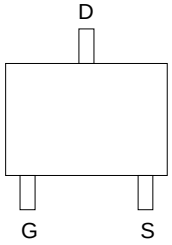
P-Channel Enhancement Mode MOSFET

Features

- -20V/-0.9A , $R_{DS(ON)}$=370mΩ(typ.) @ V_{GS}=-4.5V
  $R_{DS(ON)}$=560mΩ(typ.) @ V_{GS}=-2.5V
- Super High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Reliable and Rugged
- SOT-23 Package

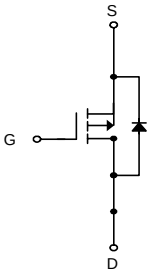
Pin Description



Top View of SOT-23

Applications

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



P-Channel MOSFET

Ordering and Marking Information

APM2321 □□-□□

- Handling Code
- Temp. Range
- Package Code

Package Code
A : SOT-23
Operating Junction Temp. Range
C : -55 to 150°C
Handling Code
TR : Tape & Reel

APM2321A : M21X

X - 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	-0.9	A
I_{DM}	Maximum Drain Current – Pulsed	-3.6	

* Surface Mounted on FR4 Board, t ≤ 10 sec.

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.

Copyright © ANPEC Electronics Corp.

Rev. A.1 - Jun., 2003

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

Symbol	Parameter		Rating	Unit
P_D	Maximum Power Dissipation	T_A=25°C	1.25	W
		T_A=100°C	0.5	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
$R_{\theta jA}$	Thermal Resistance – Junction to Ambient		100	°C/W

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

Symbol	Parameter	Test Condition	APM2321			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	-0.6	-0.8	-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}=-0.9A		370	520	mΩ
		V_{GS}=-2.5V , I_{DS}=-0.8A		560	800	
V_{SD}[a]	Diode Forward Voltage	I_{SD}=-0.5A , V_{GS}=0V		-0.8	-1.3	V
Dynamic[b]						
Q_g	Total Gate Charge	V_{DS}=-10V , I_{DS}= -0.9A , V_{GS}=-4.5V		6.8	9	nC
Q_{gs}	Gate-Source Charge			1		
Q_{gd}	Gate-Drain Charge			1.1		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-10V , I_{DS}=-0.9A , V_{GEN}=-4.5V , R_G=6Ω		5	10	ns
T_r	Turn-on Rise Time			8	12	
$t_{d(OFF)}$	Turn-off Delay Time			9.6	15	
T_f	Turn-off Fall Time			5	10	
C_{iss}	Input Capacitance	V_{GS}=0V , V_{DS}=-15V , Frequency=1.0MHz		165		pF
C_{oss}	Output Capacitance			55		
C_{rss}	Reverse Transfer Capacitance			40		

Notes

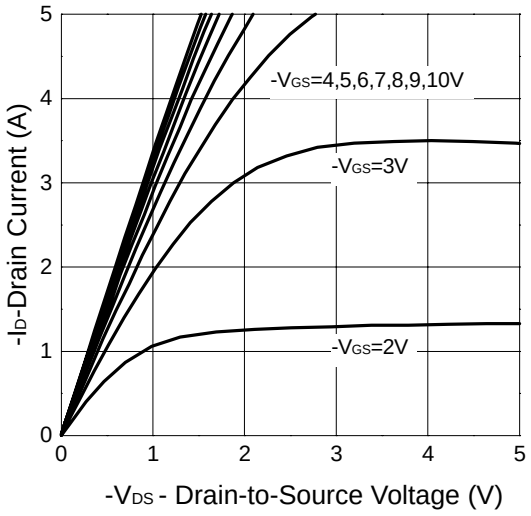
[a] : Pulse test ; pulse width ≤300μs, duty cycle ≤ 2%

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

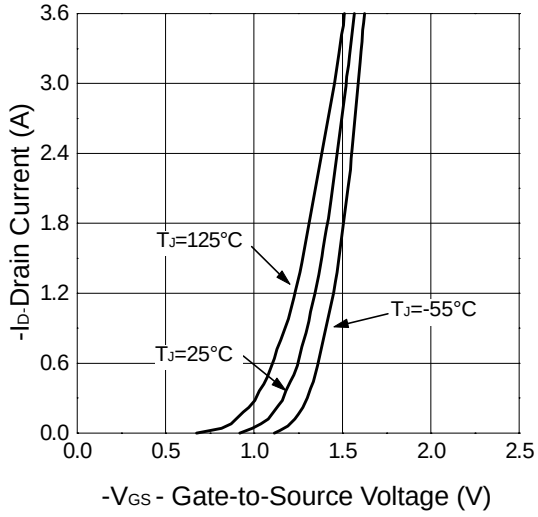
Copyright © ANPEC Electronics Corp.

Typical Characteristics

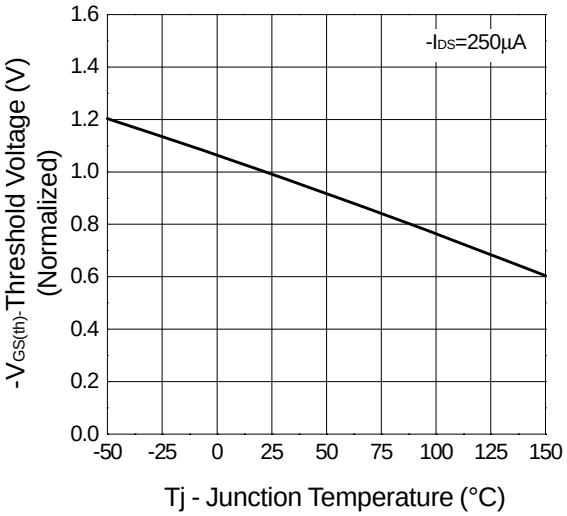
Output Characteristics



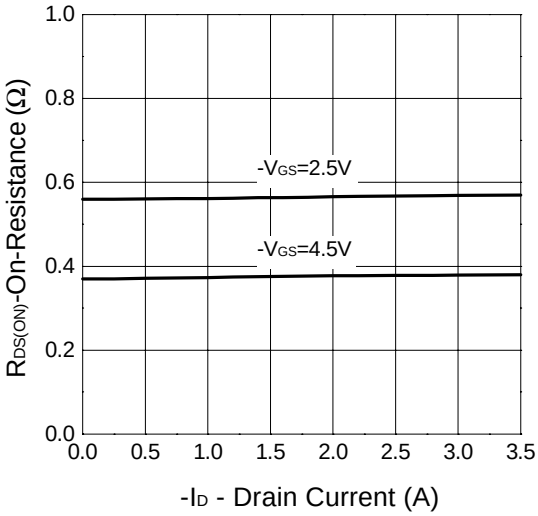
Transfer Characteristics



Threshold Voltage vs. Junction Temperature



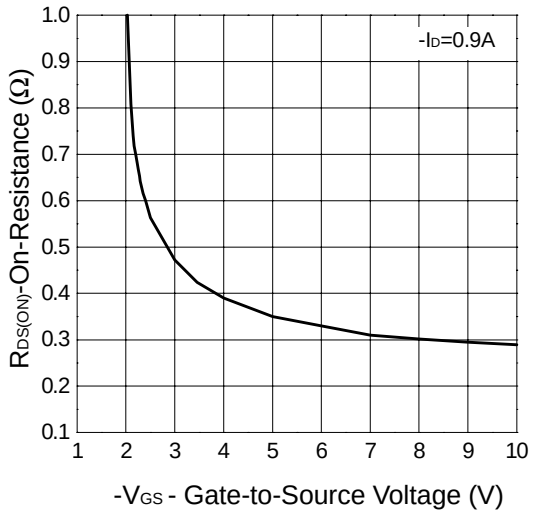
On-Resistance vs. Drain Current



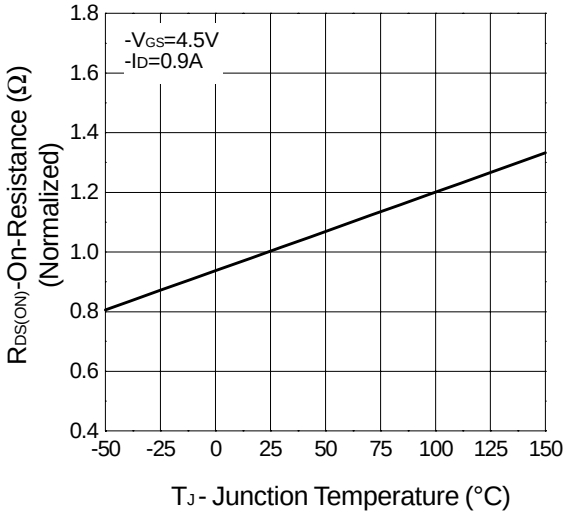
Copyright © ANPEC Electronics Corp.

Typical Characteristics (Cont.)

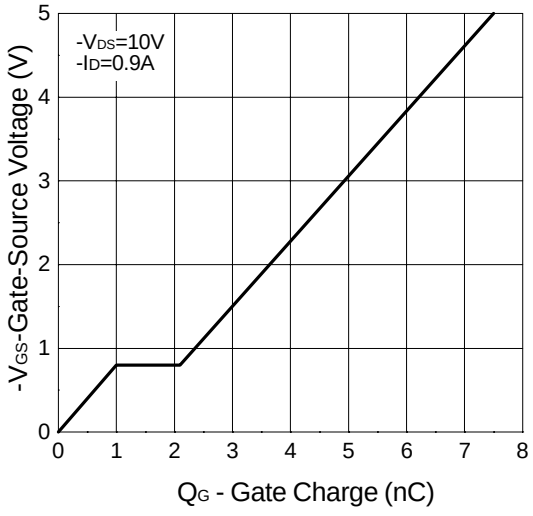
On-Resistance vs. Gate-to-Source Voltage



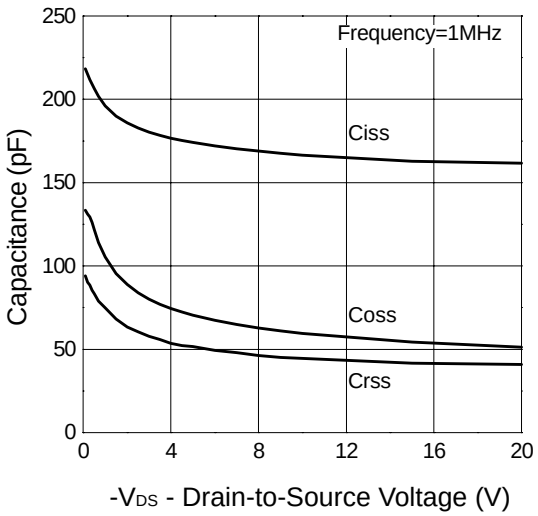
On-Resistance vs. Junction Temperature



Gate Charge



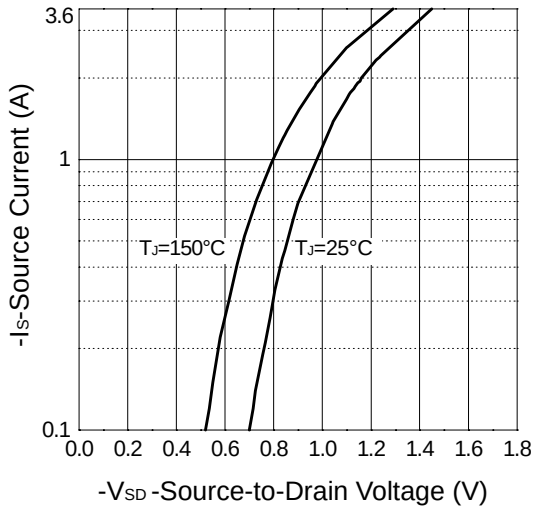
Capacitance



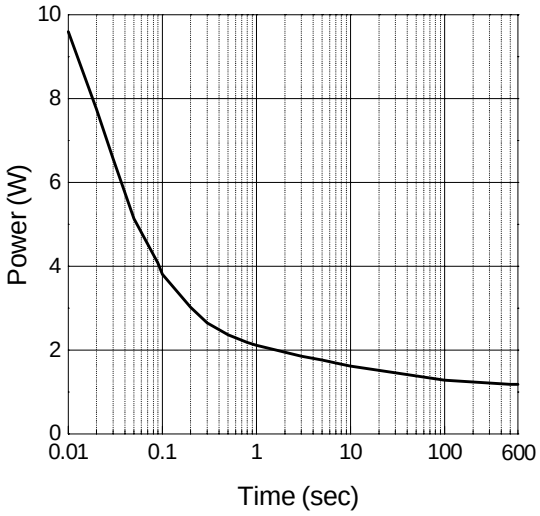
Copyright © ANPEC Electronics Corp.

Typical Characteristics (Cont.)

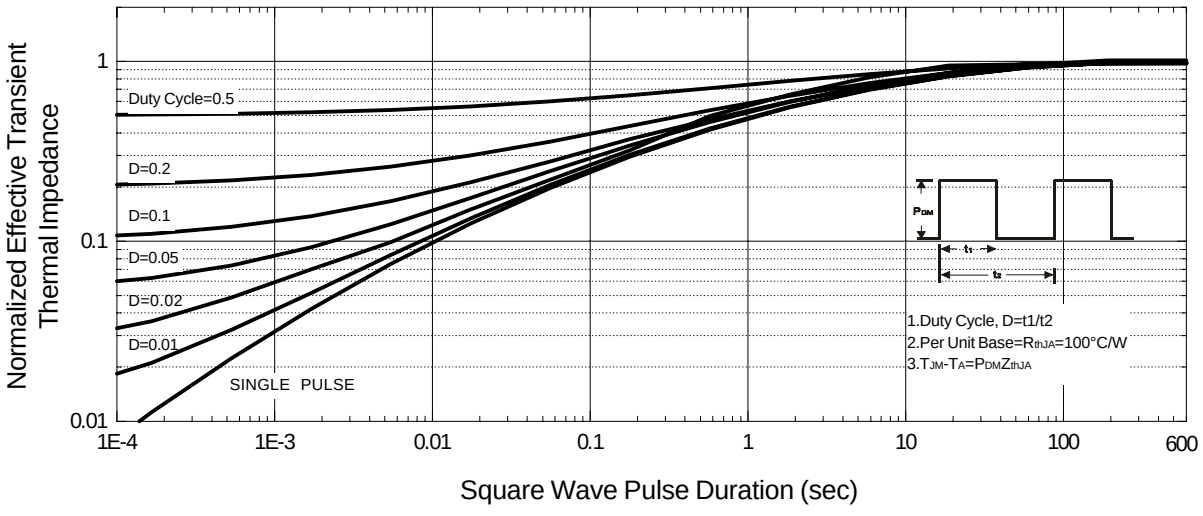
Source-Drain Diode Forward Voltage



Single Pulse Power

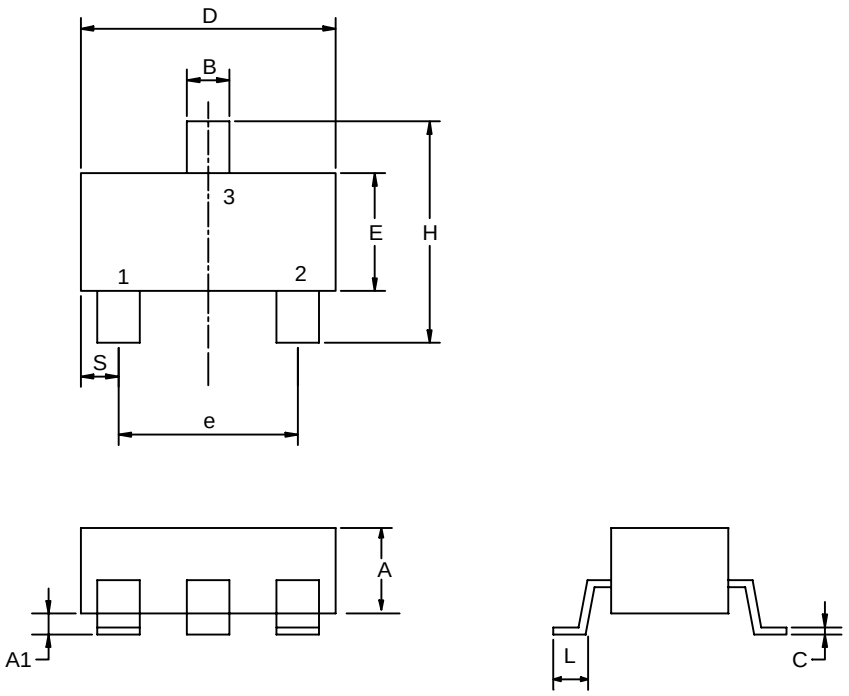


Normalized Thermal Transient Impedence, Junction to Ambient



Packaging Information

SOT-23



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
B	0.35	0.51	0.014	0.020
C	0.10	0.25	0.004	0.010
D	2.70	3.10	0.106	0.122
E	1.40	1.80	0.055	0.071
e	1.90 BSC		0.075 BSC	
H	2.40	3.00	0.094	0.118
L	0.37		0.0015	

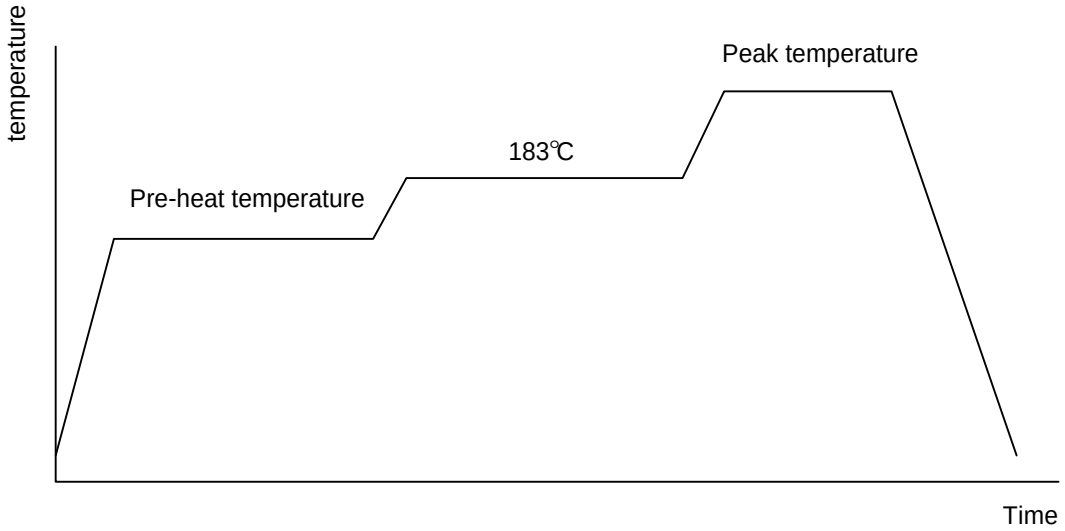
Copyright © ANPEC Electronics Corp.

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

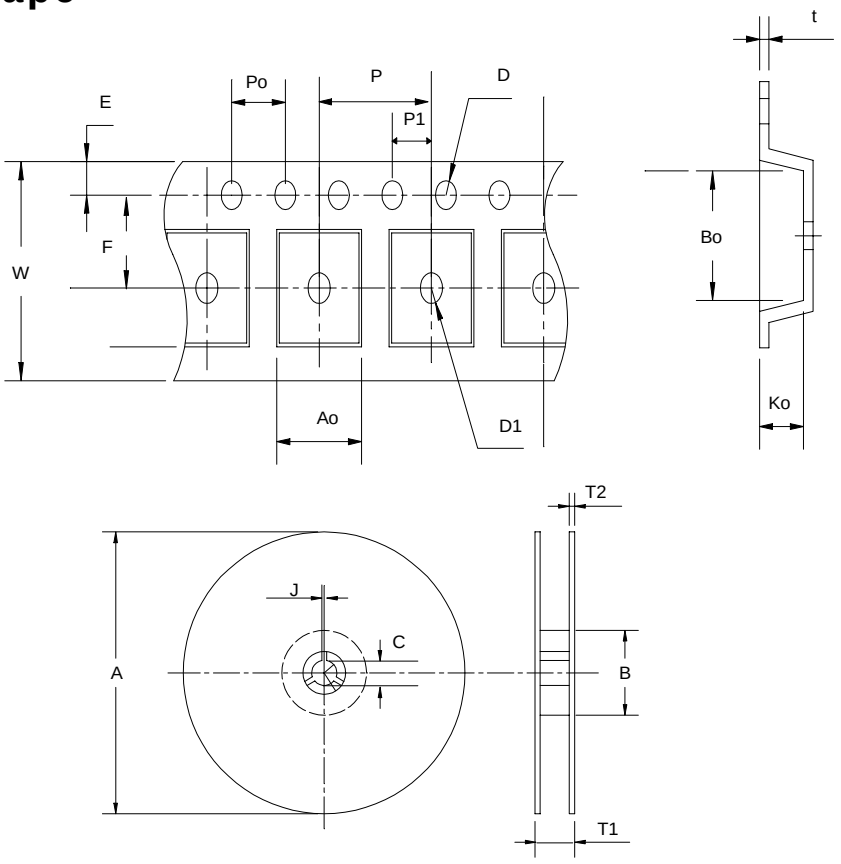
pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³	pkg. thickness < 2.5mm and pkg. volume < 350mm³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

Copyright © ANPEC Electronics Corp.

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



Application	A	B	C	J	T1	T2	W	P	E
SOT-23	178±1	72 ± 1.0	13.0 + 0.2	2.5 ± 0.15	8.4 ± 2	1.5± 0.3	8.0+ 0.3 - 0.3	4 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5 ± 0.05	1.5 +0.1	1.5 +0.1	4.0 ± 0.1	2.0 ± 0.1	3.15 ± 0.1	3.2± 0.1	1.4± 0.1	0.2±0.03

Copyright © ANPEC Electronics Corp.

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOT- 23	8	5.3	3000

Customer Service

Anpec Electronics Corp.
Head Office :
5F, No. 2 Li-Hsin Road, SBIP,
Hsin-Chu, Taiwan, R.O.C.
Tel : 886-3-5642000
Fax : 886-3-5642050
Taipei Branch :
7F, No. 137, Lane 235, Pac Chiao Rd.,
Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.
Tel : 886-2-89191368
Fax : 886-2-89191369

Copyright © ANPEC Electronics Corp.