



# STB160NF3LL

## N-CHANNEL 30V - 0.0026 Ω - 160A D<sup>2</sup>PAK STripFET™ II POWER MOSFET

PRELIMINARY DATA

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
ST160NF3LL	30 V	<0.003 Ω	160 A

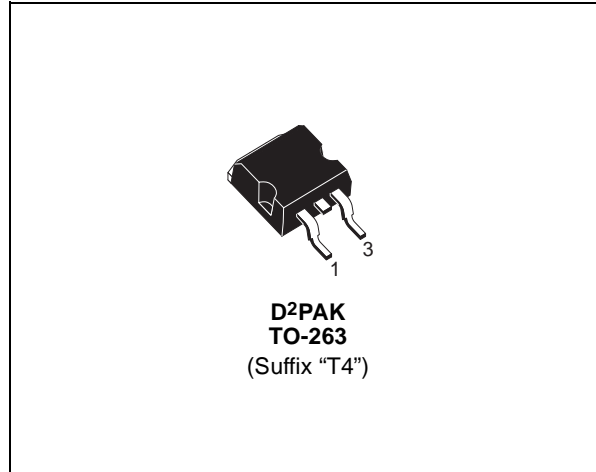
- TYPICAL R<sub>DS(on)</sub> = 0.0026 Ω
- LOW THRESHOLD DRIVE
- ULTRA LOW ON-RESISTANCE
- LOGIC LEVEL DEVICE
- 100% AVALANCHE TESTED
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263)  
POWER PACKAGE IN TUBE (NO SUFFIX) OR  
IN TAPE & REEL (SUFFIX "T4")

### DESCRIPTION

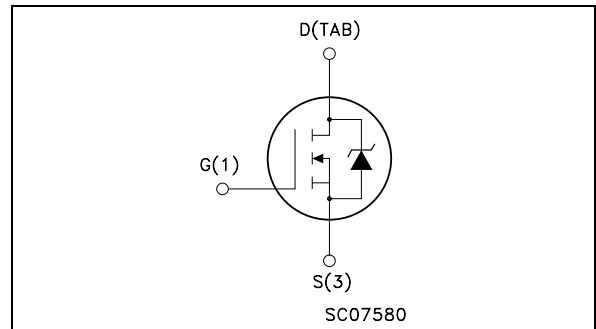
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- SOLENOID AND RELAY DRIVERS



### INTERNAL SCHEMATIC DIAGRAM



### 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	± 15	V
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>C</sub> = 25°C	160	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	160	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	640	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	300	W
	Derating Factor	2	W/°C
E <sub>AS</sub> ( <sup>1</sup> )	Single Pulse Avalanche Energy	1.2	J
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature		

(•) Pulse width limited by safe operating area.

(\*) Current Limited by Package

(1) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 80A, V<sub>DD</sub> = 20V

## STB160NF3LL

### 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 <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 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> = ± 15 V			±100	nA

#### ON (\*)

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> = 250 μA	1			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 80 A V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 80 A		0.0026 0.0032	0.0030 0.0043	Ω Ω

#### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 15 V I <sub>D</sub> = 80 A		60		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V f = 1 MHz V <sub>GS</sub> = 0		6200		pF
C <sub>oss</sub>	Output Capacitance			1720		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			300		pF

**ELECTRICAL CHARACTERISTICS** (continued)

## SWITCHING ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 15\text{ V}$ $I_D = 80\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		50 350		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD}=24\text{V}$ $I_D=160\text{A}$ $V_{GS}=5\text{V}$		95 25 45	125	nC nC nC

## SWITCHING OFF(\*)

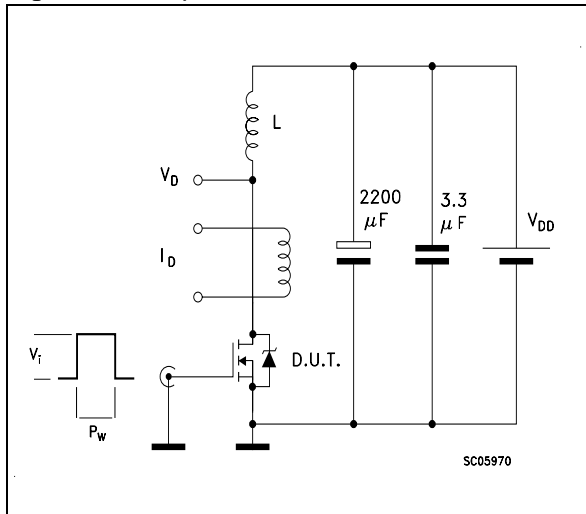
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 15\text{ V}$ $I_D = 80\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		150 120		ns ns

## SOURCE DRAIN DIODE(\*)

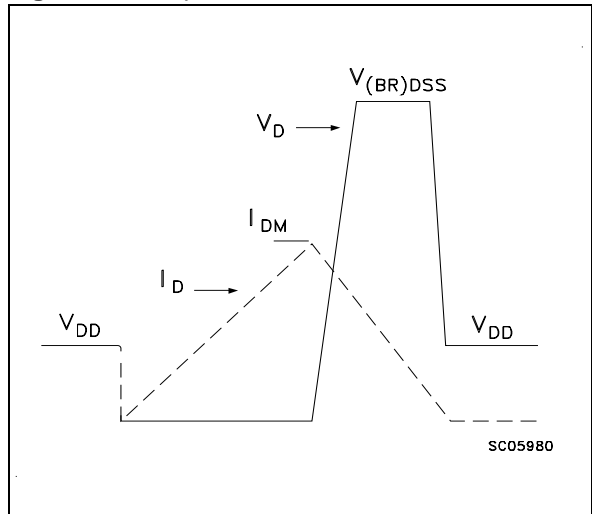
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}$ (*)	Source-drain Current Source-drain Current (pulsed)				160 640	A A
$V_{SD}$ (*)	Forward On Voltage	$I_{SD} = 160\text{ A}$ $V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 160\text{ A}$ $di/dt = 100\text{A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		90 200 5		ns nC A

(\*)Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.(\*)Pulse width limited by  $T_{jmax}$

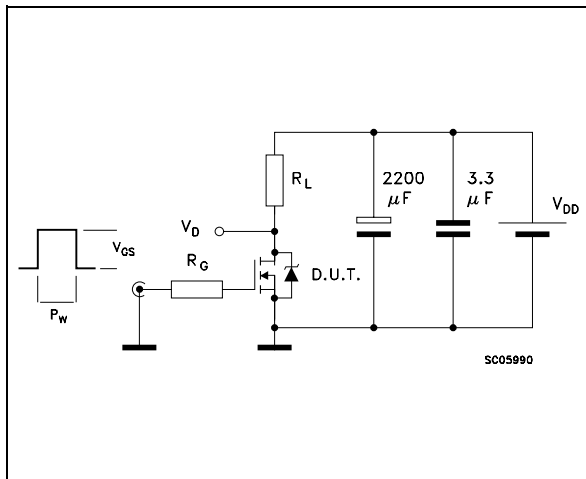
**Fig. 1: Unclamped Inductive Load Test Circuit**



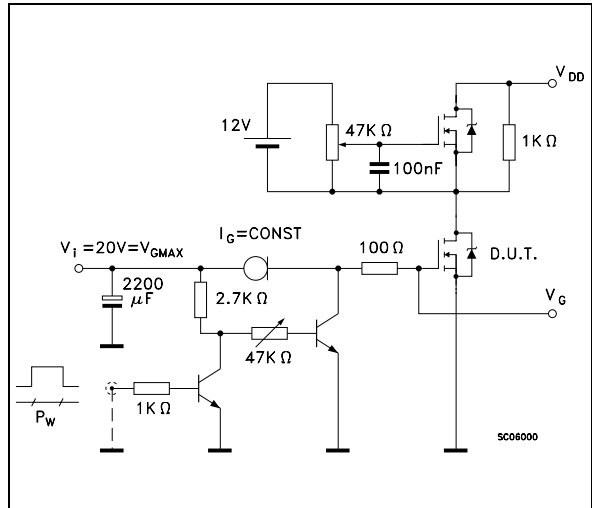
**Fig. 2: Unclamped Inductive Waveform**



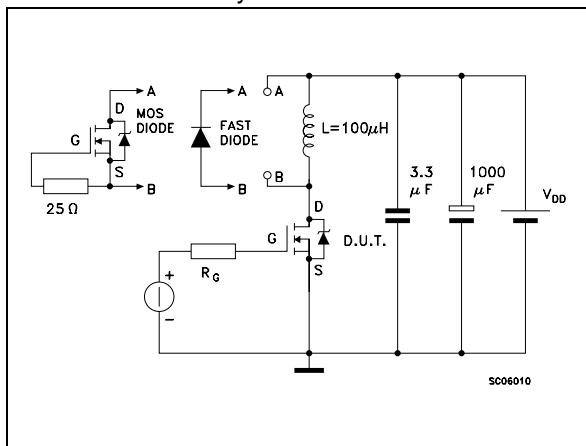
**Fig. 3: Switching Times Test Circuits For Resistive Load**



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

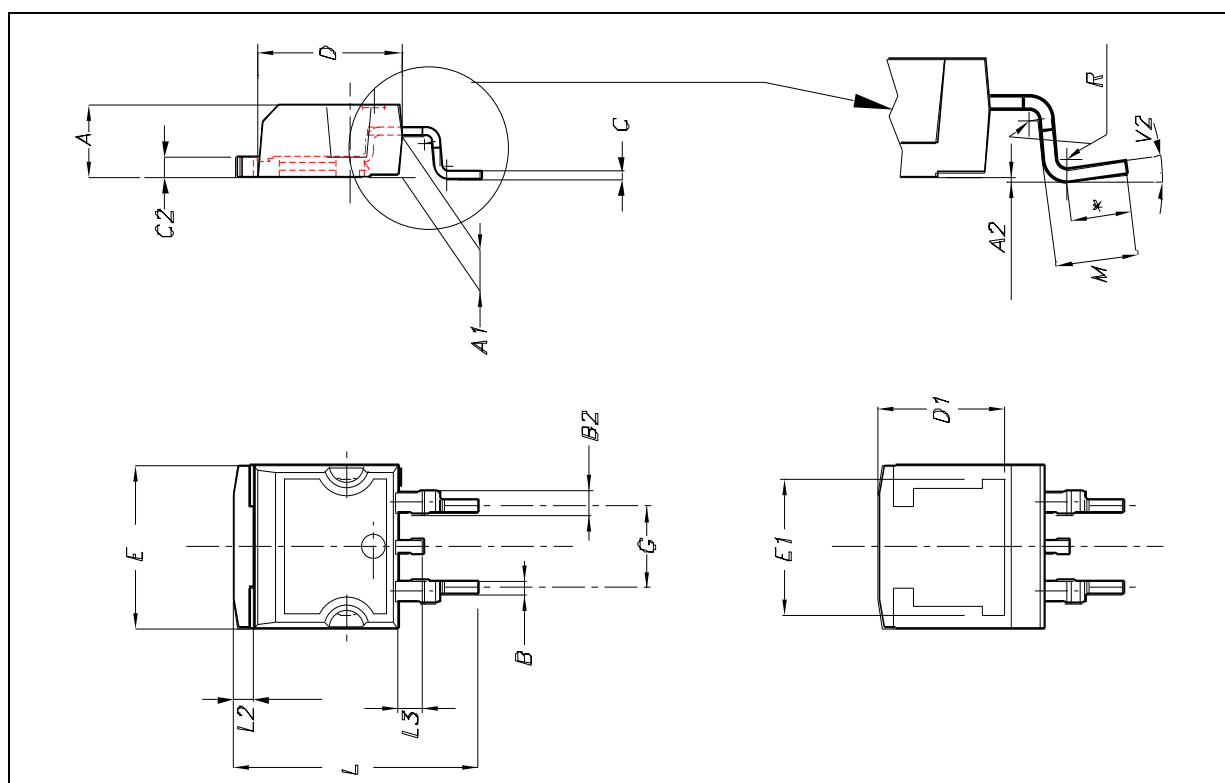


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

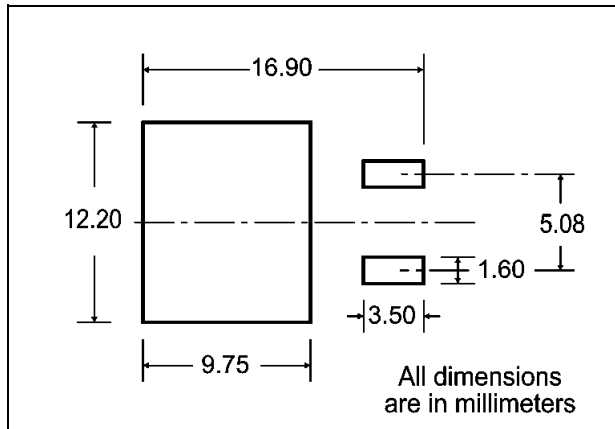


D<sup>2</sup>PAK MECHANICAL DATA

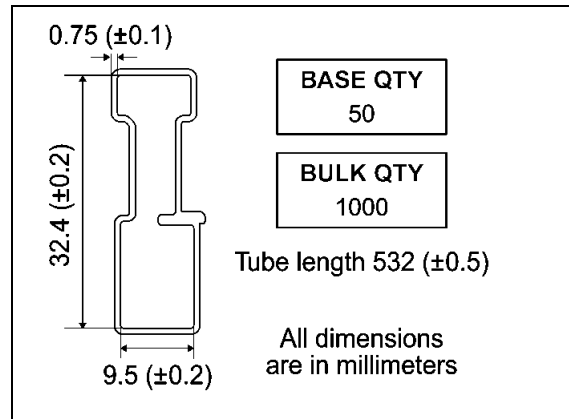
DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.028		0.037
B2	1.14		1.7	0.045		0.067
C	0.45		0.6	0.018		0.024
C2	1.21		1.36	0.048		0.054
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.394		0.409
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.591		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.069
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°	0°		8°



**D2PAK FOOTPRINT**



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



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

Diagram showing the tape and reel shipment details. The top view shows a circular reel with a diameter of A. The tape slot in the core has a width of 2.5 mm min. and a full radius. The distance from the center of the reel to the start of the tape slot is B. The distance from the center of the reel to the center of the tape slot is D. The distance from the center of the reel to the center of the tape slot is also labeled as 40 mm min. Access hole at slot location. The side view shows the tape thickness T, the distance from the center of the reel to the center of the tape slot C, the distance from the center of the reel to the center of the tape slot N, and the distance from the center of the reel to the center of the tape slot G measured at the hub.

**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

**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

Diagram showing the tape mechanical data. The top view shows the tape with dimensions K0, D, P2, P0, E, F, W, B0, D1, A0, P1, and Center line of cavity. The distance from the center of the cavity to the center of the tape slot is P1. The distance from the center of the cavity to the center of the tape slot is also labeled as 10 pitches cumulative tolerance on tape +/- 0.2 mm. The side view shows the tape thickness T, the distance from the center of the cavity to the center of the tape slot C, the distance from the center of the cavity to the center of the tape slot N, and the distance from the center of the cavity to the center of the tape slot G measured at the hub. The bottom view shows the tape with dimensions TRL and FEED DIRECTION. The bending radius is R min.

\* on sales type

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