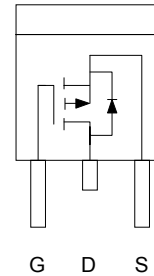


P-Channel Enhancement Mode MOSFET

Features

- 30V/-11A, $R_{DS(ON)} = 17m\Omega(\text{typ.}) @ V_{GS} = -10V$
 $R_{DS(ON)} = 24m\Omega(\text{typ.}) @ V_{GS} = -5V$
- Super High Density Cell Design
- 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

APM3020P □□-□□ Handling Code Temp. Range Package Code	Package Code U : TO-252 Operating Junction Temp. Range C : -55 to 125°C Handling Code TU : Tube TR : Tape & Reel
APM3020P U :	XXXXXX - Date Code

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		Rating	Unit
V_{DSS}	Drain-Source Voltage		-30	V
V_{GSS}	Gate-Source Voltage		± 20	
I_D^*	Maximum Drain Current – Continuous		-40	A
I_{DM}	Maximum Drain Current – Pulsed		-70	
P_D	Maximum Power Dissipation	$T_A = 25^\circ\text{C}$	50	W
		$T_A = 100^\circ\text{C}$	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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Unit
T_J	Maximum Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance – Junction to Case	2.5	$^\circ\text{C/W}$

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	APM3020P			Unit
			Min.	Typ.	Max.	
Static						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _{DS} =-250A	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-24V , V _{GS} =0V			-1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-1		-3	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V , V _{DS} =0V			±100	nA
R _{DS(ON)} ^a	Drain-Source On-state	V _{GS} =-10V , I _{DS} =-11A		17	20	mΩ
	Resistance	V _{GS} =-5V , I _{DS} =-7A		24	30	
V _{SD} ^a	Diode Forward Voltage	I _{SD} =-11A, V _{GS} =0V	-1.3		-1.3	V
Dynamic ^b						
Q _g	Total Gate Charge	V _{DS} =-15V , V _{GS} =-4.5V, I _{DS} =-4.6A		23	30	nC
Q _{gs}	Gate-Source Charge			10		
Q _{gd}	Gate-Drain Charge			9		
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-15V , I _{DS} =-6A , V _{GEN} =-10 V , R _G =1Ω R _L =2.5Ω		16	30	ns
T _r	Turn-on Rise Time			22	30	
t _{d(OFF)}	Turn-off Delay Time			75	120	
T _f	Turn-off Fall Time			31	80	
C _{iss}	Input Capacitance	V _{GS} =0V		3720		pF
C _{oss}	Output Capacitance	V _{DS} =-25V		580		
C _{rss}	Reverse Transfer Capacitance	Frequency=1.0MHz		245		

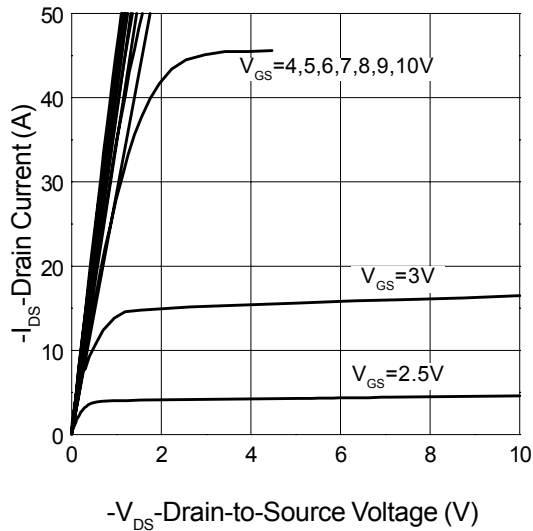
Notes

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

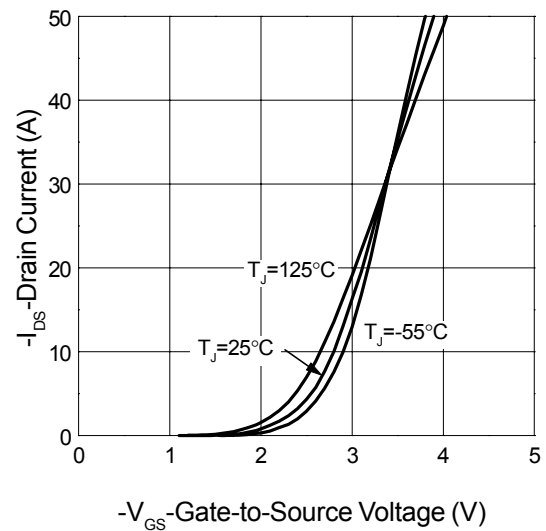
^b : Pulse test ; pulse width $\leq 500\mu s$, duty cycle $\leq 2\%$

Typical Characteristics

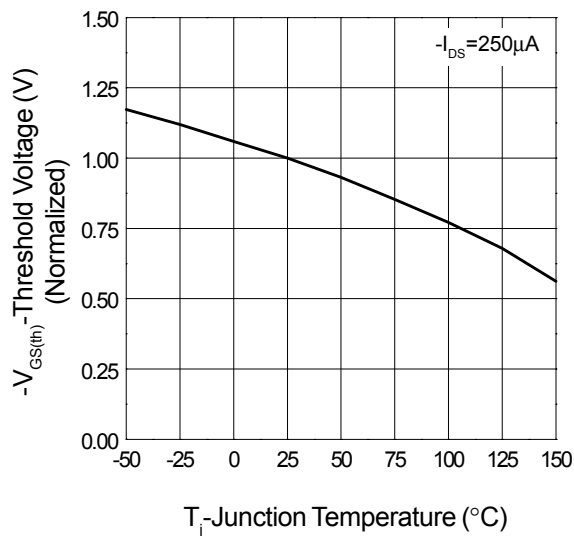
Output Characteristics



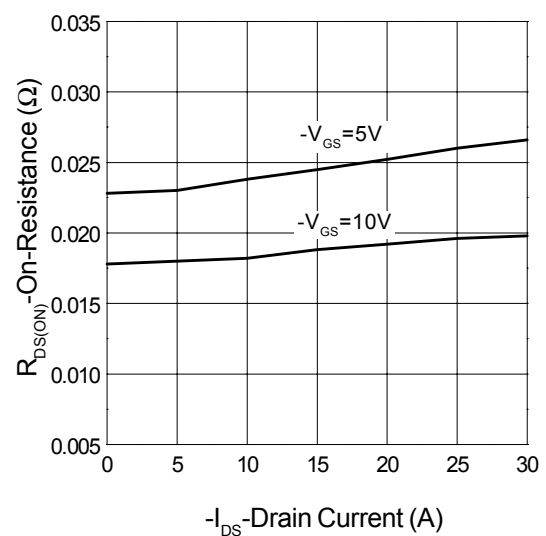
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

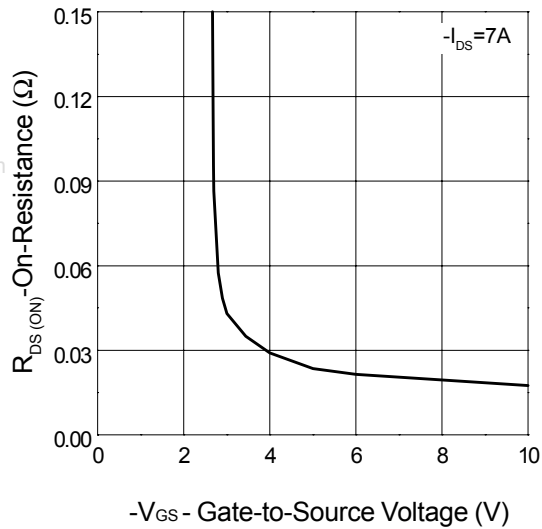


On-Resistance vs. Drain Current

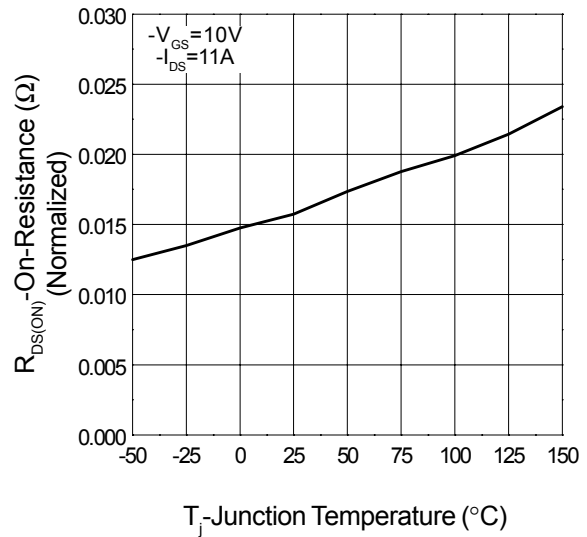


Typical Characteristics Cont.

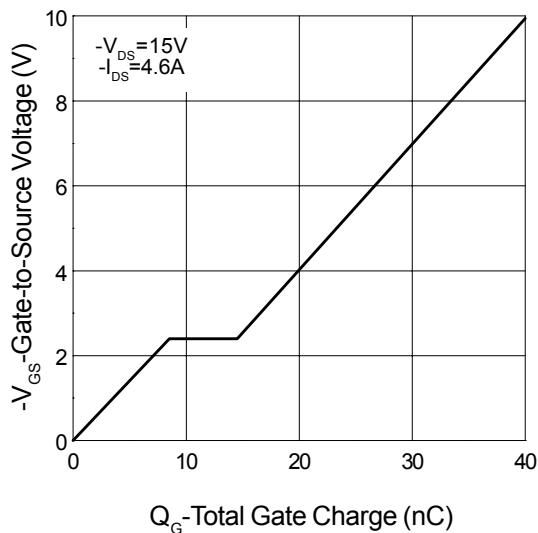
On-Resistance vs. Gate-to-Source Voltage



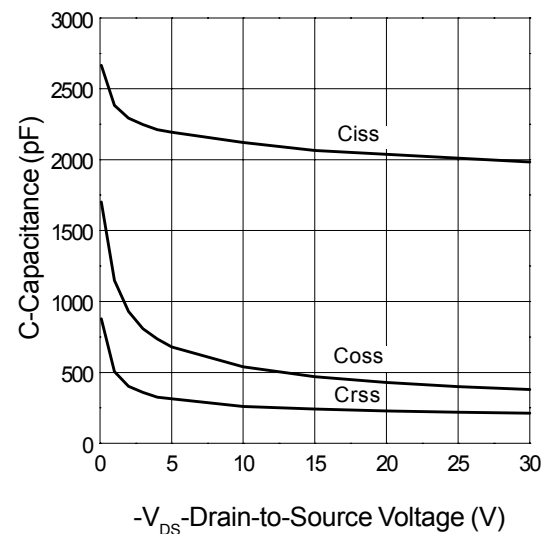
On-Resistance vs. Junction Temperature



Gate Charge

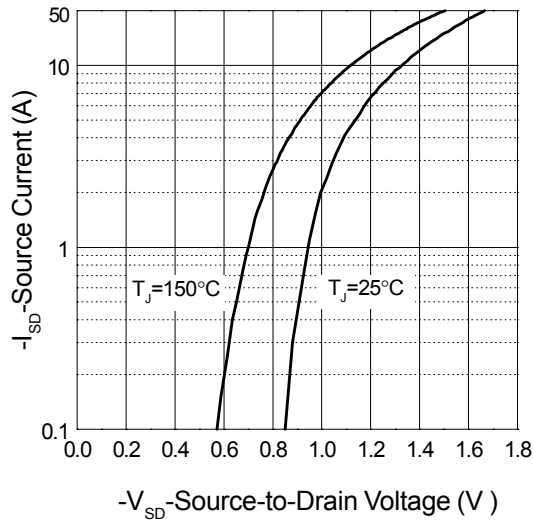


Capacitance Characteristics

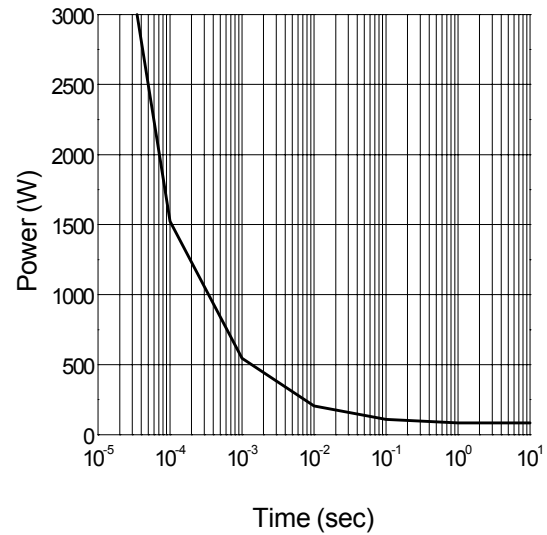


Typical Characteristics Cont.

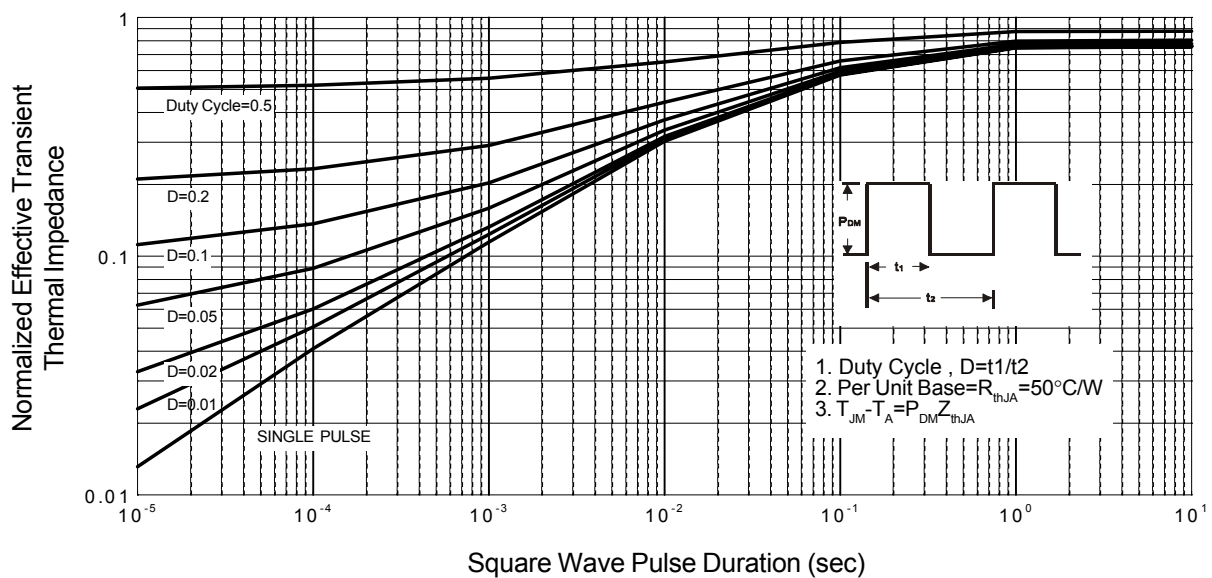
Source-Drain Diode Forward Voltage



Single Pulse Power

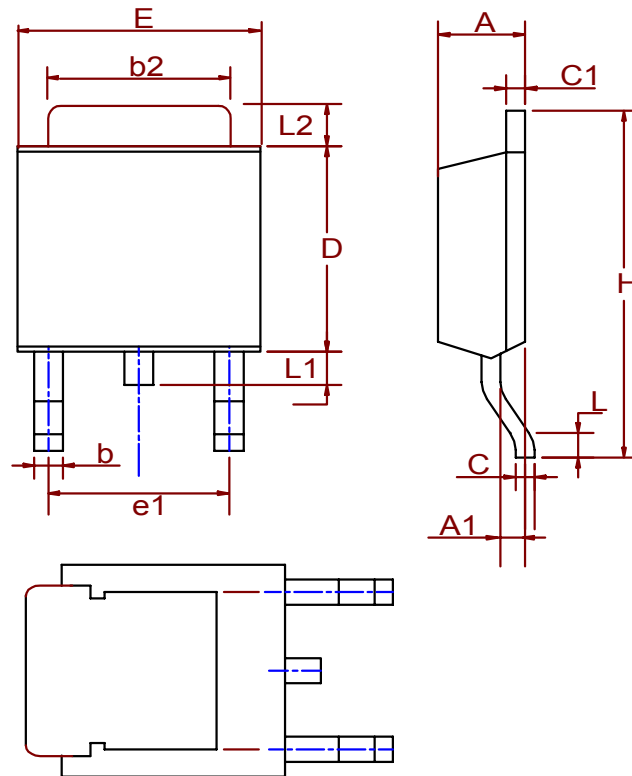


Normalized Transient Thermal Impedance, Junction to Ambient



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

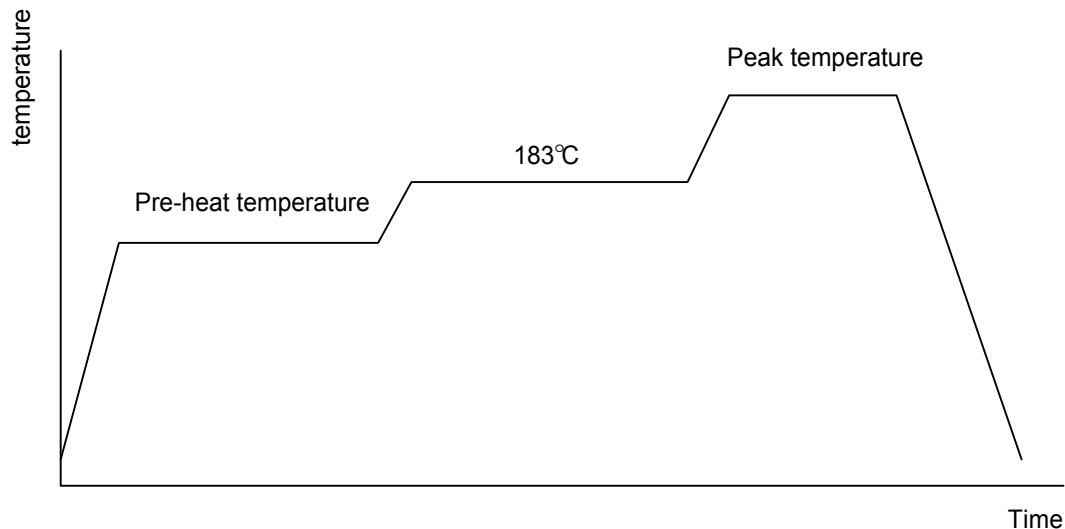
Physical Specifications

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

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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

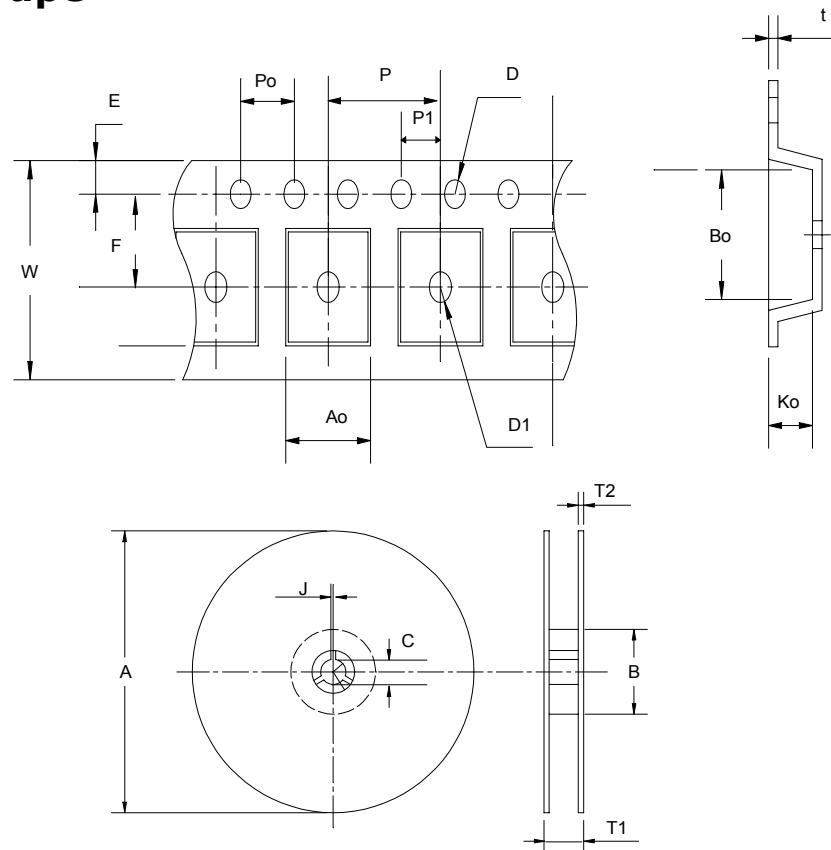
pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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

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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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