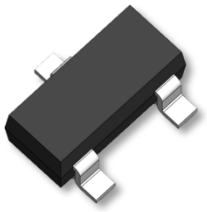


CES2321B

-20V ▲ 42mΩ ▲ -3.9A ▲ Si MOSFET

SILICON Si MOSFET ▲ SMD type
P-channel enhancement mode
UL94V-0 rated flame retardant epoxy
SOT23 package ▲ MSL 3
Super high dense cell density for extremely low $R_{DS(ON)}$
Rugged and reliable

MAXIMUM RATINGS

Parameter (T_A = 25°C, unless otherwise noted)		Characteristics
Drain-Source Voltage	V_{DS}	-20V
Gate-Source Voltage	V_{GS}	±12V
Continuous Drain Current	I_D	-3.9A
Pulsed Drain Current Note 1	I_{DM}	-15.6A
Maximum Power Dissipation	P_D	1.25W
Operating and Storage Temperature Range	T_J, T_{STG}	-55°C to +150°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Limit
Thermal Resistance, Junction-to-Ambient Note 2	R_{TH_JA}	100°C/W

APPLICATIONS

Data Server Control	DC/DC Converter	Network Devices	Portable Products	USB Storage

PIN DESCRIPTION

Circuit Diagram	Outline ▪ Top View	Pin No.	Description
D (1) G (3) S (2)	1 3 2	1 2 3	Drain Source Gate

ELECTRICAL CHARACTERISTICS ▲ T_A = 25°C, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = -250μA	BV_{DSS}	-20			V
Zero Gate Voltage Drain Current	V_{DS} = -20V, V_{GS} = 0V	I_{DSS}			-1	μA
Gate Body Leakage Current, Forward	V_{GS} = 12V, V_{DS} = 0V	I_{GSSF}			100	nA
Gate Body Leakage Current, Reverse	V_{GS} = -12V, V_{DS} = 0V	I_{GSSR}			-100	nA
On Characteristics Note 3						
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = -250μA	$V_{GS(th)}$	-0.4		-1	V
Static Drain-Source On-Resistance	V_{GS} = -4.5V, I_D = -0.5A	$R_{DS(ON)}$		42	52	mΩ
Static Drain-Source On-Resistance	V_{GS} = -2.5V, I_D = -0.5A	$R_{DS(ON)}$		56	72	mΩ
Dynamic Characteristics Note 4						
Input Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1MHz	C_{ISS}		675		pF
Output Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1MHz	C_{OSS}		105		pF
Reverse Transfer Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1MHz	C_{RSS}		85		pF
Switching Characteristics Note 4						
Turn-On Delay Time	V_{DD} = -10V, V_{GS} = -4.5V, I_D = -3.8A, $R_{G(ext)}$ = 3Ω	$t_{D(ON)}$		11		ns
Turn-On Rise Time	V_{DD} = -10V, V_{GS} = -4.5V, I_D = -3.8A, $R_{G(ext)}$ = 3Ω	t_R		5		ns
Turn-Off Delay Time	V_{DD} = -10V, V_{GS} = -4.5V, I_D = -3.8A, $R_{G(ext)}$ = 3Ω	$t_{D(OFF)}$		35		ns
Turn-Off Fall Time	V_{DD} = -10V, V_{GS} = -4.5V, I_D = -3.8A, $R_{G(ext)}$ = 3Ω	t_F		7		ns
Total Gate Charge	V_{DS} = -10V, V_{GS} = -4.5V, I_D = -3.8A	Q_G		8.7		nC
Gate Source Charge	V_{DS} = -10V, V_{GS} = -4.5V, I_D = -3.8A	Q_{GS}		0.7		nC
Gate Drain Charge	V_{DS} = -10V, V_{GS} = -4.5V, I_D = -3.8A	Q_{GD}		2.6		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Current Note 2		I_S			-1	A
Drain-Source Diode Forward Voltage Note3	V_{GS} = 0V, I_S = -0.5A	V_{SD}			-1.2	V

Notes

1: Repetitive Rating: Pulse width limited by maximum junction temperature

2: Surface Mounted on FR4 Board, t ≤ 5 sec

3: Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

4: Guaranteed by design, not subject to production testing.

REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 ▪ Output Characteristics

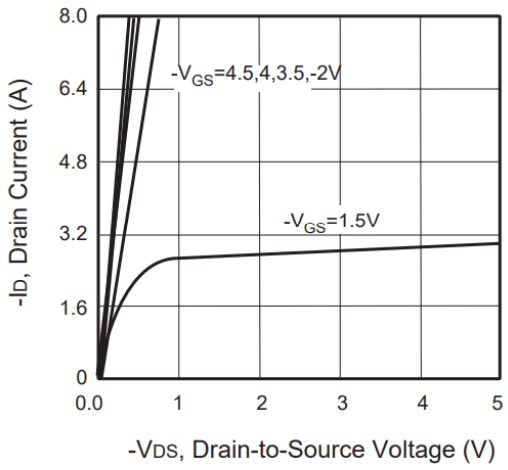


Fig. 2 ▪ Transfer Characteristics

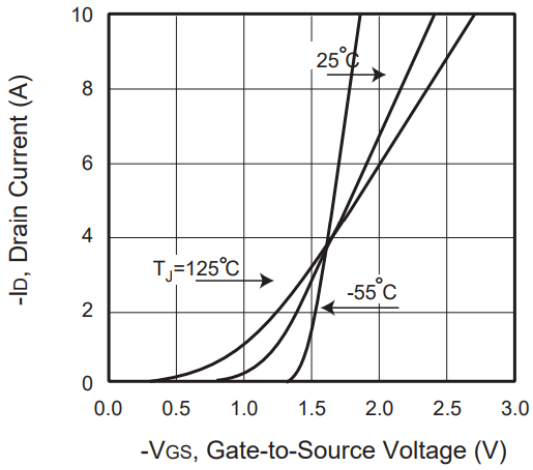


Fig. 3 ▪ Capacitance

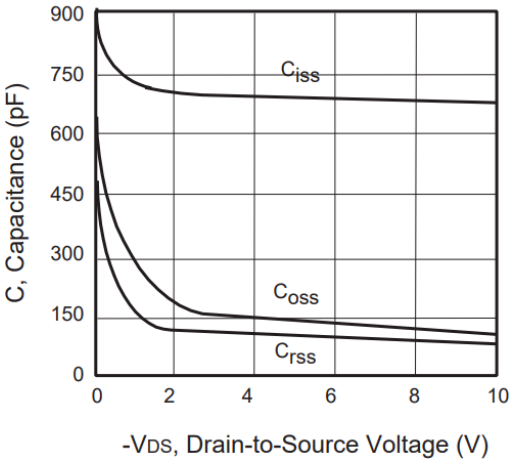


Fig. 4 ▪ On-Resistance Variation with Temperature

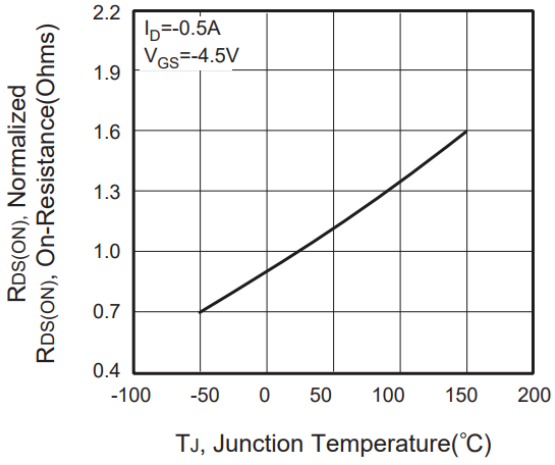


Fig. 5 ▪ Gate Threshold Variation with Temperature

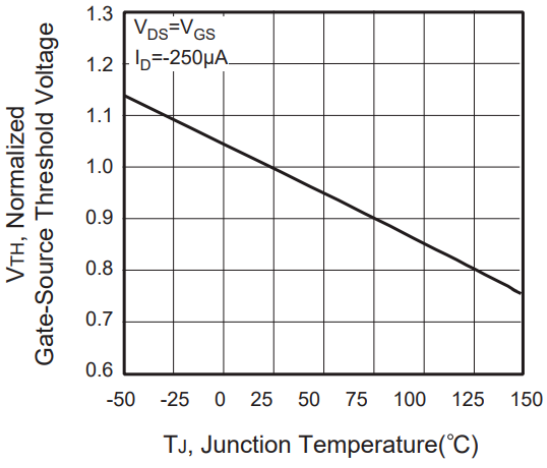
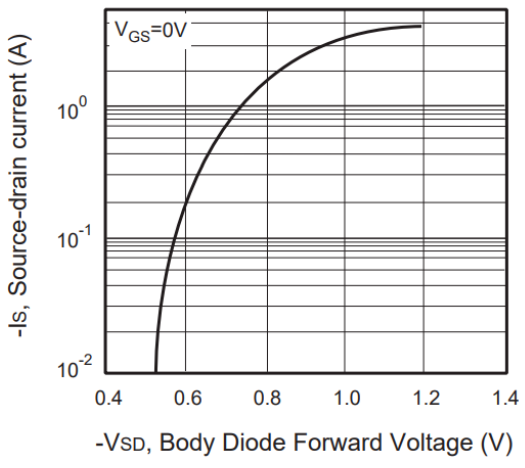


Fig. 6 ▪ Body Diode Forward Voltage Variation with Source Current



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 ▪ Gate Charge

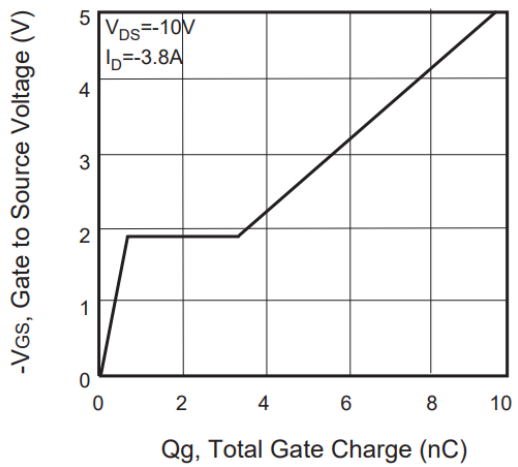


Fig. 8 ▪ Maximum Safe Operating Area

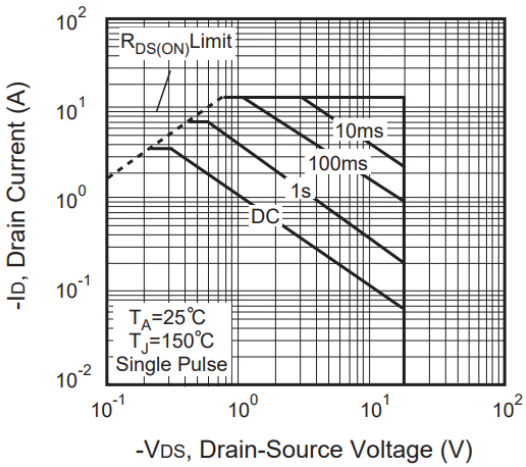


Fig. 9 ▪ Breakdown Voltage Variation vs. Temperature

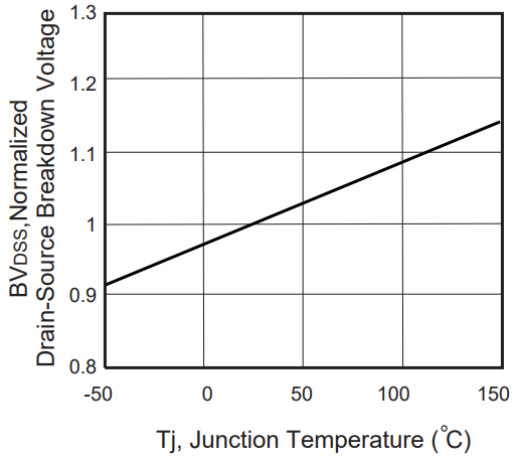


Fig. 10 ▪ Switching Test Circuit

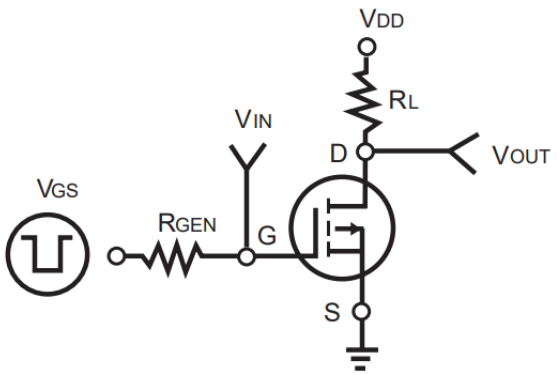
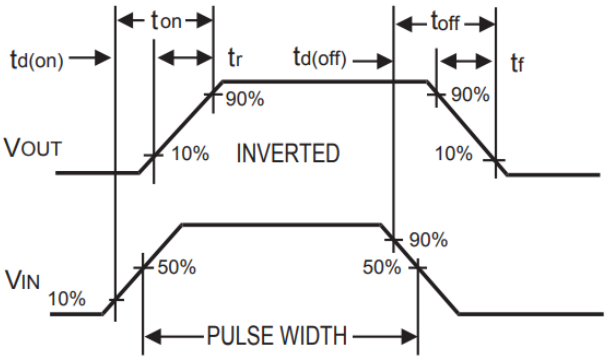
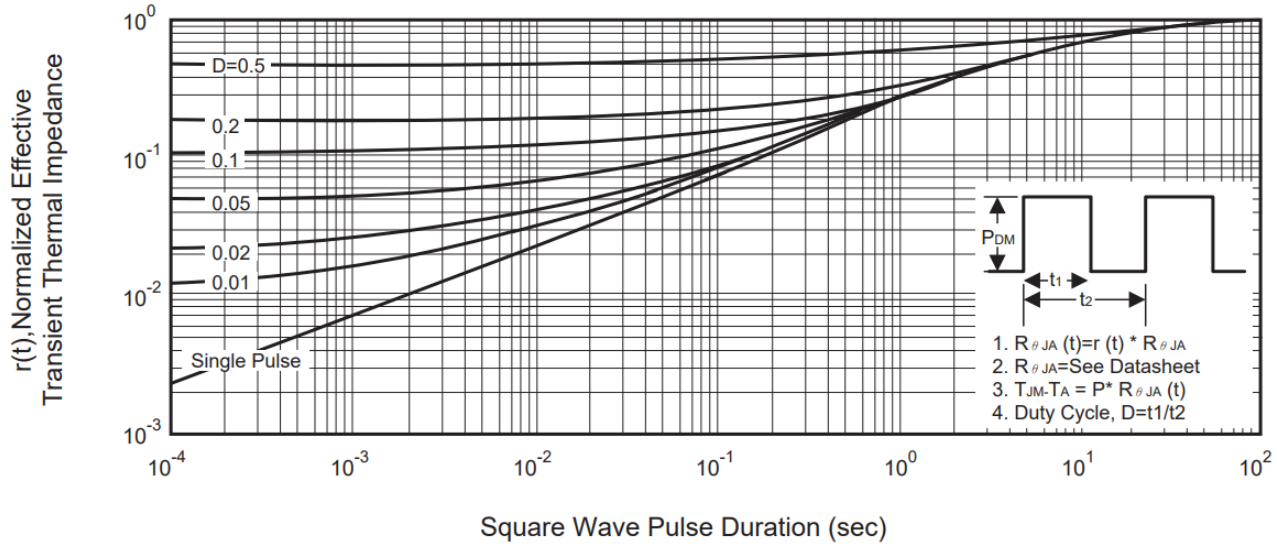


Fig. 11 ▪ Switching Waveforms

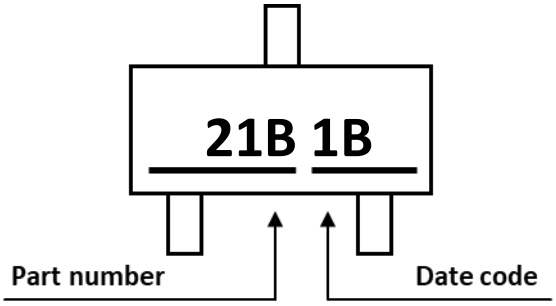


REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 12 ▪ Normalized Thermal Transient Impedance Curve

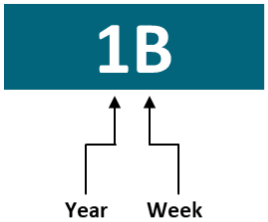


PART MARKING



DATE CODE

Example: 1B



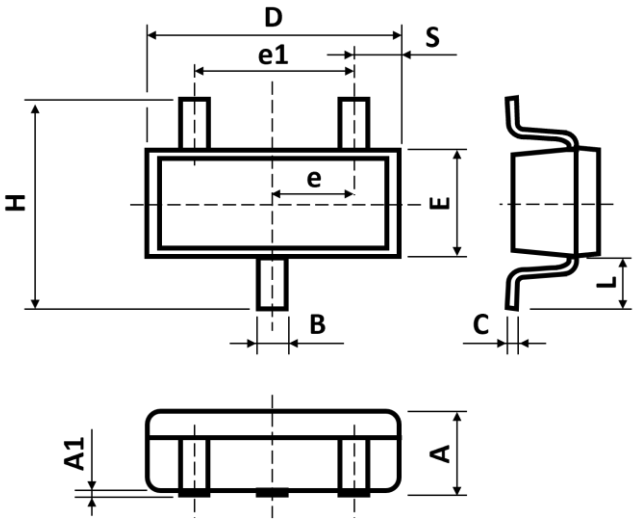
Coding list for „Week“

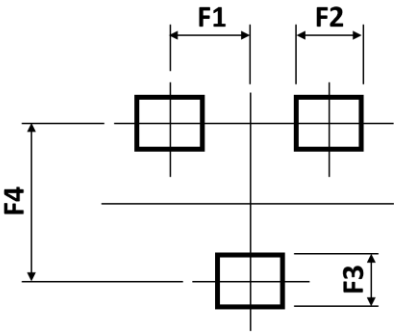
A	B	C	D	E	F	G	H	I
1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18
J	K	L	M	N	O	P	Q	R
19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36
S	T	U	V	W	X	Y	Z	
37-38	39-40	41-42	43-44	45-46	47-48	49-50	51-52	

Coding list for „Year“

0	1	2	3	4
2020	2021	2022	2023	2024
5	6	7	8	9
2025	2026	2027	2028	2029

PACKAGE OUTLINE AND RECOMMENDED PAD LAYOUT





Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
A	0.890	-	1.250
A1	0.000	-	0.100
B	0.300	-	0.500
C	0.085	-	0.200
D	2.720	-	3.040
E	1.400	-	1.800

Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
e		0.95 BSC	
e1	1.780	-	2.180
H	2.500	-	3.100
L		0.550 REF	
S	0.410	-	0.610

Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
F1	-	0.950	-
F2	-	0.760	-

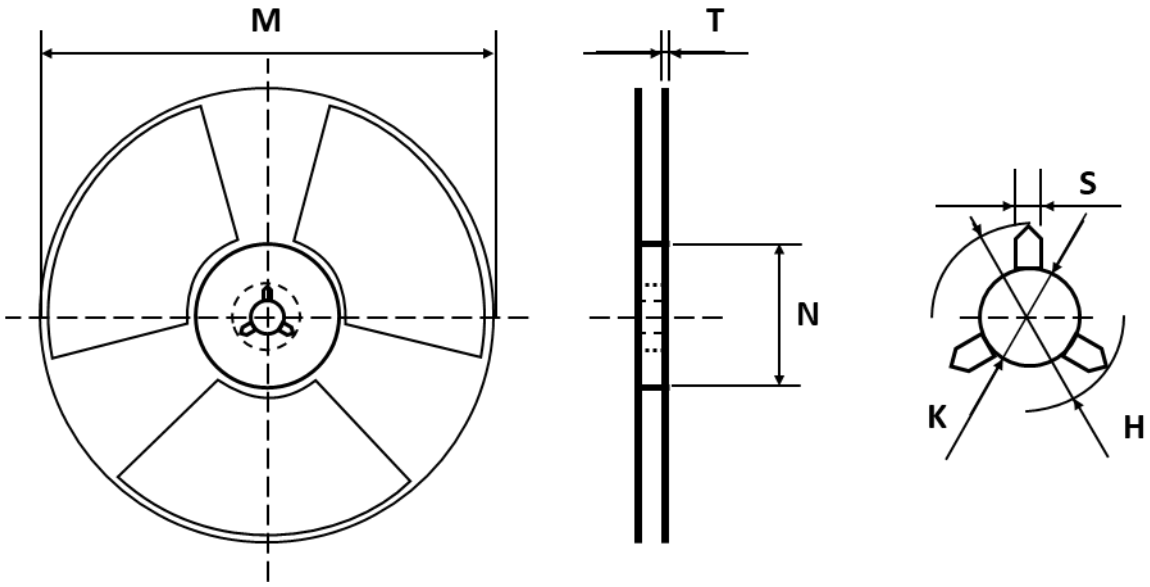
Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
F3	-	0.760	-
F4	-	2.290	-

Notes: **1. The suggested land pattern dimensions have been provided for reference only.**
2. For further information, please reference document IPC-7351A.

ORDERING INFORMATION

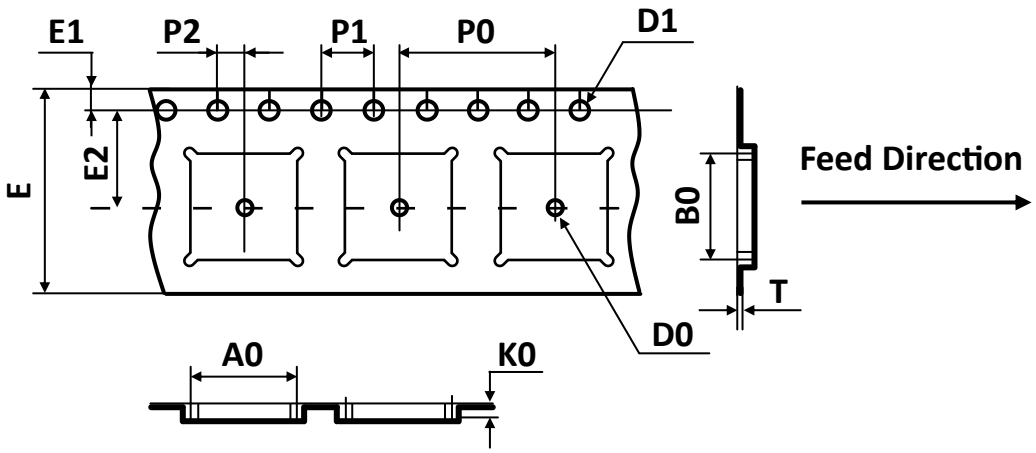
Part Number	Package	Packing	Reel Qty.	Inner Box Qty.
CES2321B	SOT23	7” Reel	3,000pcs	15,000pcs

REEL DIMENSIONS ▲ All dimensions in mm



Tape Size	Reel Size	M	N	T	H	K	S
8mm	Ø180	Ø178.00	Ø54.00	1.20	20.00	13.30	3.00
		±1.00	±0.50	±0.20	±1.00	±0.30	±1.00

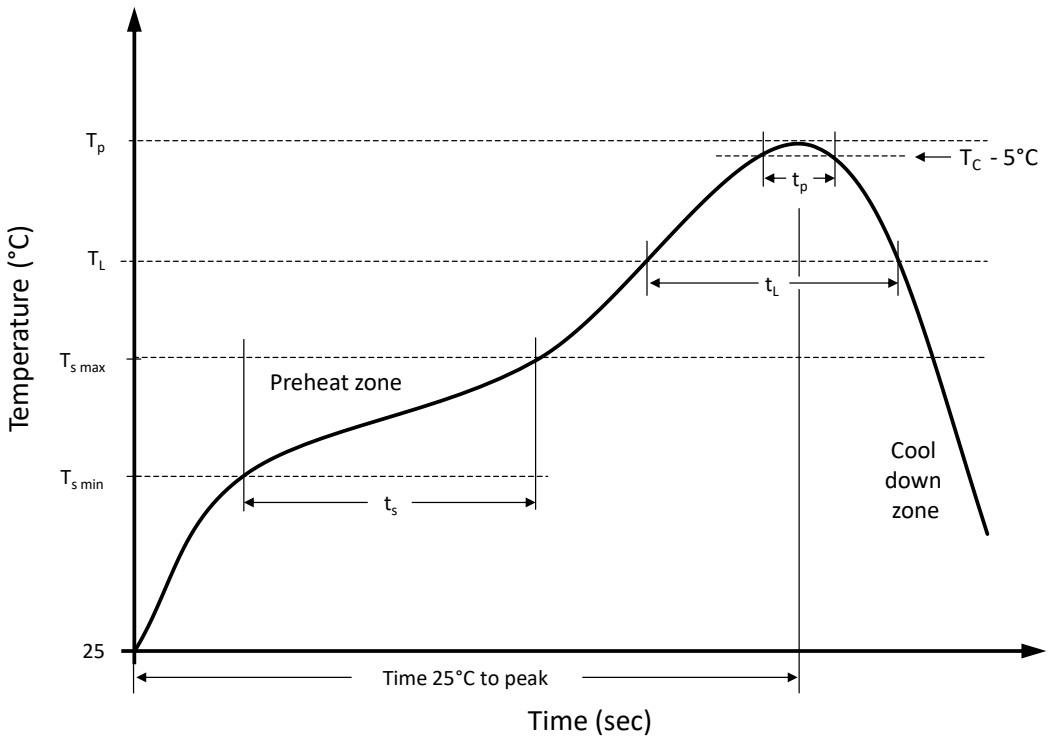
TAPE DIMENSIONS ▲ All dimensions in mm



Package	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SOT23	3.25	3.25	1.35	1.00	1.50	8.00	1.75	3.50	4.00	4.00	2.00	0.20
	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.02

Note: **All dimensions meet EIA-481-D requirements.**

RECOMMENDED REFLOW SOLDERING PROFILE



Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s\,min}$	100 °C	150 °C
Preheat temperature max.	$T_{s\,max}$	150 °C	200 °C
Preheat time t_s from $T_{s\,min}$ to $T_{s\,max}$	t_s	120 seconds	120 seconds
Ramp-up rate (T_L to T_p)		max. 3 °C/second	max. 3 °C/second
Liquidous temperature	T_L	183 °C	217 °C
Time t_L maintained above T_L	t_L	150 seconds max.	150 seconds max.
Peak package body temperature	T_p	235°C	260°C
Timeframe of within 5°C below and up to max actual peak body temperature	t_p	20 seconds max.	30 seconds max.
Ramp-down rate (T_L to T_p)		max. 6 °C/second	max. 6 °C/second
Time 25°C to peak temperature		max. 6 minutes	max. 8 minutes

REVISION TABLE

Revision	Date	Status	Notes
001	30/09/2022	Initial release	Initial publication

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