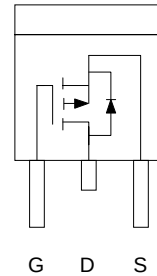


P-Channel Enhancement Mode MOSFET

Features

- -20V/-3.6A , $R_{DS(ON)} = 70m\Omega (typ.) @ V_{GS} = -4.5V$
 $R_{DS(ON)} = 100m\Omega (typ.) @ V_{GS} = -2.5V$
- 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 :	 APM2095P XXXXX XXXXX - Date Code

Absolute Maximum Ratings ($T_A = 25^\circ C$ 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 $\leq 300\mu s$)	-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.

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

Symbol	Parameter	Rating	Unit
P _D	Maximum Power Dissipation	T _C =25°C	W
		T _C =100°C	
T _J	Maximum Junction Temperature	150	°C
T _{STG}	Storage Temperature Range	-55 to 150	
R _{θJA} [*]	Thermal Resistance – Junction to Ambient	50	°C/W
R _{θJC}	Thermal Resistance – Junction to Case	2.5	

*Mounted on 1in² 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		550		pF	
C _{oss}	Output Capacitance	V _{DS} =-15V		170			
C _{rss}	Reverse Transfer Capacitance	Frequency=1.0MHz		120			

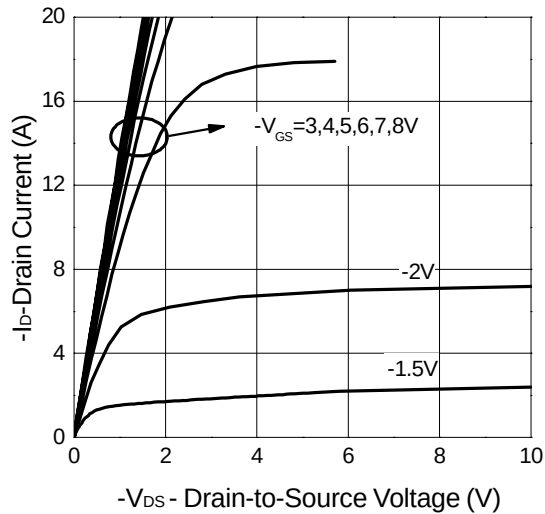
Notes

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

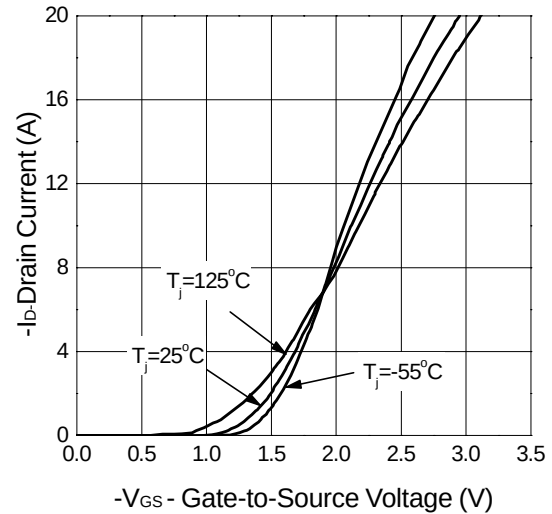
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

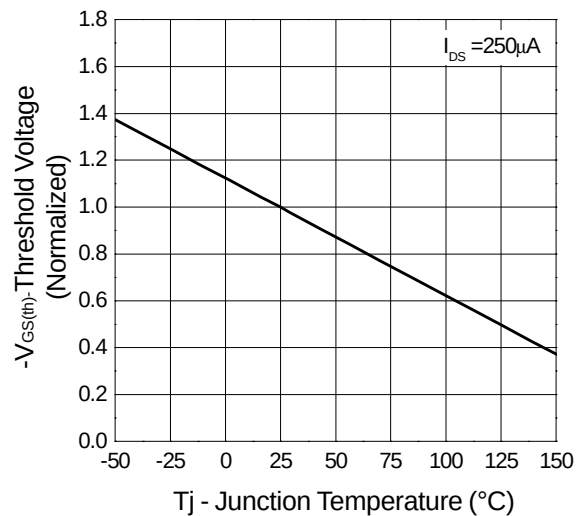
Output Characteristics



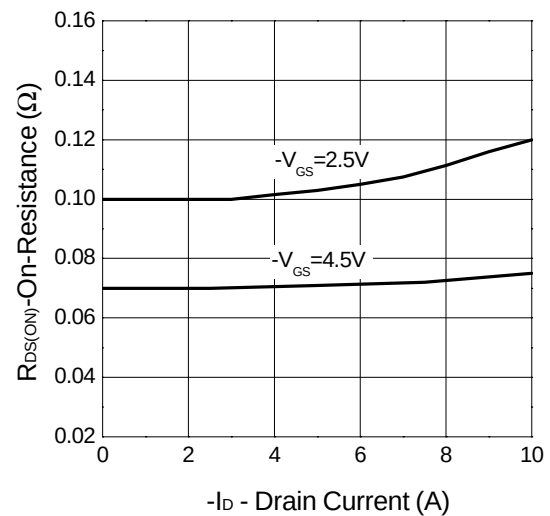
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

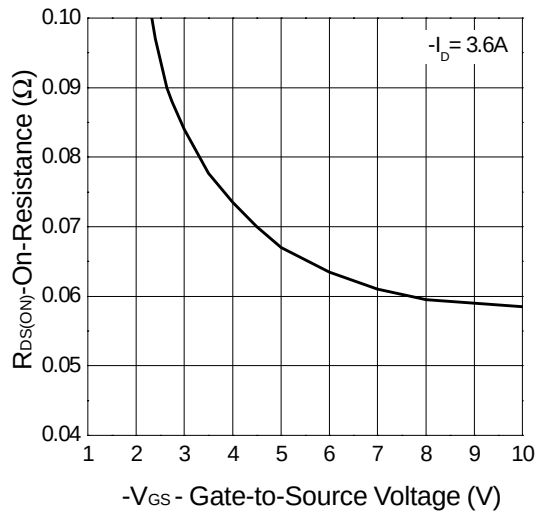


On-Resistance vs. Drain Current

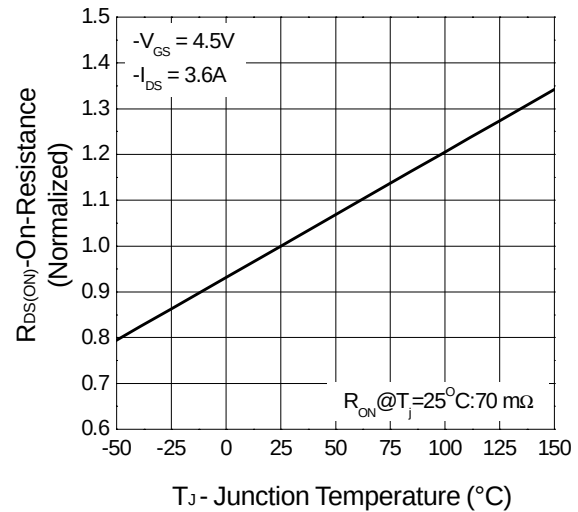


Typical Characteristics

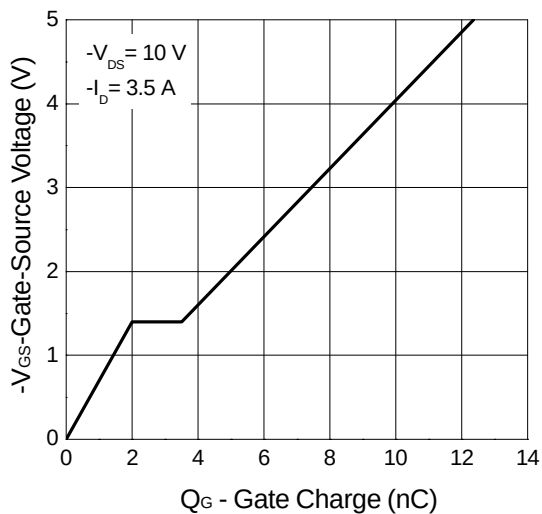
On-Resistance vs. Gate-to-Source Voltage



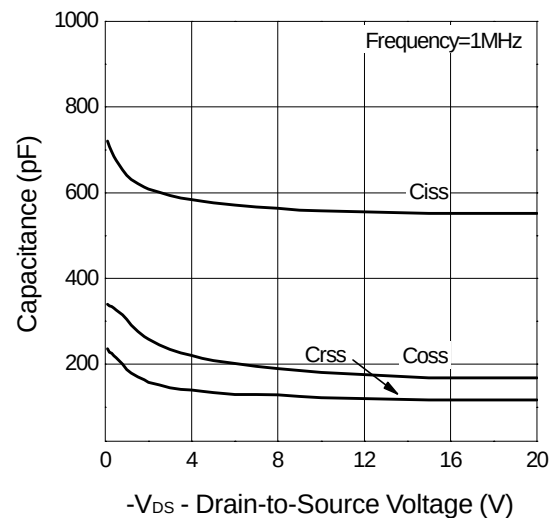
On-Resistance vs. Junction Temperature



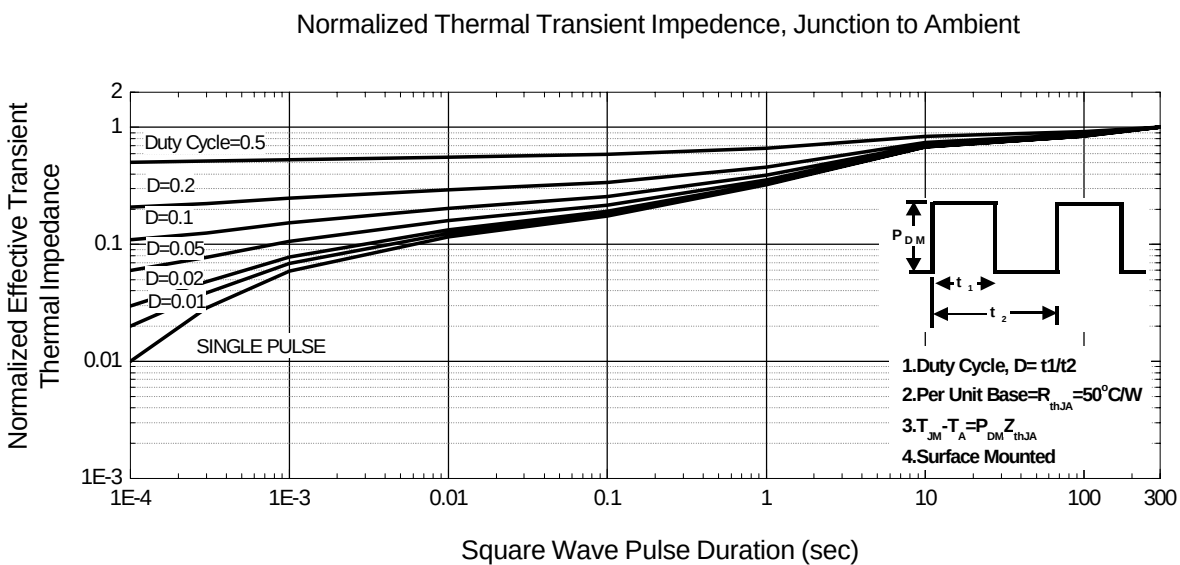
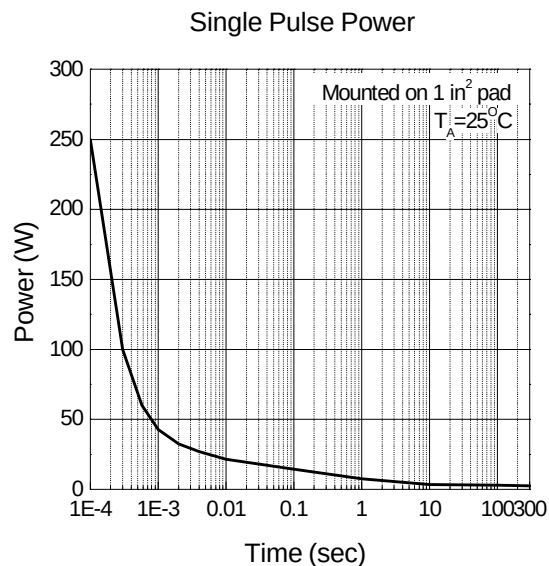
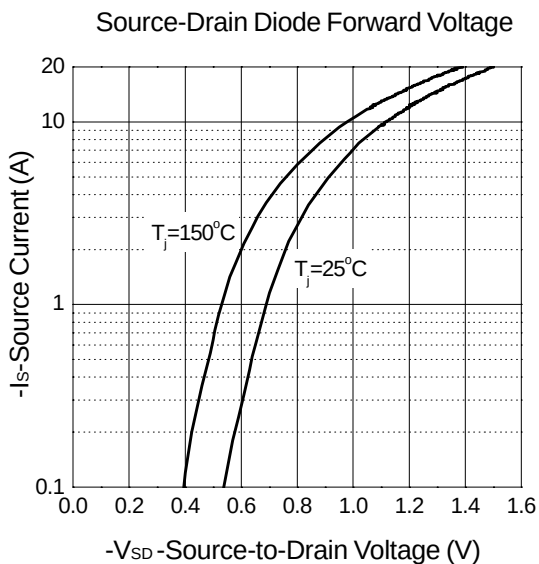
Gate Charge



Capacitance

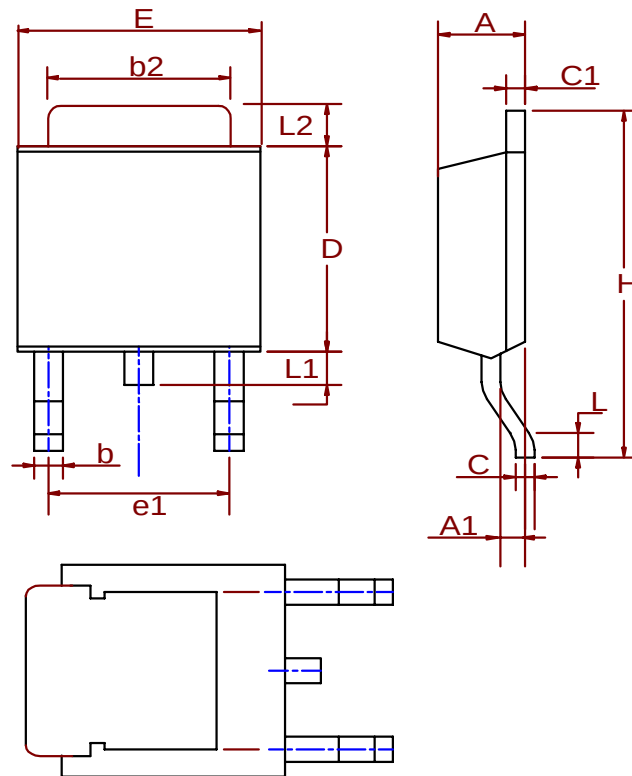


Typical Characteristics



Packaging Information

TO-252(Reference JEDEC Registration TO-252)



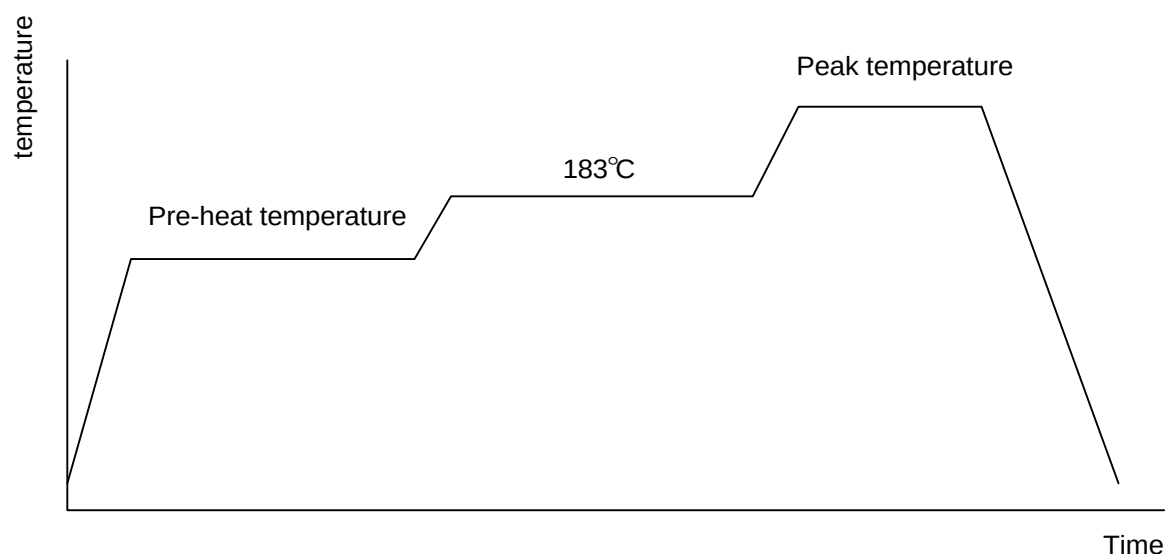
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.39	0.086	0.094
A1	0.89	1.27	0.035	0.050
b	0.508	0.89	0.020	0.035
b2	5.207	5.461	0.205	0.215
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.334	6.22	0.210	0.245
E	6.35	6.73	0.250	0.265
e1	3.96	5.18	0.156	0.204
H	9.398	10.41	0.370	0.410
L	0.51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

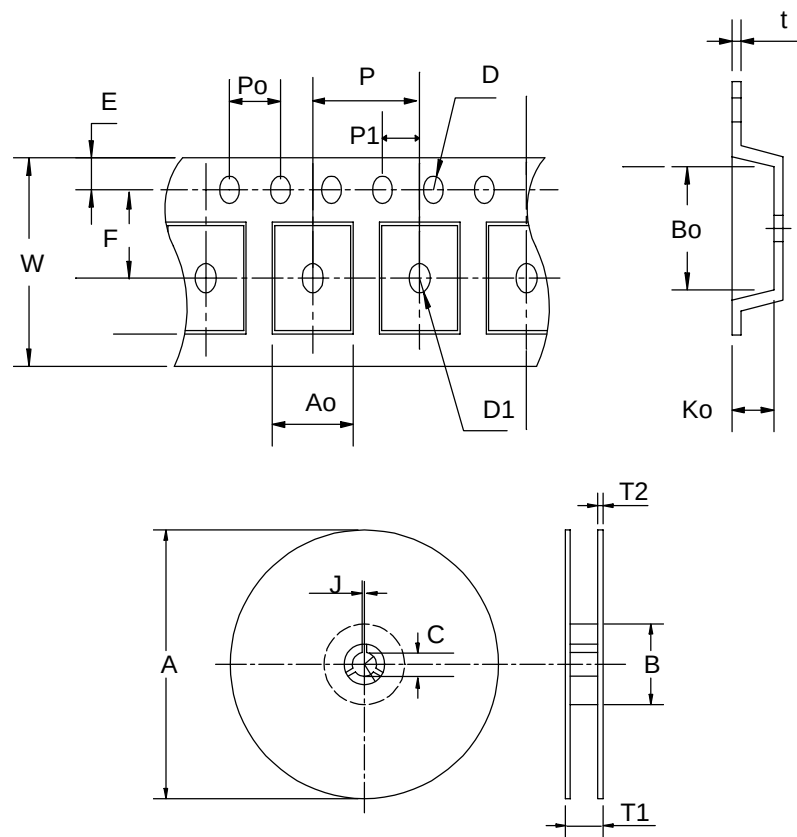
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
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	T ₁	T ₂	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	D ₁	P ₀	P ₁	A ₀	B ₀	K ₀	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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