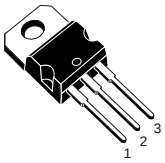
STP80NF03L

N-CHANNEL 30V - 0.004 Ω - 80A TO-220
STripFET™ II MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP80NF03L	30 V	< 0.0045 Ω	80 A

- TYPICAL $R_{DS}(on)$ = 0.004 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW THRESHOLD DRIVE

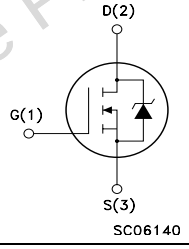


TO-220

DESCRIPTION

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

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT (INJECTION,ABS, AIR-BAG, LAMPDRIVERS Etc.)

ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP80NF03L	P80NF03L	TO-220	TUBE

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	± 20	V
I_D (#)	Drain Current (continuous) at T_C = 25°C	80	A
I_D (#)	Drain Current (continuous) at T_C = 100°C	80	A
I_{DM} (●)	Drain Current (pulsed)	320	A
P_{TOT}	Total Dissipation at T_C = 25°C	300	W
	Derating Factor	2.0	W/°C
dv/dt (1)	Peak Diode Recovery Voltage Slope	2.0	V/ns
T_{stg}	Storage Temperature	–65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(#) Current Limited by Package.
(●) Pulse width limited by safe operating area.
(1) $I_{SD} \leq 80A$, $di/dt \leq 240$ A/µs, V_{DD} = 24V ; $T_j \leq T_{JMAX.}$

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 Typ	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 20 V)	2.3	J

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

OFF/ON

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			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250 µA	1	1.5	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V, I_D = 40 A		0.004	0.0045	Ω
		V_{GS} = 4.5 V, I_D = 40 A		0.0045	0.0065	Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} =15 V, I_D = 15 A		50		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		5500		pF
C_{oss}	Output Capacitance			1670		pF
C_{rss}	Reverse Transfer Capacitance			290		pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 15 V, I_D = 40 A		30		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 4.5 V (Resistive Load, Figure 3)		270		ns
Q_g	Total Gate Charge	V_{DD} = 24V, I_D = 80A,		85	110	nC
Q_{gs}	Gate-Source Charge	V_{GS} = 4.5V		23		nC
Q_{gd}	Gate-Drain Charge			40		nC

SWITCHING OFF

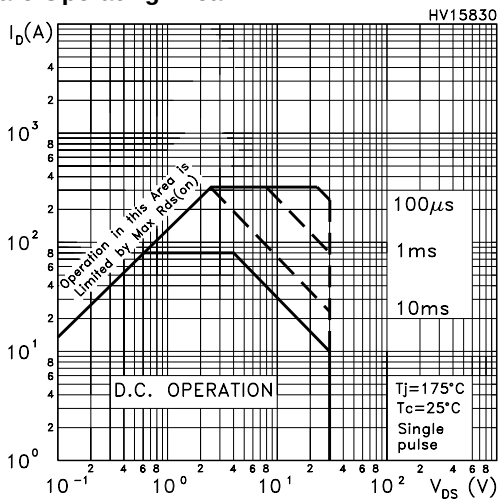
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	V_{DD} = 15 V, I_D = 40 A,		110		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 4.5V (Resistive Load, Figure 3)		95		ns
$t_{r(Voff)}$	Off-Voltage Rise Time	V_{clamp} = 24 V, I_D = 80 A,		125		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 4.5V		75		ns
t_c	Cross-over Time	(Inductive Load, Figure 5)		125		ns

SOURCE DRAIN DIODE

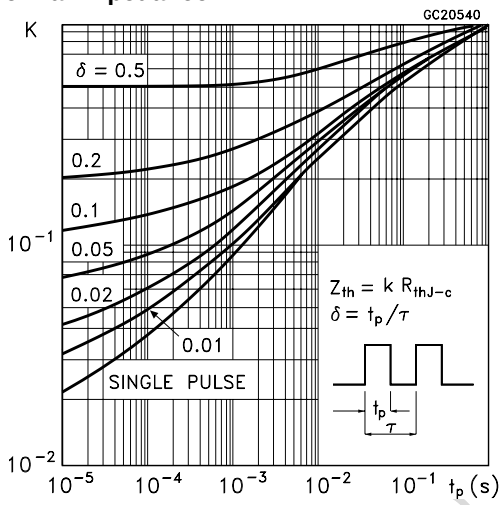
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				80	A
I_{SDM} (1)	Source-drain Current (pulsed)				320	A
V_{SD} (2)	Forward On Voltage	I_{SD} = 80 A, V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 80 A, di/dt = 100 A/µs,		75		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 20 V, T_j = 150°C		0.15		µC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		4		A

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

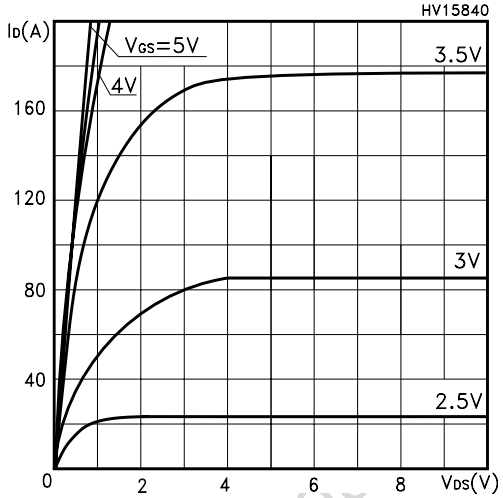
Safe Operating Area



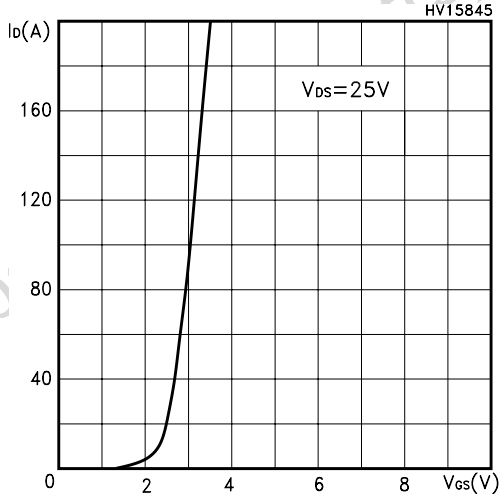
Thermal Impedance



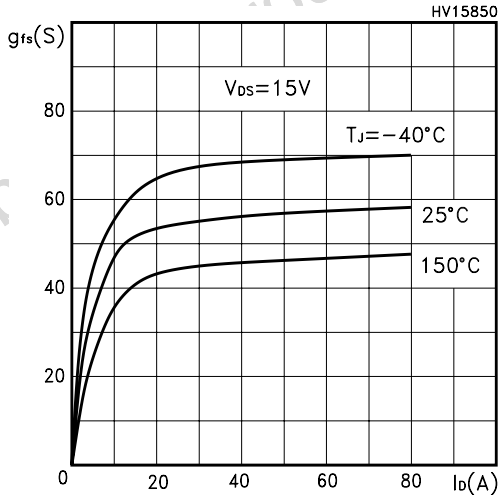
Output Characteristics



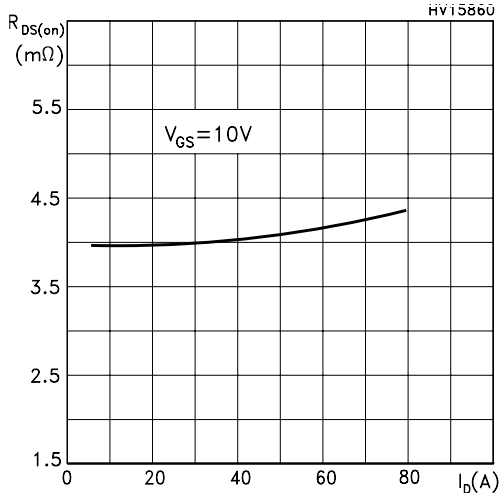
Transfer Characteristics



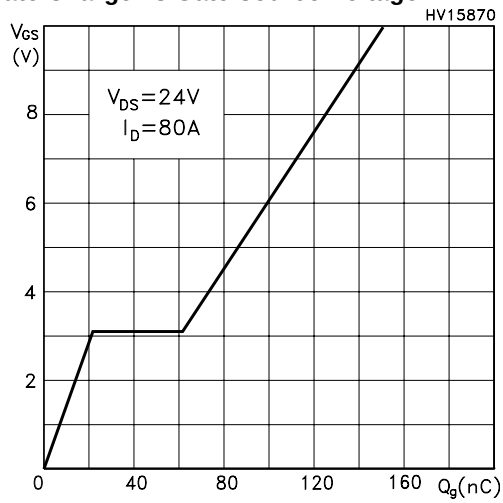
Transconductance



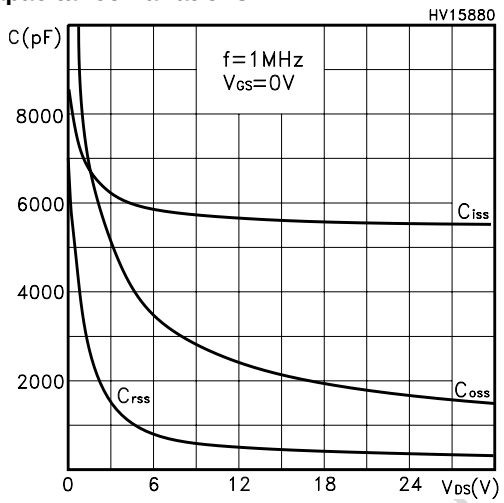
Static Drain-source On Resistance



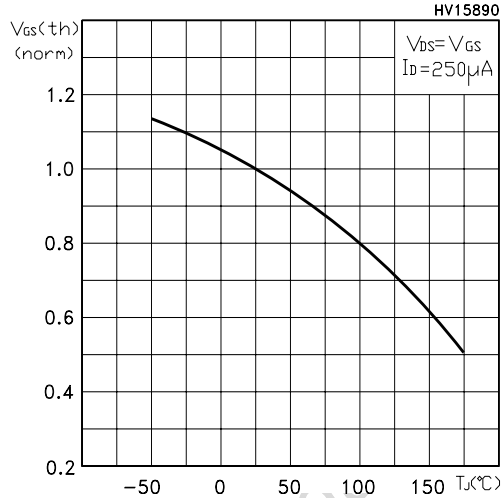
Gate Charge vs Gate-source Voltage



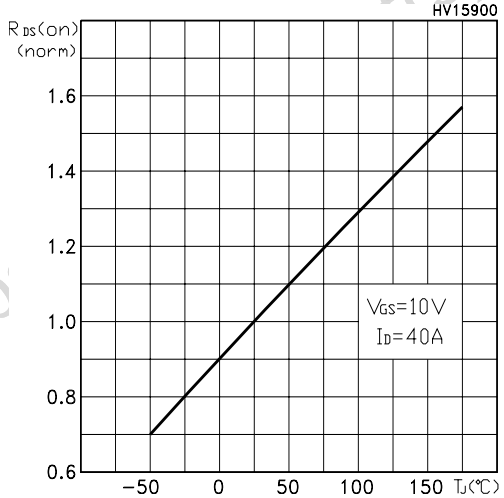
Capacitance Variations



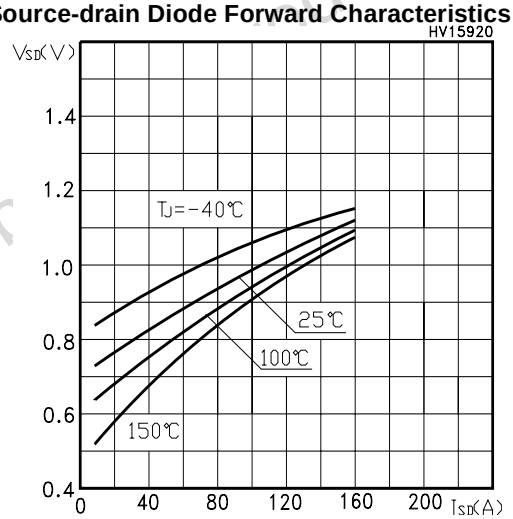
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature

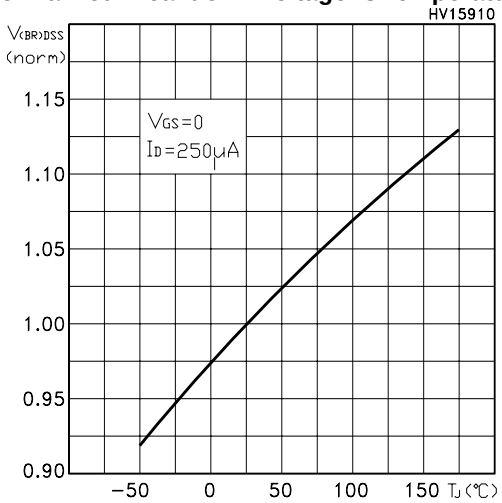


Fig. 1: Unclamped Inductive Load Test Circuit

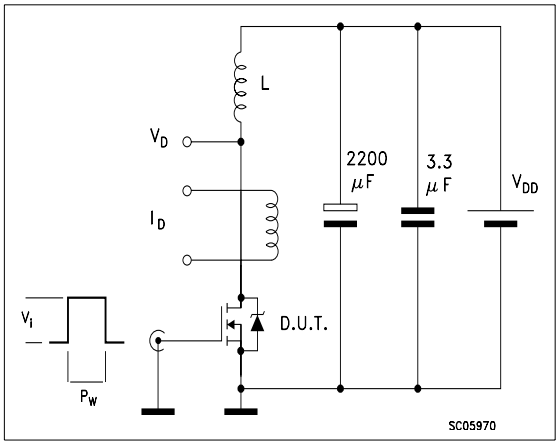


Fig. 2: Unclamped Inductive Waveform

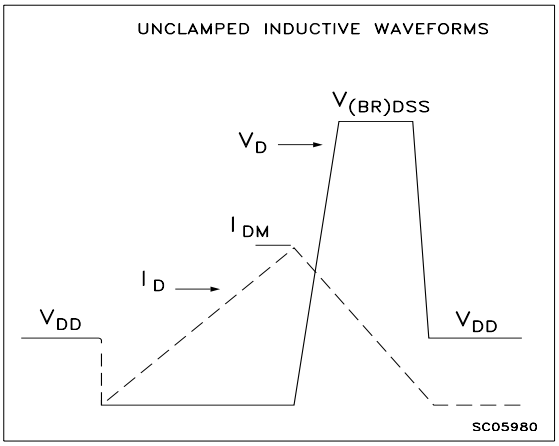


Fig. 3: Switching Times Test Circuit For Resistive Load

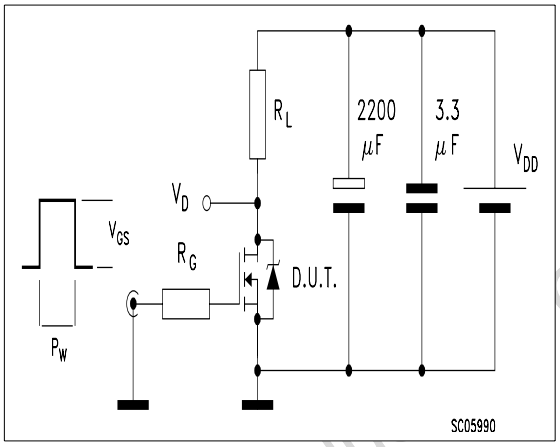


Fig. 4: Gate Charge test Circuit

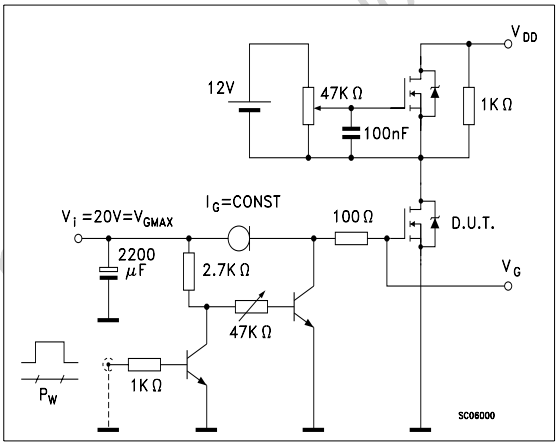
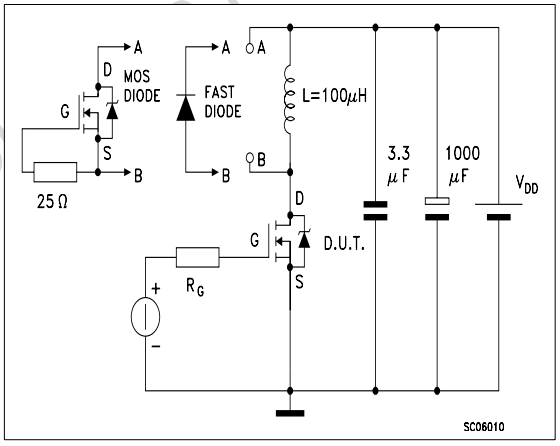


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116