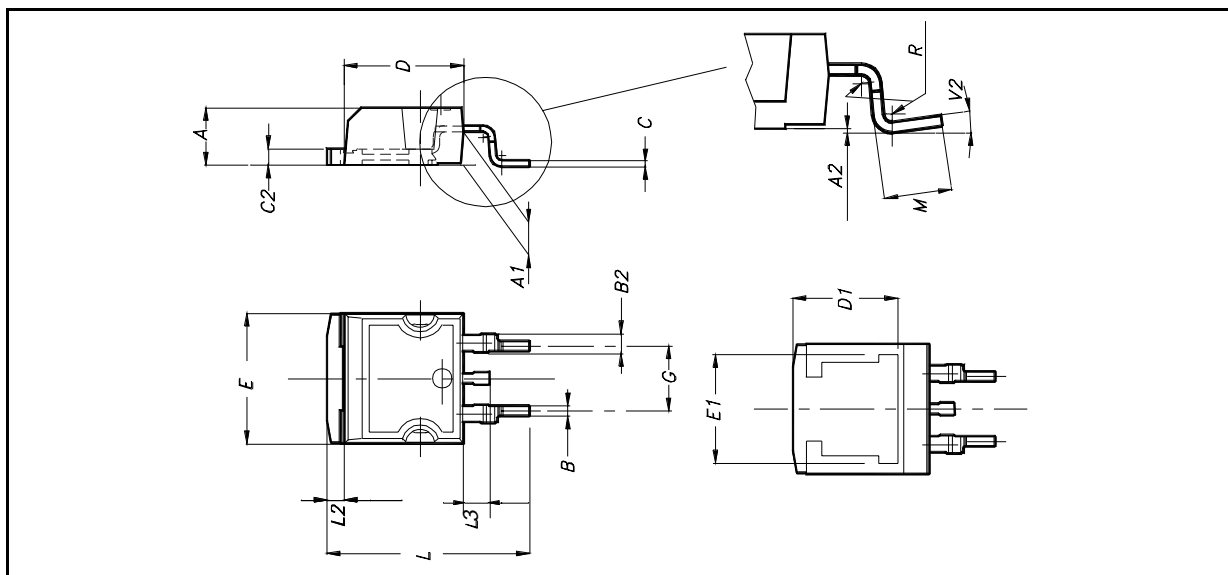


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

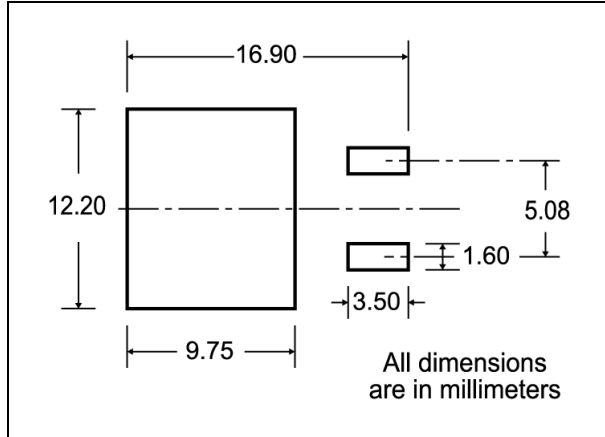


D²PAK MECHANICAL DATA

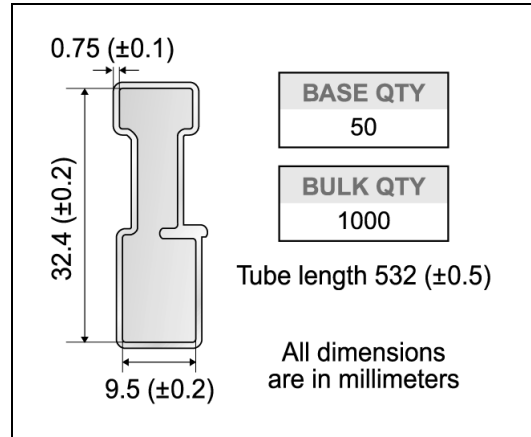
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

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

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

Bending radius R min.

TRL

FEED DIRECTION

* on sales type

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