STD60N10
STP70N10

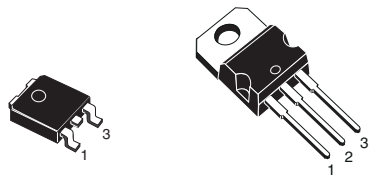
N-channel 100 V - 0.016 Ω - 60 A TO-220 / DPAK low $R_{DS(on)}$ Power MOSFET

Preliminary Data

Features

Type	V_{DSS}	$R_{DS(on)}$max	I_D
STD60N10	100 V	<0.0195 Ω	60 A
STP70N10	100 V	<0.0195 Ω	65 A

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



DPAK TO-220

Application

- Switching applications

Description

This Power MOSFET is designed to minimize the $R_{DS(on)}$, making it suitable for the most applications where high power density is required.

Figure 1. Internal schematic diagram

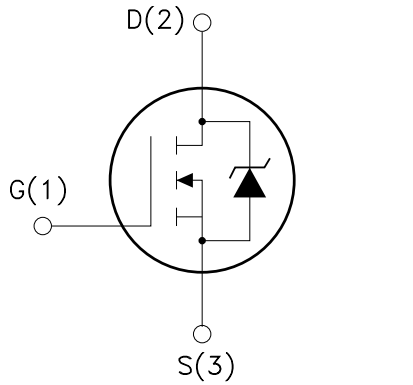


Table 1. Device summary

Order codes	Marking	Package	Packaging
STP70N10	70N10	TO-220	Tube
STD60N10	60N10	DPAK	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	DPAK	
V_{DS}	Drain-source voltage (v_{gs} = 0)	100		V
V_{GS}	Gate- source voltage	± 20		V
I_D	Drain current (continuous) at T_C = 25 °C	65	60	A
I_D	Drain current (continuous) at T_C = 100 °C	46	43	A
I_{DM} (1)	Drain current (pulsed)	260	240	A
P_{TOT}	Total dissipation at T_C = 25 °C	150	125	W
	Derating factor	1	0.83	W/°C
dv/dt(2)	Peak diode recovery voltage slope	TBD		V/ns
E_{AS} (3)	Single pulse avalanche energy	TBD		mJ
T_{stg}	Storage temperature	– 55 to 175		°C
T_j	Max. operating junction temperature			

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 50$ A, di/dt ≤ 600A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX.}$
3. Starting T_j= 25 °C, I_D= 50 A, V_{DD}=25 V

Table 3. Thermal data

Symbol	Parameter	Value		Unit
		TO-220	DPAK	
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1	1.2	°C/W
$R_{thj\text{-}a}$	Thermal resistance junction-ambient max	62.5	50 (1)	°C/W
T_l	Maximum lead temperature for soldering purpose	300		°C

1. When mounted on FR-4 board of 1 inch², 2 oz Cu

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	I_D = 250 µA, V_{GS} = 0	100			V
I_{DSS}	Zero gate voltage Drain current (V_{GS} = 0)	V_{DS} = max rating V_{DS} = max rating,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 = 30 A		0.016	0.0195	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		5800		pF
C_{oss}	Output capacitance			300		pF
C_{rss}	Reverse transfer capacitance			190		pF
Q_g	Total gate charge	V_{DD} = 80 V, I_D = 60 A, V_{GS} = 10 V *(see Figure 3)*		80		nC
Q_{gs}	Gate-source charge			20		nC
Q_{gd}	Gate-drain charge			25		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} = 50 V, I_D = 30 A R_G = 4.7 Ω V_{GS} = 10 V *(see Figure 2)*		125 20		ns ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time	V_{DD} = 50 V, I_D = 30 A, R_G = 4.7 Ω, V_{GS} = 10 V *(see Figure 2)*		60 150		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current				60	A
I_{SDM} (1)	Source-drain current (pulsed)				240	A
V_{SD} (2)	Forward on voltage	I_{SD} = 60 A, V_{GS} = 0			TBD	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 60 A, V_{DD} = 25 V di/dt = 100 A/µs, T_j = 150 °C *(see Figure 4)*		85 280 6.7		ns nC A

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

3 Test circuit

Figure 2. Switching times test circuit for resistive load

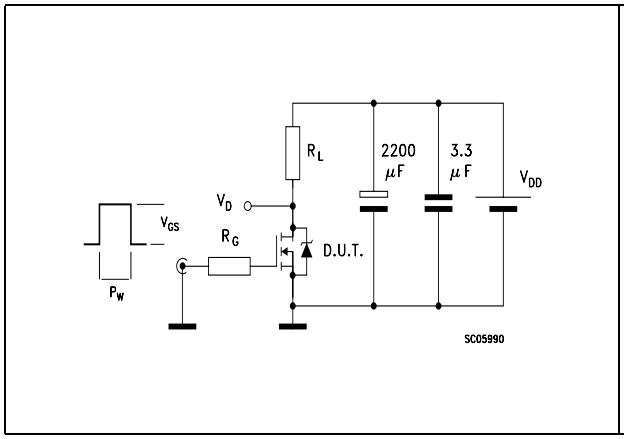


Figure 3. Gate charge test circuit

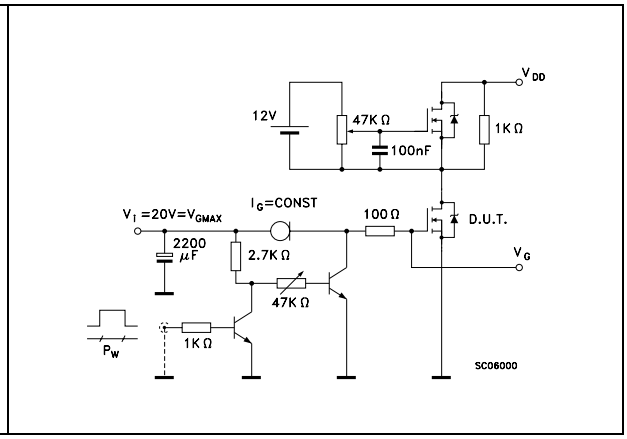


Figure 4. Test circuit for inductive load switching and diode recovery times

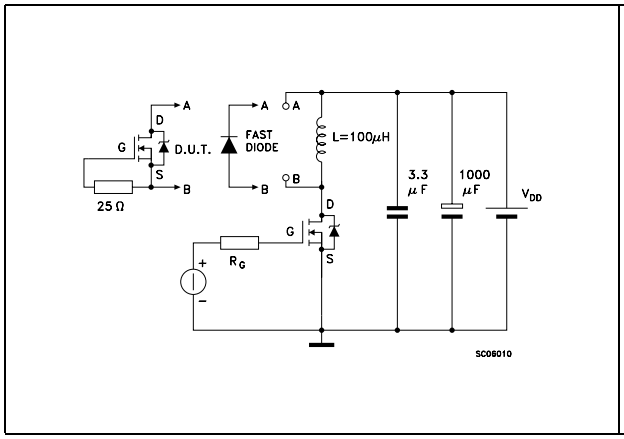


Figure 5. Unclamped Inductive load test circuit

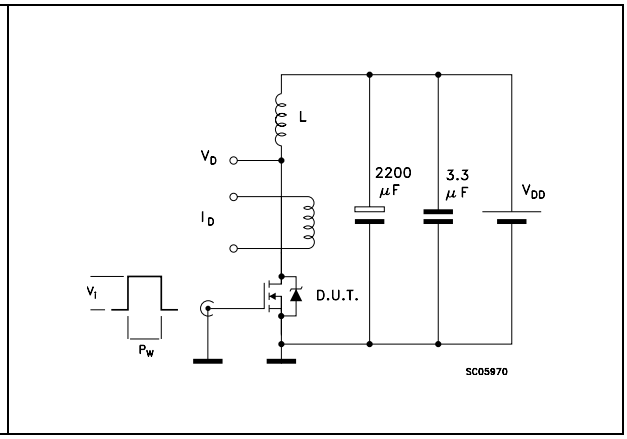


Figure 6. Unclamped inductive waveform

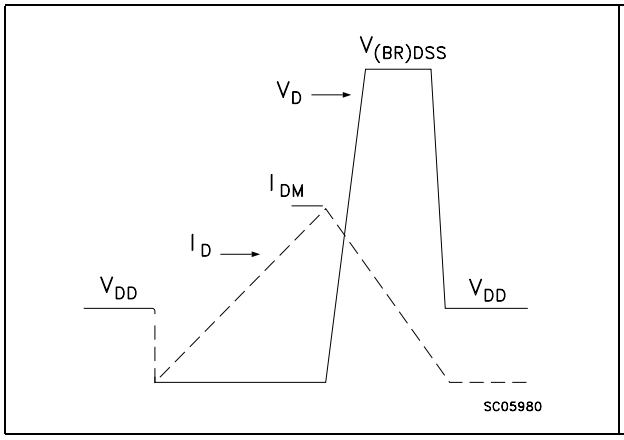
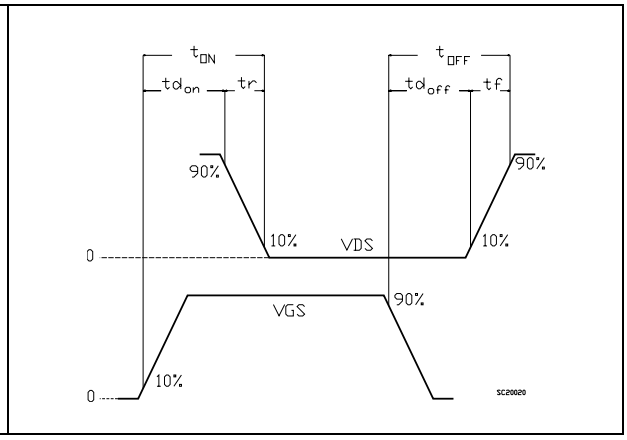


Figure 7. Switching time waveform

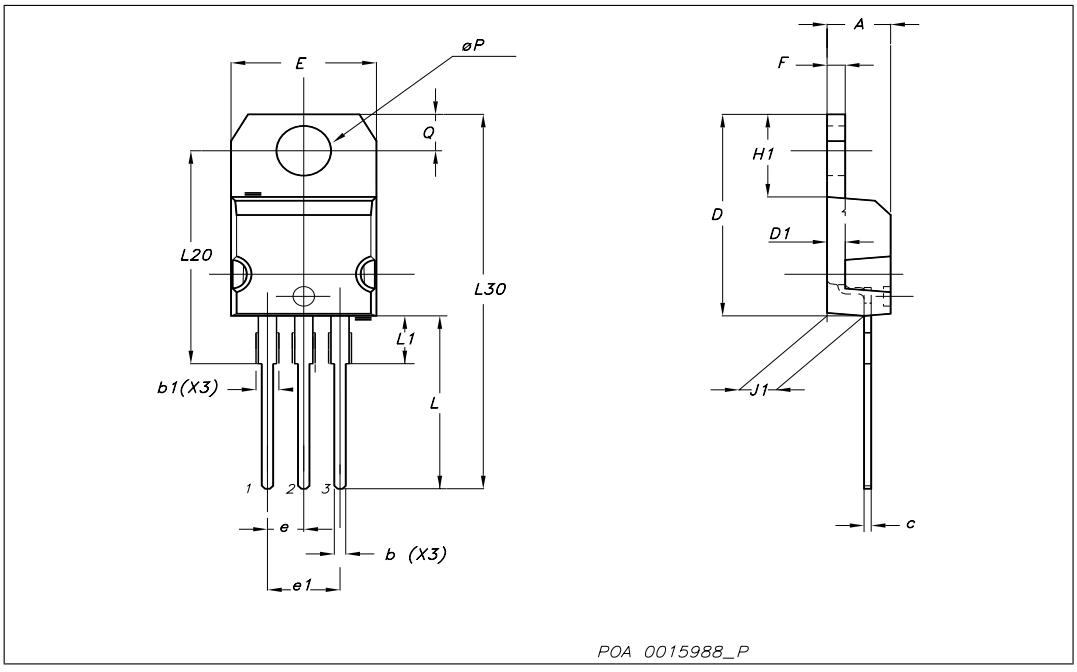


4 Package mechanical data

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*

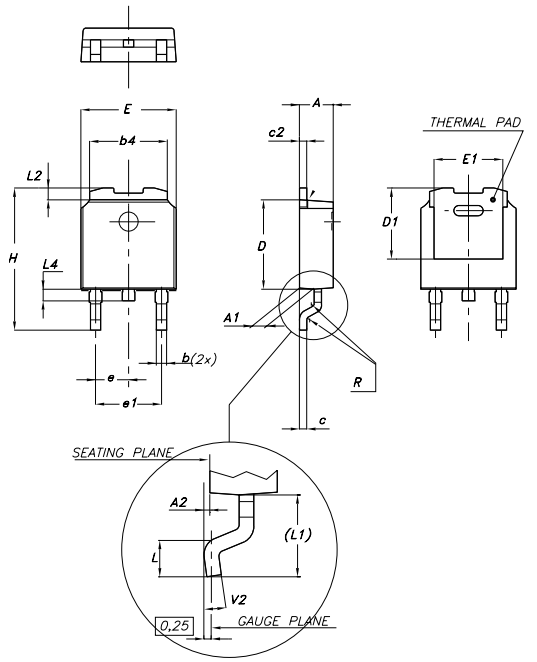
TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
ØP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



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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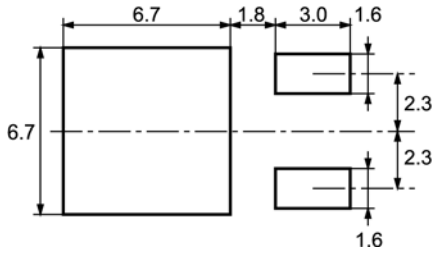
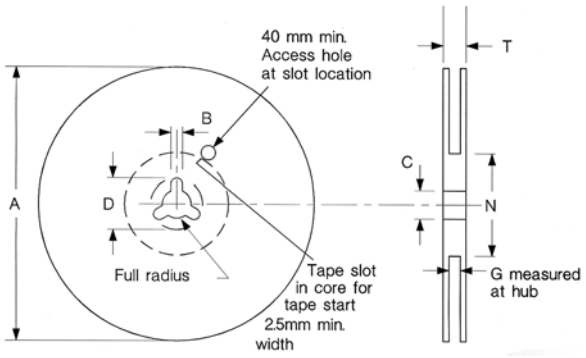
5 Packaging mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



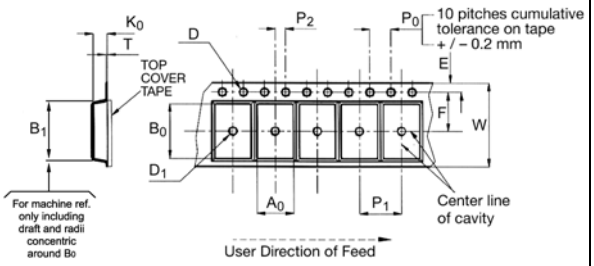
REEL MECHANICAL DATA

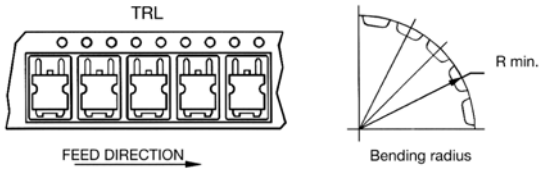
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

TAPE MECHANICAL DATA

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 8. Document revision history

Date	Revision	Changes
02-Oct-2007	1	First release
15-Feb-2008	2	Inserted new data on *Table 4*, *Table 5* and *Table 6*