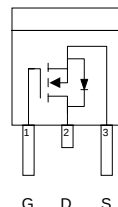


N-Channel Enhancement Mode MOSFET

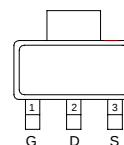
Features

- 30V/30A, $R_{DS(ON)} = 15m\Omega$ (typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 22m\Omega$ (typ.) @ $V_{GS} = 5V$
- Super High Dense Cell Design
- High Power and Current Handling Capability
- TO-252, TO-220 and SOT-223 Packages

Pin Description



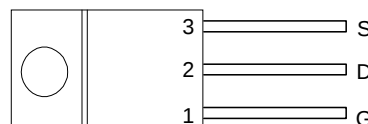
Top View of TO-252



Top View of SOT-223

Applications

- Switching Regulators
- Switching Converters



TO-220 Package

Ordering and Marking Information

APM3023N □□-□□ Handling Code Temp. Range Package Code	Package Code U : TO-252 V : SOT-223 F : TO-220 Operating Junction Temp. Range C : -55 to 150° C Handling Code TR : Tape & Reel
APM3023N U/F: :	XXXXXX - Date Code
APM3023N V :	XXXXXX - Date Code

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

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	30	V
V_{GSS}	Gate-Source Voltage	± 20	
I_D^*	Maximum Drain Current – Continuous	30	A
I_{DM}	Maximum Drain Current – Pulsed	70	

* Surface Mounted on FR4 Board, $t \leq 10 \text{ sec.}$

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.

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

Symbol	Parameter			Rating	Unit
P _D	Maximum Power Dissipation	T _A =25°C	TO-252/TO-220	62.5	W
			SOT-223	3	
		T _A =100°C	TO-252/TO220	25	W
			SOT-223	1.2	
T _J	Maximum Junction Temperature			150	°C
T _{STG}	Storage Temperature Range			-55 to 150	°C

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

Symbol	Parameter	Test Condition	APM3023N			Unit
			Min.	Typ.	Max.	
Static						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _{DS} =250μA	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V , V _{GS} =0V			1	μA
		V _{DS} =24V, V _{GS} =0V, T _j = 55°C			5	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	1.5	2	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V , V _{DS} =0V			±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =10V , I _{DS} =20A		15	20	mΩ
		V _{GS} =5V , I _{DSS} =10A		22	28	
V _{SD} ^a	Diode Forward Voltage	I _{SD} =15A , V _{GS} =0V		0.7	1.3	V
Dynamic ^b						
Q _g	Total Gate Charge	V _{DS} =15V , I _{DS} = 10A V _{GS} =5V ,		15	20	nC
Q _{gs}	Gate-Source Charge			5.8		
Q _{gd}	Gate-Drain Charge			3.8		
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V , I _{DS} =2A , V _{GEN} =10V , R _G =6Ω		11	18	ns
T _r	Turn-on Rise Time			17	26	
t _{d(OFF)}	Turn-off Delay Time			37	54	
T _f	Turn-off Fall Time			20	30	
C _{iss}	Input Capacitance	V _{GS} =0V		1200		pF
C _{oss}	Output Capacitance	V _{DS} =15V		220		
C _{rss}	Reverse Transfer Capacitance	Frequency=1.0MHz		100		

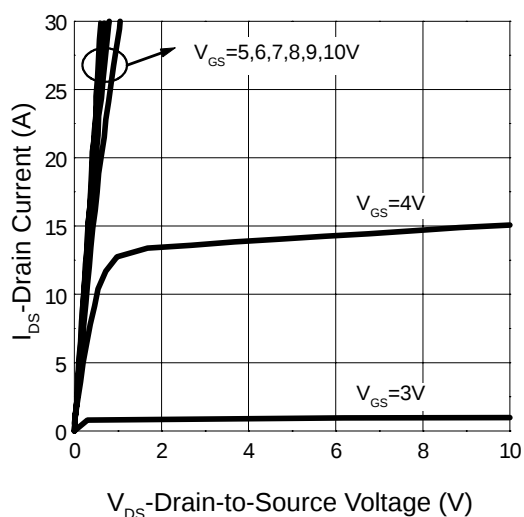
Notes

^a : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

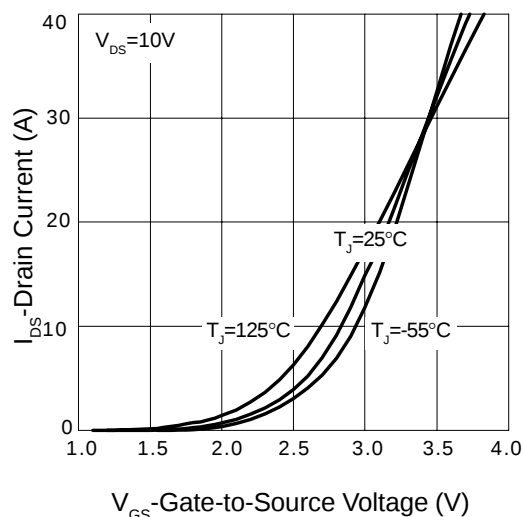
^b : Guaranteed by design, not subject to production testing

Typical Characteristics

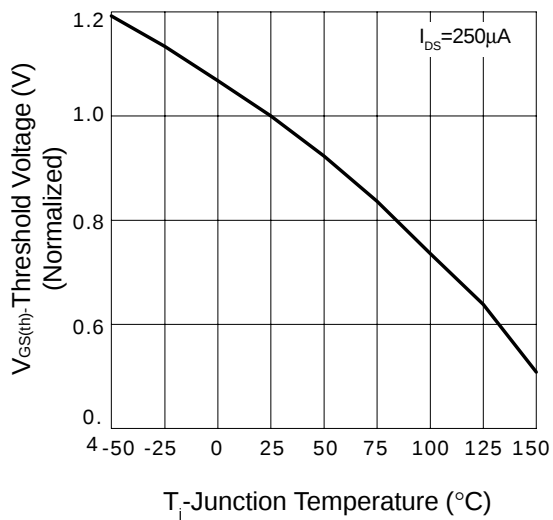
Output Characteristics



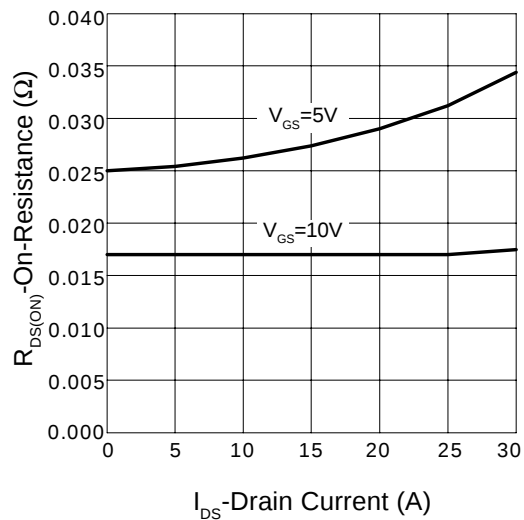
Transfer Characteristics



Threshold Voltage vs. Junction Temperature

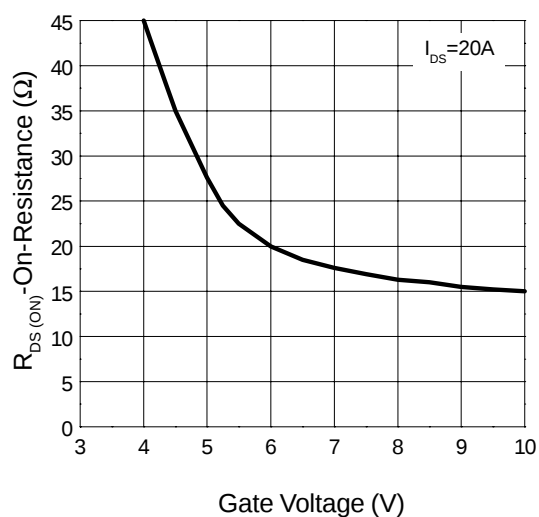


On-Resistance vs. Drain Current

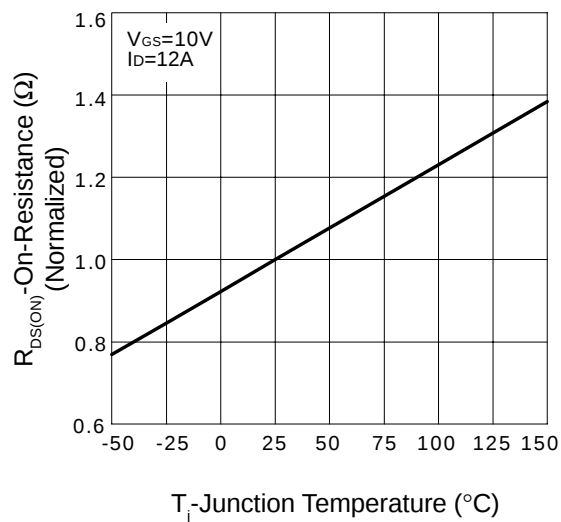


Typical Characteristics (Cont.)

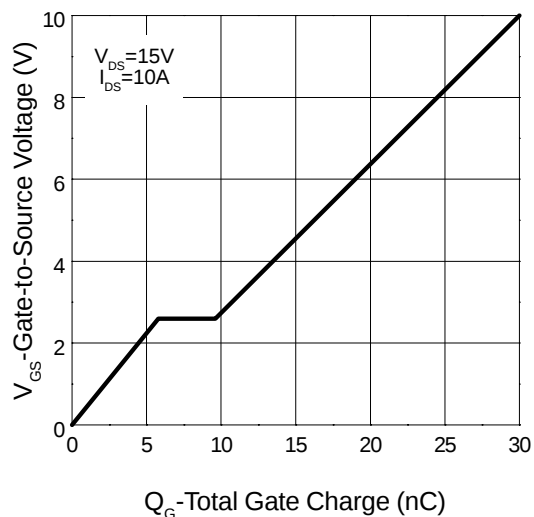
On-Resistance vs. Gate-to-Source Voltage



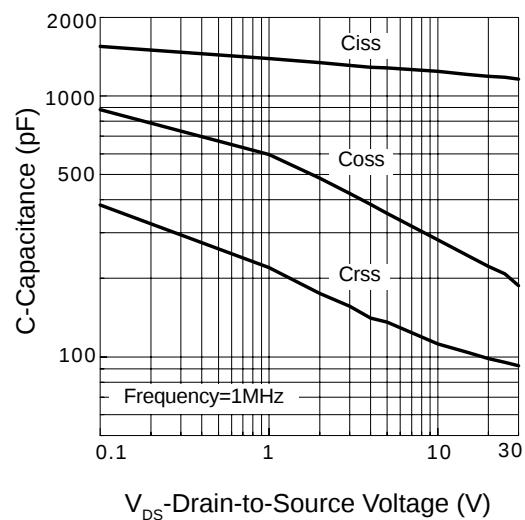
On-Resistance vs. Junction Temperature



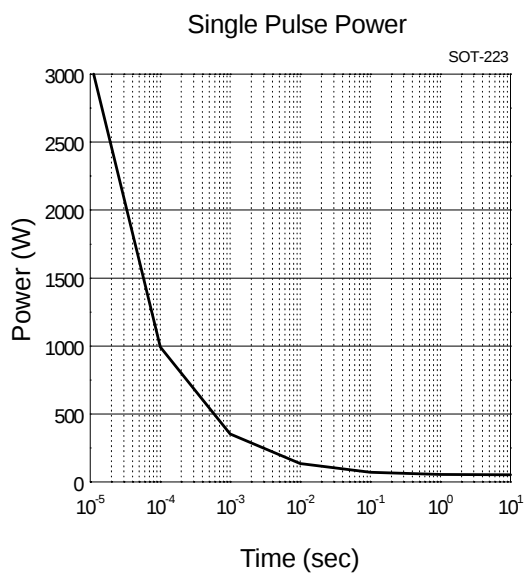
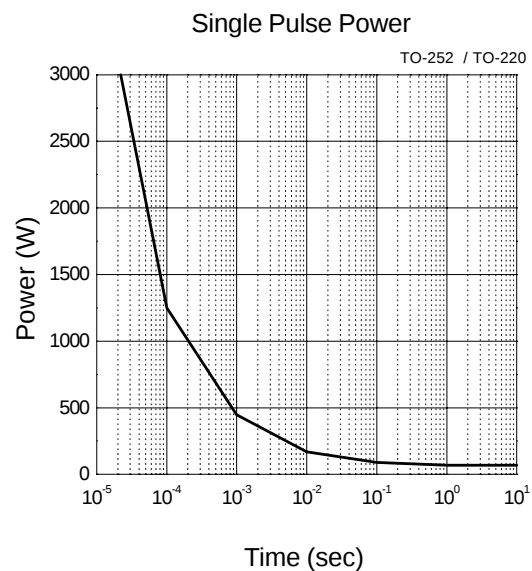
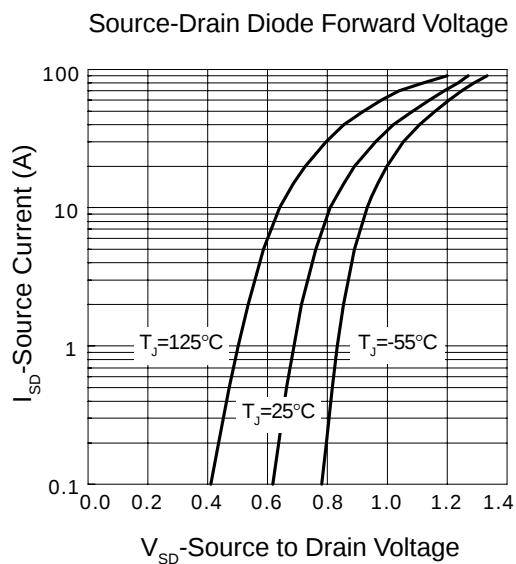
Gate Charge



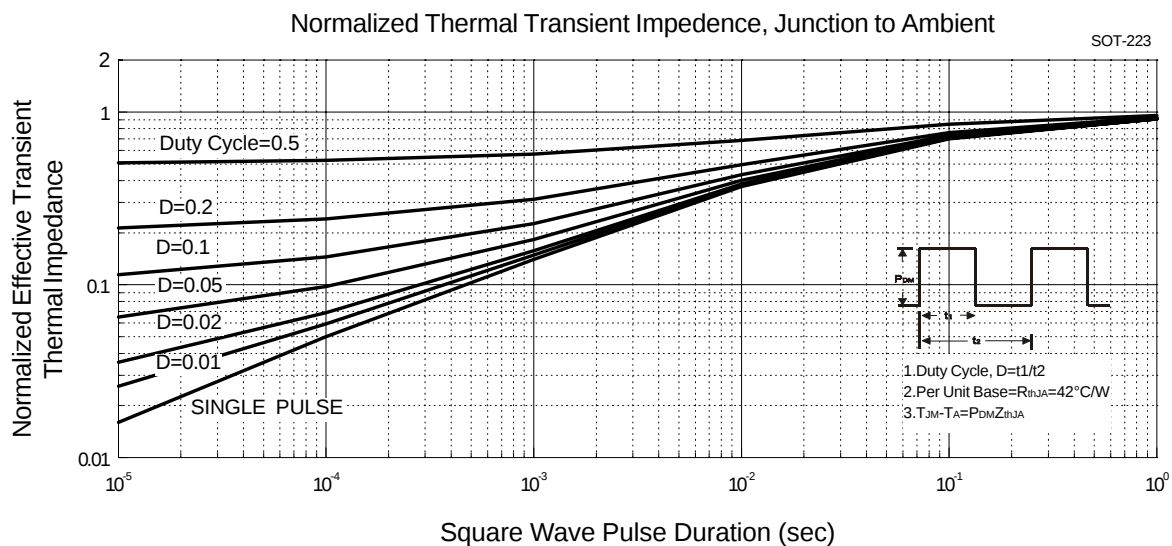
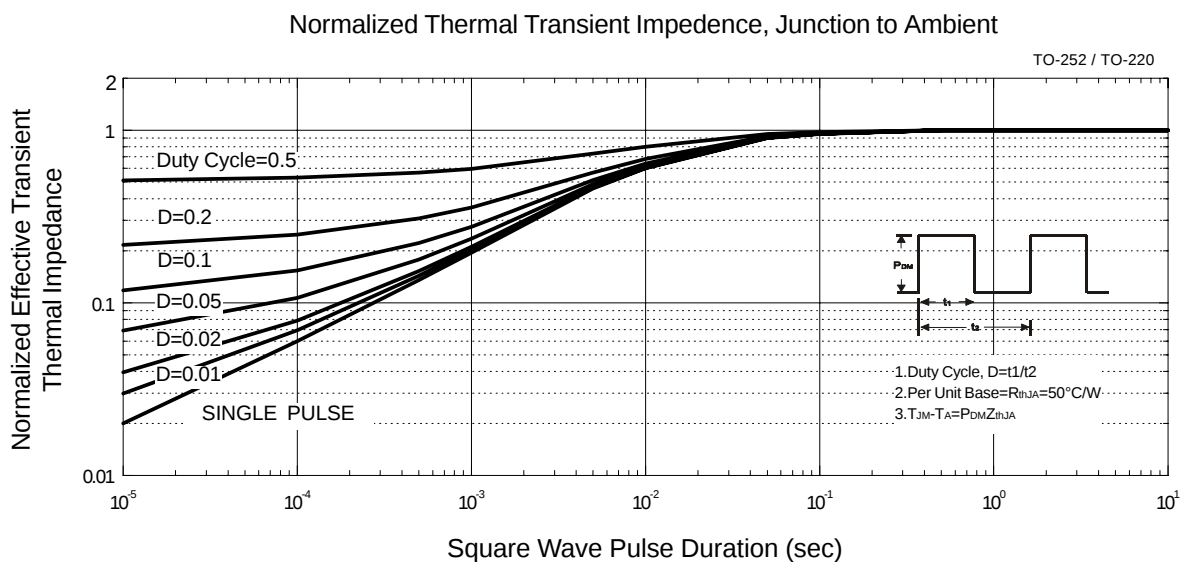
Capacitance Characteristics



Typical Characteristics (Cont.)

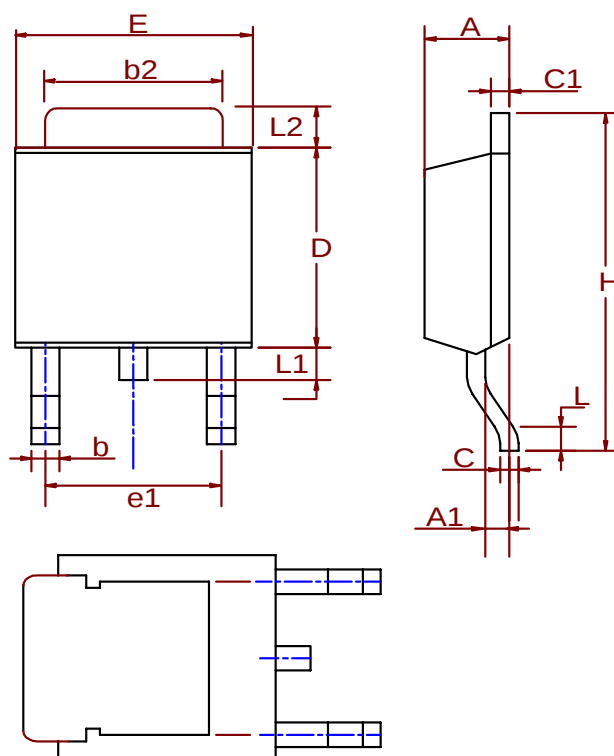


Typical Characteristics (Cont.)



Package Information

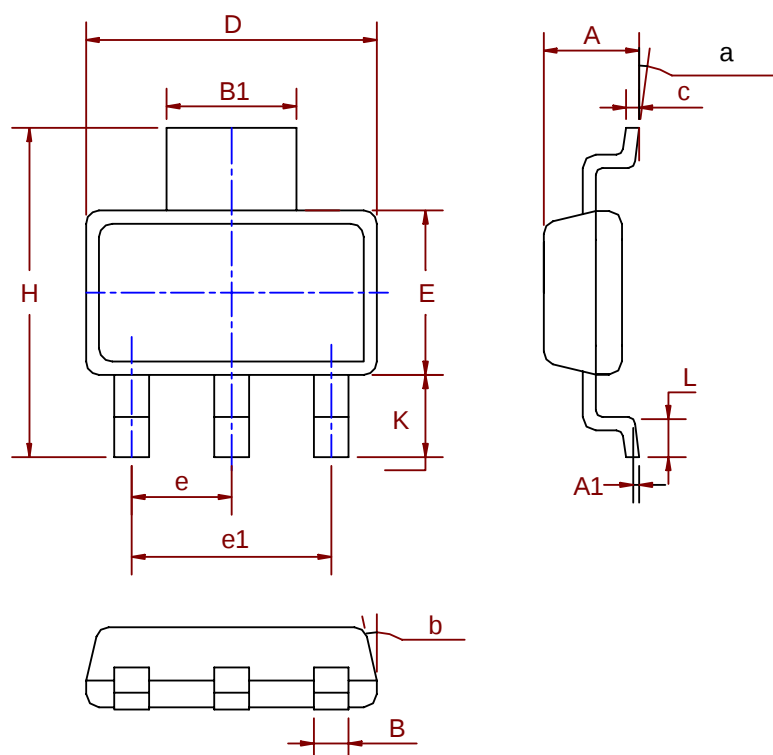
TO-252(Reference JEDEC Registration TO-252)



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

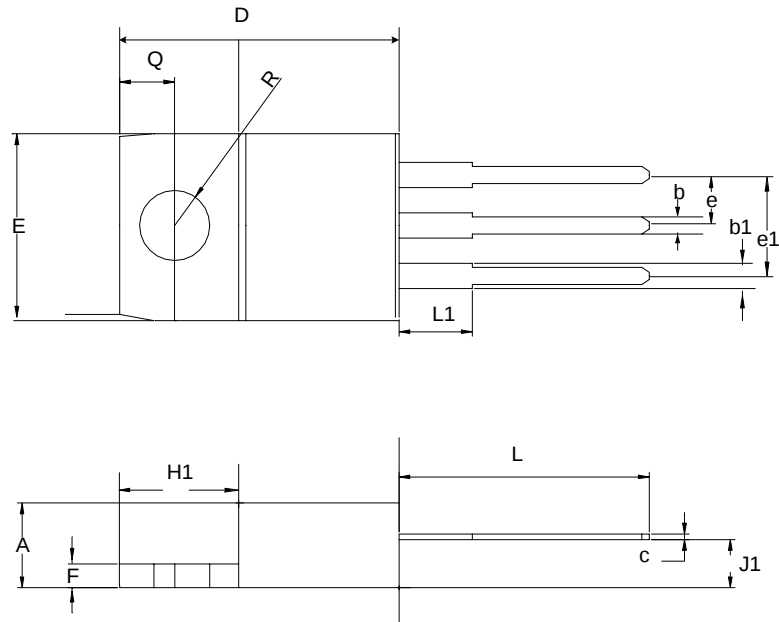
Package Information

SOT-223(Reference JEDEC Registration SOT-223)



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.50	1.80	0.06	0.07
A1	0.02	0.08		
B	0.60	0.80	0.02	0.03
B1	2.90	3.10	0.11	0.12
c	0.28	0.32	0.01	0.01
D	6.30	6.70	0.25	0.26
E	3.30	3.70	0.13	0.15
e	2.3 BSC		0.09 BSC	
e1	4.6 BSC		0.18 BSC	
H	6.70	7.30	0.26	0.29
L	0.91	1.10	0.04	0.04
K	1.50	2.00	0.06	0.08
α	0°	10°	0°	10°
β	13°		13°	

TO-220 (Reference JEDEC Registration TO-220)



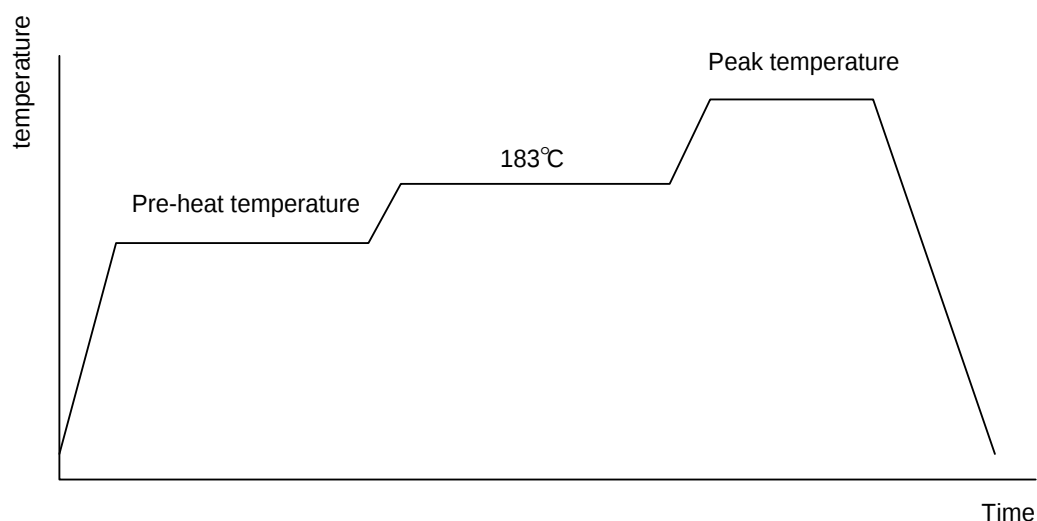
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.56	4.83	0.140	0.190
b1	1.14	1.78	0.045	0.070
b	0.51	1.14	0.020	0.045
c	0.31	1.14	0.012	0.045
D	14.23	16.51	0.560	0.650
e	2.29	2.79	0.090	0.110
e1	4.83	5.33	0.190	0.210
E	9.65	10.67	0.380	0.420
F	0.51	1.40	0.020	0.055
H1	5.84	6.86	0.230	0.270
J1	2.03	2.92	0.080	0.115
L	12.7	14.73	0.500	0.580
L1	3.65	6.35	0.143	0.250
R	3.53	4.09	0.139	0.161
Q	2.54	3.43	0.100	0.135

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.	

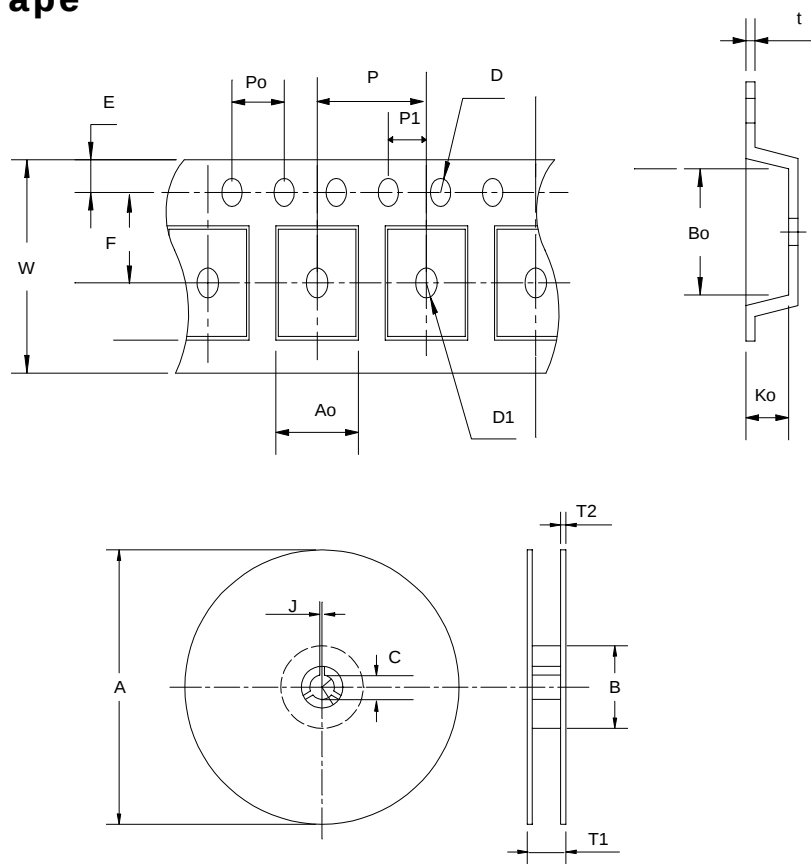
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 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



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	P0	P1	A0	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
Application	A	B	C	J	T1	T2	W	P	E
SOT-223	330 ± 1	62 ± 1.5	12.75 ± 0.15	2 ± 0.6	12.4 + 0.2	2 ± 0.2	12 ± 0.3	8 ± 0.1	1.75 ± 0.1
	F	D	D1	P0	P1	A0	Bo	Ko	t
	5.5 ± 0.05	1.5 + 0.1	1.5 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	6.9 ± 0.1	7.5 ± 0.1	2.1 ± 0.1	0.3 ± 0.05

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO- 252	16	13.3	2500
SOT- 223	12	9.3	2500

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