

# STP190NF04

## STB190NF04 - STB190NF04-1

N-channel 40V - 0.0039Ω - 120A - D<sup>2</sup>PAK/I<sup>2</sup>PAK/TO-220  
STripFET™ III Power MOSFET

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP190NF04	40V	<0.0043Ω	120A
STB190NF04	40V	<0.0043Ω	120A
STB190NF04-1	40V	<0.0043Ω	120A

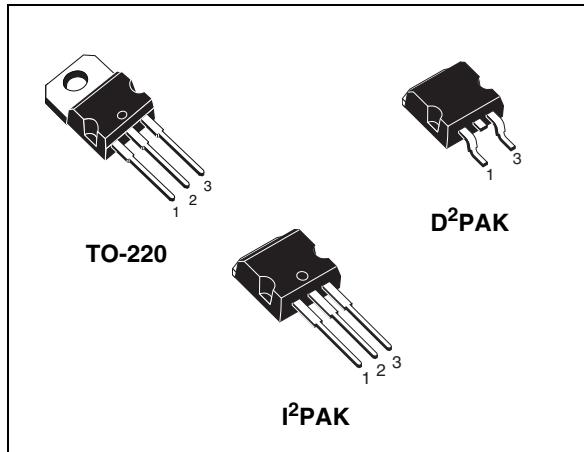
- Standard threshold drive
- 100% avalanche tested

### Description

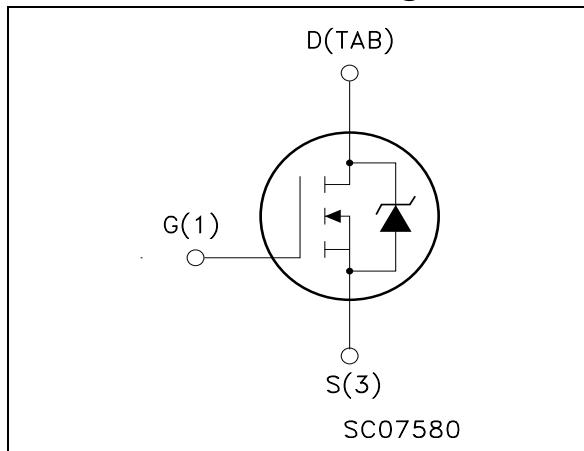
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

### Applications

- Switching application



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
STB190NF04T4	B190NF04	D <sup>2</sup> PAK	Tape & reel
STB190NF04-1	B190NF04	I <sup>2</sup> PAK	Tube
STP190NF04	P190NF04	TO-220	Tube

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	40	V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	40	V
$V_{GS}$	Gate- source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	120	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	480	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	310	W
	Derating factor	2.07	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	7	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	860	mJ
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		

1. Value limited by package
2. Pulse width limited by safe operating area.
3.  $I_{SD} \leq 190\text{A}$ ,  $dI/dt \leq 600\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$
4. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = 95\text{A}$ ,  $V_{DD} = 35\text{V}$

**Table 2. Thermal data**

$R_{thj-case}$	Thermal resistance junction-case max	0.48	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	50	$^\circ\text{C/W}$
$T_J$	Maximum lead temperature for soldering purpose <sup>(1)</sup>	300	$^\circ\text{C}$

1. for 10 sec. 1.6mm from case

## 2 Electrical characteristics

( $T_{CASE}=25^\circ\text{C}$  unless otherwise specified)

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu\text{A}, V_{GS} = 0$	40			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{max ratings}$ $V_{DS} = \text{max ratings}, T_C = 125^\circ\text{C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{V}$			$\pm 100$	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2		4	V
$R_{DS(\text{on})}$	Static drain-source on resistance	$V_{GS} = 10\text{V}, I_D = 95\text{A}$		0.0039	0.0043	$\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{V}, I_D = 95\text{A}$		200		s
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{V}, f = 1\text{MHz}, V_{GS} = 0$		5800 1500 200		pF pF pF
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 20\text{V}, I_D = 95\text{A}$ $R_G = 4.7\Omega, V_{GS} = 10\text{V}$		45 380 100 75		ns ns ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 20\text{V}, I_D = 190\text{A}, V_{GS} = 5\text{V}$		130 40 45		nC nC nC

1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

**Table 5. Source drain diode**

<b>Symbol</b>	<b>Parameter</b>	<b>Test conditions</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				120 480	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 120A, V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 190A,$ $dI/dt = 100A/\mu s,$ $V_{DD} = 34V, T_j = 150^\circ C$		90 295 6.5		ns nC A

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