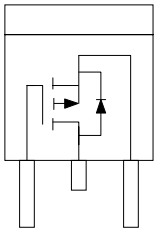
P-Channel Enhancement Mode MOSFET

Features

- -20V/-3.6A , $R_{DS(ON)}$=70mΩ(typ.) @ V_{GS}=-4.5V
  $R_{DS(ON)}$=100mΩ(typ.) @ V_{GS}=-2.5V
- Super High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- TO-252 Package

Pin Description



Top View of TO-252

Applications

- Power Management in Notebook Computer , Portable Equipment and Battery Powered Systems.

Ordering and Marking Information

APM2095P □□-□□

- Handling Code
- Temp. Range
- Package Code

Package Code
U : TO-252
Operating Junction Temp. Range
C : -55 to 150°C
Handling Code
TU : Tube
TR : Tape & Reel

APM2095P U :

XXXXX - Date Code

Absolute Maximum Ratings (T$_A$ = 25°C unless otherwise noted)

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage	±10	
I_D	Maximum Drain Current – Continuous	-3.6	A
I_{DM}	Maximum Pulsed Drain Current (pulse width ≤ 300μs)	-20	

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Rev. A.1 - Nov., 2003

Absolute Maximum Ratings Cont. (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Rating	Unit
P_D	Maximum Power Dissipation	T_C=25°C	50	W
		T_C=100°C	20	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	
$R_{\theta JA}$*	Thermal Resistance – Junction to Ambient		50	°C/W
$R_{\theta JC}$	Thermal Resistance – Junction to Case		2.5	

*Mounted on 1in^2 pad area of PCB.

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	APM2095P			Unit
			Min.	Typ.	Max.	
Static						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_{DS}=-250µA	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V , V_{GS}=0V			-1	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_{DS}=-250µA	-0.5	-0.7	-1	V
I_{GSS}	Gate Leakage Current	V_{GS}=±10V , V_{DS}=0V			±100	nA
$R_{DS(ON)}$[a]	Drain-Source On-state Resistance	V_{GS}=-4.5V , I_{DS}=-3.6A		70	95	mΩ
		V_{GS}=-2.5V , I_{DS}=-2A		100	125	
V_{SD}[a]	Diode Forward Voltage	I_{SD}=-1A , V_{GS}=0V		-0.7	-1.3	V
Dynamic[b]						
Q_g	Total Gate Charge	V_{DS}=-10V , I_{DS}=-3.6A		11	15	nC
Q_{gs}	Gate-Source Charge	V_{GS}=-4.5V		2		
Q_{gd}	Gate-Drain Charge			1.5		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-10V , I_{DS}=-3.6A , V_{GEN}=-4.5V , R_G=6Ω		13	22	ns
T_r	Turn-on Rise Time			36	56	
$t_{d(OFF)}$	Turn-off Delay Time			45	70	
T_f	Turn-off Fall Time			37	58	
C_{iss}	Input Capacitance	V_{GS}=0V , V_{DS}=-15V , Frequency=1.0MHz		550		pF
C_{oss}	Output Capacitance			170		
C_{rss}	Reverse Transfer Capacitance			120		

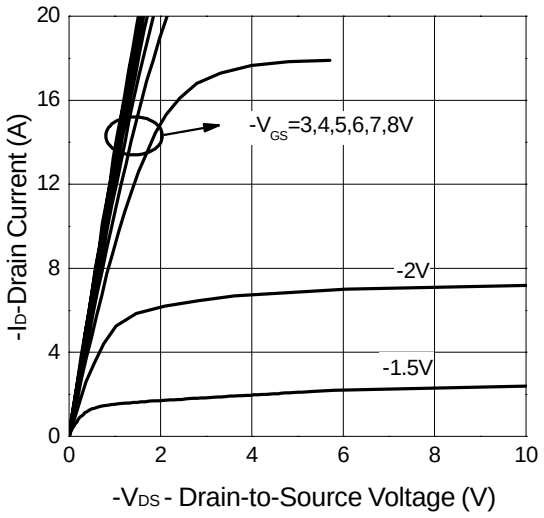
Notes

[a] : Pulse test ; pulse width ≤300µs, duty cycle ≤ 2%

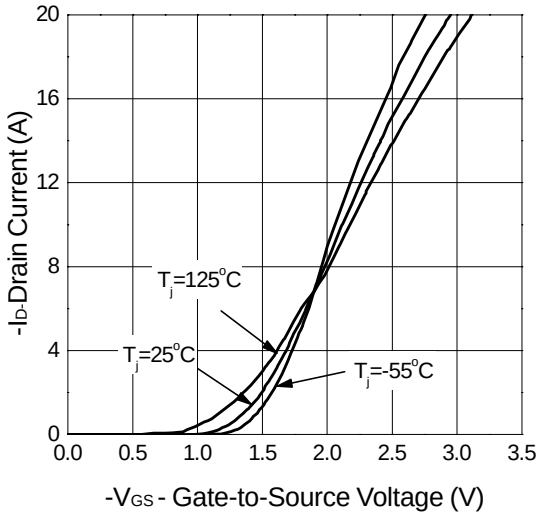
[b] : Guaranteed by design, not subject to production testing

Typical Characteristics

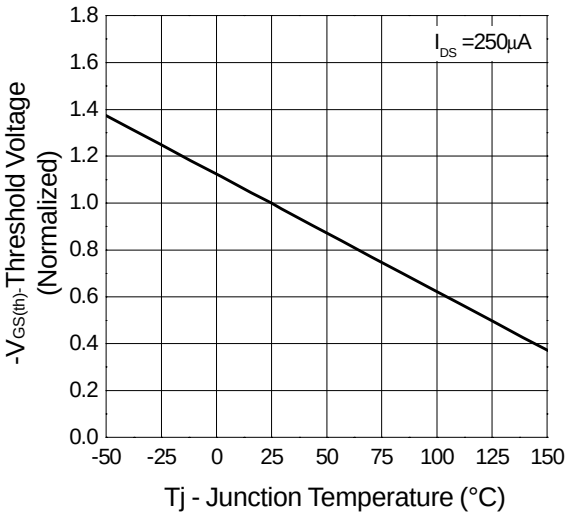
Output Characteristics



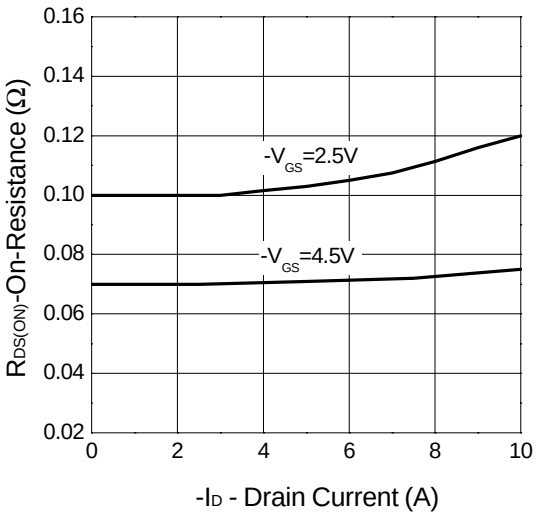
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

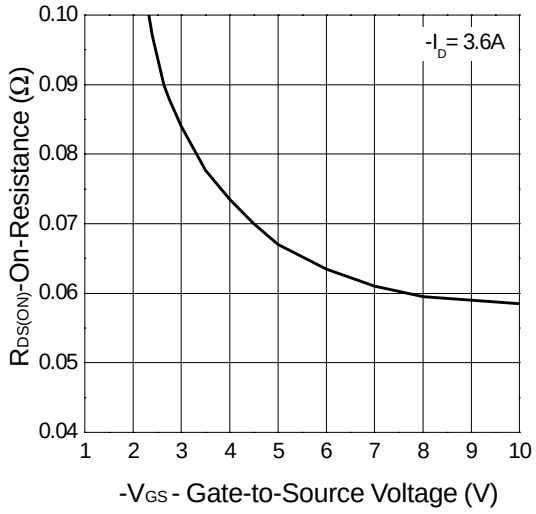


On-Resistance vs. Drain Current

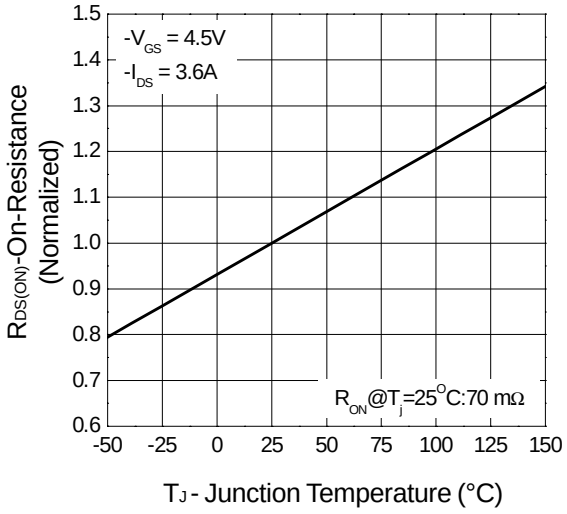


Typical Characteristics

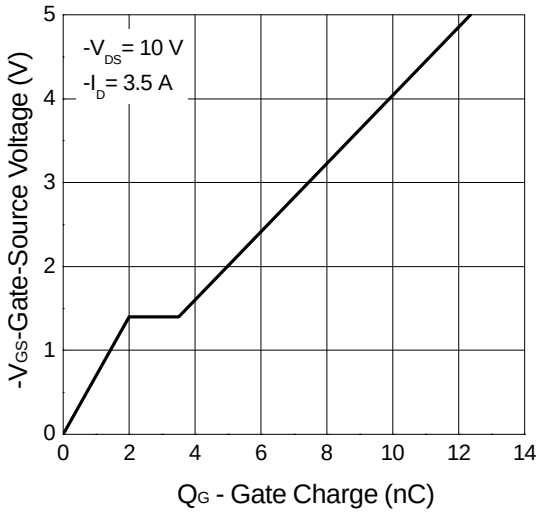
On-Resistance vs. Gate-to-Source Voltage



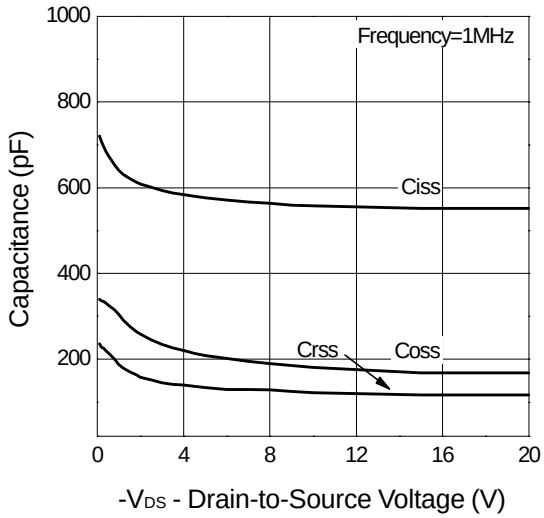
On-Resistance vs. Junction Temperature



Gate Charge

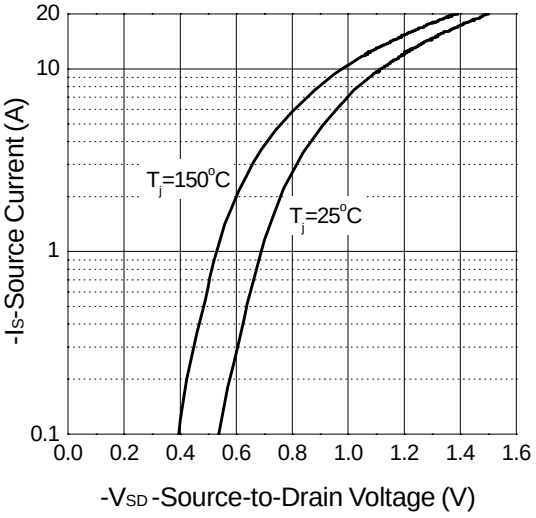


Capacitance

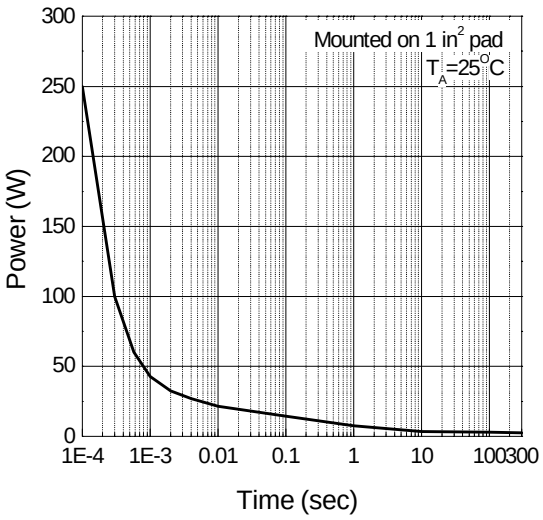


Typical Characteristics

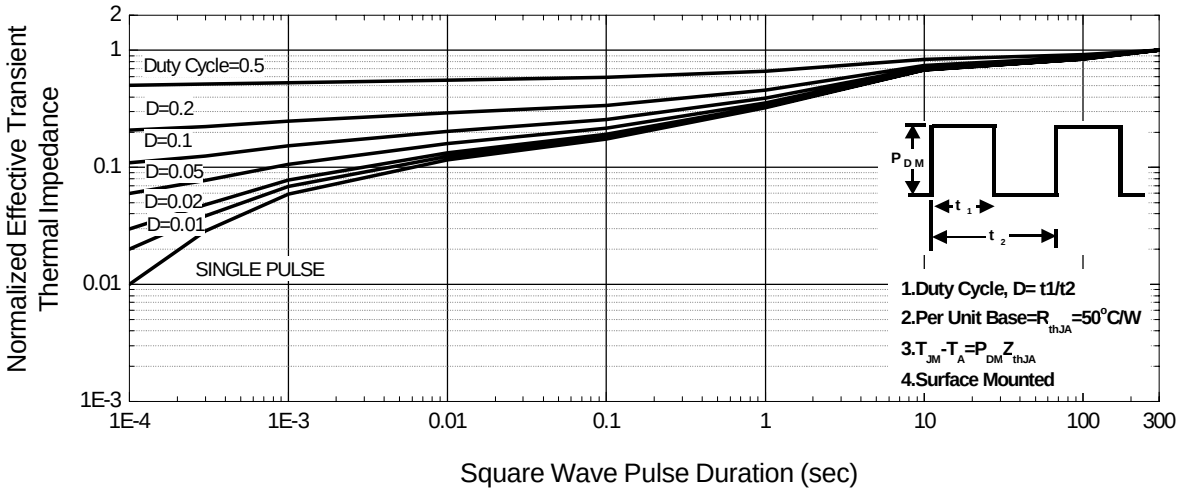
Source-Drain Diode Forward Voltage



Single Pulse Power

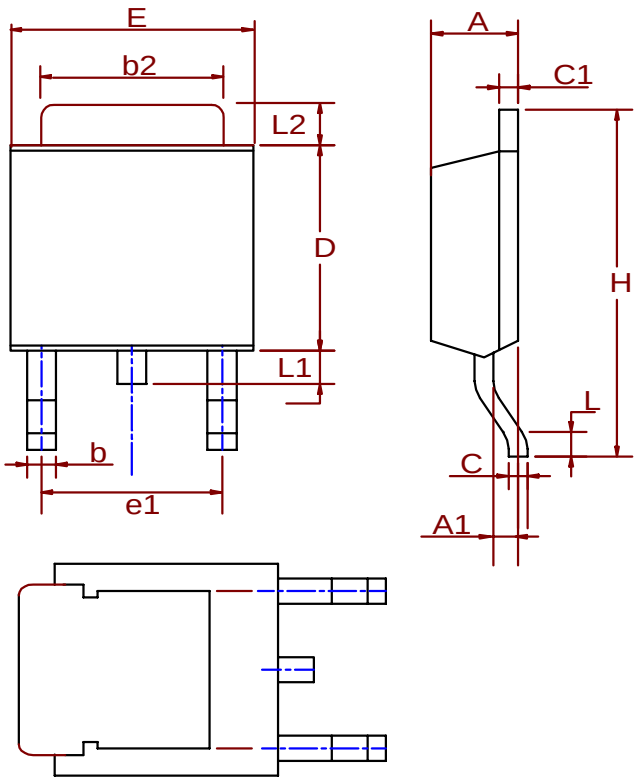


Normalized Thermal Transient Impedence, Junction to Ambient



Packaging Information

TO-252(Reference JEDEC Registration TO-252)



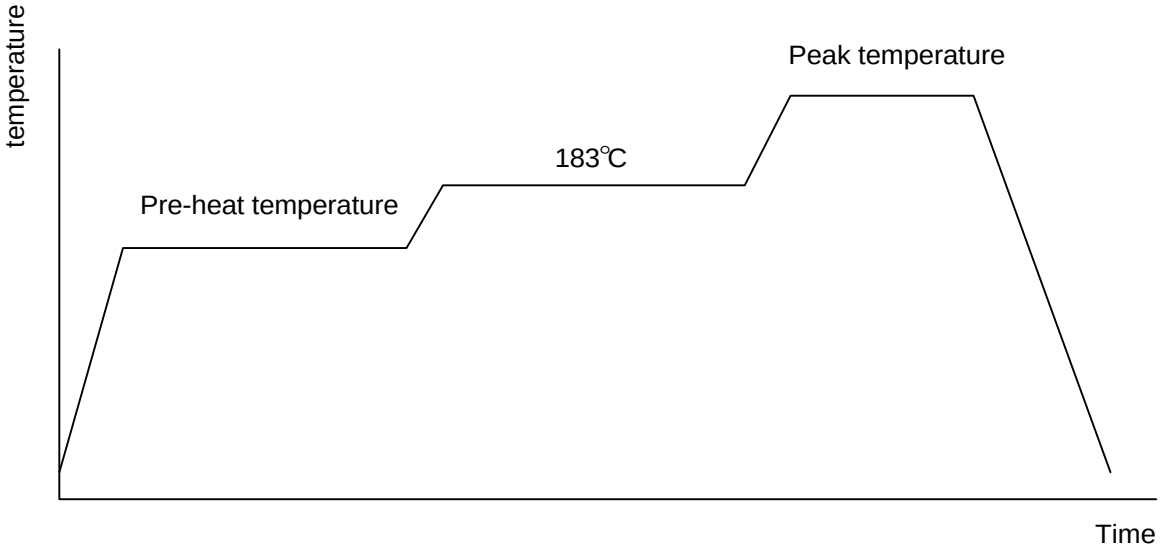
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
E	6.35	6.73	0.250	0.265
e1	3.96	5.18	0.156	0.204
H	9.398	10.41	0.370	0.410
L	0.51		0.020	
L1	0.64	1.02	0.025	0.040
L2	0.89	2.032	0.035	0.080

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max.	
Temperature maintained above 183°C	60 ~ 150 seconds	
Time within 5°C of actual peak temperature	10 ~ 20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215~ 219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

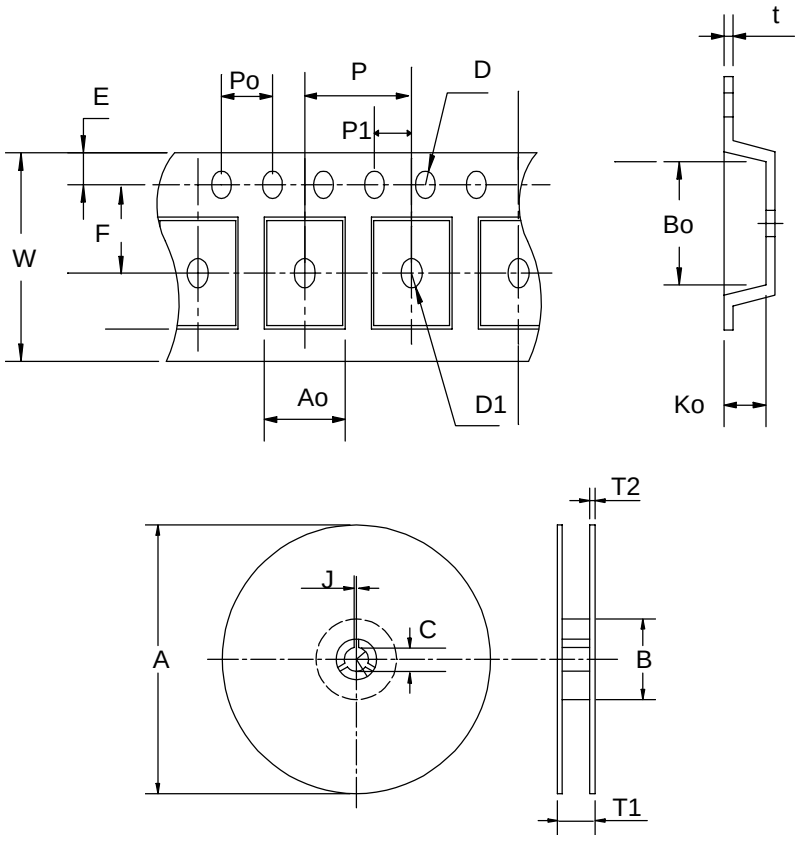
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	**pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³**	**pkg. thickness < 2.5mm and pkg. volume < 350mm³**
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C,5 SEC
HOLT	MIL-STD 883D-1005.7	1000 Hrs Bias @ 125°C
PCT	JESD-22-B, A102	168 Hrs, 100% RH, 121°C
TST	MIL-STD 883D-1011.9	-65°C ~ 150°C, 200 Cycles

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
TO-252	330 ±3	100 ± 2	13 ± 0. 5	2 ± 0.5	16.4 + 0.3 -0.2	2.5± 0.5	16+ 0.3 - 0.1	8 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	7.5 ± 0.1	1.5 +0.1	1.5± 0.25	4.0 ± 0.1	2.0 ± 0.1	6.8 ± 0.1	10.4± 0.1	2.5± 0.1	0.3±0.05

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO- 252	16	13.3	2500

Customer Service

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