



# STD40NF03L

## N-CHANNEL 30V - 0.0090 Ω - 40A DPAK LOW GATE CHARGE STripFET™II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD40NF03L	30 V	<0.011 Ω	40 A

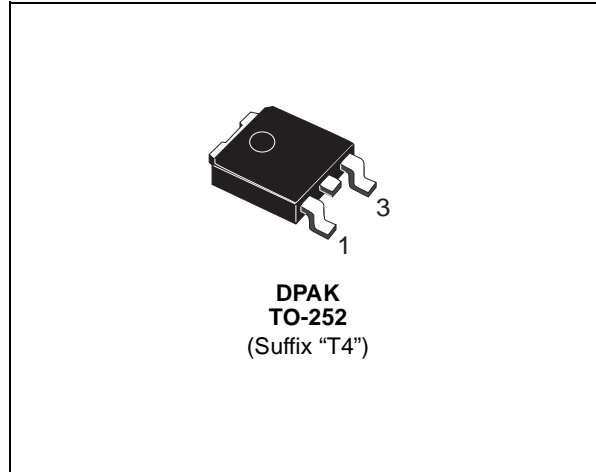
- TYPICAL R<sub>DS(on)</sub> = 0.0090 Ω @ 10 V
- TYPICAL Q<sub>g</sub> = 22.5 nC @ 5 V
- OPTIMAL R<sub>DS(on)</sub> x Q<sub>g</sub> TRADE-OFF
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED
- SURFACE-MOUNTING DPAK (TO-252)  
POWER PACKAGE IN TAPE & REEL  
(SUFFIX "T4")

### DESCRIPTION

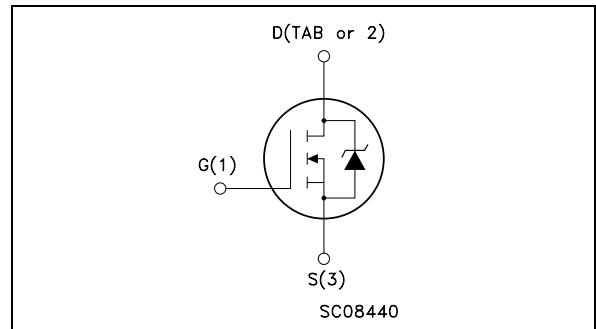
This application specific Power MOSFET is the third generation of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance 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

- SPECIFICALLY DESIGNED AND OPTIMISED FOR HIGH EFFICIENCY CPU CORE DC/DC CONVERTERS



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate- source Voltage	± 20	V
I <sub>D(●)</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	40	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	28	A
I <sub>DM(●●)</sub>	Drain Current (pulsed)	160	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	80	W
	Derating Factor	0.53	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	5.5	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	850	mJ
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	Operating Junction Temperature		

(●) Current limited by the package

(●●) Pulse width limited by safe operating area.

(1) I<sub>SD</sub> ≤ 40A, di/dt ≤ 350A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 20A, V<sub>DD</sub> = 25V

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## THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1.88	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	100	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	Typ	300	°C

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA, 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> = ± 20 V			±100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	1			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 20 A V <sub>GS</sub> = 5 V I <sub>D</sub> = 10 A		0.0090 0.0150	0.0110 0.0195	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 15 V I <sub>D</sub> = 20 A		23		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		1440		pF
C <sub>oss</sub>	Output Capacitance			560		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			135		pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 15\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		22 165		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 15\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 5\text{ V}$		22.5 9 12	30	nC nC nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 15\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		21 25		ns ns

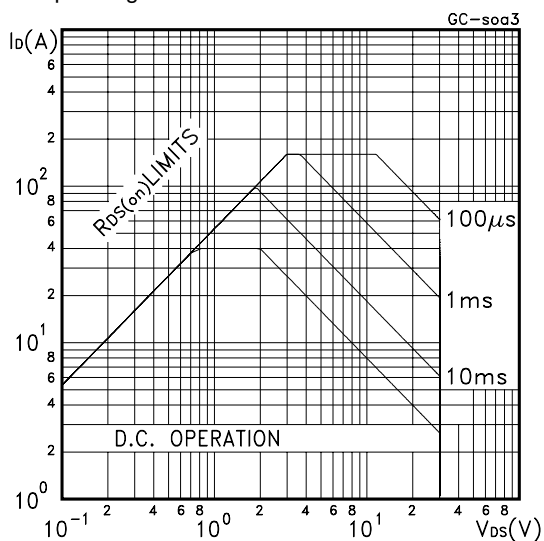
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				40 160	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 20\text{ A}$ $V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		42 52 2.5		ns nC A

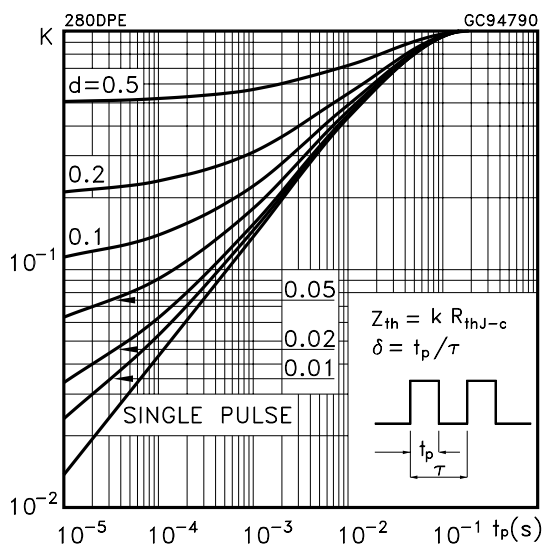
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

( $\bullet$ ) Pulse width limited by safe operating area.

Safe Operating Area

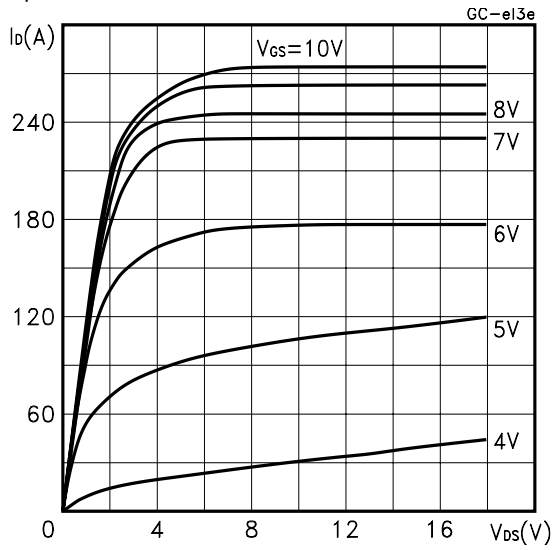


Thermal Impedance

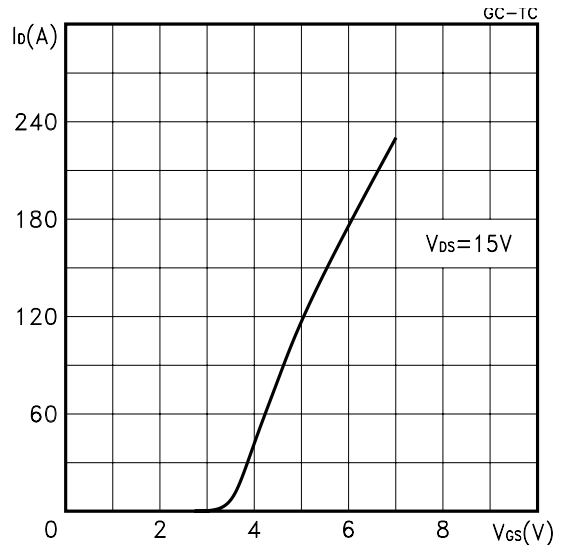


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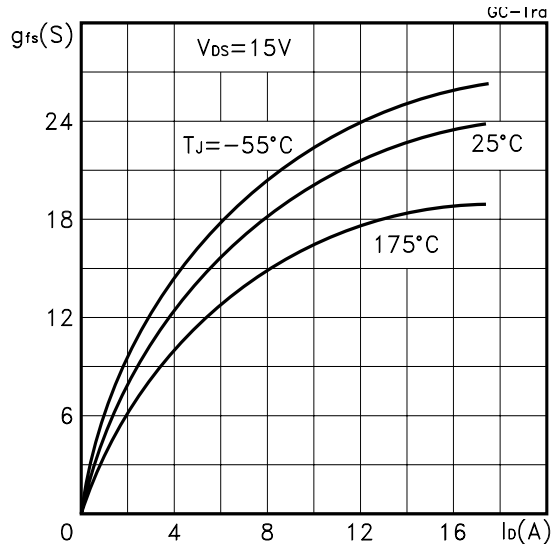
Output Characteristics



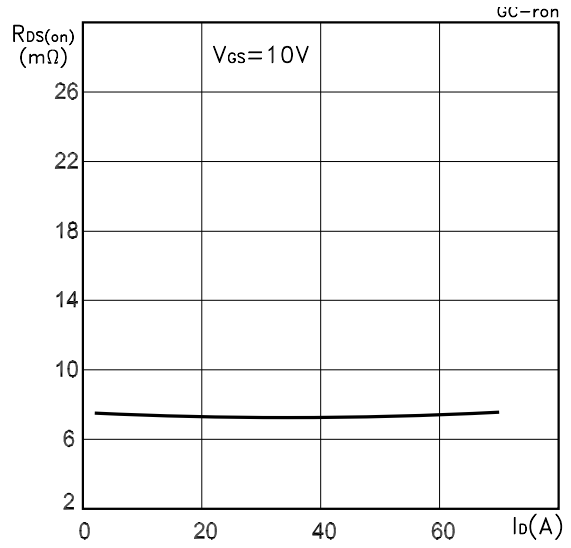
Transfer Characteristics



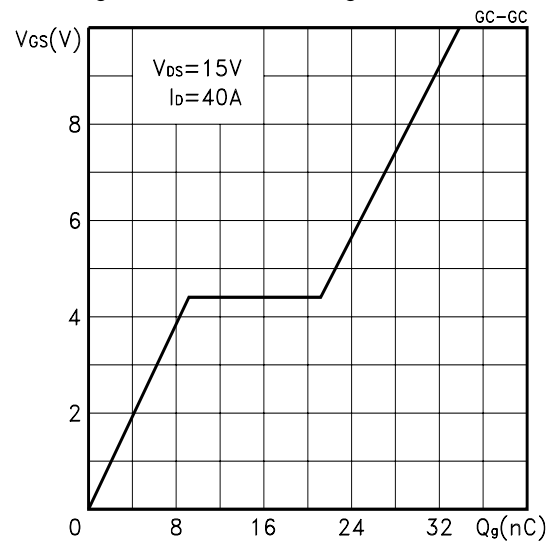
Transconductance



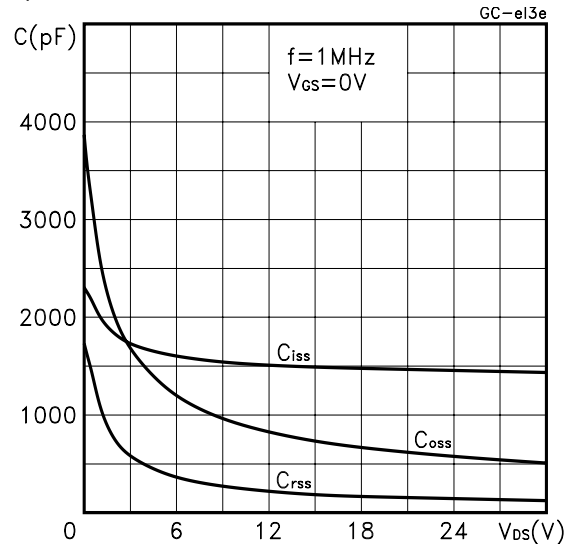
Static Drain-source On Resistance



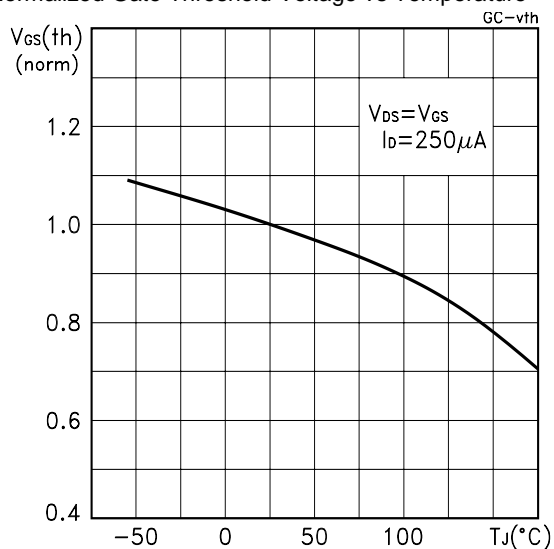
Gate Charge vs Gate-source Voltage



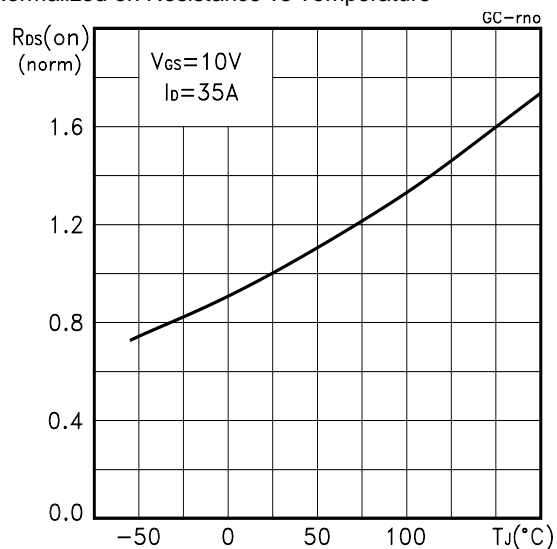
Capacitance Variations



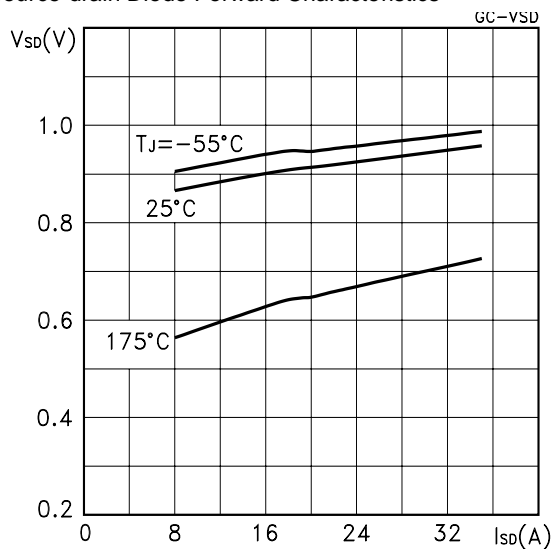
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature.

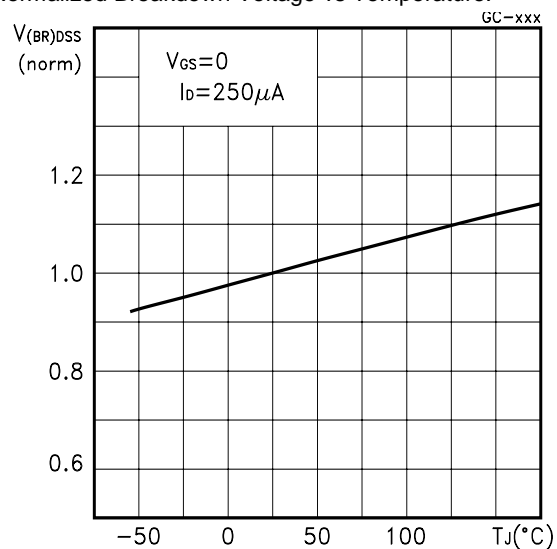


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

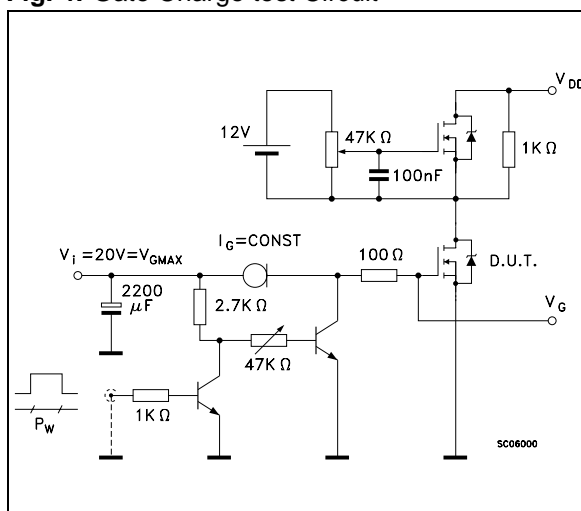
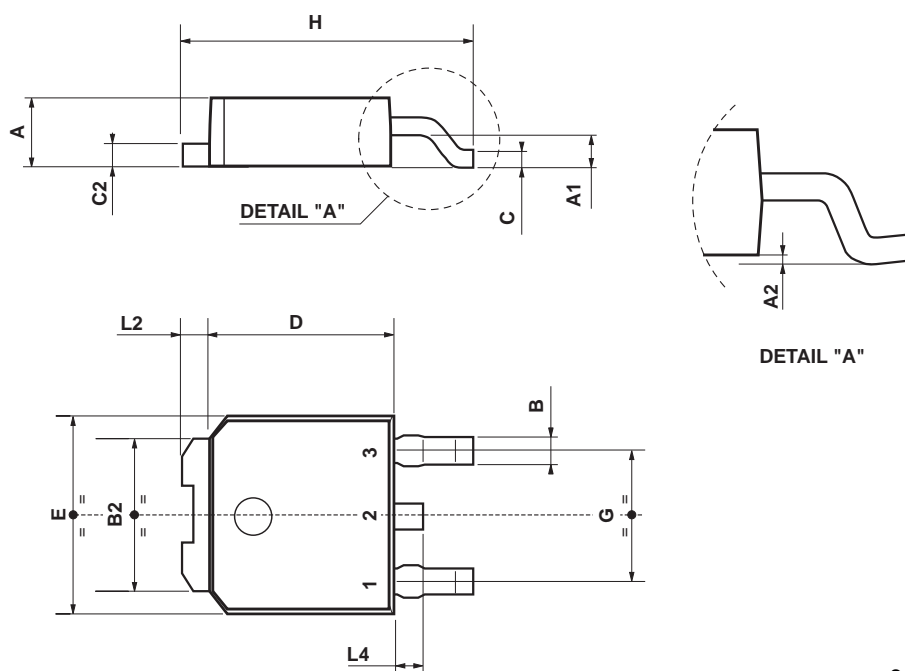


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



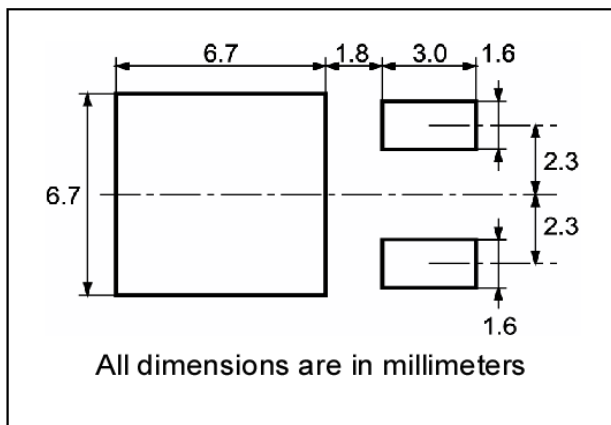
**TO-252 (DPAK) MECHANICAL DATA**

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
B2	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
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039

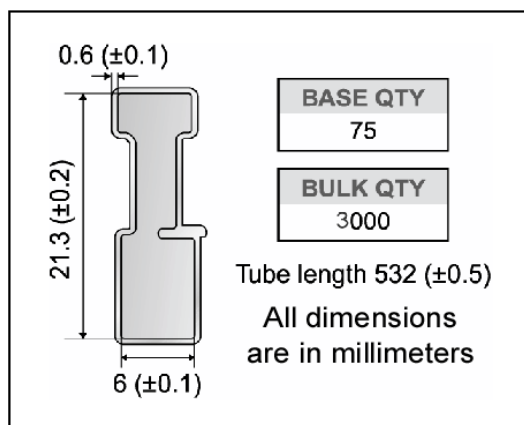


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**DPAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

Diagram showing the tape mechanical data. It includes a circular view of the tape with dimensions A, B, C, D, and a full radius. A slot is shown with a width of 2.5 mm and a length of 40 mm. A note indicates a 40 mm min. access hole at the slot location. A side view shows dimensions T, C, N, and G (measured at hub).

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

**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
1000	1000

**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

Diagram showing the tape and reel shipment details. It includes a side view of the tape with dimensions K0, T, B1, B0, D, D1, and A0. A note indicates that for machine reference, only drift and radii concentric around B0 are included. A top view shows the tape with dimensions P2, P0, P1, and A0. A note indicates a 10-pitch cumulative tolerance on the tape of ±0.2 mm. A side view of the reel shows the center line of the cavity, the user direction of feed, and the bending radius R min. The feed direction is indicated by an arrow.

For machine ref. only including drift and radii concentric around B0

10 pitches cumulative tolerance on tape ±0.2 mm

User Direction of Feed

Center line of cavity

FEED DIRECTION

Bending radius R min.



