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## STD60NF3LL

N-channel 30V - 0.0075Ω - 60A - DPAK  
 STripFET™ II Power MOSFET

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD60NF3LL	60V	<0.0095Ω	60A

- Optimal R<sub>DS(ON)</sub> x Q<sub>g</sub> trade-off @ 4.5V
- Conduction losses reduced
- Switching losses reduced

### Description

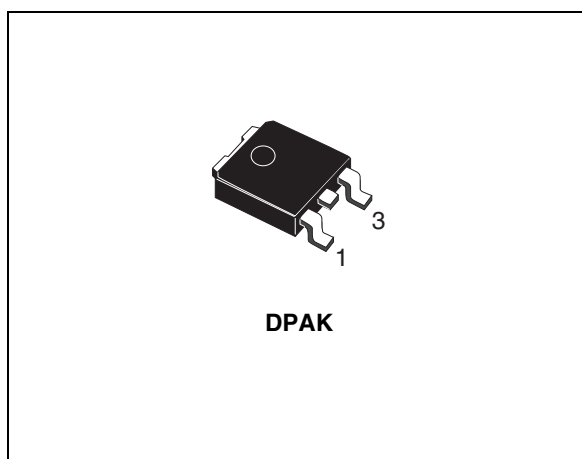
This application specific Power MOSFET is the third generation of STMicroelectronics unique “Single Feature Size™” strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance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

### Applications

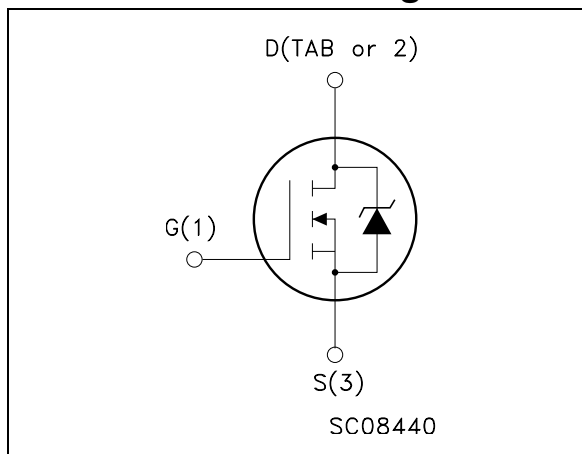
- Switching application

### Order codes

Part number	Marking	Package	Packaging
STD60NF3LLT4	D60NF3LL	DPAK	Tape & reel



### Internal schematic diagram



## Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	30	V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )	30	V
$V_{GS}$	Gate- source voltage	$\pm 16$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	60	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	43	A
$I_{DM}^{(1)}$	Drain current (pulsed)	240	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	100	W
	Derating Factor	0.67	W/ $^\circ\text{C}$
$E_{AS}^{(2)}$	Single pulse avalanche energy	700	mJ
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		

1. Pulse width limited by safe operating area.
2. Starting  $T_j=25^\circ\text{C}$ ,  $I_D=30\text{A}$ ,  $V_{DD}=27.5\text{V}$

**Table 2. Thermal data**

Rthj-case	Thermal resistance junction-case max	1.5	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal resistance junction-to ambient max	100	$^\circ\text{C}/\text{W}$
$T_J$	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

Electrical characteristics

STD60NF3LL

## 2 Electrical characteristics

(T<sub>CASE</sub>=25°C unless otherwise specified)

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0	30			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating V <sub>DS</sub> = Max rating, T <sub>C</sub> = 125°C			1 10	μA μA
I <sub>GSS</sub>	Gate-body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 16V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1			V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 30A		0.0075 0.0085	0.0095 0.0105	Ω Ω

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 30A		30		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> = 25V, f = 1MHz, V <sub>GS</sub> = 0		2210 635 138		pF pF pF
t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub>	Turn-on delay time Rise time Turn-off delay time Fall time	V <sub>DD</sub> = 15V, I <sub>D</sub> = 30A R <sub>G</sub> = 4.7Ω V <sub>GS</sub> = 4.5V (see <a href="#">Figure 12</a> )		22 130 36.5 36.5		ns ns ns ns
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 24V, I <sub>D</sub> = 60A, V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 4.7Ω (see <a href="#">Figure 13</a> )		30 9 12.5	40	nC nC nC

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

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**Electrical characteristics**

**Table 5. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				60 240	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 60A, V_{GS} = 0$			1.2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 60A, di/dt = 100A/\mu s,$ $V_{DD} = 15V, T_j = 150^\circ C$ (see <a href="#">Figure 14</a> )		65 105 3.4		ns nC A

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

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

Figure 2. Thermal impedance

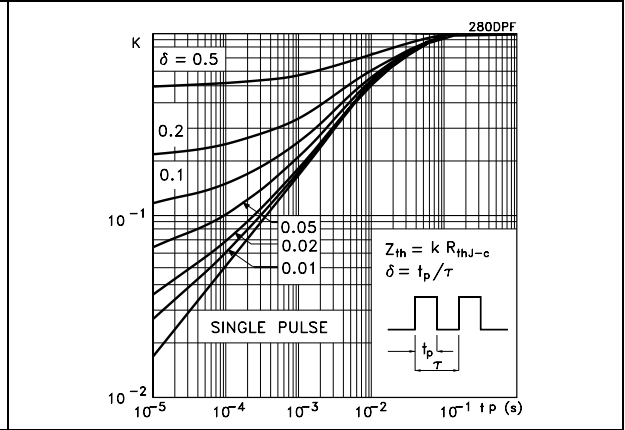
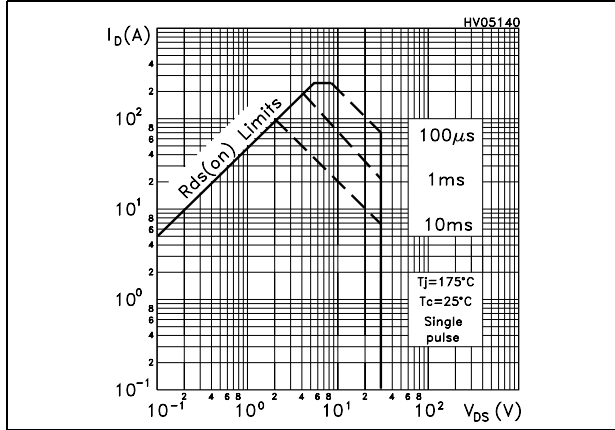


Figure 3. Output characteristics

Figure 4. Transfer characteristics

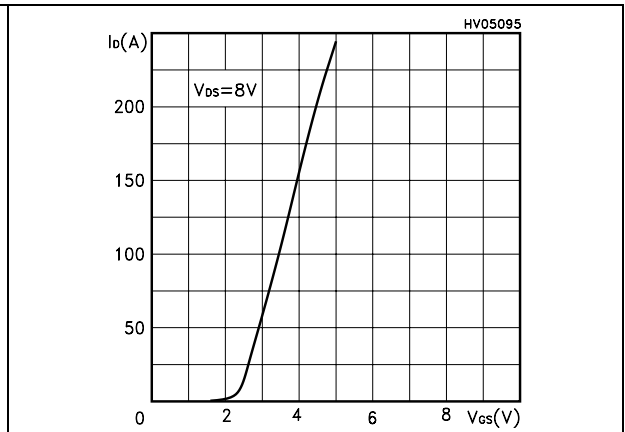
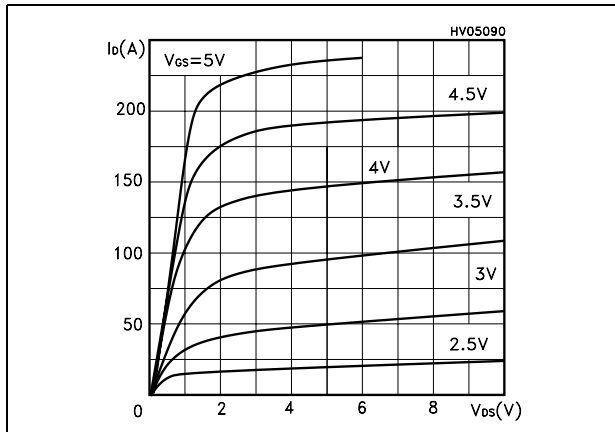
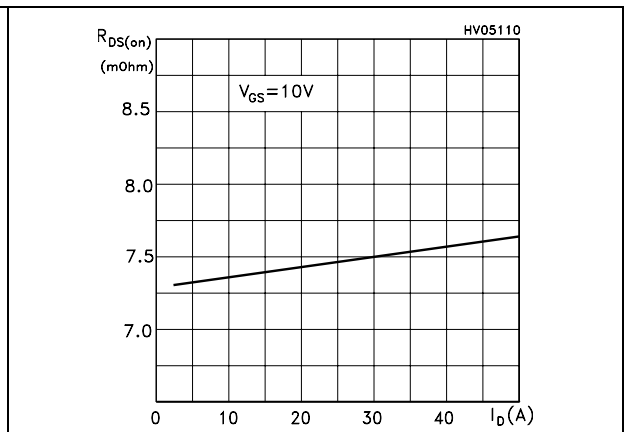
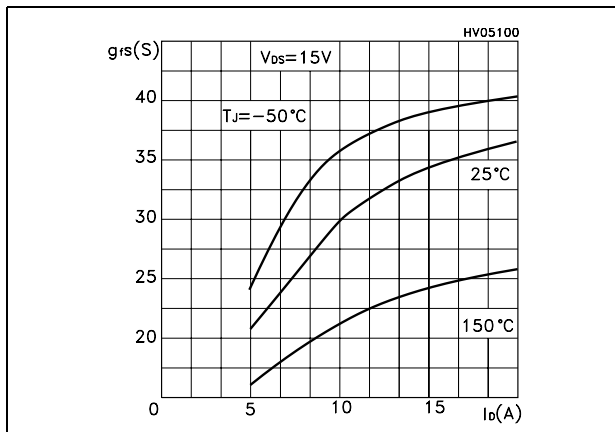


Figure 5. Transconductance

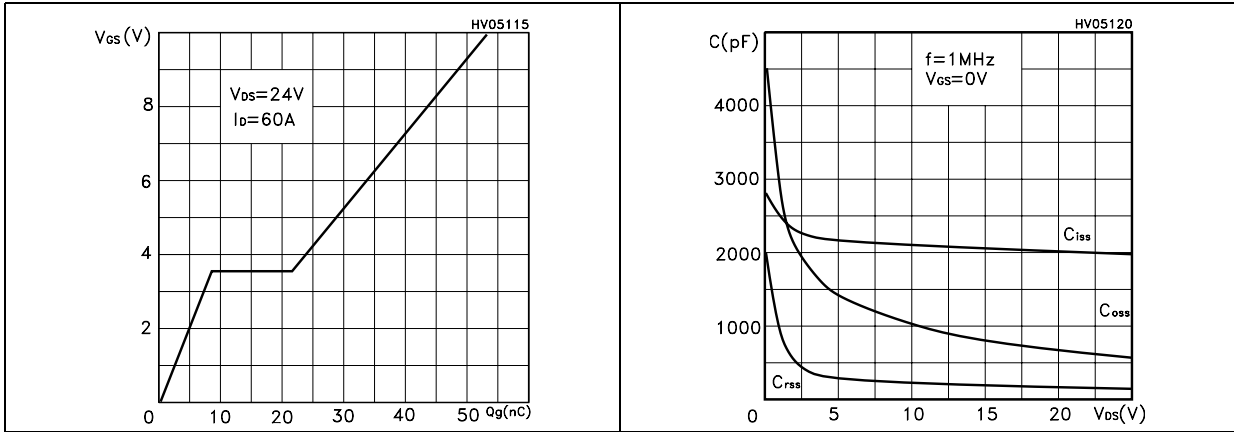
Figure 6. Static drain-source on resistance



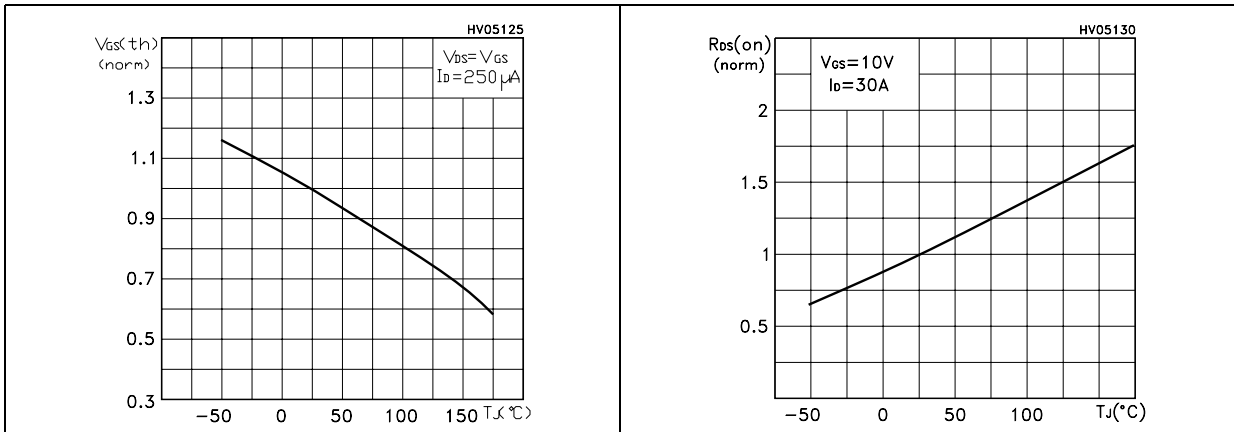
**STD60NF3LL**

**Electrical characteristics**

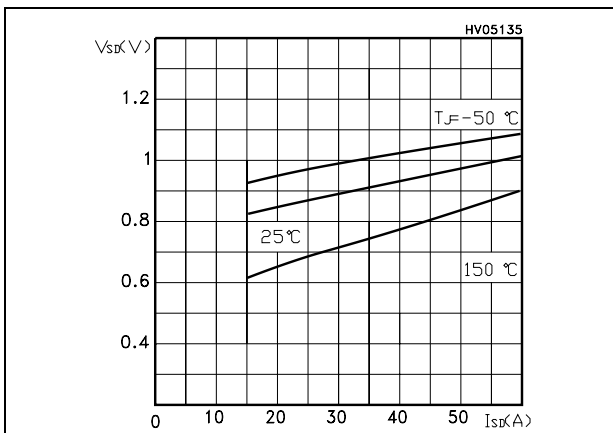
**Figure 7. Gate charge vs gate-source voltage**    **Figure 8. Capacitance variations**



**Figure 9. Normalized gate threshold voltage vs temperature**    **Figure 10. Normalized on resistance vs temperature**



**Figure 11. Source-drain diode forward characteristics**





Test circuit

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### 3 Test circuit

Figure 12. Switching times test circuit for resistive load

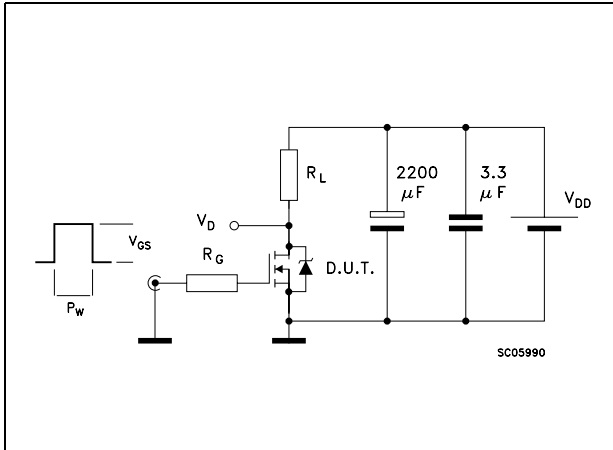


Figure 13. Gate charge test circuit

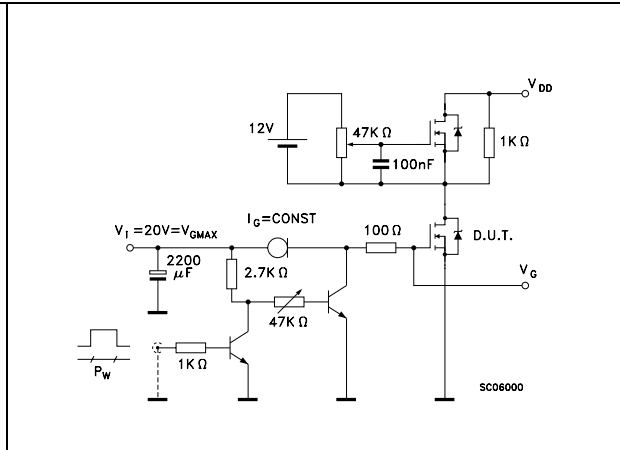


Figure 14. Test circuit for inductive load switching and diode recovery times

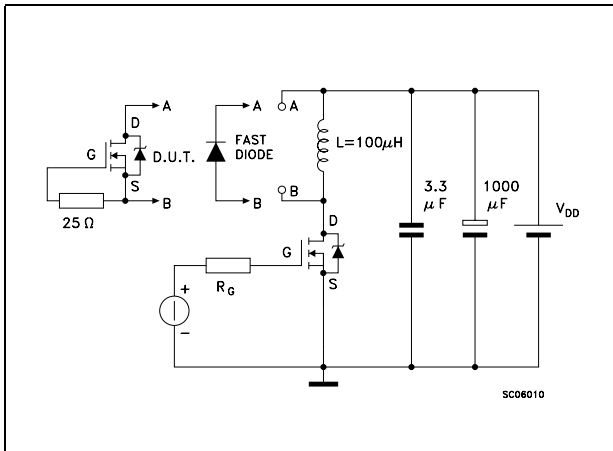


Figure 15. Unclamped Inductive load test circuit

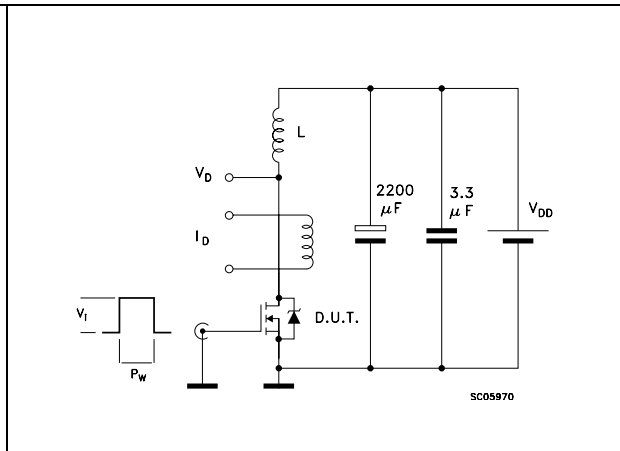


Figure 16. Unclamped inductive waveform

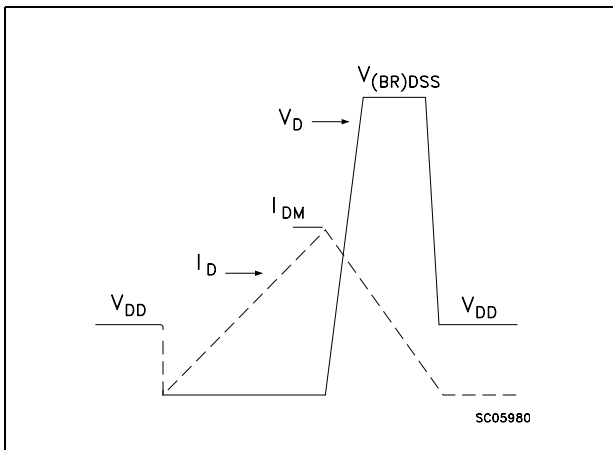
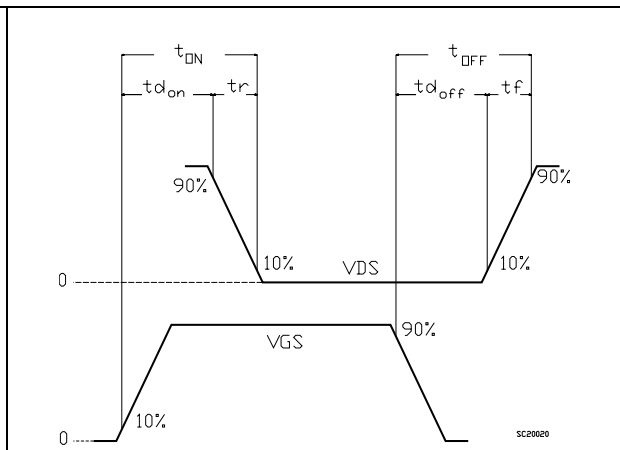


Figure 17. Switching time waveform



## 4 Package mechanical data

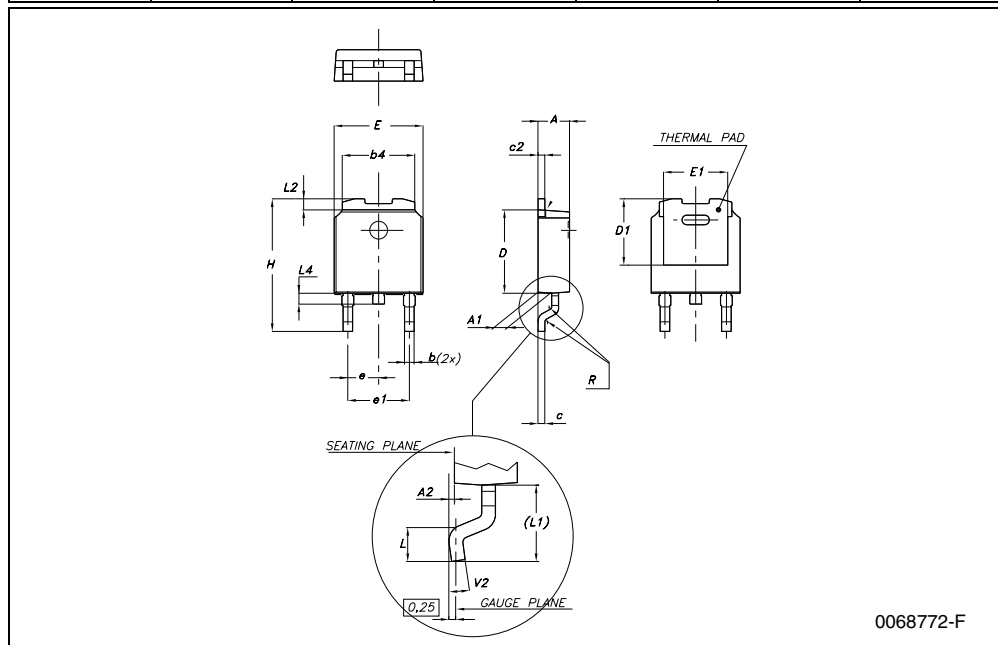
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**Package mechanical data**

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**DPAK MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



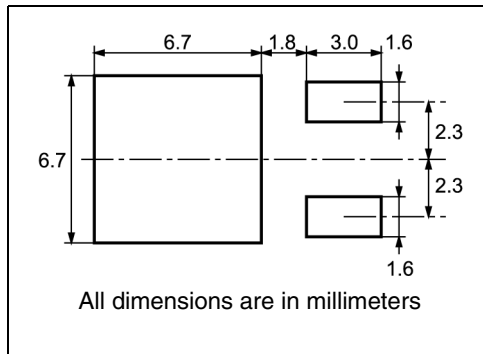
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STD60NF3LL

Packing mechanical data

## 5 Packing mechanical data

### DPAK FOOTPRINT



### TAPE AND REEL SHIPMENT

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

## 6 Revision history

Table 6. Revision history

Date	Revision	Changes
09-Sep-2004	4	Preliminary version
19-Jul-2006	5	New template, no content change

## STD60NF3LL

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