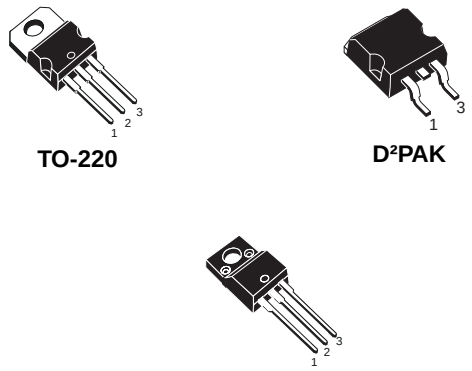
STP45NF3LL - STP45NF3LLFP
STB45NF3LL

N-channel 30V - 0.014Ω - 45A TO-220 - TO-220FP - D^2PAK
STripFET II™ power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STB45NF3LL	30V	<0.018Ω	45A
STP45NF3LLFP	30V	<0.018Ω	45A
STP45NF3LL	30V	<0.018Ω	27A

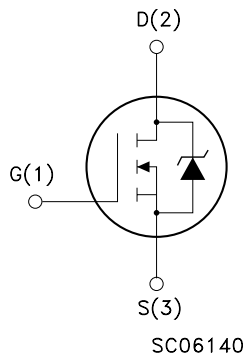
- Optimal $R_{DS(on)}$ x Q_g trade-off @ 4.5V
- Conduction losses reduced
- Switching losses reduced



Description

This application specific Power MOSFET is the third genaration of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance ang gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STB11NM60FD	B11NM60FD	D²PAK	Tape & reel
STB11NM60FD-1	B11NM60FD	I²PAK	Tube
STP11NM60FD	P11NM60FD	TO-220	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220/ D²PAK/I²PAK	TO-220FP	
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	±16		V
I_D	Drain current (continuos) at T_C = 25°C	45	27	A
I_D	Drain current (continuos) at T_C = 100°C	32	19	A
I_{DM} (1)	Drain current (pulsed)	180	108	A
P_{TOT}	Total dissipation at T_C = 25°C	70	25	W
	Derating factor	0.46	0.167	W/°C
E_{AS} (2)	Single pulse avalanche energy	241		mj
V_{ISO}	Insulation winthstand voltage (dc)	--	2500	V
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= 22.5A, V_{DD}= 24V

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		TO-220 D²PAK	TO-220FP	
$R_{thj-case}$	Thermal resistance junction-case Max	2.14	6	°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 3. On/off states

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 V_{DS}=Max rating, T_C=125°C			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±16V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 22.5A V_{GS} = 4.5V, I_D = 22.5A		0.014 0.016	0.018 0.020	Ω Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15V, I_D=22.5A		20		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		800 250 60		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 24V, I_D = 45A, V_{GS} = 5V		12.5 4.6 5.2	17	nC nC nC

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

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 15V, I_D = 22.5A R_G = 4.7Ω V_{GS} = 4.5V (see Figure 15)		17 100		ns ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time	V_{DD} = 15V, I_D = 22.5A, R_G = 4.7Ω, V_{GS} = 4.5V (see Figure 15)		20 21		ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				45	A
I_{SDM} (1)	Source-drain current (pulsed)				180	A
V_{SD} (2)	Forward on voltage	I_{SD} = 45A, V_{GS} = 0			1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 45A, V_{DD} = 15V		35		ns
Q_{rr}	Reverse recovery charge	di/dt = 100A/µs,		44		nC
I_{RRM}	Reverse recovery current			2.5		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 1. Safe operating area for TO-220/ D²PAK

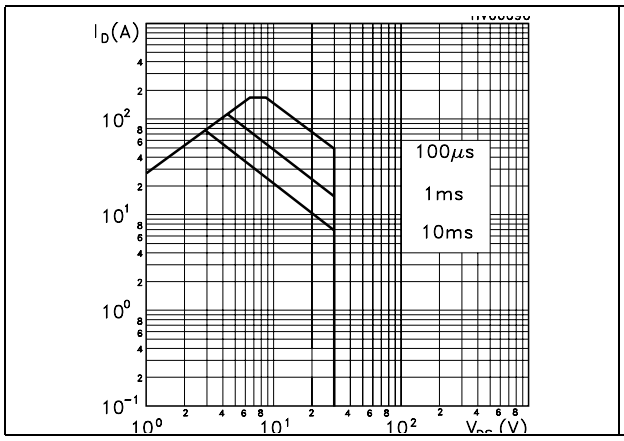


Figure 2. Thermal impedance for TO-220/ D²PAK

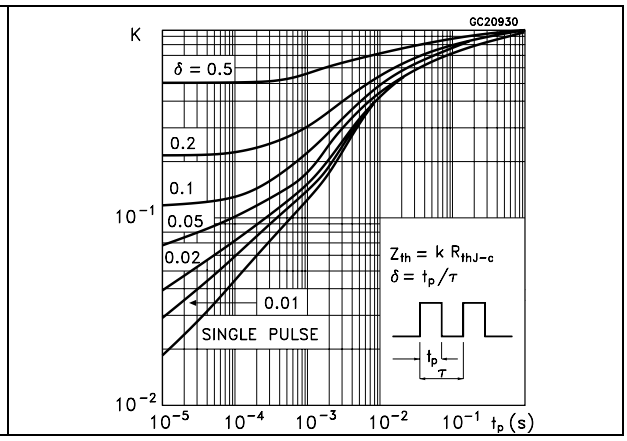


Figure 3. Safe operating areafor TO-220FP

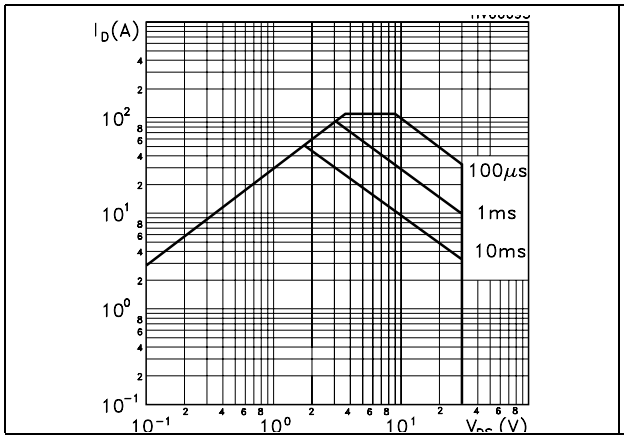


Figure 4. Thermal impedance for TO-220FP

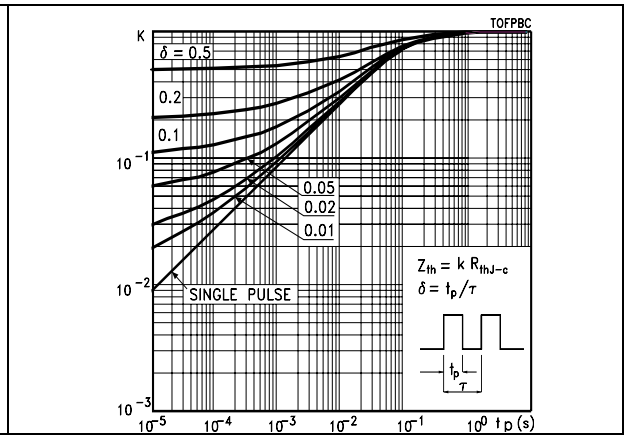


Figure 5. Output characterisics

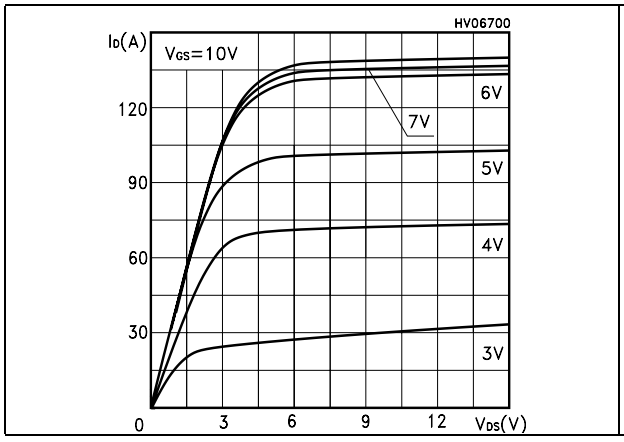


Figure 6. Transfer characteristics