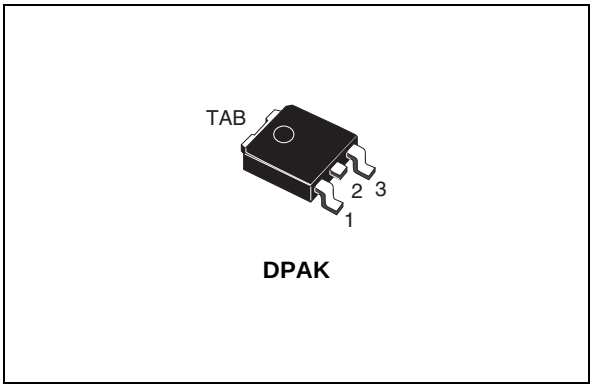
STD46P4LLF6

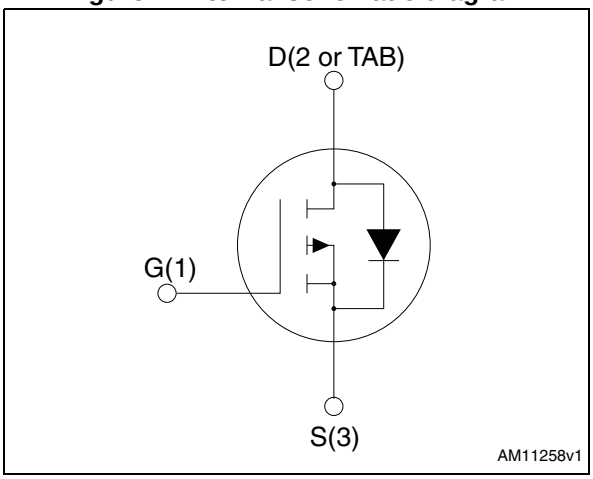
P-channel 40 V, 0.013 Ω typ.,46 A, STripFET™ VI DeepGATE™ Power MOSFET in a DPAK package

Datasheet - preliminary data



DPAK

Figure 1. Internal schematic diagram



Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STD46P4LLF6	40 V	0.017 Ω	46 A

- $R_{DS(on)}$ * Q_g industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate input resistance

Applications

- Switching applications
- LCC converters, resonant converters

Description

This device is a P-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages

Table 1. Device summary

Order code	Marking	Package	Packaging
STD46P4LLF6	46P4LLF6	DPAK	Tape and reel

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (continuous) at T_C = 25 °C	46	A
I_D	Drain current (continuous) at T_C = 100 °C	32.5	A
I_{DM} (1)	Drain current (pulsed)	184	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	70	W
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Max. operating junction temperature	175	°C

1. Pulse width limited by safe operating area.

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	2.14	°C/W

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	I_D = 250 µA, V_{GS}= 0	40			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 40 V, (V_{GS} = 0)			1	µA
		V_{DS} = 40 V, Tc = 125 °C			10	µA
I_{GSS}	Gate body leakage current	V_{GS} = ± 20 V, (V_{DS} = 0)			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 23 A		0.013	0.017	Ω
		V_{GS} = 4.5 V, I_D =23 A		0.018	0.0235	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 32 V, f=1 MHz, V_{GS} = 0	-	2900	-	pF
C_{oss}	Output capacitance		-	400	-	pF
C_{rss}	Reverse transfer capacitance		-	150	-	pF
Q_g	Total gate charge	V_{DD} = 24 V, I_D = 46 A V_{GS} = 4.5 V *(see Figure 3)*	-	30	-	nC
Q_{gs}	Gate-source charge		-	TBD	-	nC
Q_{gd}	Gate-drain charge		-	TBD	-	nC

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 32 V, I_D = 23 A, R_G = 4.7 Ω, V_{GS} = 10 V *(see Figure 2)*	-	TBD	-	ns
t_r	Rise time		-	TBD	-	ns
$t_{d(off)}$	Turn-off delay time		-	TBD	-	ns
t_f	Fall time		-	TBD	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		46	A
I_{SDM}(1)	Source-drain current (pulsed)		-		184	A
V_{SD}(2)	Forward on voltage	I_{SD} = 23A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 23 A, di/dt = 100 A/µs, V_{DD} = 16 V *(see Figure 4)*	-	TBD		ns
Q_{rr}	Reverse recovery charge		-	TBD		nC
I_{RRM}	Reverse recovery current		-	TBD		A

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

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

3 Test circuits

Figure 2. Switching times test circuit for resistive load

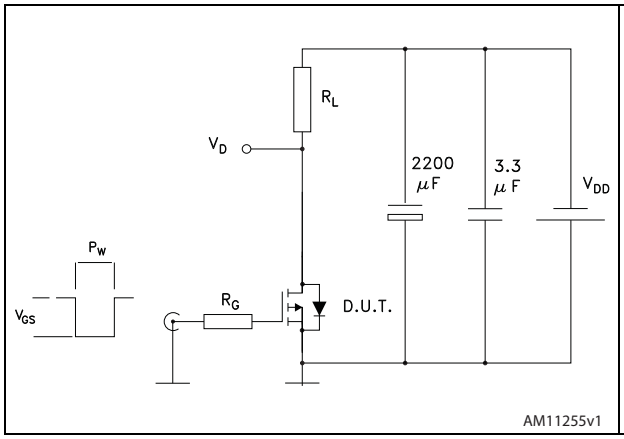


Figure 3. Gate charge test circuit

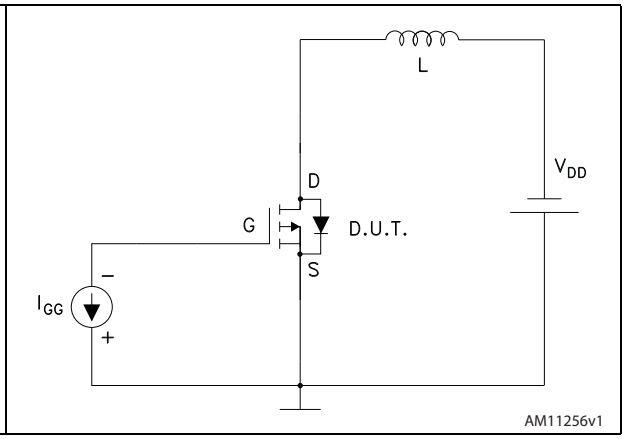
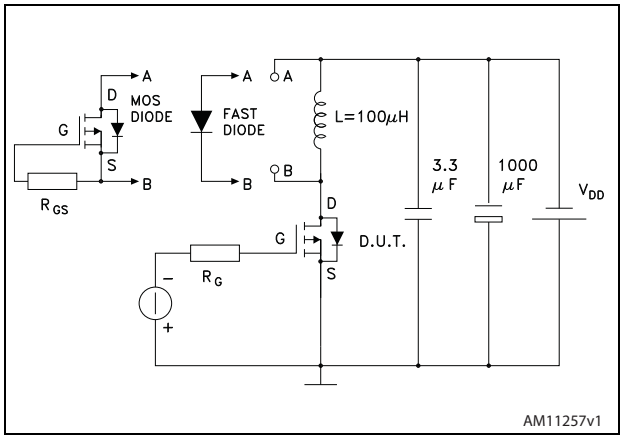


Figure 4. Test circuit for diode recovery behavior



4 Package mechanical data

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Figure 5. DPAK (TO-252) type A drawing

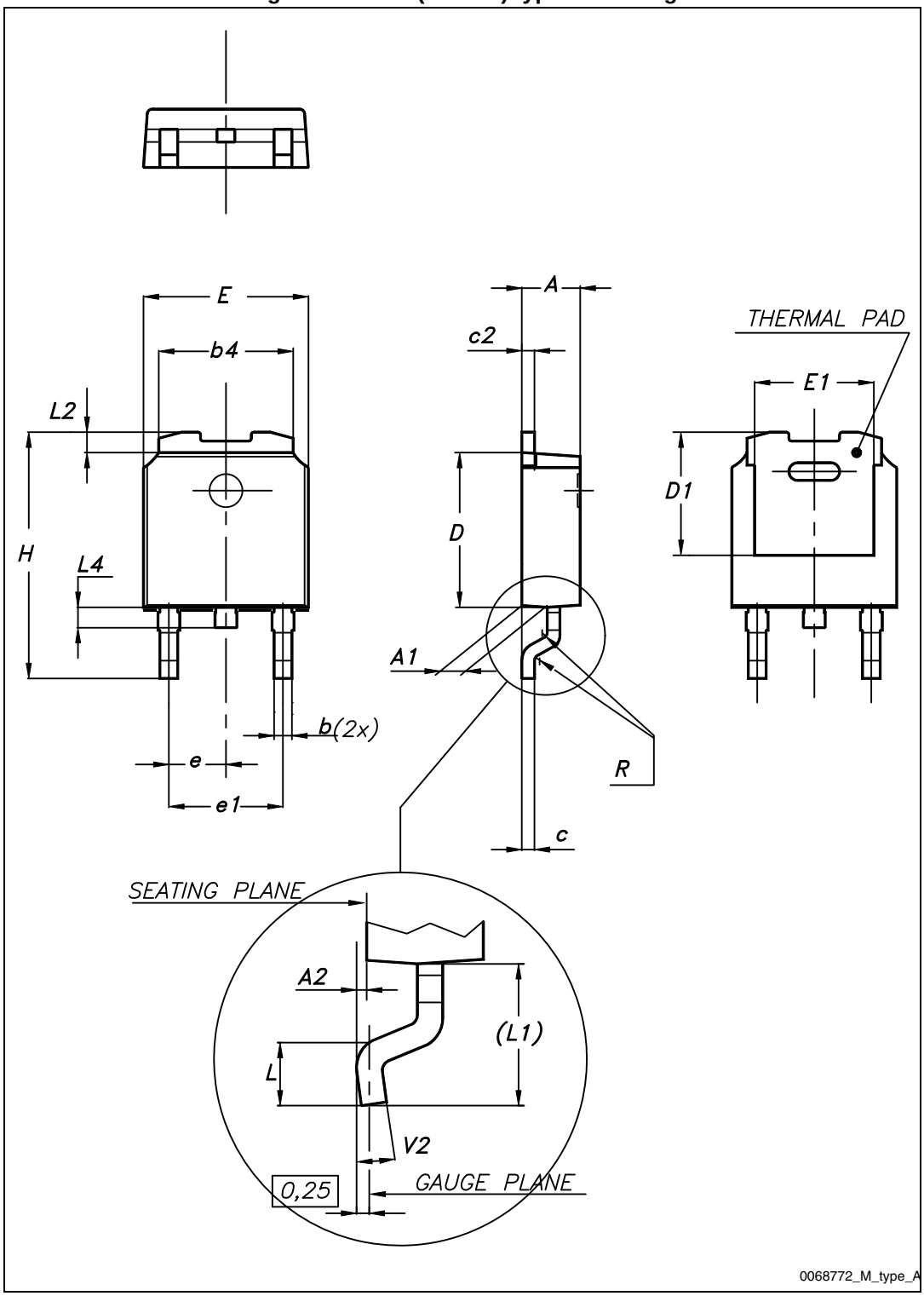
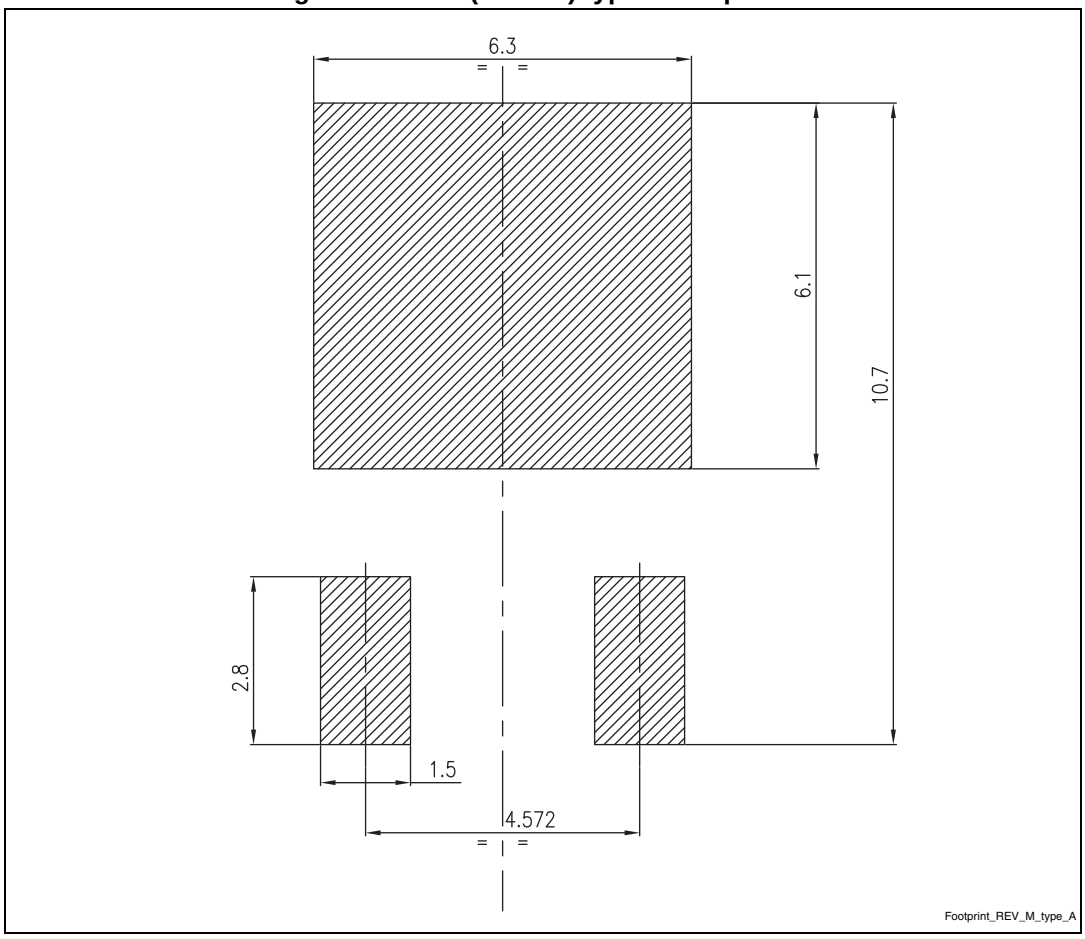


Table 8. DPAK (TO-252) type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 6. DPAK (TO-252) type A footprint [(a)]



a. All dimensions are in millimeters

5 Packaging mechanical data

Figure 7. Tape for DPAK (TO-252)

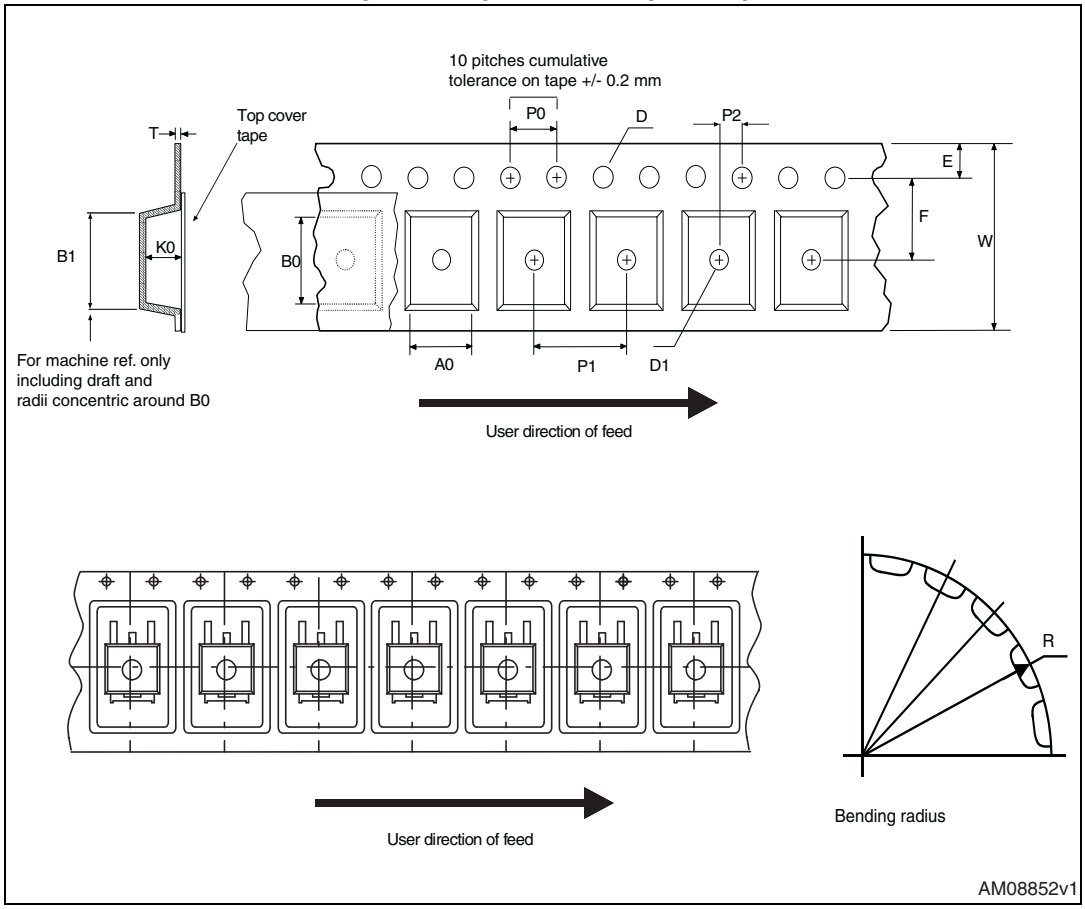


Figure 8. Reel for DPAK (TO-252)

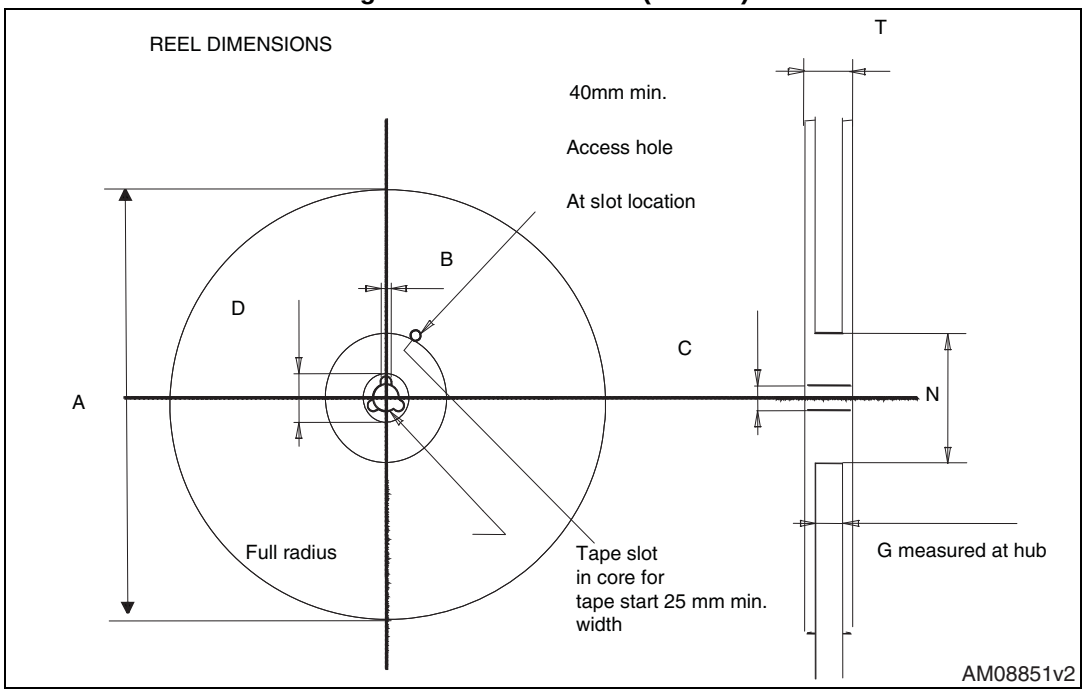


Table 9. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

6 Revision history

Table 10. Document revision history

Date	Revision	Changes
17-Jan-2014	1	First release

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