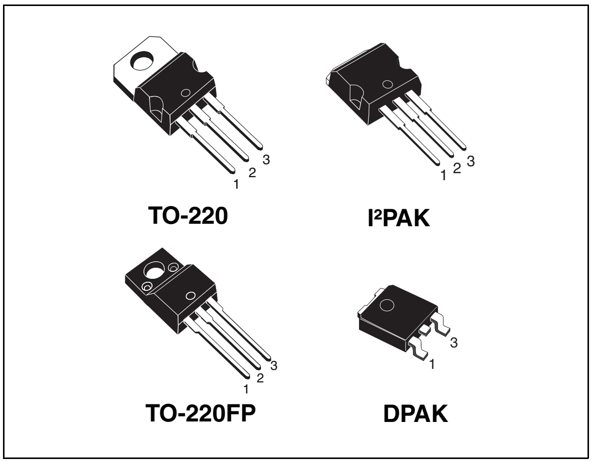
STI17NF25 - STD17NF25
STF17NF25 - STP17NF25

N-channel 250V - 0.14Ω - 17A - TO-220/FP - DPAK - I^{2}PAK
Low gate charge STripFET™ II Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D	P_{TOT}
STD17NF25	250V	< 0.165Ω	17A	90W
STI17NF25	250V	< 0.165Ω	17A	90W
STF17NF25	250V	< 0.165Ω	17A	25W
STP17NF25	250V	< 0.165Ω	17A	90W

- Low gate charge
- 100% avalanche tested
- Exceptional dv/dt capability



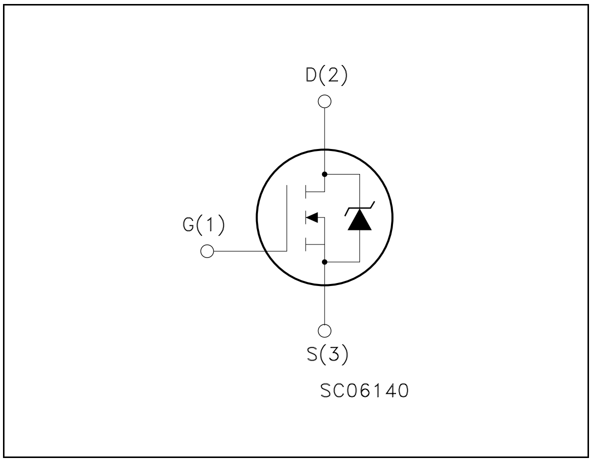
Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.

Applications

- Switching applications

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STD17NF25	17NF25	DPAK	Tape & reel
STI17NF25	17NF25	I²PAK	Tube
STF17NF25	17NF25	TO-220FP	Tube
STP17NF25	17NF25	TO-220	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220 DPAK/I²PAK	TO-220FP	
V_{DS}	Drain-source voltage (V_{GS} = 0)	250		V
V_{GS}	Gate-source voltage	±20		V
I_D	Drain current (continuous) at T_C = 25°C	17	17(1)	A
I_D	Drain current (continuous) at T_C=100°C	10	10(1)	A
I_{DM}(2)	Drain current (pulsed)	68	68(1)	A
P_{TOT}	Total dissipation at T_C = 25°C	90	25	W
	Derating factor	0.72	0.2	W/°C
dv/dt(3)	Peak diode recovery voltage slope	10		V/ns
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 17A$, di/dt ≤200A/µs, $V_{DD} \leq 80\% V_{(BR)DSS}$

Table 2. Thermal data

Symbol	Parameter	TO-220 I²PAK	DPAK	TO-220FP	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.38		5	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	62.5	50 (1)	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300			°C

1. When mounted on 1inch² FR-4, 2 Oz copper board

Table 3. Avalanche data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by Tjmax)	17	A
E_{AS}	Single pulse avalanche energy (starting Tj=25°C, I_D=I_{AR}, V_{DD}=50V)	100	mJ

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 = 1mA, V_{GS}= 0	250			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating,Tc=125°C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±20V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10V, I_D= 8.5A		0.14	0.165	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} [1]	Forward transconductance	V_{DS} = 15V, I_D = 8.5A		14		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25V, f=1 MHz, V_{GS}=0		1000 178 28		pF pF pF
$C_{oss\ eq}$	Equivalent output capacitance	VGS=0, VDS =0V to 200V		135		pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=200V, I_D = 17A V_{GS} =10V *(see Figure 16)*		29.5 4.8 15.6		nC nC nC
R_G	Gate input resistance	f=1MHz gate DC bias=0 test signal level=20mV open drain		2		Ω

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

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}=125V, I_D=8.5A, R_G=4.7Ω, V_{GS}=10V *(see Figure 15)*		8.8 17.2		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD}=125V, I_D=8.5A, R_G=4.7Ω, V_{GS}=10V *(see Figure 15)*		21 8.8		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)				17 68	A A
V_{SD}(2)	Forward on voltage	I_{SD}=17A, V_{GS}=0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 17A, di/dt = 100A/µs, V_{DD} = 50 V, Tj = 25°C *(see Figure 17)*		157 0.91 11.6		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 17A, di/dt = 100A/µs, V_{DD} = 50 V, Tj=150°C *(see Figure 17)*		196 1.34 13.7		ns µC A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220 / DPAK / I²PAK

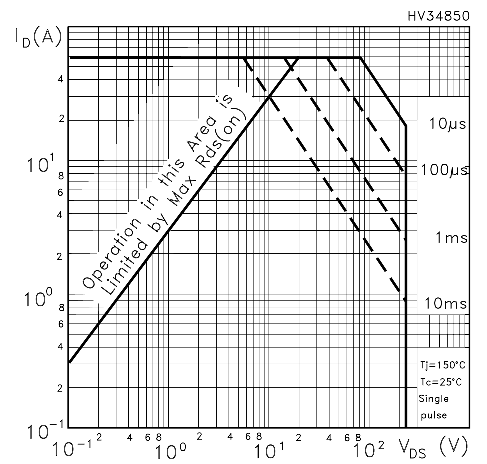


Figure 2. Thermal impedance for TO-220 / DPAK / I²PAK

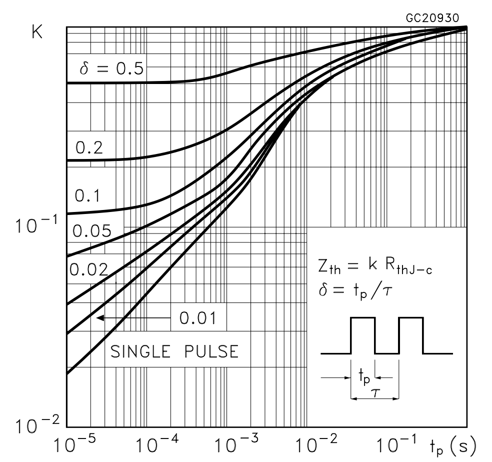


Figure 3. Safe operating area for TO-220FP

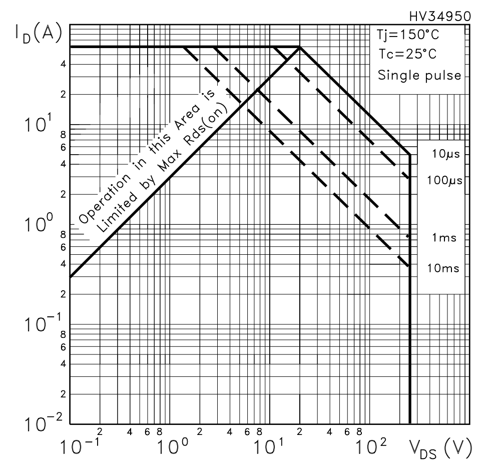


Figure 4. Thermal impedance for TO-220FP

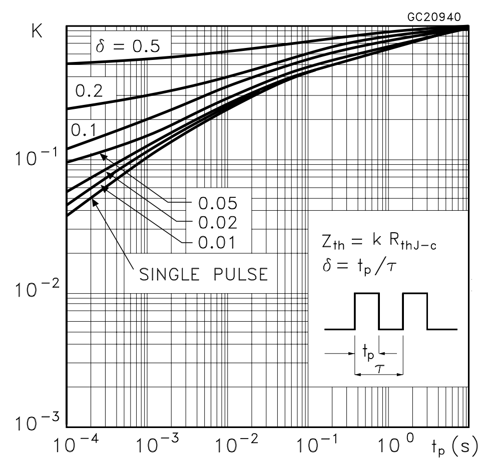


Figure 5. Output characteristics

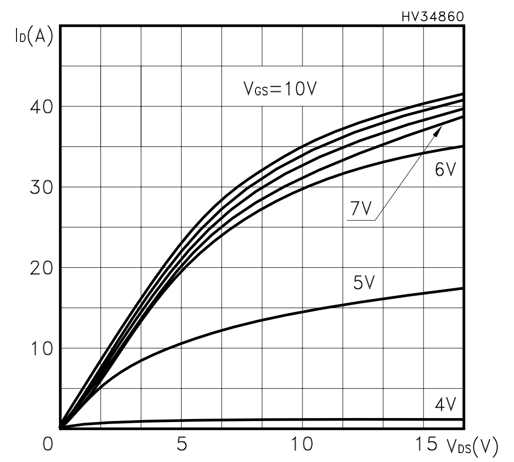


Figure 6. Transfer characteristics

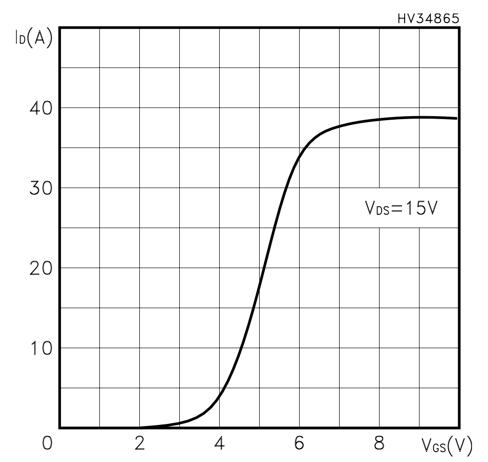


Figure 7. Normalized BV_{DSS} vs temperature

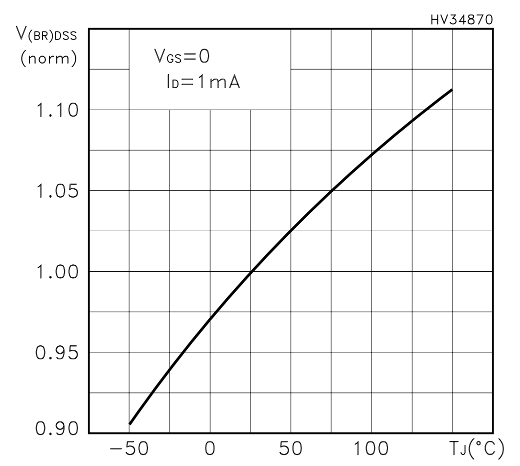


Figure 8. Static drain-source on resistance

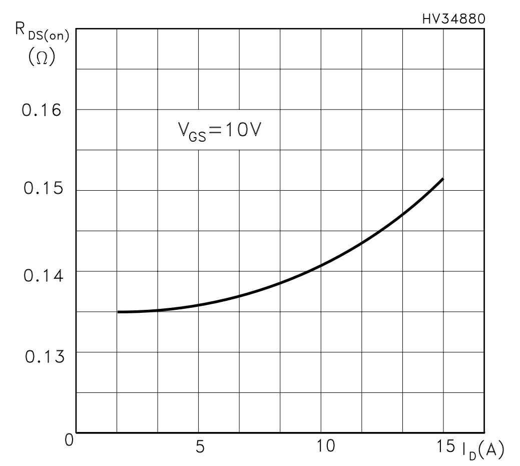


Figure 9. Gate charge vs gate-source voltage

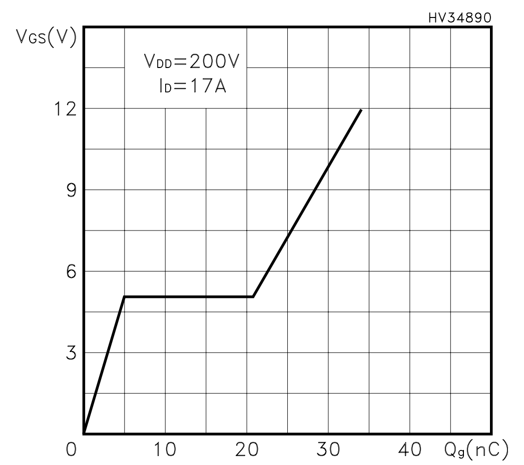


Figure 10. Capacitance variations

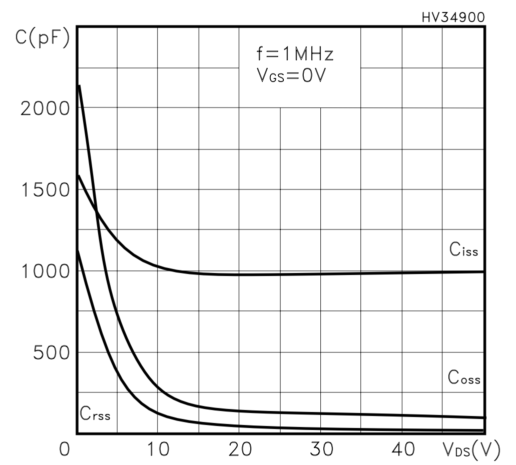


Figure 11. Normalized gate threshold voltage vs temperature

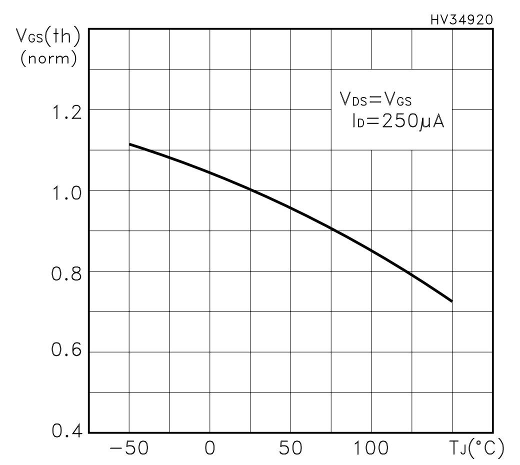


Figure 12. Normalized on resistance vs temperature

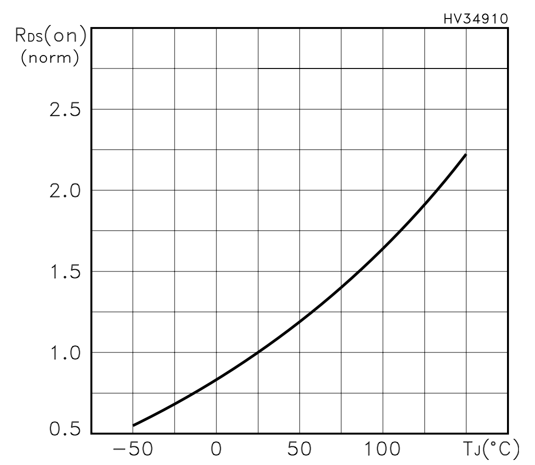


Figure 13. Source-drain diode forward characteristics

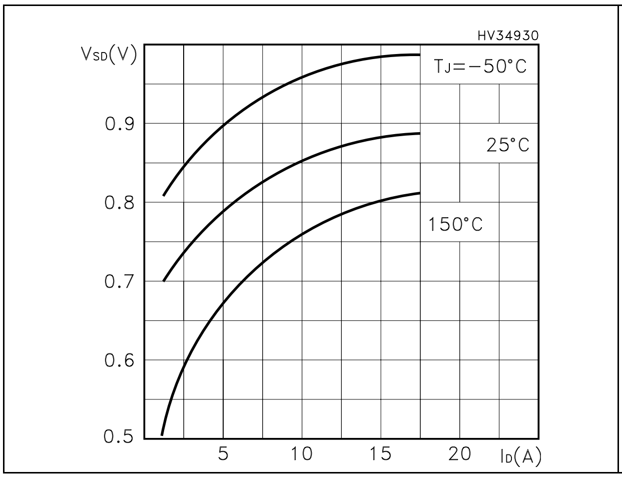
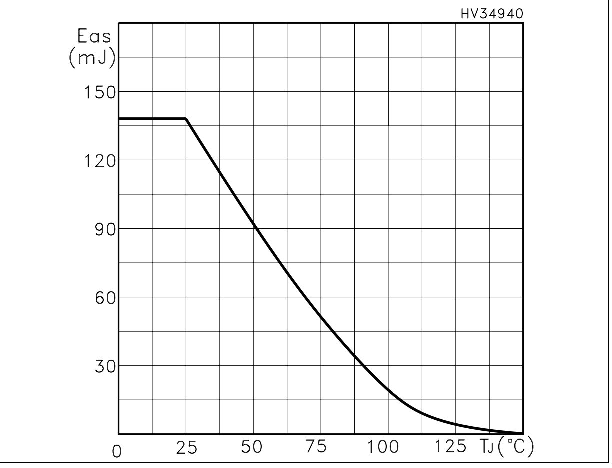


Figure 14. Maximum avalanche energy



3 Test circuit

Figure 15. Switching times test circuit for resistive load

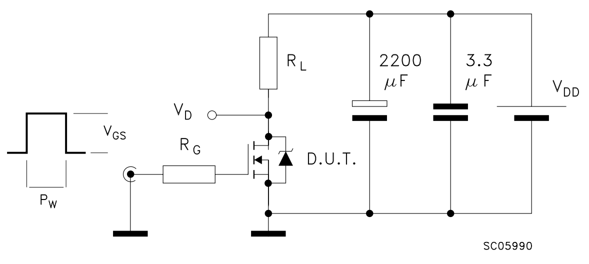


Figure 16. Gate charge test circuit

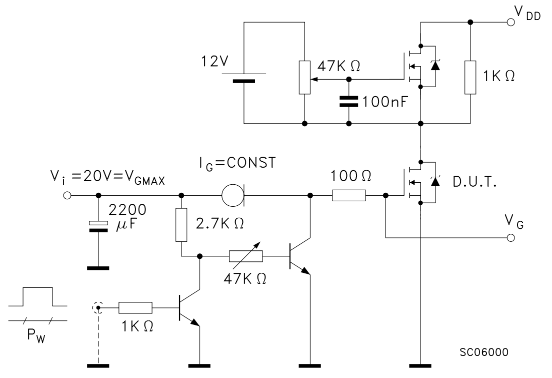


Figure 17. Test circuit for inductive load switching and diode recovery times

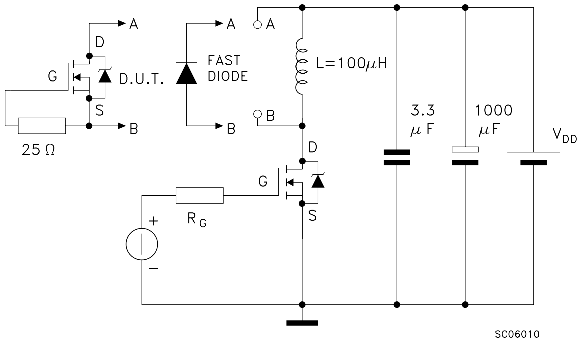


Figure 18. Unclamped Inductive load test circuit

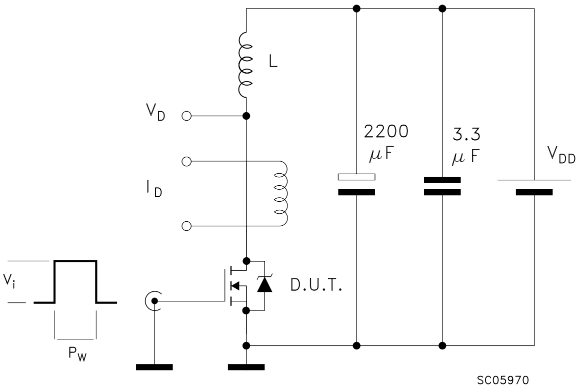


Figure 19. Unclamped inductive waveform

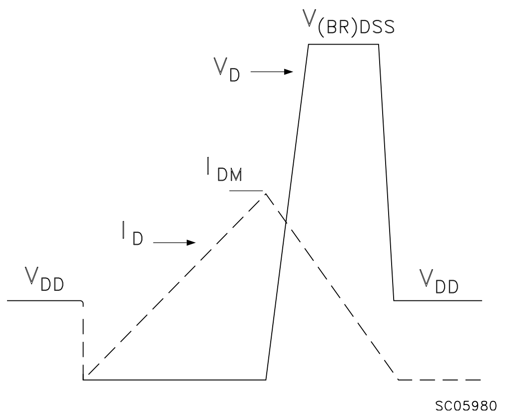
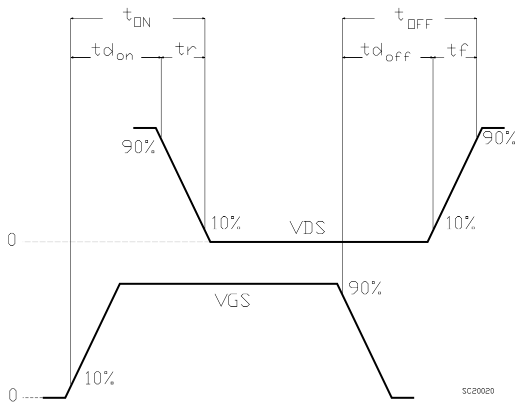


Figure 20. Switching time waveform

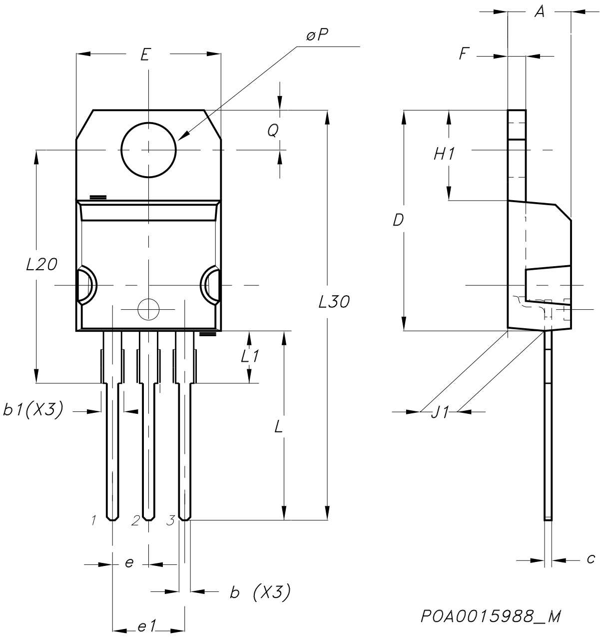


4 Package mechanical data

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*

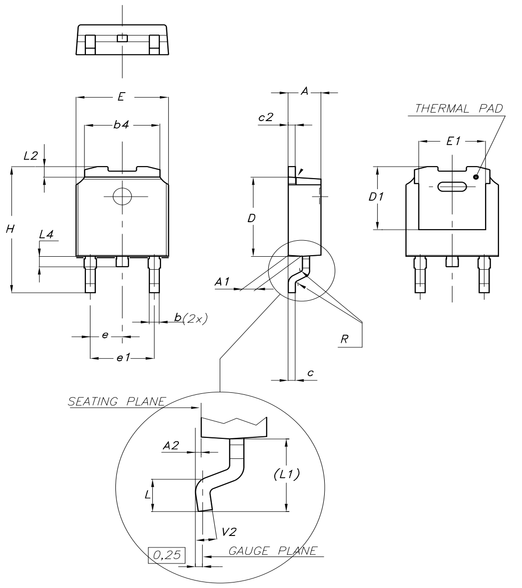
TO-220 MECHANICAL DATA

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	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
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		0.052
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

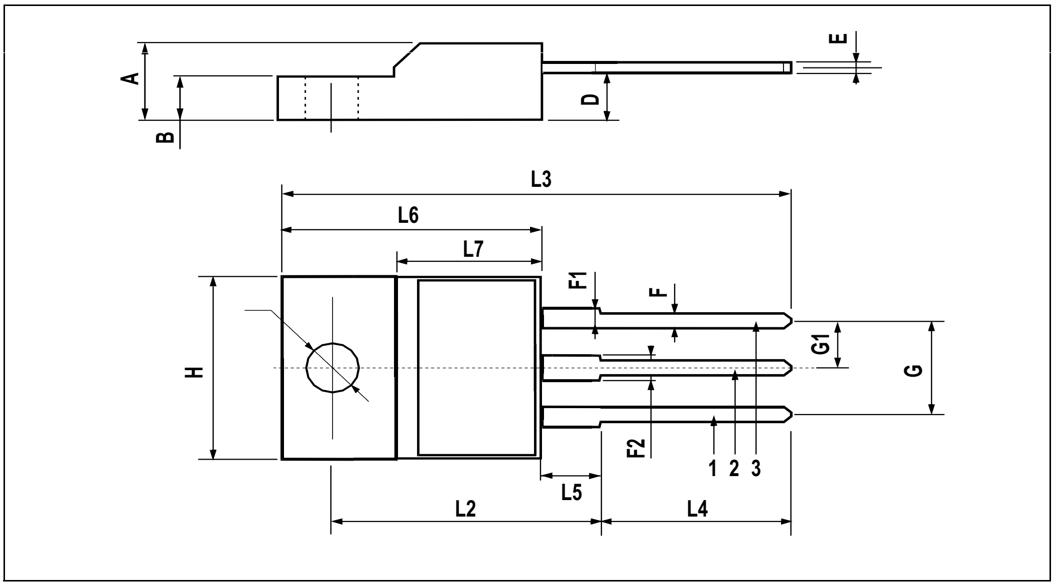
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
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°



0068772-F

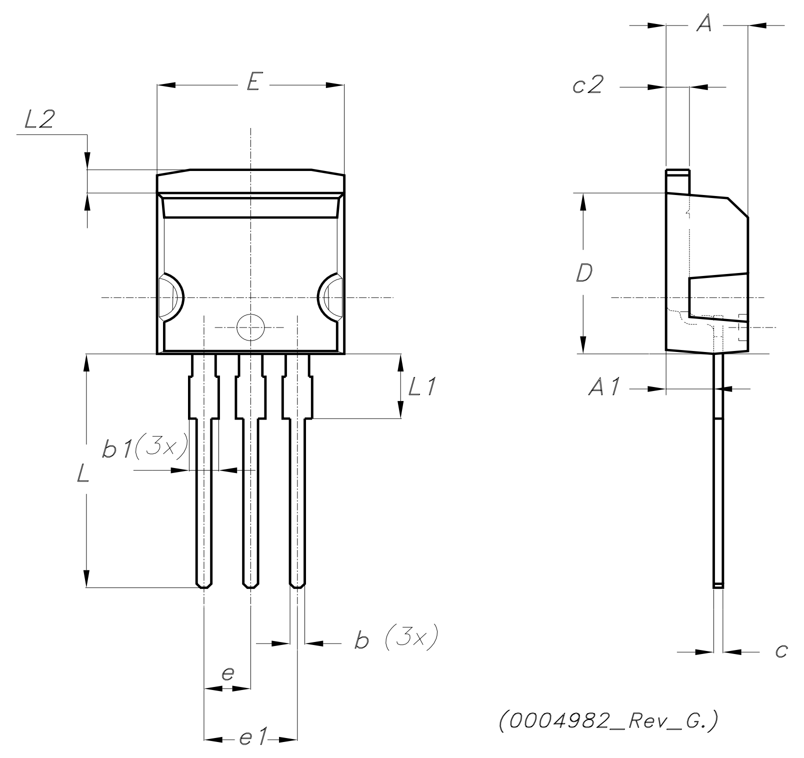
TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



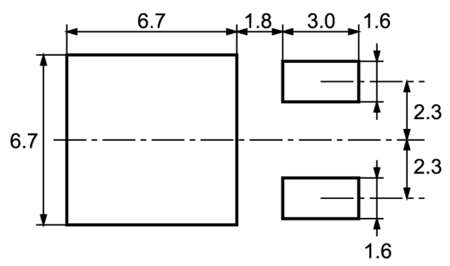
TO-262 (I^{2}PAK) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
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
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



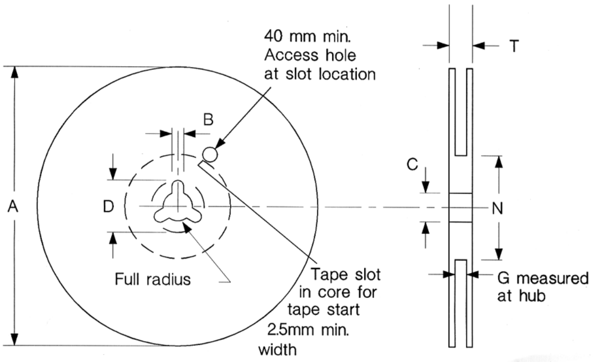
5 Packaging mechanical data

DPAK FOOTPRINT



All dimensions are in millimeters

TAPE AND REEL SHIPMENT



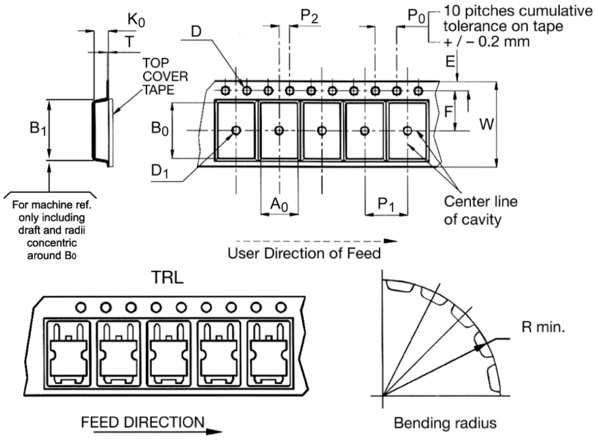
REEL MECHANICAL DATA

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. Revision history

Date	Revision	Changes
01-Feb-2007	1	First release

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