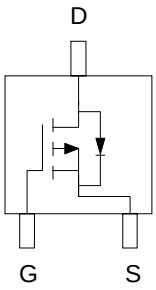
P-Channel Enhancement Mode MOSFET

Features

- -20V/-2.8A , $R_{DS(ON)}$=72mΩ(typ.) @ V_{GS}=-10V
  $R_{DS(ON)}$=100mΩ(typ.) @ V_{GS}=-4.5V
- 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.

Ordering and Marking Information

APM2301 □□-□□

- Handling Code
- Temp. Range
- Package Code

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

APM2301 A : M01X

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	±16	
I_D*	Maximum Drain Current – Continuous	-2.8	A
I_{DM}	Maximum Drain Current – Pulsed	-10	

* 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.

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Rev. A.2 - Aug., 2002

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	APM2301			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		1.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±16V , V_{DS}=0V			±100	nA
$R_{DS(ON)}$[a]	Drain-Source On-state Resistance	V_{GS}=-10V , I_{DS}=-2.8A		72	85	mΩ
		V_{GS}=-4.5V , I_{DS}=-2.5A		98	110	
V_{SD}[a]	Diode Forward Voltage	I_{SD}=-1.25A , V_{GS}=0V	0.6		1.3	V
Dynamic[b]						
Q_g	Total Gate Charge	V_{DS}=-10V , I_{DS}=-3A		7.6	10	nC
Q_{gs}	Gate-Source Charge	V_{GS}=-4.5V		3.2		
Q_{gd}	Gate-Drain Charge			2		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-10V , I_{DS}=-1A , V_{GEN}=-4.5V , R_G=6Ω R_L=6Ω		11	22	ns
T_r	Turn-on Rise Time			32	55	
$t_{d(OFF)}$	Turn-off Delay Time			38	68	
T_f	Turn-off Fall Time			32	55	
C_{iss}	Input Capacitance	V_{GS}=0V V_{DS}=-15V Frequency=1.0MHz		430		pF
C_{oss}	Output Capacitance			235		
C_{rss}	Reverse Transfer Capacitance			95		

Notes

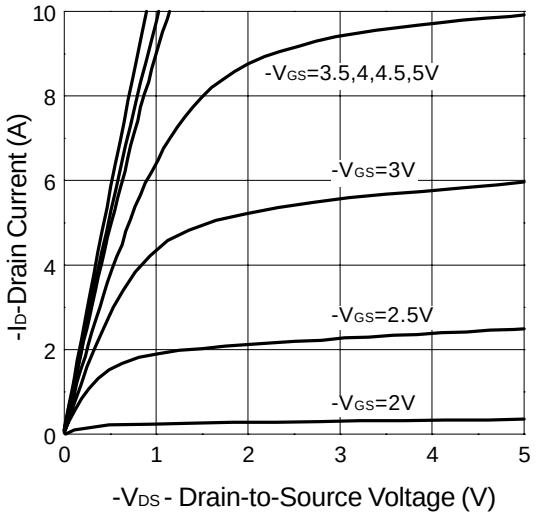
[a] : Pulse test ; pulse width ≤300μs, duty cycle ≤ 2%

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

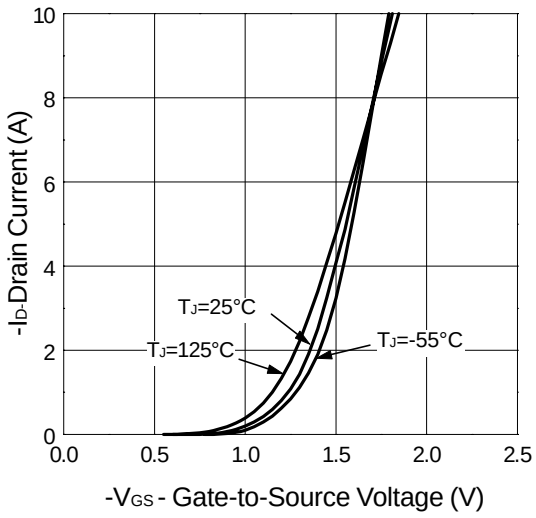
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Typical Characteristics

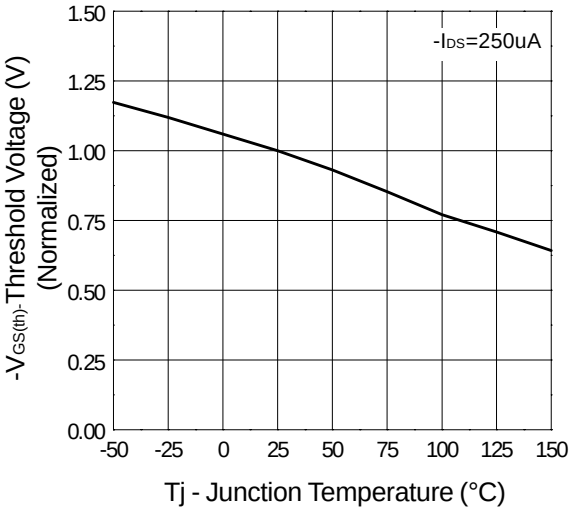
Output Characteristics



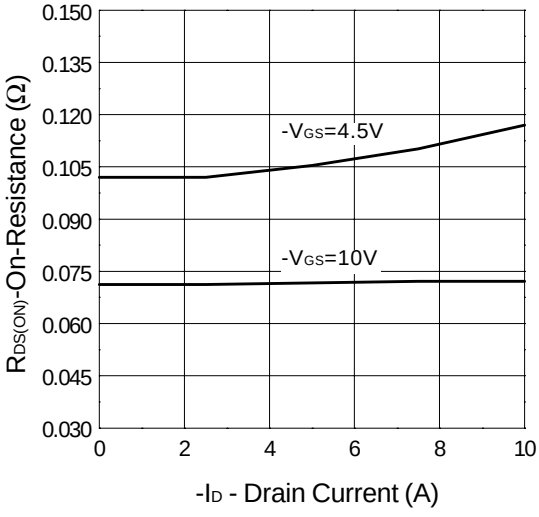
Transfer Characteristics



Threshold Voltage vs. Junction Temperature



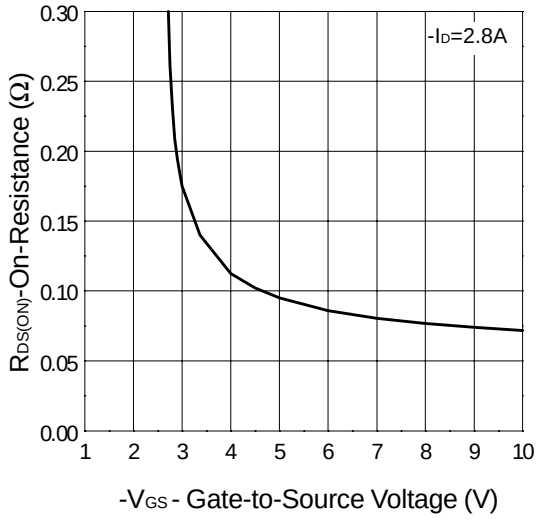
On-Resistance vs. Drain Current



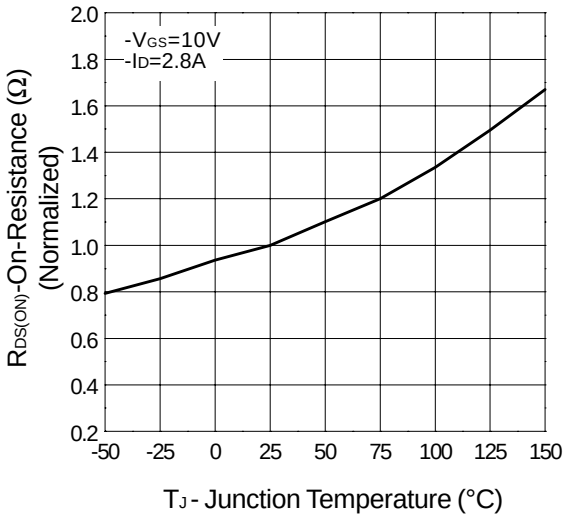
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Typical Characteristics

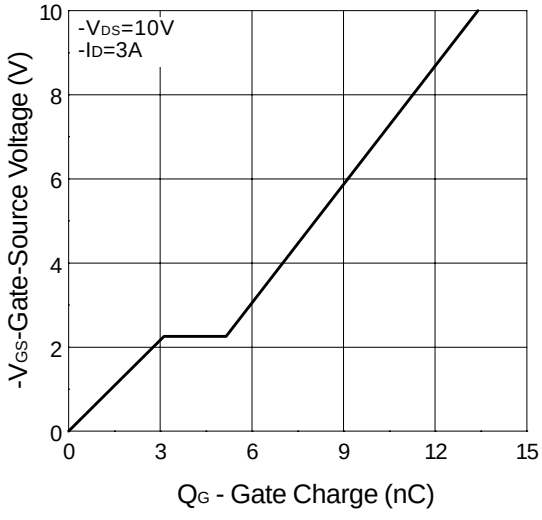
On-Resistance vs. Gate-to-Source Voltage



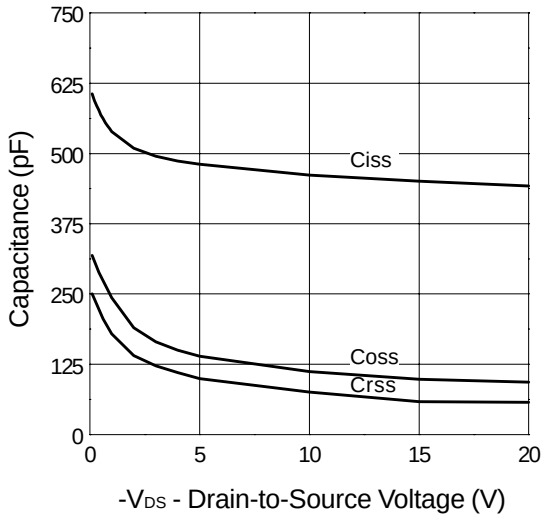
On-Resistance vs. Junction Temperature



Gate Charge



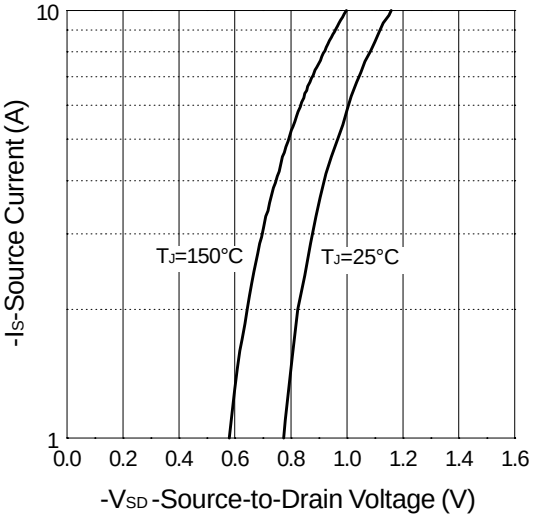
Capacitance



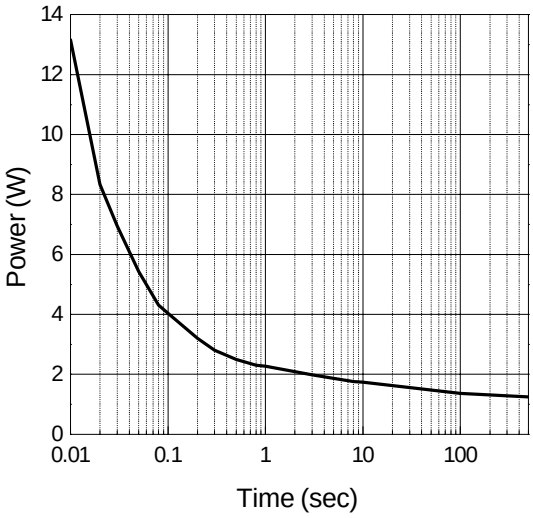
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Typical Characteristics

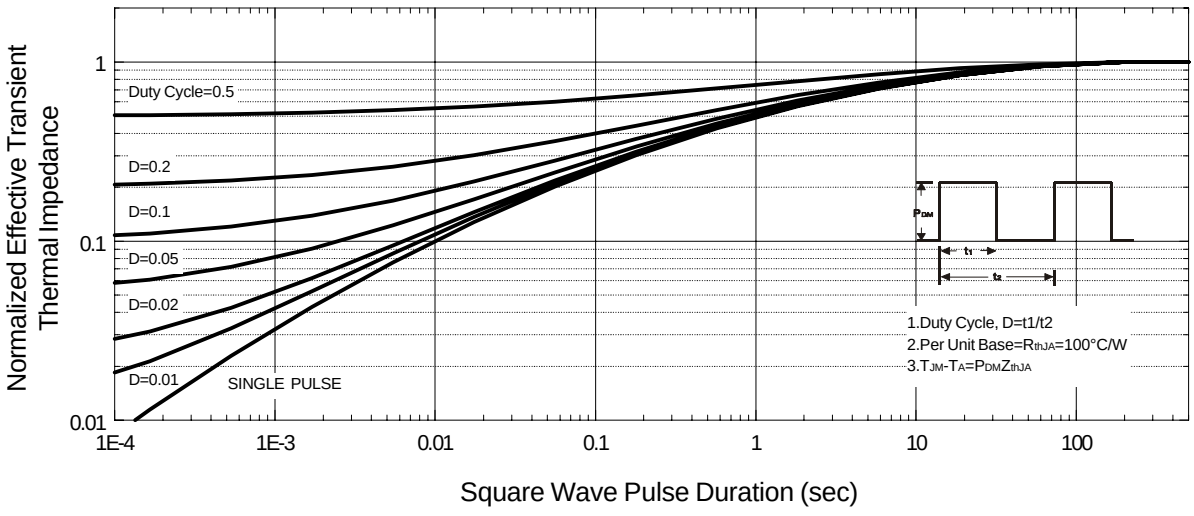
Source-Drain Diode Forward Voltage



Single Pulse Power

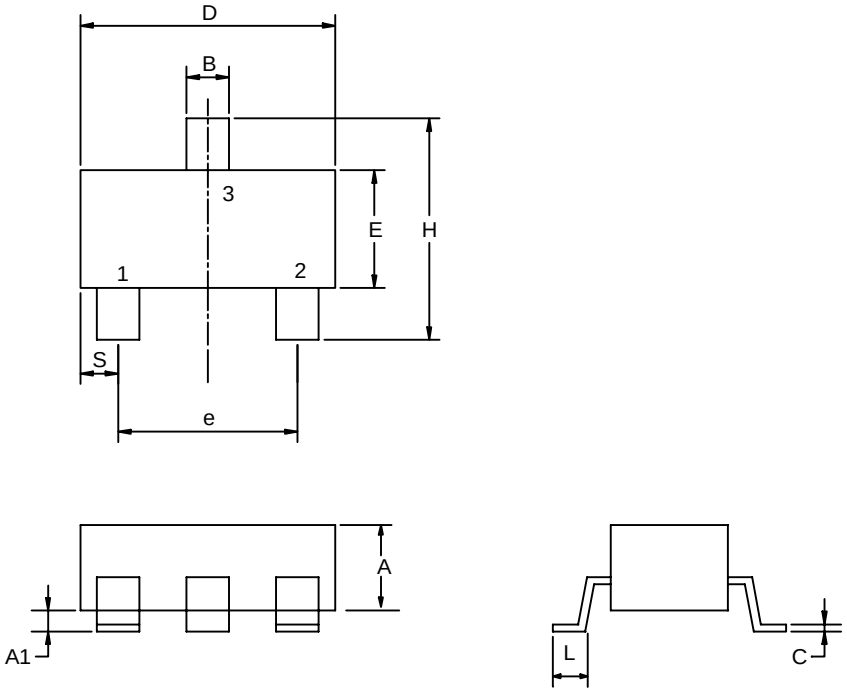


Normalized Thermal Transient Impedence, Junction to Ambient



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	

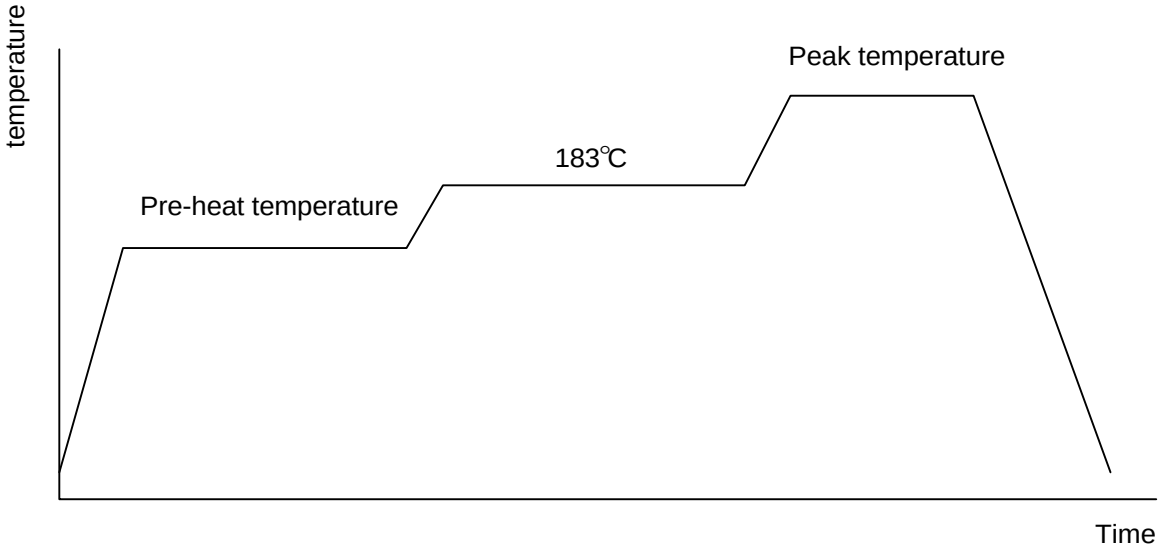
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Physical Specifications

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

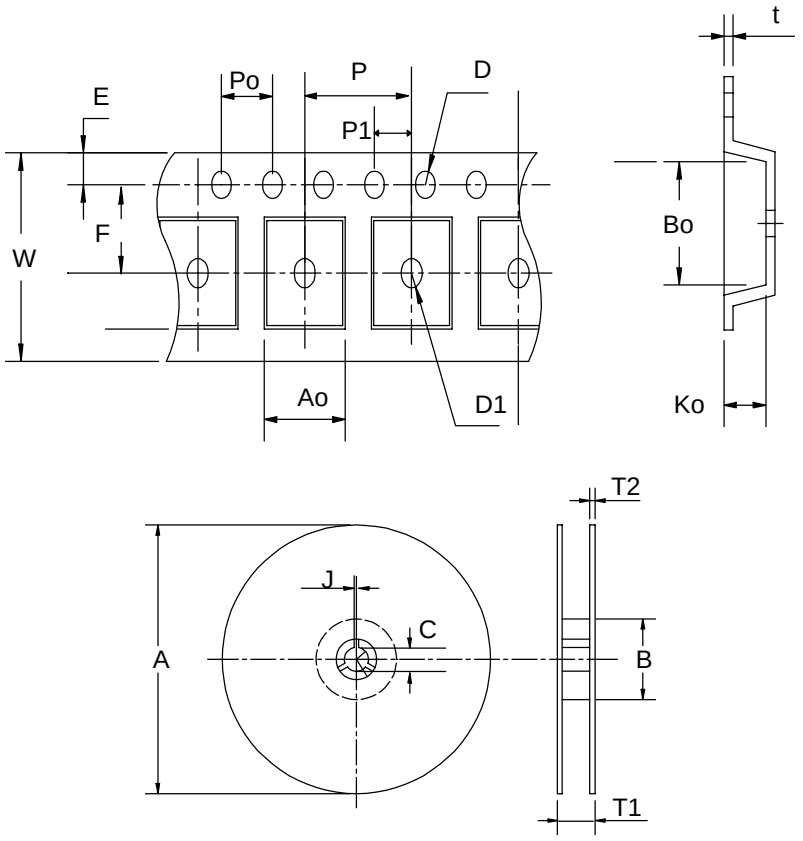
pkg. thickness ≥ 2.5mm and all bags	**pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³**	**pkg. thickness < 2.5mm and pkg. volume < 350mm³**
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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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
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

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