

STD90N4F3 - STI90N4F3 STP90N4F3 - STU90N4F3

N-channel 40 V, 5.4 mΩ, 80 A, DPAK, TO-220, IPAK, I²PAK
STripFET™ Power MOSFET

Features

Type	V _{DSS}	R _{DS(on) max}	I _D	P _w
STD90N4F3	40 V	< 6.5 mΩ	80 A	110 W
STI90N4F3	40 V	< 6.5 mΩ	80 A	110 W
STP90N4F3	40 V	< 6.5 mΩ	80 A	110 W
STU90N4F3	40 V	< 6.5 mΩ	80 A	110 W

- Standard threshold drive
- 100% avalanche tested

Application

- Switching applications

Description

This n-channel enhancement mode Power MOSFET is the latest refinement of STMicroelectronics unique “single feature size” strip-based process with less critical alignment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

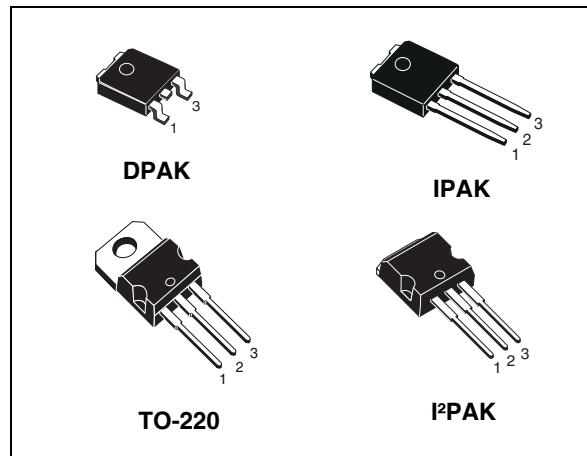


Figure 1. Internal schematic diagram

Table 1. Device summary

Order codes	Marking	Package	Packaging
STD90N4F3	90N4F3	DPAK	Tape & reel
STI90N4F3	90N4F3	I ² PAK	Tube
STP90N4F3	90N4F3	TO-220	Tube
STU90N4F3	90N4F3	IPAK	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS}=0$)	40	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	80	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	65	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	110	W
	Derating factor	0.73	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	8	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	400	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Current limited by package
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80 \text{ A}$, $di/dt \leq 400\text{A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_j \leq T_{jmax}$
4. Starting $T_j = 25^\circ\text{C}$, $I_D = 40\text{A}$, $V_{DD} = 30\text{V}$

Table 3. Thermal resistance

Symbol	Parameter	Value			Unit
		TO-220 I ² PAK	IPAK	DPAK	
$R_{thj-case}$	Thermal resistance junction-case max	1.36			$^\circ\text{C/W}$
R_{thj-a}	Thermal resistance junction-ambient max	62.5	100	--	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max	--	--	50	$^\circ\text{C/W}$
T_I	Maximum lead temperature for soldering purpose	300	275	--	$^\circ\text{C}$

1. When mounted on 1inch² FR-4 2Oz Cu board

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	40			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}, V_{DS} = \text{Max rating}, T_c = 125^\circ C$			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 V$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 40 A$		5.4	6.5	$m\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 25 V, I_D = 40 A$		100		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0$		2200 580 40		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 20 V, I_D = 80 A$ $V_{GS} = 10 V$		40 11 8	54	nC nC nC

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=20\text{ V}$, $I_D=40\text{ A}$, $R_G=4.7\text{ }\Omega$, $V_{GS}=10\text{ V}$		15 50		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=20\text{ V}$, $I_D=40\text{ A}$, $R_G=4.7\text{ }\Omega$, $V_{GS}=10\text{ V}$		40 15		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				80 320	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=80\text{ A}$, $V_{GS}=0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=80\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=30\text{ V}$, $T_j=150^\circ\text{C}$		45 60 2.8		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

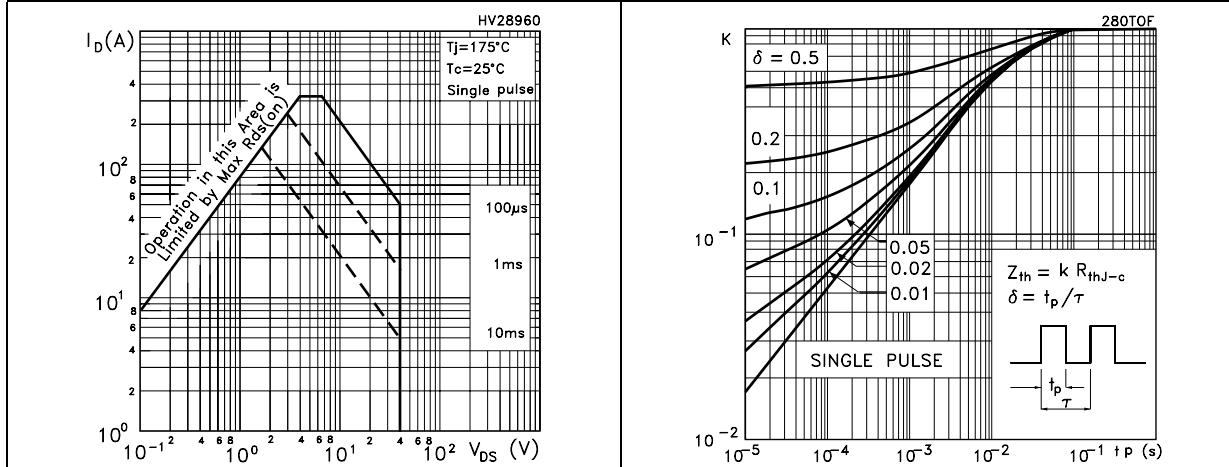


Figure 4. Output characteristics

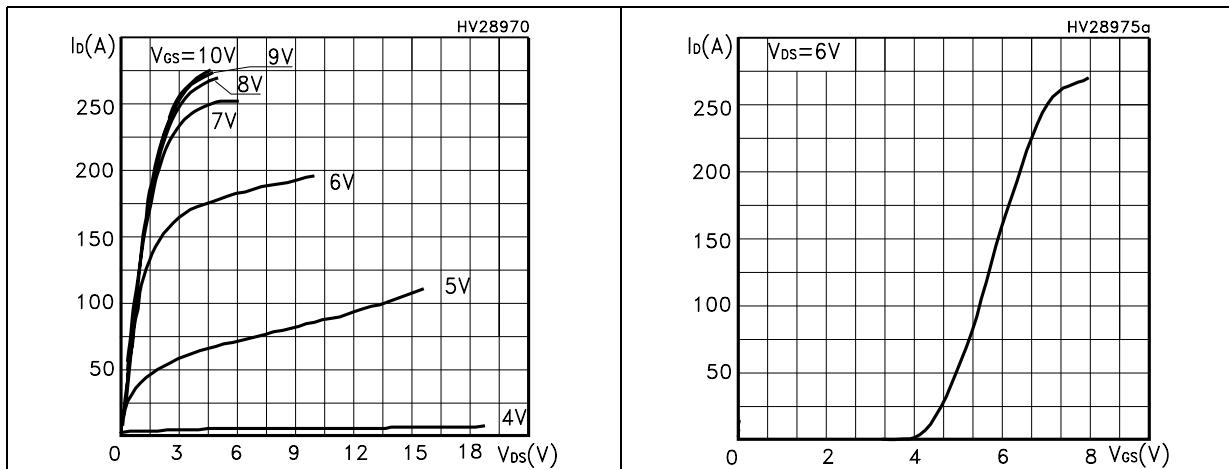


Figure 6. Static drain-source on resistance

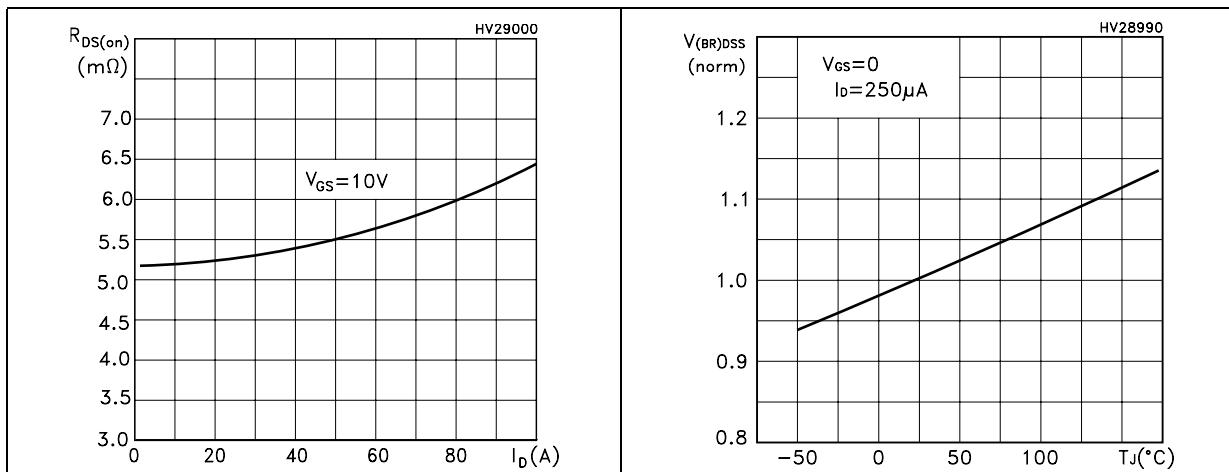


Figure 3. Thermal impedance

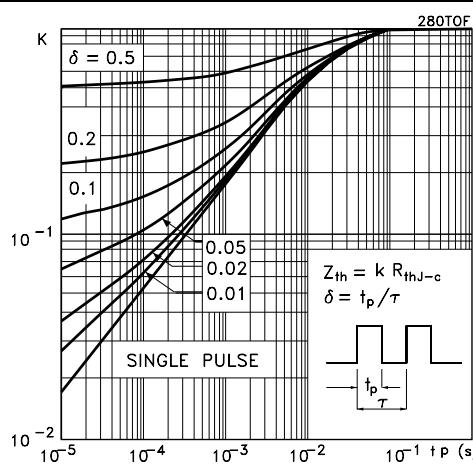


Figure 5. Transfer characteristics

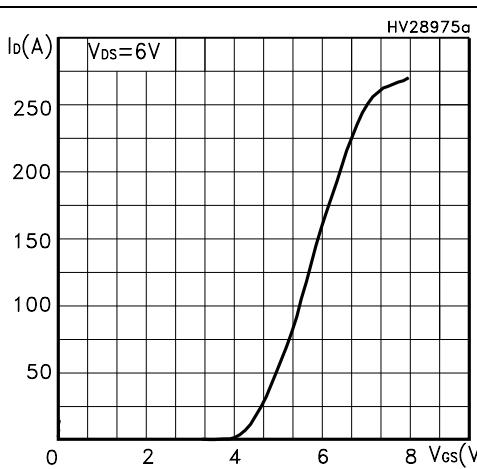


Figure 7. Normalized BVDSS vs temperature

