STP90N55F4

N-channel 55 V, 0.0064 Ω, 90 A, TO-220
STripFET™ DeepGATE™ Power MOSFET

Features

Type	V_{DSS}	$R_{DS(on)}$ max	I_D
STP90N55F4	55 V	< 0.008 Ω	90 A

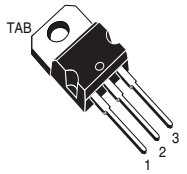
- Exceptional dv/dt capability
- Extremely low on-resistance $R_{DS(on)}$
- 100% avalanche tested

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using ST's STripFET™ DeepGATE™ technology. The device has a new gate structure and is specially designed to minimize on-state resistance to provide superior switching performance.



TO-220

Figure 1. Internal schematic diagram

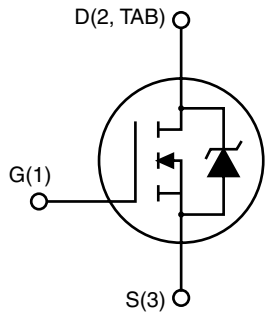


Table 1. Device summary

Order codes	Marking	Packages	Packaging
STP90N55F4	90N55F4	TO-220	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	55	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at T_C = 25 °C	90	A
I_D	Drain current (continuous) at T_C = 100 °C	65	A
I_{DM} (1)	Drain current (pulsed)	360	A
P_{TOT}	Total dissipation at T_C = 25 °C	150	W
	Derating factor	1	W/°C
E_{AS} (2)	Single pulse avalanche energy	290	mJ
T_{stg}	Storage temperature	– 55 to 175	°C
T_j	Max. operating junction temperature		

1. Pulse width limited by safe operating area
2. Starting T_j = 25 °C, I_D= 32.5 A, V_{DD}= 45 V

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1	°C/W
R_{thj-a}	Thermal resistance junction-ambient max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown voltage (V_{GS} = 0)	I_D = 250 µA	55			V
I_{DSS}	Zero gate voltage Drain current (V_{GS} = 0)	V_{DS} = 55 V V_{DS} = 55 V, T_C=125 °C			1 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 45 A		0.0064	0.008	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	4800	-	pF
C_{oss}	Output capacitance			350		pF
C_{rss}	Reverse transfer capacitance			210		pF
Q_g	Total gate charge	V_{DD} = 27.5 V, I_D = 90 A, V_{GS} = 10 V	-	90	-	nC
Q_{gs}	Gate-source charge			25		nC
Q_{gd}	Gate-drain charge			26		nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 27.5 V, I_D = 90 A R_G = 4.7 Ω V_{GS} = 10 V	-	20 60	-	ns ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time	V_{DD} = 27.5 V, I_D = 90 A, R_G = 4.7 Ω, V_{GS} = 10 V	-	55 30	-	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)		-		90 360	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 90 A, V_{GS} = 0	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 90 A, V_{DD} = 44 V di/dt = 100 A/µs, T_j = 150 °C	-	50 105 4		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

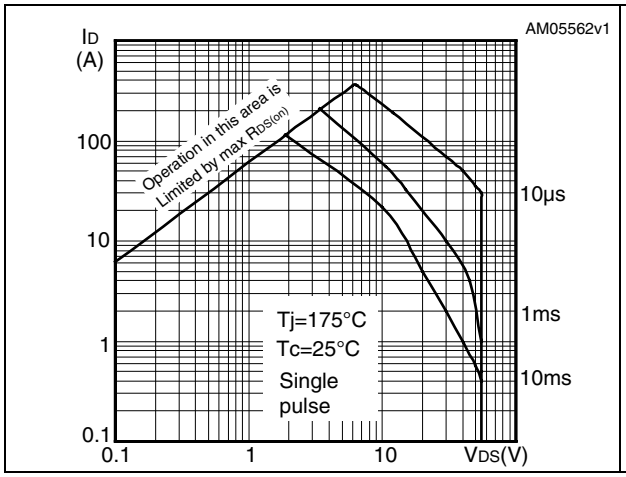


Figure 3. Thermal impedance

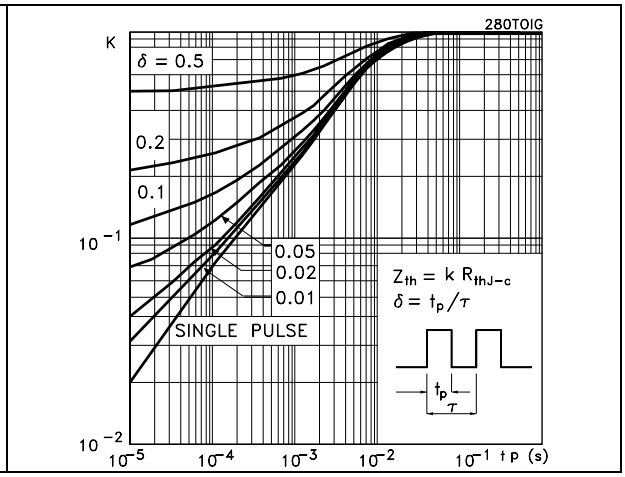


Figure 4. Output characteristics

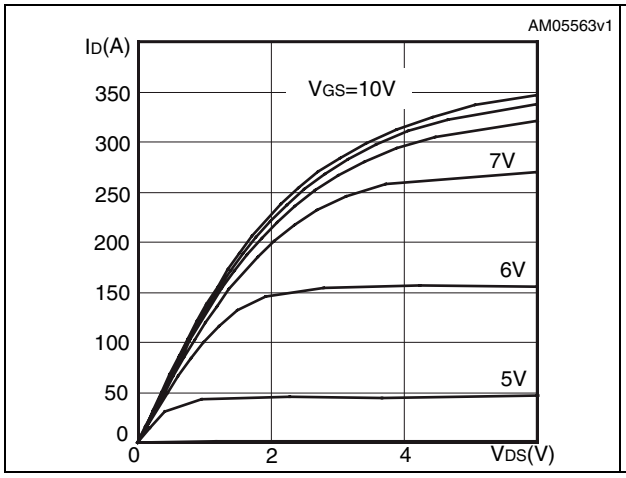


Figure 5. Transfer characteristics

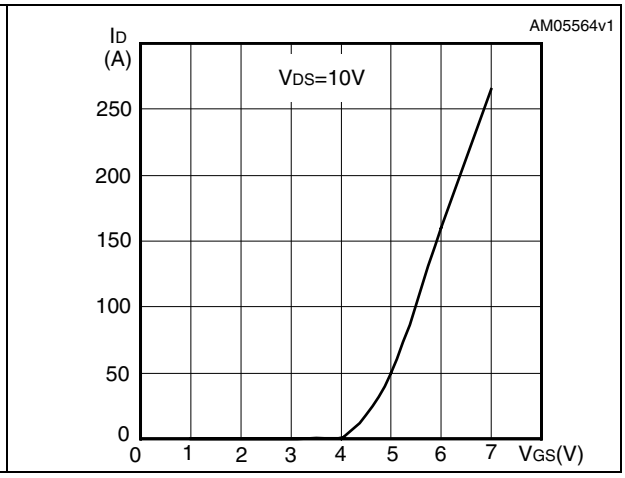


Figure 6. Normalized BV_{DSS} vs temperature

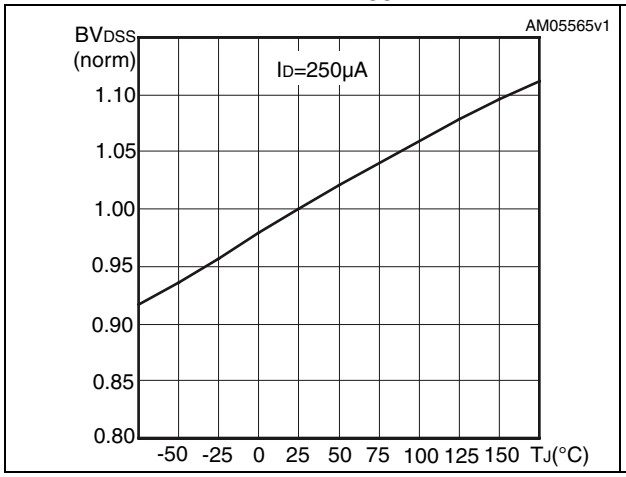


Figure 7. Static drain-source on resistance