

# STC5DNF30V

# Dual N-channel 30V - 0.032Ω - 4.5A - TSSOP8 2.7V-Driver STripFET™ Power MOSFET

### **General features**

Туре	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STC5DNF30V	30V	< 0.035Ω (@4.5V) < 0.040Ω (@2.7V)	4.5A

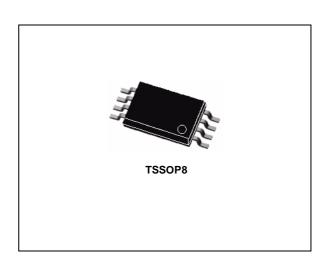
- Standard outline for easy automated surface mount assembly
- Ultra low threshold gate drive (2.7V)

### **Description**

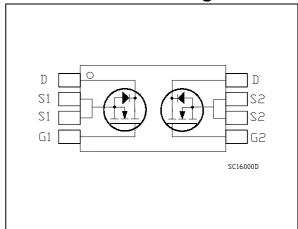
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility. No electrical connections are shared between mosfets.

### **Applications**

Switching application



### Internal schematic diagram



#### **Order codes**

Part number	number Marking Package		Packaging	
STC5DNF30V	C5DNF30V	TSSOP8	Tape & reel	

Contents STC5DNF30V

# **Contents**

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	6
3	Test circuits	8
4	Package mechanical data	9
5	Revision history	11

STC5DNF30V Electrical ratings

# 1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source voltage (V <sub>GS</sub> = 0)	30	V
$V_{GS}$	Gate- source voltage	± 8	V
I <sub>D</sub> <sup>(1)</sup>	Drain current (continuous) at T <sub>C</sub> = 25°C	4.5	Α
I <sub>D</sub> <sup>(1)</sup>	Drain current (continuous) at T <sub>C</sub> = 100°C	2.8	Α
I <sub>DM</sub> <sup>(2)</sup>	Drain current (pulsed)	18	Α
P <sub>TOT</sub> (1)	Total dissipation at t <sub>C</sub> = 25°C	1.3	W

<sup>1.</sup> When mounted on FR-4 board with 1inch² pad, 2 Oz of Cu and t<10sec.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
	Thermal resistance junction-pcb max	120	°C/W
Rthj-pcb <sup>(2)</sup>	Thermal resistance junction-pcb max	97.5	°C/W
Tj	Operating junction temperature	-55 to 150	°C
T <sub>stg</sub>	Storage temperature	-55 to 150	°C

<sup>1.</sup> When mounted on minimum recommended footprint.

<sup>2.</sup> Pulse width limited by safe operating area

<sup>2.</sup> When mounted on FR-4 board with 1inch² pad, 2 Oz of Cu and t<10sec.

Electrical characteristics STC5DNF30V

# 2 Electrical characteristics

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

Table 3. On/off

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	30			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	$V_{DS}$ = Max rating $V_{DS}$ = Max rating, $T_{C}$ =125°C			1 10	μA μA
I <sub>GSS</sub>	Gate-body leakage current (V <sub>DS</sub> = 0)	$V_{GS} = \pm 8V$			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	0.6			V
R <sub>DS(on)</sub>	Static drain-source on resistance	$V_{GS} = 4.5V, I_D = 2.3A$ $V_{GS} = 2.7V, I_D = 2.3A$		0.032 0.036	0.035 0.040	Ω Ω

Table 4. Dynamic

	•					
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 <sub>fs</sub>	Forward transconductance	V <sub>DS</sub> =25V <sub>;</sub> I <sub>D</sub> = 2.3A		9.5		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25V, f = 1 \text{ MHz},$ $V_{GS} = 0$		460 200 50		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 16V, I_{D} = 4.5A,$ $V_{GS} = 4.5V$ (see Figure 14)		8.5 1.8 2.4	11.5	ns ns ns

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>r</sub>	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD}$ = 10V, $I_{D}$ = 2.3A, $R_{G}$ = 4.7 $\Omega$ $V_{GS}$ = 4.5V (see Figure 13)		7 33 27 10		ns ns ns ns
t <sub>r(Voff)</sub> t <sub>f</sub>	Off-voltage rise time Fall time Cross-over time	$V_{DD} = 16V, I_{D} = 2.3A,$ $R_{G} = 4.7\Omega, V_{GS} = 4.5V$ (see Figure 17)		26 11 21		ns ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I <sub>SD</sub>	Source-drain current Source-drain current (pulsed)				4.5 18	A A
V <sub>SD</sub> <sup>(2)</sup>	Forward on voltage	I <sub>SD</sub> = 4.5A, V <sub>GS</sub> = 0			1.2	V
t <sub>rr</sub> Q <sub>rr</sub> I <sub>RRM</sub>	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 4.5A$ , di/dt =100A/ $\mu$ s, $V_{DD} = 10V$ , $T_j = 150$ °C (see Figure 15)		26 13 1		ns nC A

<sup>1.</sup> Pulse width limited by safe operating area.

<sup>2.</sup> Pulsed: Pulse duration =  $300 \mu s$ , duty cycle 1.5 %.

Electrical characteristics STC5DNF30V

### 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

Figure 2. Thermal impedance

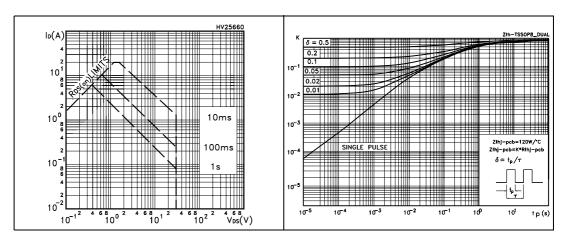


Figure 3. Output characteristics

Figure 4. Transfer characteristics

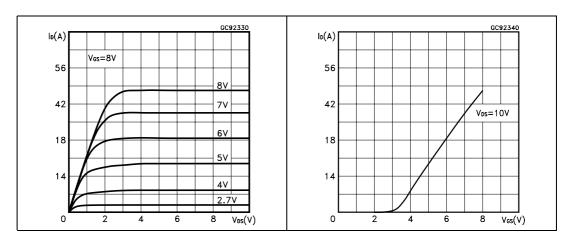


Figure 5. Transconductance

Figure 6. Static drain-source on resistance

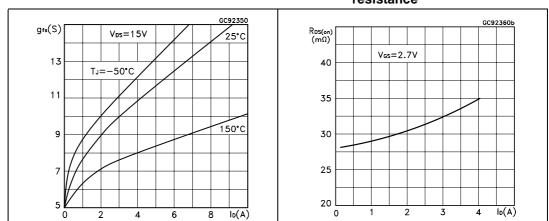
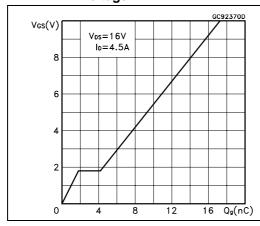


Figure 7. Gate charge vs gate-source voltage

Figure 8. Capacitance variations



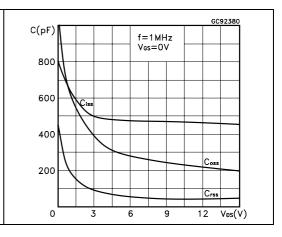
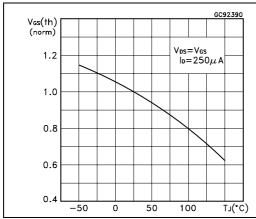


Figure 9. Normalized gate thereshold voltage vs temperature

Figure 10. Normalized on resistance vs temperature



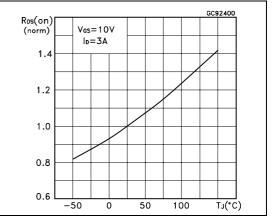
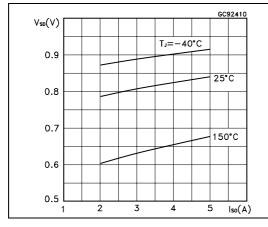
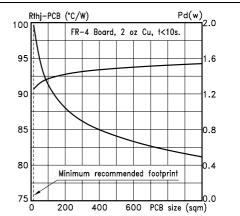


Figure 11. Source-drain diode forward characteristics

Figure 12. Thermal resistance and max power





Test circuits STC5DNF30V

# 3 Test circuits

Figure 13. Switching times test circuit for resistive load

Figure 14. Gate charge test circuit

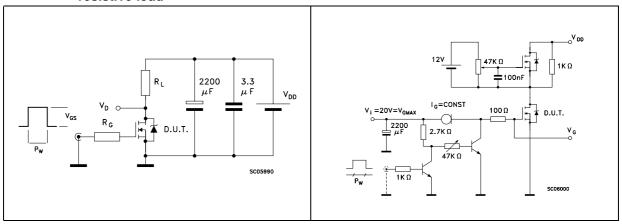


Figure 15. Test circuit for inductive load switching and diode recovery times

Figure 16. Unclamped inductive load test circuit

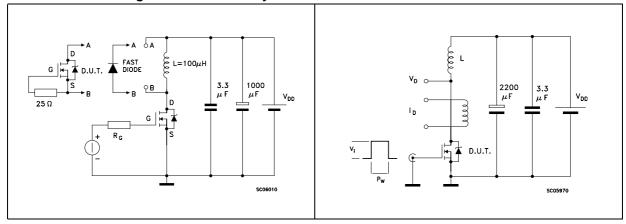
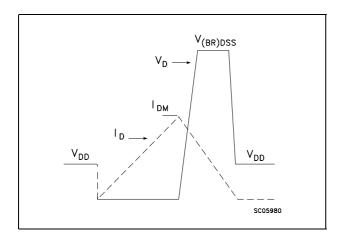


Figure 17. Unclamped inductive waveform



**577** 

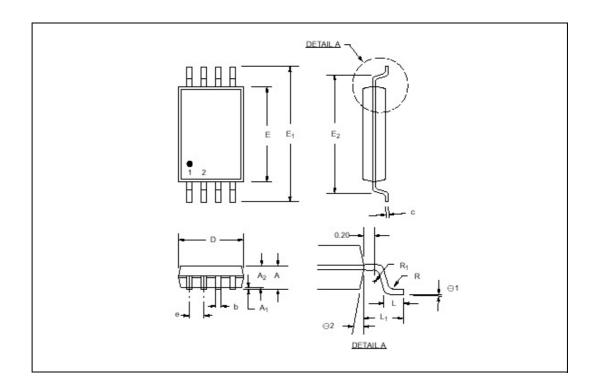
# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

**577** 

### **TSSOP8 MECHANICAL DATA**

DIM.		mm.			inch	
DINI.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α	1.05		1.20	0.041		0.047
A1	0.05		0.15	0.002		0.006
A2	0.80		1.05	0.032		0.041
b	0.19		0.30	0.008		0.012
С		0.127			0.005	
D	2.90		3.10	0.114		0.122
Е	4.30		4.50	0.170		0.177
E1	6.20		6.60	0.240		0.260
E2	5.14		5.24	0.202		0.206
е		0.65			0.025	
L	0.45		0.75	0.018		0.030
L1	0.90		1.10	0.0355		0.0433
R	0.09			0.004		
R1	0.09			0.004		
θ1	0°		8°	0°		8°
θ2			1	2°		•



STC5DNF30V Revision history

# 5 Revision history

Table 7.

Date	Revision	Changes
11-Apr-2006	1	First release

**47/** 

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57