STD60NF55LA

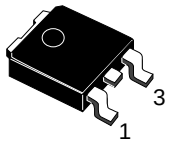
N-CHANNEL 55V - 0.012Ω - 60A DPAK
STripFET™II MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D (1)
STD60NF55LA	55V	< 0.015Ω	60A

- TYPICAL $R_{DS(on)}$ = 0.012Ω
- LOW THRESHOLD DRIVE

Figure 1: Package



DPAK

DESCRIPTION

This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED

Figure 2: Internal Schematic Diagram

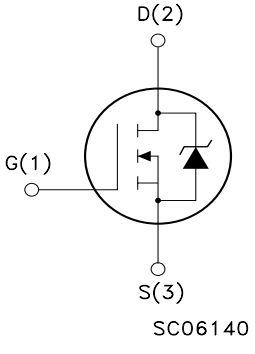


Table 2: Order Codes

Part Number	Marking	Package	Packaging
STD60NF55LAT4	D60NF55LA	DPAK	TAPE & REEL

Rev. 1

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	55	V
V_{GS}	Gate- source Voltage	± 15	V
I_D	Drain Current (continuous) at T_C = 25°C	60	A
I_D	Drain Current (continuous) at T_C = 100°C	42	A
I_{DM} (●)	Drain Current (pulsed)	240	A
P_{TOT}	Total Dissipation at T_C = 25°C	110	W
	Derating Factor	0.73	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	16	V/ns
E_{AS} (2)	Single Pulse Avalanche Energy	400	mJ
T_{stg}	Storage Temperature	– 55 to 175	°C
T_j	Operating Junction Temperature		

(●) Pulse width limited by safe operating area
(1)I_{SD} ≤40A, di/dt ≤350A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ $T_{JMAX.}$
(2) Starting T_j=25°C, I_D=30A, V_{DD}=20V

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	1.36	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	°C

ELECTRICAL CHARACTERISTICS (T_{CASE} =25°C UNLESS OTHERWISE SPECIFIED)

Table 5: On /Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	55			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS}= Max Rating, T_C= 125°C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	1		2	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V, I_D = 30 A		0.012	0.015	Ω
		V_{GS} = 5 V, I_D = 30 A		0.014	0.017	Ω

Table 6: Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} = 10 V, I_D = 30 A		35		S
C_{iss}	Input Capacitance	V_{DS}= 25V, f= 1 MHz, V_{GS}= 0		1950		pF
C_{oss}	Output Capacitance			390		pF
C_{rss}	Reverse Transfer Capacitance			130		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 7: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 25 V, I_D = 30 A		30		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 4.5V (see test circuit, Figure 3)		180		ns
Q_g	Total Gate Charge	V_{DD} = 40 V, I_D = 60 A,		40		nC
Q_{gs}	Gate-Source Charge	V_{GS} = 5 V		10		nC
Q_{gd}	Gate-Drain Charge			20		nC

Table 8: Switching

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	V_{DD} = 25 V, I_D = 30 A,		80		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 4.5V (see test circuit, Figure 3)		35		ns

Table 9: Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				60	A
I_{SDM} (2)	Source-drain Current (pulsed)				240	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 60A, V_{GS} = 0			1.3	V
t_{rr}	Reverse Recovery Time	I_{SD} = 40 A, di/dt = 100 A/µs, V_{DD}		65		ns
Q_{rr}	Reverse Recovery Charge	= 25 V, T_j = 150 °C		130		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		4		A

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

Figure 3: Safe Operating Area

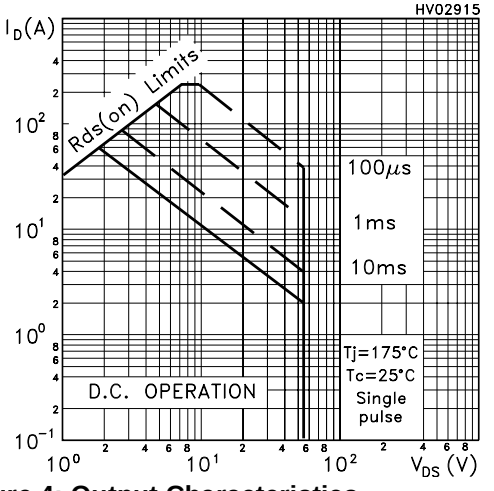


Figure 4: Output Characteristics

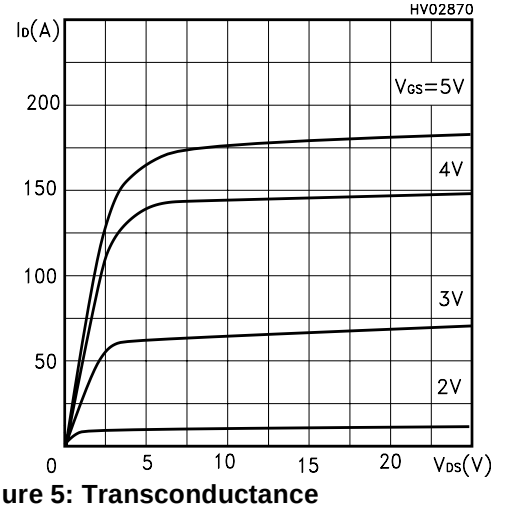


Figure 5: Transconductance

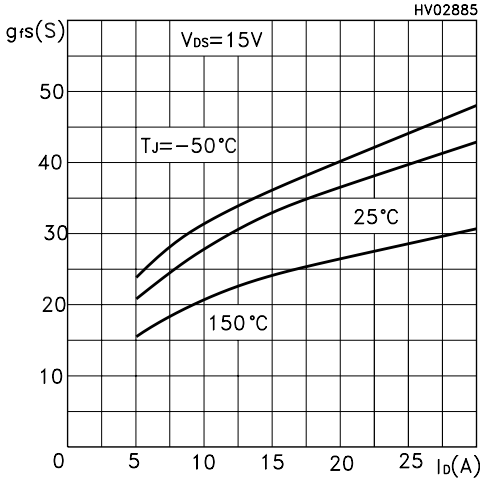


Figure 6: Thermal Impedance

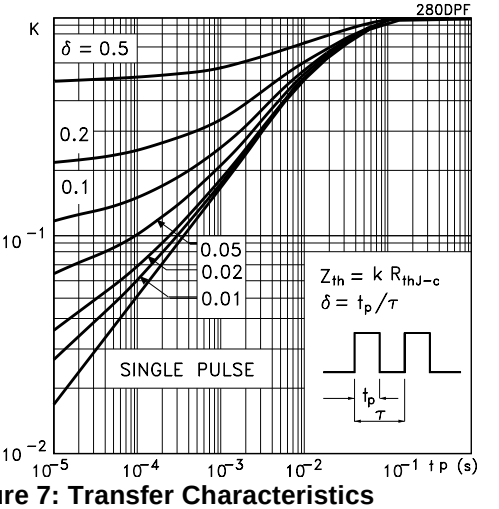


Figure 7: Transfer Characteristics

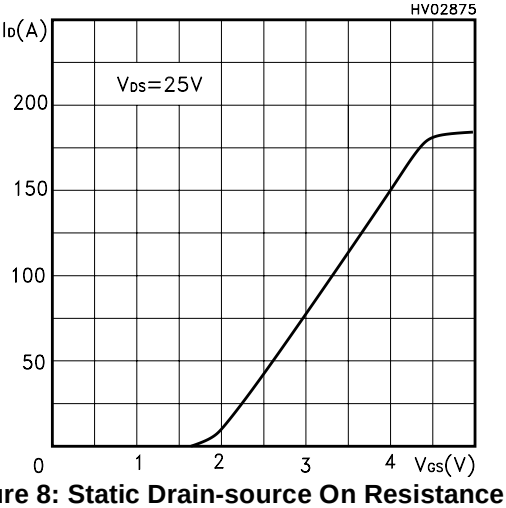


Figure 8: Static Drain-source On Resistance

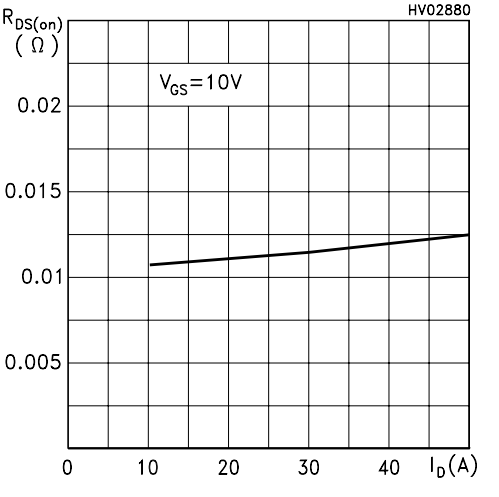


Figure 9: Gate Charge vs Gate-source Voltage

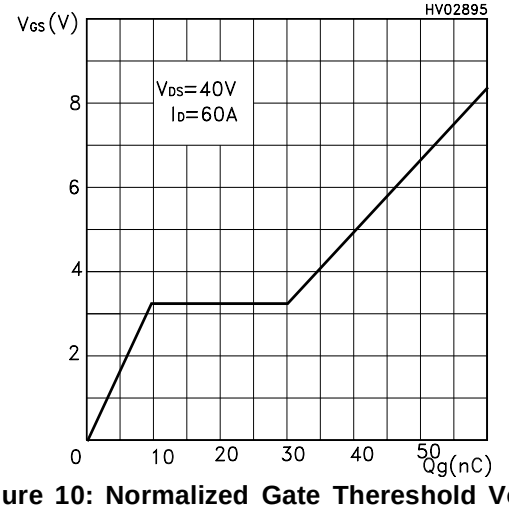


Figure 10: Normalized Gate Thereshold Voltage vs Temperature

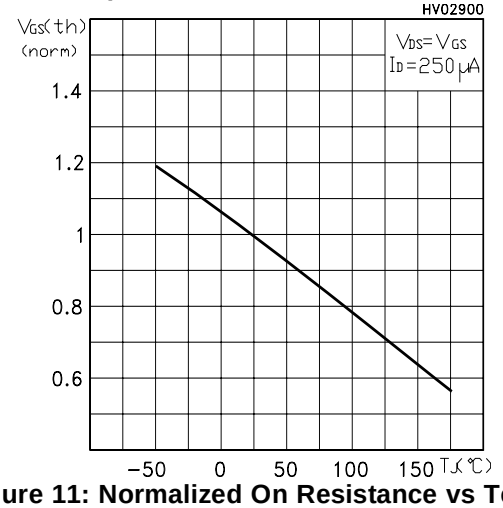


Figure 11: Normalized On Resistance vs Temperature

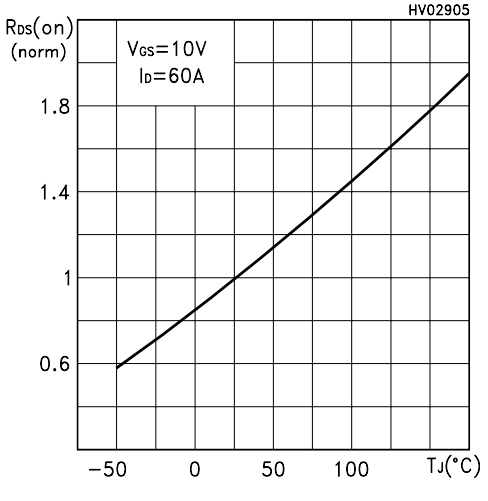


Figure 12: Capacitance Variation

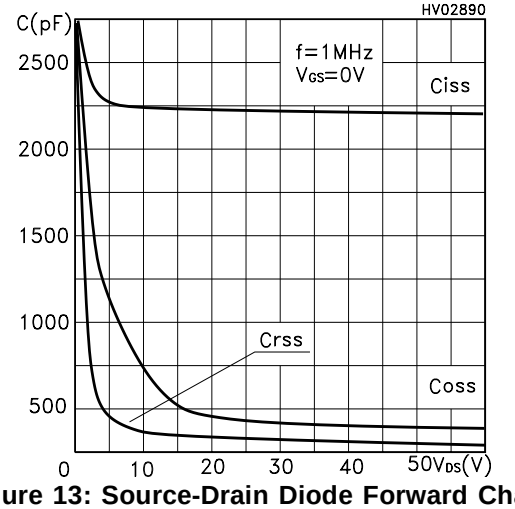


Figure 13: Source-Drain Diode Forward Characteristics

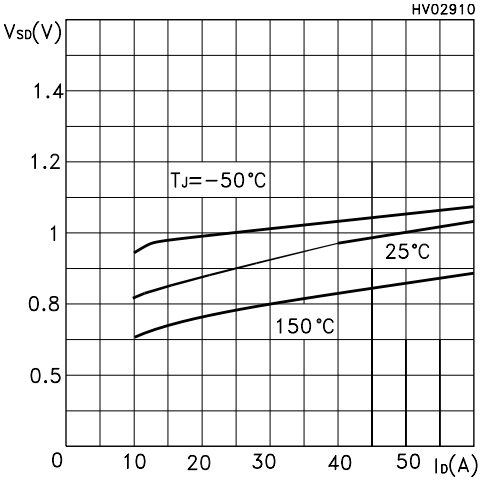
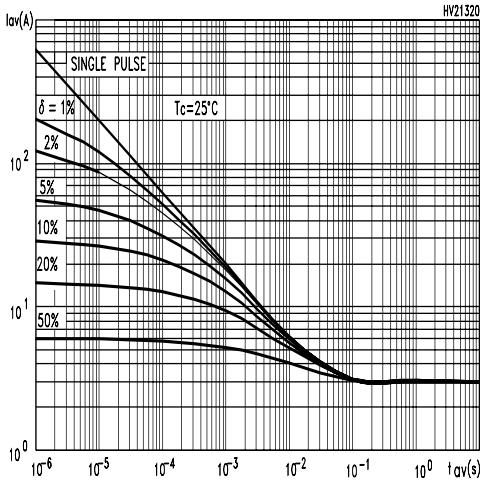


Figure 14: Allowable Iav vs Time in Avalanche



The previous curve gives the safe operating area for unclamped inductive loads, single pulse or repetitive, under the following conditions:

$P_{D(AVE)} = 0.5 * (1.3 * BV_{DSS} * I_{AV})$

$E_{AS(AR)} = P_{D(AVE)} * t_{AV}$

Where:

I_{AV} is the Allowable Current in Avalanche

$P_{D(AVE)}$ is the Average Power Dissipation in Avalanche (Single Pulse)

t_{AV} is the Time in Avalanche

To derate above 25 °C, at fixed I_{AV}, the following equation must be applied:

$$I_{AV} = 2 * (T_{jmax} - T_{CASE}) / (1.3 * BV_{DSS} * Z_{th})$$

Where:

$Z_{th} = K * R_{th}$ is the value coming from Normalized Thermal Response at fixed pulse width equal to T_{AV}.

Figure 15: Switching Times Test Circuit For Resistive Load

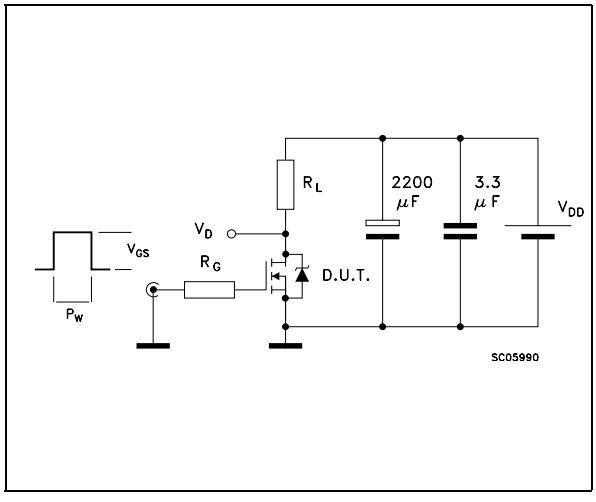


Figure 16: Test Circuit For Diode Recovery Times

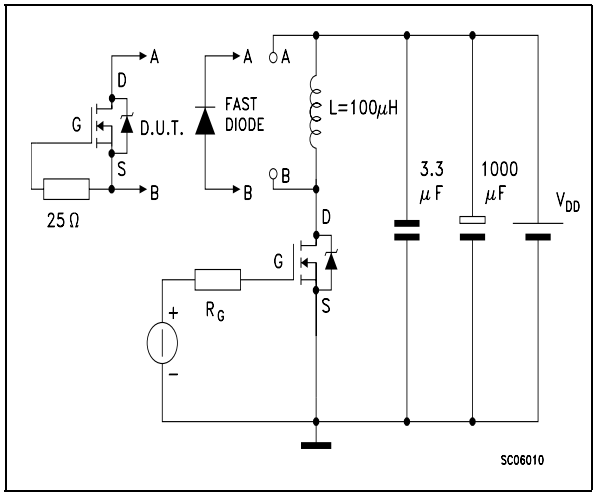
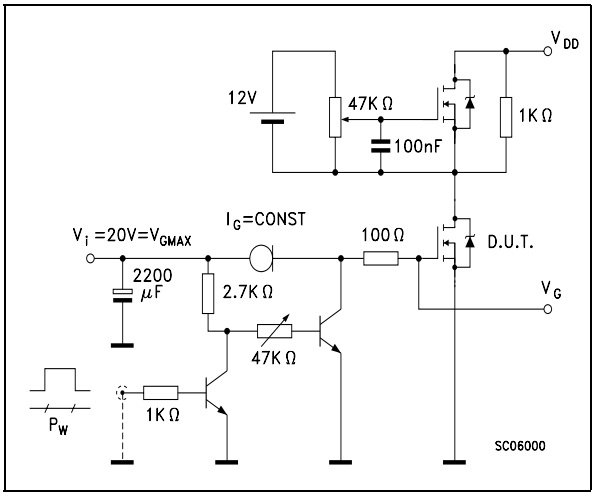
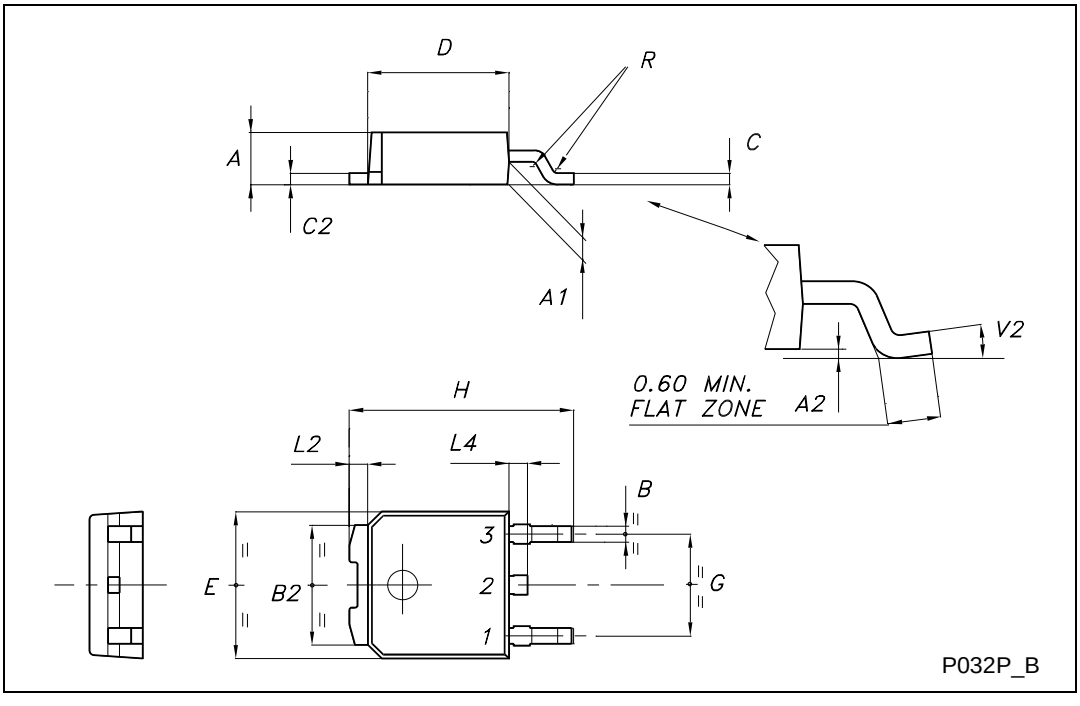


Figure 17: Gate Charge Test Circuit

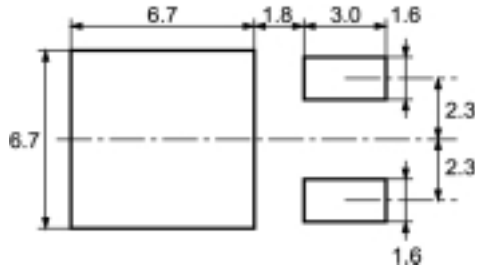


TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0^o		8^o	0^o		0^o



DPAK FOOTPRINT



All dimensions are in millimeters

TUBE SHIPMENT (no suffix)*

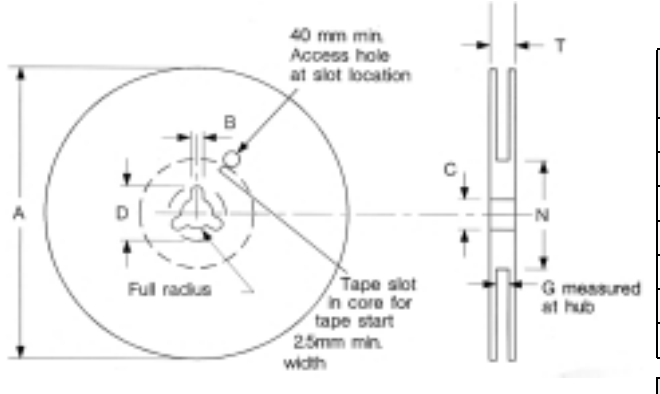
BASE QTY 75

BULK QTY 3000

Tube length 532 (±0.5)

All dimensions are in millimeters

TAPE AND REEL SHIPMENT (suffix "T4")*



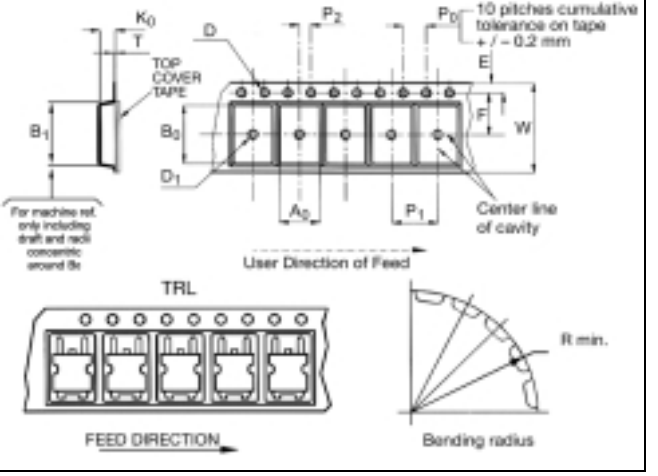
REEL MECHANICAL DATA

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



* on sales type

Table 10: Revision History

Date	Revision	Description of Changes
15-Feb-2005	1	First Release.