# KP2182X

## High Performance Quasi-Resonant Primary Side Regulation CV/CC Power Switch with Single Failure Protections

## FEATURES

- **Integrated with Power MOSFET**
- **High Efficiency Quasi-Resonant Primary Side Regulation (QR-PSR) Control**
- **High-Precision CC and CV Regulation**
- **Low Standby Power <75mW@265Vac**
- **Multi-Mode PSR Control**
- **Audio Noise Free Operation**
- **Fast Dynamic Response**
- **Optimized EMI Performance**
- **Built-in Cable Drop Compensation (CDC)**
- **Single Failure Protections for Power Supply**
- **Build in Protections:**
  - **Short Load Protection (FB SLP)**
  - **On-Chip Thermal Shutdown (OTP)**
  - **FB Over Voltage Protection (FB OVP)**
  - **VDD OVP & UVP & Clamp**
- **Available with SOP-7/8, DIP-8 and ASOP-6 Package**

## APPLICATIONS

- **Battery Chargers for Cellular Phones**
- **AC-DC Power Adapter**

## GENERAL DESCRIPTION

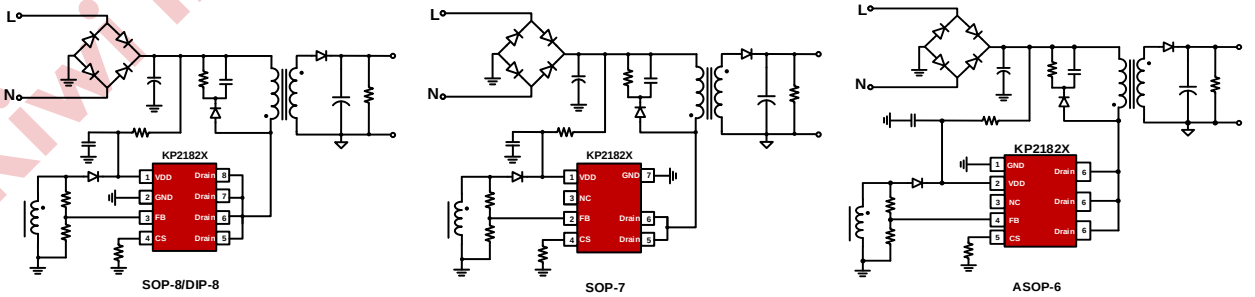
KP2182X is a family of high performance Quasi Resonant (QR) Primary Side Regulation (PSR) PWM power switch with high precision CV/CC control ideal for charger applications. At full load, the switch operates in quasi-resonant (QR) mode in the universal line voltage to optimize efficiency and thermal performance.

The IC can achieve audio noise free operation and optimized dynamic response. The built-in Cable Drop Compensation (CDC) function and line CC compensation can provide excellent CV, CC performance.

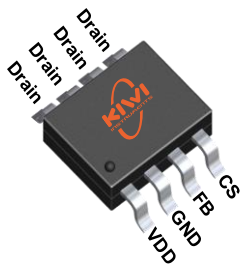
KP2182X integrates functions and protections of Under Voltage Lockout (UVLO), VDD over Voltage Protection (VDD OVP), Cycle-by-cycle Current Limiting (OCP), Short Load Protection (FB SLP), FB over Voltage Protection (FB OVP), On-Chip Thermal Shutdown, VDD Clamping, etc.

KP2182X also integrates single failure protections, which can ensure there is no damage to IC and no over voltage of output when IC pin open or short failure happens.

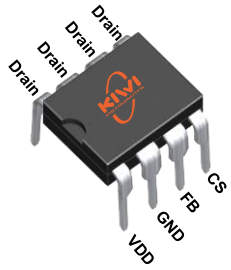
## TYPICAL APPLICATION CIRCUIT



## Pin Configuration




**SOP-8**

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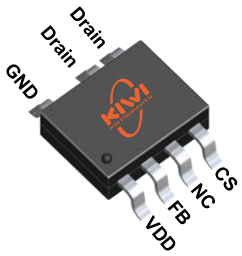
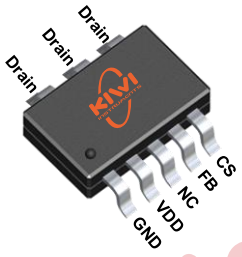


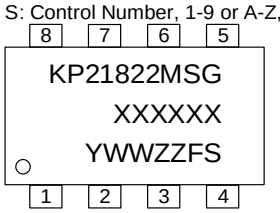

**SOP-7**




**ASOP-6**

## Marking Information

XXXXXX: Wafer Lot Code
Y: Year Code
WW: Week Code, 01-52
ZZ: Serial Number, 01-99 or A0-ZZ
F, S: Control Number, 1-9 or A-Z, a-z

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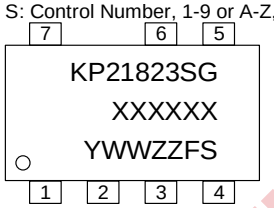


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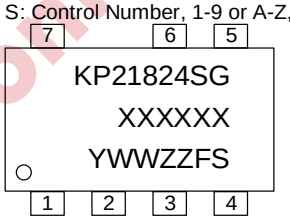


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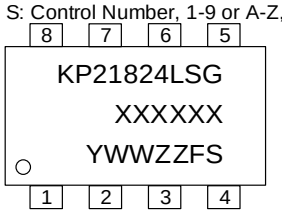


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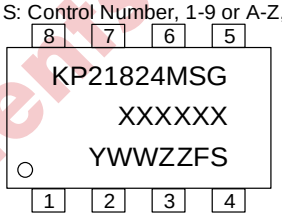


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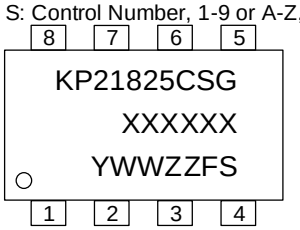


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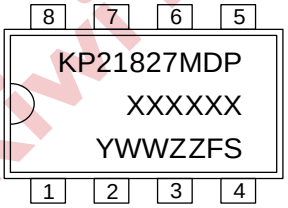


**DIP-8**

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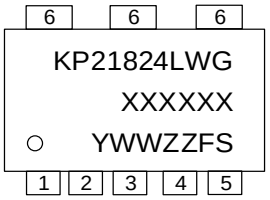


**ASOP-6**

XXXXXX: Wafer Lot Code
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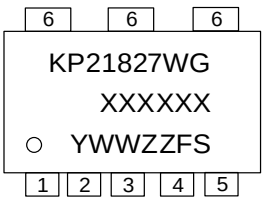
F, S: Control Number, 1-9 or A-Z, a-z




**ASOP-6**

## Typical Output Power Table(1)

| Product | Package | 230VAC ± 15%(2) | 85-265VAC |
|---|---|---|---|
| | | Adapter(3) | Adapter(3) |
| KP21822M | SOP-8 | 15W | 12W |
| KP21823 | SOP-7 | 18W | 15W |
| KP21824 | SOP-7 | 21W | 18W |
| KP21824L | SOP-8 | 21W | 18W |
| KP21824M | SOP-8 | 21W | 18W |
| KP21825C | SOP-8 | 24W | 21W |
| KP21824L | ASOP-6 | 24W | 21W |
| KP21827M | DIP-8 | 27W | 24W |
| KP21827 | ASOP-6 | 27W | 24W |

**(1)** The Max. output power is limited by junction temperature.

**(2)** 230VAC or 100/115VAC with voltage doublers.

**(3)** Typical continuous power in a non-ventilated enclosed adapter with sufficient drain pattern as a heat sink at 50˚C ambient.

## Pin Description

| Pin Number ASOP-6 | Pin Number SOP-8/DIP-8 | Pin Number SOP-7 | Pin Name | I/O(4) | Description |
|---|---|---|---|---|---|
| 1 | 2 | 7 | GND | G | The Ground of the IC |
| 2 | 1 | 1 | VDD | P | IC Power Supply Pin |
| 3 | - | 3 | NC | - | No Connect |
| 4 | 3 | 2 | FB | I | System Feedback and Demagnetization Detection Pin |
| 5 | 4 | 4 | CS | I | Current Sense Input Pin |
| 6 | 5, 6, 7, 8 | 5,6 | Drain | P | The Power MOSFET Drain |

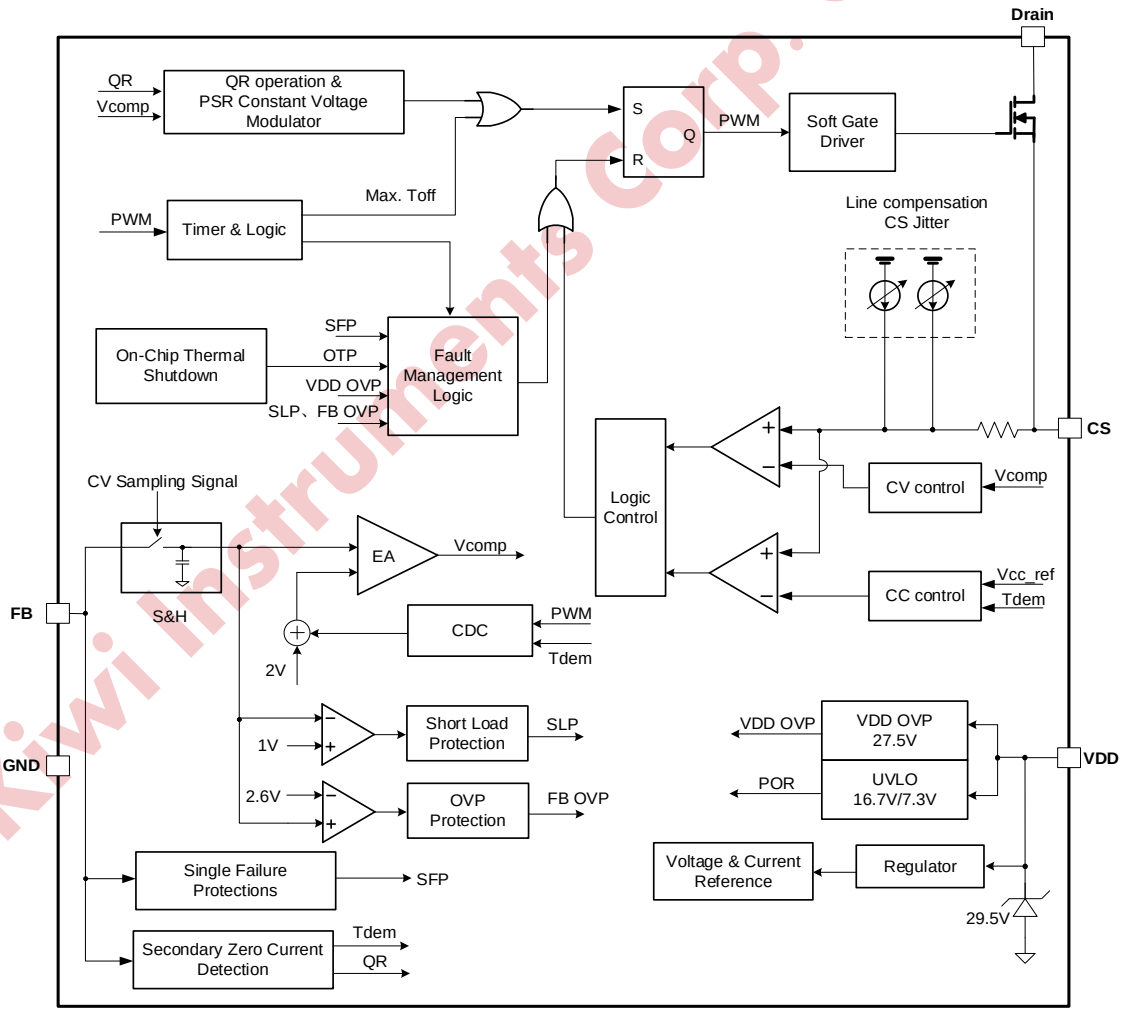
**(4)** I - Input; P - Power; G – Ground

## Ordering Information

| Part Number(5) | Description |
|---|---|
| KP21822MSGA | SOP-8, Halogen free, in T&R, 4000Pcs/Reel |
| KP21823SGA | SOP-7, Halogen free, in T&R, 4000Pcs/Reel |
| KP21824SGA | SOP-7, Halogen free, in T&R, 4000Pcs/Reel |
| KP21824LSGA | SOP-8, Halogen free, in T&R, 4000Pcs/Reel |
| KP21824MSGA | SOP-8, Halogen free, in T&R, 4000Pcs/Reel |
| KP21825CSGA | SOP-8, Halogen free, in T&R, 4000Pcs/Reel |
| KP21827MDP | DIP-8, Pb free, 50Pcs/Tube |
| KP21824LWGA | ASOP-6, Halogen free, in T&R, 5000Pcs/Reel |
| KP21827WGA | ASOP-6, Halogen free, in T&R, 5000Pcs/Reel |

**(5)** Suffix "A" - Tape&Reel

## Block Diagram



## Absolute Maximum Ratings(6)

| Parameter | | Value | Unit |
|---|---|---|---|
| VDD DC Supply Voltage | | -0.3 to 33 | V |
| VDD DC Clamp Current | | 5 | mA |
| Drain pin Voltage Range | | -0.3 to 650 | V |
| FB Voltage Range | | -0.7 to 5.5 | V |
| CS Voltage Range | | -0.3 to 5.5 | V |
| Package Thermal Resistance---Junction to Ambient (SOP-7/8) | | 165 | ˚C/W |
| Package Thermal Resistance---Junction to Ambient (DIP-8) | | 105 | ˚C/W |
| Package Thermal Resistance---Junction to Ambient (ASOP-6) | | 120 | ˚C/W |
| Maximum Junction Temperature | | 165 | ˚C |
| Storage Temperature Range | | -40 to 165 | ˚C |
| Lead Temperature (Soldering, 10sec.) | | 260 | ˚C |
| ESD Capability, HBM (Human Body Model) | | 3 | kV |
| ESD Capability, CDM (Charged Device Model) | | 2 | kV |
| Maximum MOSFET Continuous Drain Current | KP21822M | 2 | A |
| | KP21823 | 3 | A |
| | KP21824 | 2 | A |
| | KP21824M | 4 | A |
| | KP21824L(SOP-8) | 4 | A |
| | KP21825C | 2.7 | A |
| | KP21827M | 7 | A |
| | KP21824L(ASOP-6) | 4 | A |
| | KP21827 | 3.5 | A |
| Maximum MOSFET Pulse Drain Current | KP21822M | 8 | A |
| | KP21823 | 12 | A |
| | KP21824 | 8 | A |
| | KP21824M | 16 | A |
| | KP21824L(SOP-8) | 16 | A |
| | KP21825C | 8.1 | A |
| | KP21827M | 28 | A |
| | KP21824L(ASOP-6) | 16 | A |
| | KP21827 | 10.5 | A |

## Recommended Operation Conditions

| Parameter | Value | Unit |
|---|---|---|
| Supply Voltage, VDD | 9 to 25 | V |
| Operating Junction Temperature | -40 to 125 | ℃ |

## Electrical Characteristics ($T_A$= 25℃, VDD=10V, if not otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| **Supply Voltage Section (VDD Pin)** | | | | | | |
| $I_{VDD\_st}$ | Start-up current into VDD pin | VDD<VDD_on | 0 | 0.5 | 15 | μA |
| $I_{VDD\_Op}$ | Operation Current(7) | | 200 | 330 | 500 | μA |
| $V_{DD\_ON}$ | VDD Under Voltage Lockout Exit | | 15.5 | 16.7 | 17.5 | V |
| $V_{DD\_OFF}$ | VDD Under Voltage Lockout Enter | | 6 | 7.3 | 8 | V |
| $V_{DD\_OVP}$ | VDD OVP Threshold | | 25 | 27.5 | 30 | V |
| $V_{DD\_Clamp}$ | VDD Zener Clamp Voltage | $I(V_{DD})$ > 8 mA | 27.5 | 29.5 | 31.5 | V |
| **Control Function Section (FB Pin)** | | | | | | |
| $V_{FBREF}$ | Internal Error Amplifier (EA) Reference Input | | 1.97 | 2.0 | 2.02 | V |
| $V_{FB\_SLP}$ | Short Load Protection (SLP) Threshold(7) | | | 1 | | V |
| $T_{FB\_Short}$ | Short Load Protection (SLP) Debounce Time(7) | | | 50 | | ms |
| $V_{FB\_OVP}$ | FB Over Voltage Protection Threshold(7) | | | 2.6 | | V |
| $T_{FB\_OVP}$ | FB Over Voltage Protection Debounce Time | | | 3 | | Cycle |
| $V_{FB\_DEM}$ | Demagnetization Comparator Threshold (FB<1.4V) | Upper Threshold | | 20 | | mV |
| | | Lower Threshold | | -20 | | mV |
| | Demagnetization Comparator Threshold (FB>1.4V) | Upper Threshold | | 50 | | mV |
| | | Lower Threshold | | -170 | | mV |
| $T_{on\_max}$ | Maximum ON time(7) | | | 32 | | μs |
| $T_{blank}$ | Leading Edge Blanking Time | Light Load(7) | 1.8 | 2 | 2.2 | μs |
| | | Heavy Load(7) | 3.1 | 3.5 | 3.9 | μs |
| $T_{off\_max}$ | Maximum OFF time(7) | | 3.4 | 3.9 | 4.5 | ms |
| $F_{max}$ | Maximum Switching Frequency(7) | | 90 | 100 | 110 | kHz |

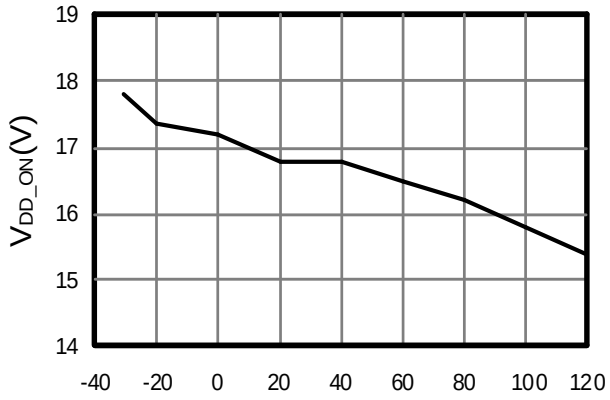
| | | | | | | |
|---|---|---|---|---|---|---|
| CDC | Maximum Cable Drop Compensation, $V_{cdc}$ / $V_{out}$(7) | | | 3 | | % |
| **Current Sense Input Section (CS Pin)** | | | | | | |
| $T_{LEB}$ | CS Input Leading Edge Blanking Time | | | 400 | | ns |
| $V_{cs\_max}$ | Maximum Current limiting threshold(7) | | 755 | 785 | 815 | mV |
| $V_{cs\_min}$ | Minimum Current limiting threshold(7) | | 170 | 180 | 190 | mV |
| $T_{D\_OC}$ | Over Current Detection and Control Delay | | | 100 | | ns |
| **CC Loop** | | | | | | |
| $V_{CC\_ref}$ | CC Loop Reference | | 0.33 | 0.34 | 0.35 | V |
| **On-Chip Thermal Shutdown** | | | | | | |
| $T_{SD}$ | Thermal Shutdown(7) | | 150 | 155 | 160 | ˚C |
| $T_{RC}$ | Thermal Recovery(7) | | 120 | 125 | 130 | ˚C |
| **Power MOSFET Section (Drain Pin)** | | | | | | |
| $V_{BR}$(8) | Power MOSFET Drain Source Breakdown Voltage | | 650 | | | V |
| $R_{dson}$ | Static Drain-Source On Resistance | KP21822M | | 5.3 | 6.4 | Ω |
| | | KP21823 | | 2.9 | 3.5 | Ω |
| | | KP21824 | | 2.2 | 2.5 | Ω |
| | | KP21824M | | 2.2 | 2.6 | Ω |
| | | KP21824L(SOP-8) | | 2.6 | 3.1 | Ω |
| | | KP21825C | | 1.6 | 1.8 | Ω |
| | | KP21827M | | 1.2 | 1.4 | Ω |
| | | KP21824L(ASOP-6) | | 2.6 | 3.1 | Ω |
| | | KP21827 | | 1.25 | 1.45 | Ω |

**(6)** Stresses listed as the above “Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to maximum rating conditions for extended periods may remain possibility to affect device reliability.

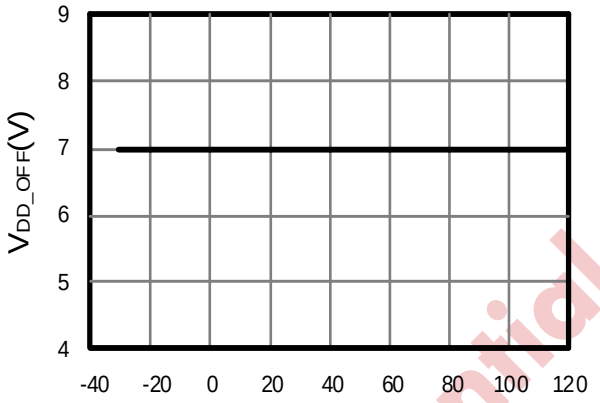
**(7)** Guaranteed by the Design.

**(8)** For KP21824L(SOP-8/ASOP-6), MOSFET minimum drain to source breakdown voltage is 620V and the MOSFET can withstand 650V voltage spike with duration below 200ns.

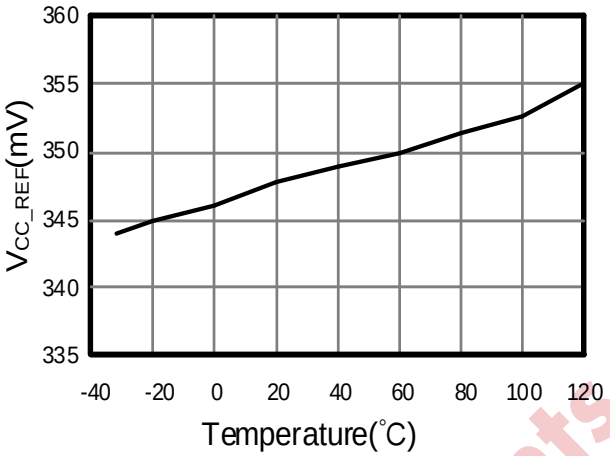
## Characterization Plots



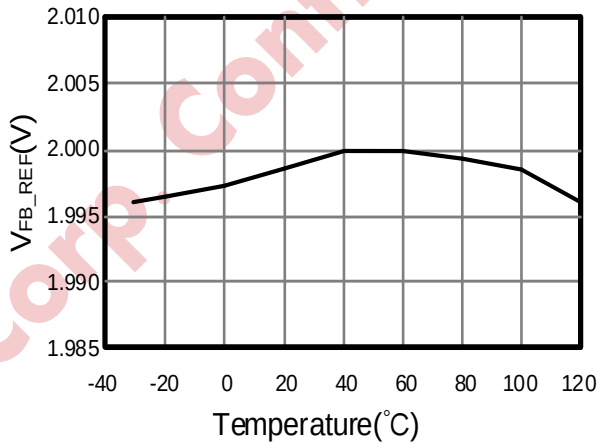

**$V_{DD\_ON}$ vs Temperature**



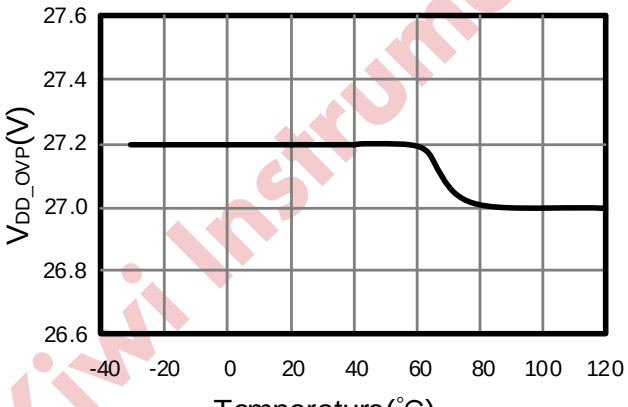

**$V_{DD\_OFF}$ vs Temperature**




**$V_{CC\_REF}$ vs Temperature**




**$V_{FB\_REF}$ vs Temperature**




**$V_{DD\_OVP}$ vs Temperature**

## Operation Description

KP2182X is a high performance, multi-mode Quasi Resonant Primary Side Regulation (QR-PSR) power switch ideal for charger applications. At full load, the switch operates in quasi-resonant (QR) mode in the universal line voltage to optimize efficiency and thermal performance.

### ● System Start-Up Operation

Before the IC starts to work, KP2182X consumes only $I_{VDD\_st}$ (typically 0.5 μA) which allows a large value startup resistor to be used to minimize the standby power loss. When VDD reaches turn-on voltage $V_{DD\_ON}$ (typically 16.7V), KP2182X begins switching. The hold-up capacitor continues to supply VDD before the auxiliary winding of the transformer takes control.

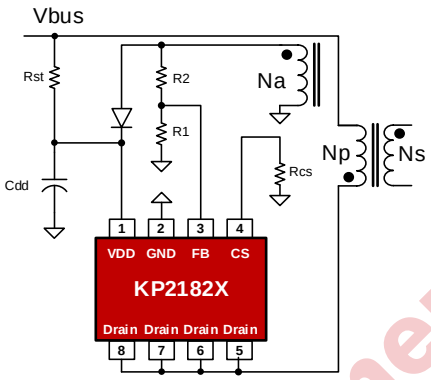



Fig.1

### ● PSR Constant Voltage Modulation (PSR-CV Mode)

In Primary Side Regulation (PSR) control, the output voltage is sensed on the auxiliary winding when transformer energy is transferred to the secondary side. Fig.2 illustrates the timing waveform of CV sampling signal, demagnetization signal in KP2182X. When the CV sampling process is over, the internal sample/hold (S&H) circuit captures the error signal and amplifies it through the internal Error Amplifier (EA). The output of EA is sent to the PSR CV Modulator (PSR-CVM) for high-precision CV regulation. The internal reference voltage $V_{FBREF}$ is trimmed to be 2V.

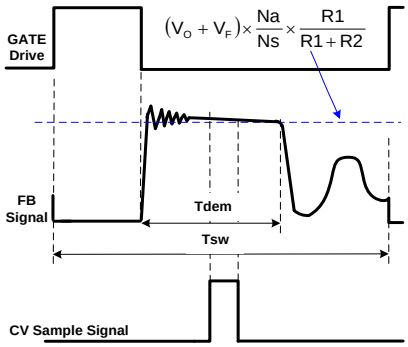



Fig.2

Fig.2 also illustrates the equation for "demagnetization plateau",

$$V_{FB} = (V_O + V_F) \times \frac{Na}{Ns} \times \frac{R1}{R1+R2}$$

where Vo and VF are the output voltage and diode forward voltage; R1 and R2 are the resistor divider connected from the auxiliary winding to FB Pin, Ns and Na are secondary winding and auxiliary winding respectively.

### ● PSR Constant Current Modulation (PSR-CC Mode)

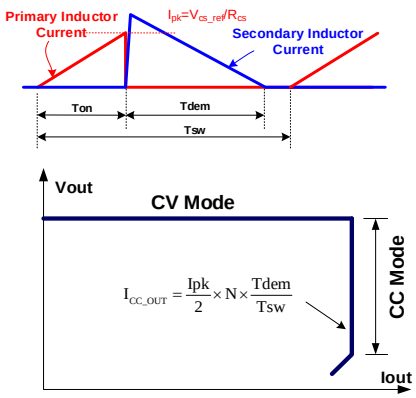



Fig.3

Referring to Fig.3 above, the primary peak current, transformer turns ratio, secondary demagnetization time (Tdem), and switching period (Tsw) determines the secondary average output current Iout. Ignoring leakage inductance effects, the equation for average output current is shown in Fig.3.

In CC mode, the IC operates in QR mode and adjust $V_{cc\_ref}$ automatically to achieve constant output current. The average output current can be expressed as:

$$I_{CC\_OUT} \cong \frac{1}{2} \times N \times \frac{V_{cc\_ref}}{R_{cs}}$$

In the equation above,

N----The turn ratio of primary side winding to secondary side winding.

Rcs---The sensing resistor connected between the power MOSFET source to GND.

Vcc_ref----CC Loop Reference.

## Multi-Mode Control in CV Mode

To meet the tight requirement of average system efficiency and no-load power consumption, a hybrid of frequency modulation (FM) and amplitude modulation (AM) is adopted in KP2182X which is shown in the Fig 4.

At full load, the system operates in QR mode to optimize efficiency and thermal performance. The IC operates in FM+AM mode for high efficiency and audio noise reduction under normal and light load.

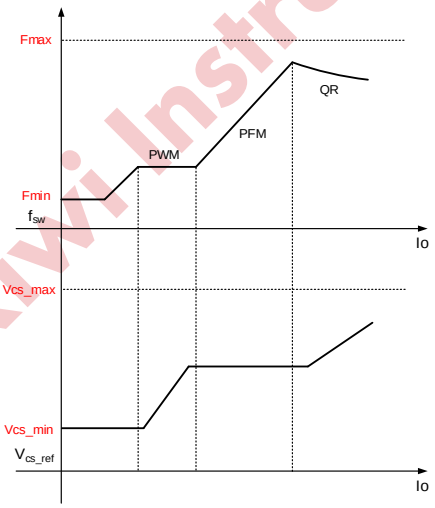



Fig.4

## Cable Drop Compensation (CDC)

In smart phone charger application, the battery is always connected to the adapter with a cable wire which can cause several percentages of voltage drop on the actual battery voltage. KP2182X integrates built-in cable drop compensation (CDC), which is proportional to the output power Pout to get a straight constant voltage output curve. The percentage of maximum compensation is 3% of $V_o$.

## Line CC Compensation

The turn-off delay of MOSFET affects CC performance, and OCP value at high voltage input will be much larger than at low voltage input without compensation. KP2182X integrates built-in line CC compensation to achieve excellent line CC regulation.

## Optimized Dynamic Response

The dynamic response performance is optimized to meet USB charge requirements.

## Audio Noise Free Operation

As mentioned above, the multi-mode CV control with a hybrid of FM and AM can provide audio noise free operation from full load to zero load.

## Single Failure Protections for Power Supply

KP2182X integrates single failure protections, including FB pull-up resistor open protection, FB pull-down resistor open protection, FB pull-down resistor short protection, output rectifier diode or SR short protection, transformer windings short protection, Rcs open protection and IC GND pin open protection. The IC will enter auto recovery protection mode once single failure occurs. This function can ensure there is no damage to IC and no over voltage of output.

### Short Load Protection (FB SLP)

The output is sampled on FB pin and then compared with $V_{FB\_SLP}$ (typically 1V).

When sensed FB voltage is below $V_{FB\_SLP}$ and lasts for $T_{FB\_Short}$ (typically 50ms), the IC will enter into Short Load Protection (SLP) mode, in which the IC will enter into auto recovery protection mode.

### FB Over Voltage Protection (FB OVP)

When sensed FB voltage is above $V_{FB\_OVP}$ (typically 2.6V) and lasts for $T_{FB\_OVP}$ (typically 3 cycles), the IC will enter into FB Over Voltage Protection (FB OVP) mode, in which the IC will enter into auto recovery protection mode.

### VDD Over Voltage Protection (OVP) and Zener Clamp

When VDD voltage is higher than $V_{DD\_OVP}$ (typically 27.5V), the IC will stop switching. This will cause VDD fall down to be lower than $V_{DD\_OFF}$ (typically 7.3V) and then the system will restart up again. An internal Zener clamp is integrated to prevent the IC from damage, and the clamp voltage is $V_{DD\_Clamp}$ (typically 29.5V).

### On-Chip Thermal Shutdown (OTP)

When the IC temperature is over $T_{SD}$ (typically 155˚C), the IC shuts down. Only when the IC temperature drops to $T_{RC}$ (typically 125˚C), IC will restart.

### Soft Totem-Pole Gate Driver

KP2182X has a soft totem-pole gate driver with optimized EMI performance. An internal 16V clamp circuit is added for power MOSFET gate protection.

## Application Information

### PCB Layout Guidelines

PCB design has a significant impact on the performance of power supply. It is recommended to refer to Figure 5 and Figure 6 when designing primary-side circuit.

1. The main power loop(Loop1) should be as small as possible and the trace should be wide for better efficiency performance.
2. The snubber circuit Loop(Loop2) should be as small as possible.
3. Place VDD capacitor C3 close to the IC to ensure the VDD loop(Loop3) is small.
4. The ground node of auxiliary winging should be connected directly to the negative node of the bus capacitor (Line1 as shown in Fig.5)
5. VDD capacitor C3 and FB pull-down resistor R5 should be connected directly to the IC GND pin firstly, and then connects them to the negative node of the bus capacitor with a single point (Line2 as shown in Fig.5)

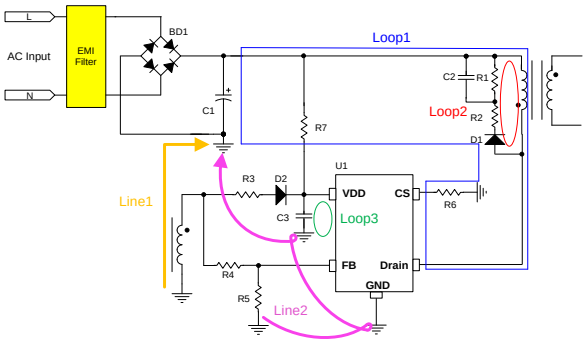



Fig.5

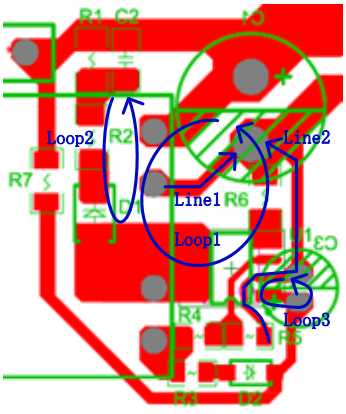
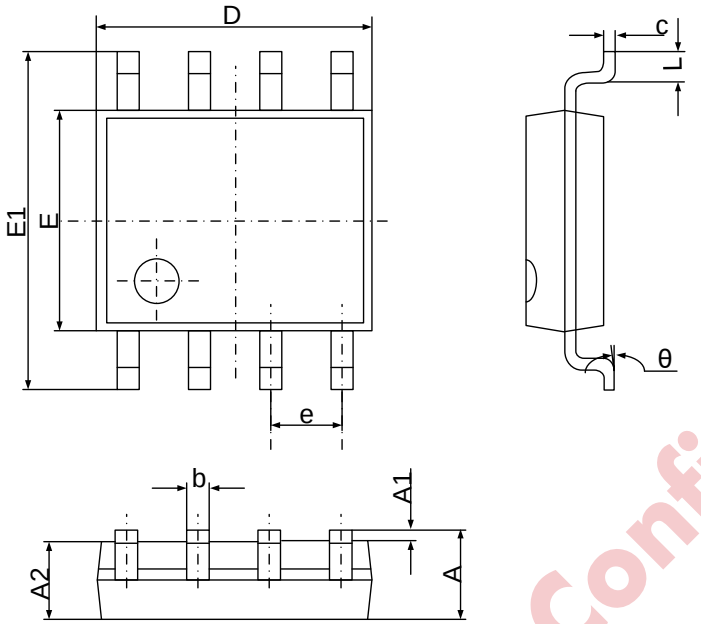



Fig.6

## Package Dimension

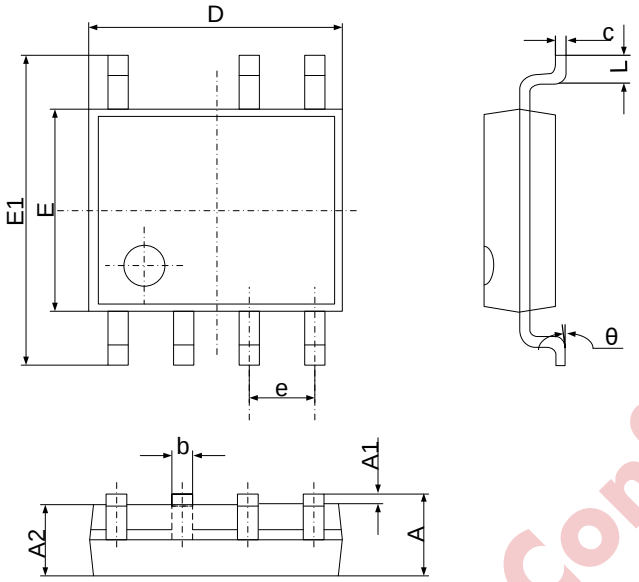
**SOP-8**




| Symbol | Dimensions in Millimeters | | Dimensions in Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.300 | 1.500 | 0.051 | 0.059 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.007 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.201 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

## Package Dimension

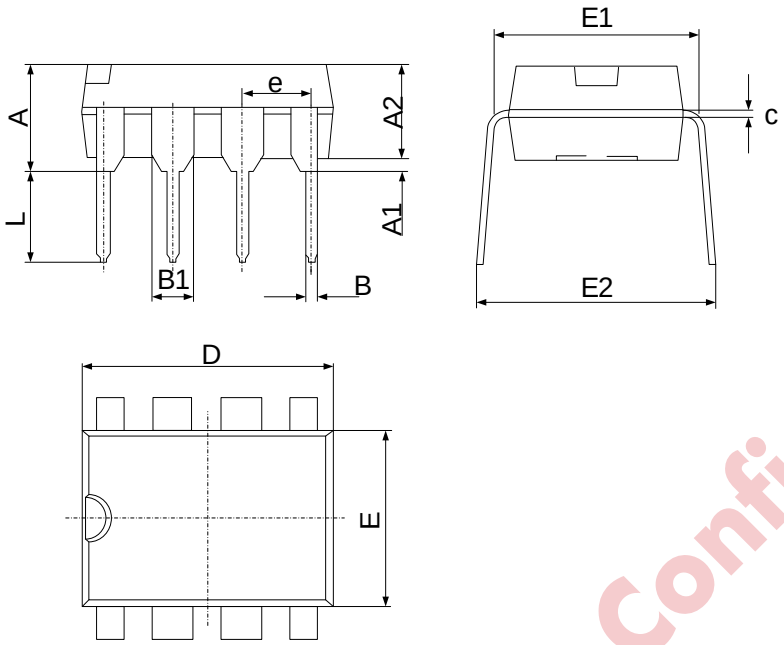
**SOP-7**




| Symbol | Dimensions in Millimeters | | Dimensions in Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.300 | 1.500 | 0.051 | 0.059 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.007 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.201 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

## Package Dimension

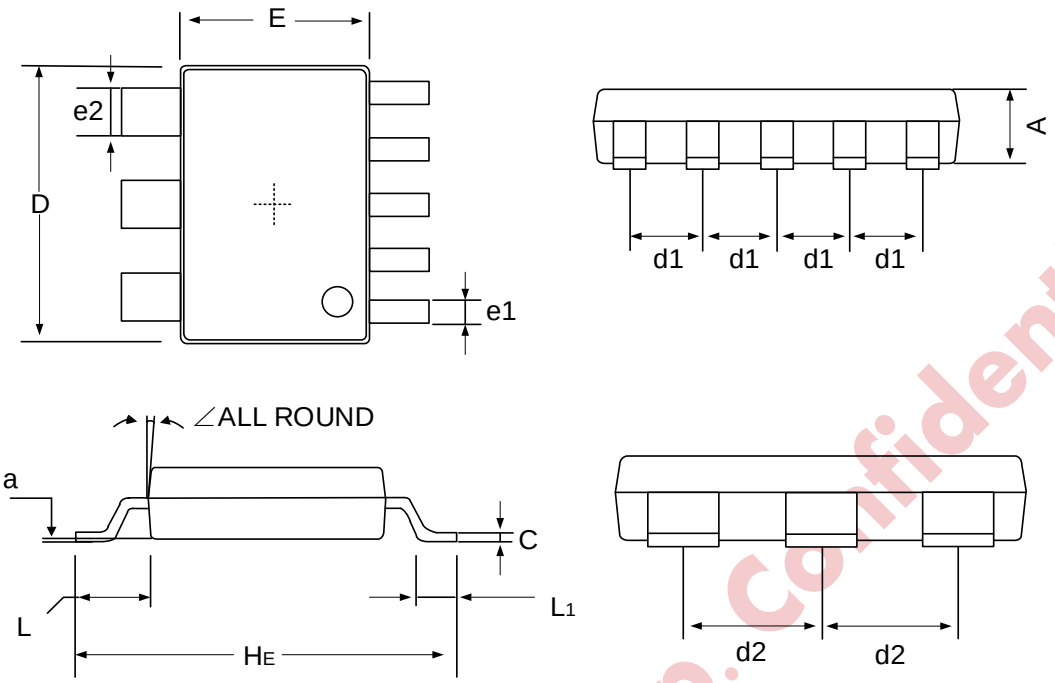
**DIP-8**




| Symbol | Dimensions in Millimeters | | Dimensions in Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 3.600 | 4.150 | 0.142 | 0.163 |
| A1 | 0.510 | - | 0.020 | - |
| A2 | 3.150 | 3.400 | 0.124 | 0.134 |
| B | 0.380 | 0.560 | 0.015 | 0.022 |
| B1 | 1.524 (BSC) | | 0.060 (BSC) | |
| C | 0.200 | 0.350 | 0.008 | 0.014 |
| D | 9.000 | 9.400 | 0.354 | 0.370 |
| E | 6.200 | 6.500 | 0.244 | 0.256 |
| E1 | 7.620 (REF) | | 0.300 (REF) | |
| e | 2.540 (BSC) | | 0.100 (BSC) | |
| L | 3.000 | 3.600 | 0.118 | 0.142 |
| E2 | 7.620 | 9.300 | 0.300 | 0.366 |

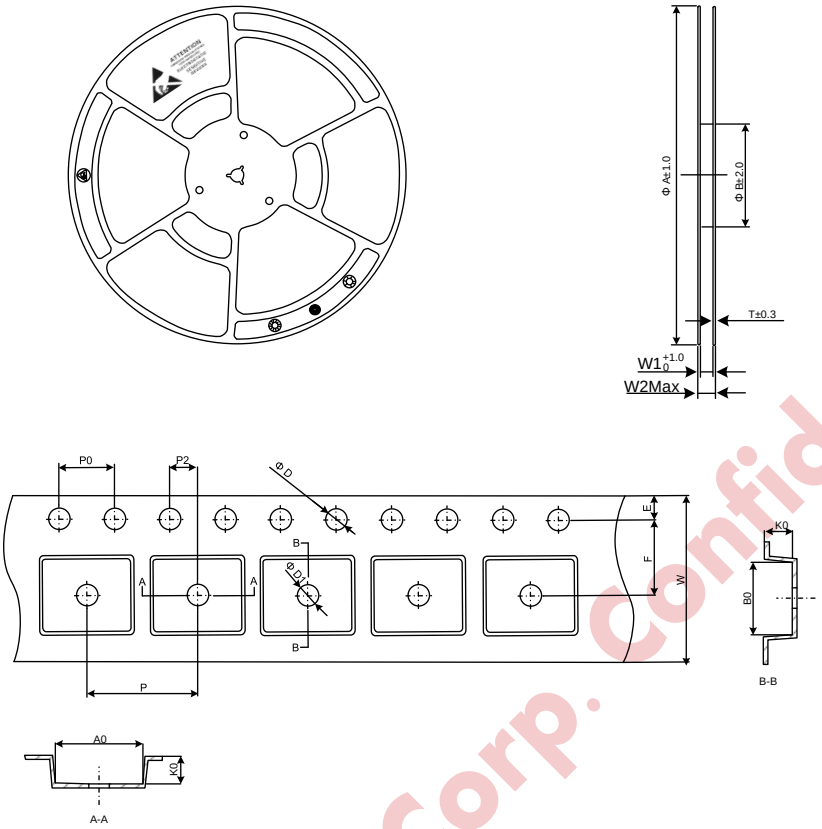
## Package Dimension

**ASOP-6**




| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 1.050 | 1.150 | 1.250 | 0.041 | 0.045 | 0.049 |
| a | 0.200 (REF) | | | 0.008 (REF) | | |
| C | 0.150 | 0.200 | 0.220 | 0.006 | 0.008 | 0.009 |
| D | 6.000 | 6.200 | 6.400 | 0.236 | 0.244 | 0.252 |
| d1 | 1.250 | 1.300 | 1.350 | 0.049 | 0.051 | 0.053 |
| d2 | 1.950 | 2.000 | 2.050 | 0.077 | 0.079 | 0.081 |
| E | 3.700 | 3.900 | 4.100 | 0.146 | 0.154 | 0.161 |
| e1 | 0.350 | 0.400 | 0.450 | 0.014 | 0.016 | 0.018 |
| e2 | 1.550 | 1.600 | 1.650 | 0.061 | 0.063 | 0.065 |
| $H_E$ | 5.900 | 6.000 | 6.100 | 0.232 | 0.236 | 0.240 |
| L | 0.950 | 1.050 | 1.150 | 0.037 | 0.041 | 0.045 |
| L1 | 0.400 | - | 0.800 | 0.016 | - | 0.031 |
| ∠ | 12° | | | | | |

## Tape and Reel Information

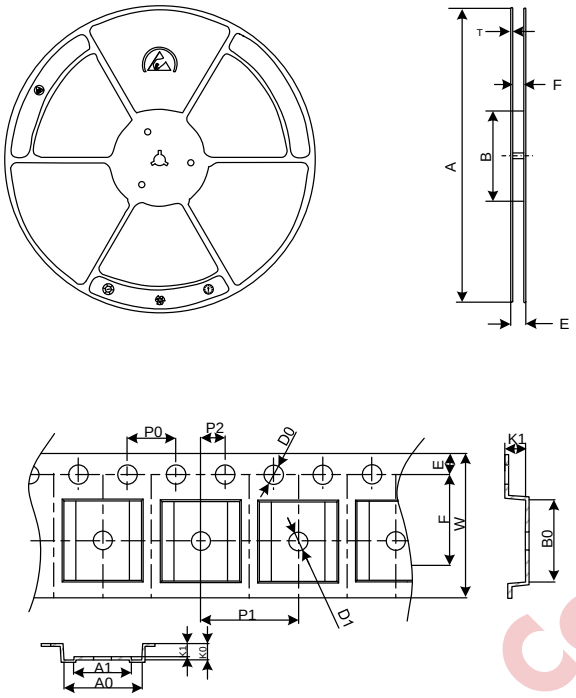



| Reel Dimensions (mm) | | | | |
|---|---|---|---|---|
| **A** | **B (Inner Diameter)** | **W1** | **W2Max** | **T** |
| 330 | 100 | 12.4 | 18.4 | 1.5 |

| Tape Dimensions | | | |
|---|---|---|---|
| **Symbol** | **Dimensions (mm)** | **Symbol** | **Dimensions (mm)** |
| E | 1.75±0.10 | W | 12.00±0.10 |
| F | 5.50±0.10 | P | 8.00±0.10 |
| P2 | 2.00±0.10 | A0 | 6.60±0.10 |
| D | $1.50^{+0.1}_{-0}$ | B0 | 5.30±0.10 |
| D1 | 1.55±0.05 | K0 | 1.90±0.10 |
| P0 | 4.00±0.10 | | |

| Packing Quantity | | | | |
|---|---|---|---|---|
| **Package** | **Pcs/Reel** | **Reels/Box** | **Boxes/Carton** | **Pcs/Carton** |
| SOP-7 | 4000 | 2 | 8 | 64000 |
| SOP-8 | 4000 | 2 | 8 | 64000 |

## Tape and Reel Information




| Reel Dimensions (mm) | | | | |
|---|---|---|---|---|
| **A** | **B (Inner Diameter)** | **E** | **F** | **T** |
| 330±2 | 100±1 | 16.9±0.5 | $12.7^{+2}_{-0.5}$ | 2.1±0.2 |

| Tape Dimensions | | | |
|---|---|---|---|
| **Symbol** | **Dimensions (mm)** | **Symbol** | **Dimensions (mm)** |
| A0 | 6.40±0.10 | K1 | 1.50±0.10 |
| B0 | 6.60±0.10 | E | 1.75±0.10 |
| K0 | 1.70±0.10 | F | 5.50±0.05 |
| P0 | 4.00±0.10 | D0 | 1.55±0.05 |
| P1 | 8.00±0.10 | D1 | 1.55±0.05 |
| P2 | 2.00±0.05 | W | 12.0±0.30 |
| A1 | 3.80±0.10 | | |

| Packing Quantity | | | | |
|---|---|---|---|---|
| **Package** | **Pcs/Reel** | **Reels/Box** | **Boxes/Carton** | **Pcs/Carton** |
| ASOP-6 | 5000 | 2 | 5 | 50000 |

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