

## Simple, 220V, 20mA, Temperature-Compensated, Constant Current, LED Driver IC

### Features

- ▶ 5.0 to 220V operating range ( $V_{A-B}$ )
- ▶ 20mA  $\pm$ 10% at 5.0 - 160V
- ▶ 0.01% / °C typical temperature coefficient
- ▶ Available in TO-252 (D-PAK) and TO-220 packages
- ▶ Can be paralleled for higher current

### Applications

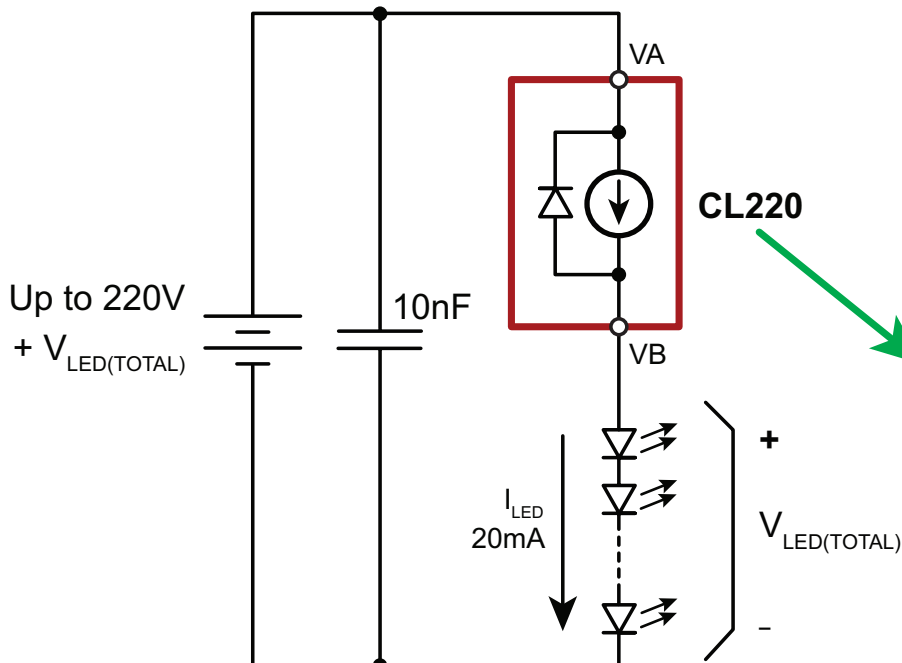
- ▶ Industrial lamp indicators
- ▶ Signage
- ▶ Accent lighting
- ▶ Constant current source
- ▶ Constant current sink

### General Description

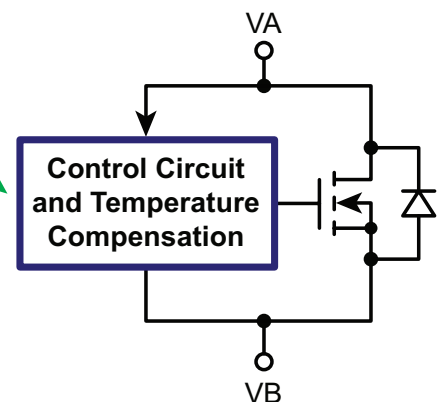
The Supertex CL220 is a high voltage, temperature-compensated, 20mA constant current regulator. The device operates at up to 220V, and is accurate to  $\pm$ 10% over a 5.0 - 160V range. The device can be used as a two terminal constant current source or constant current sink.

A typical application for the CL220 is to drive LEDs with a constant current of 20mA. Multiple CL220s can also be used in parallel to provide higher currents such as 40mA, 60mA, 80mA, and so on. The device is available in the TO-252 (D-PAK) and TO-220 packages.

### Typical Application Circuit



### Functional Circuit Diagram



## Ordering Information

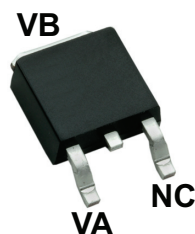
Device	Package Options	
	TO-252 (D-PAK)	TO-220
CL220	CL220K4-G	CL220N5-G

-G indicates package is RoHS compliant ('Green')

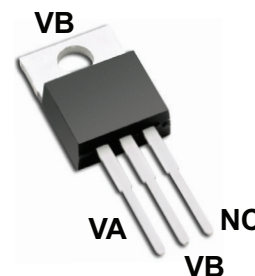


ESD Sensitive Device

## Pin Configurations



TO-252 (D-PAK)  
(front view)



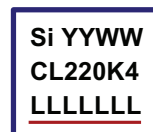
TO-220  
(front view)

## Absolute Maximum Ratings

Parameter	Value
Operating voltage, $V_{A-B}$	240V
Operating junction temperature, $T_j$	-40°C to +125°C
Storage temperature, $T_s$	-55°C to +150°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

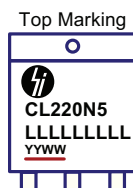
## Product Marking



YY = Year Sealed  
WW = Week Sealed  
L = Lot Number  
— = "Green" Packaging

Packages may or may not include the following marks: Si or

### TO-252 (D-PAK)



L = Lot Number  
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Packages may or may not include the following marks: Si or

### TO-220

## Pin Designation

Pin	Description
VA	Current flows into this pin.
VB	Current flows out of this pin.

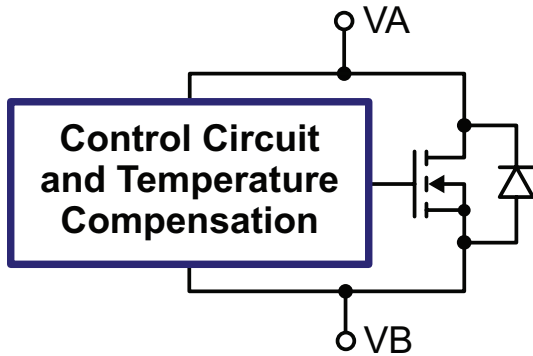
## Thermal Characteristics *Guaranteed by design – not production tested*

Sym	Parameter	Min	Typ	Max	Units	Conditions	
$\theta_{jc}$	Thermal resistance, junction to case	TO-252 (D-PAK)	-	6.3	-	°C/W	---
		TO-220	-	8.3	-		
$\theta_{ja}$	Thermal resistance, junction to ambient	TO-252 (D-PAK)	-	78	-	°C/W	Soldered to 2.0cm <sup>2</sup> exposed copper free air area
		TO-220	-	70	-		

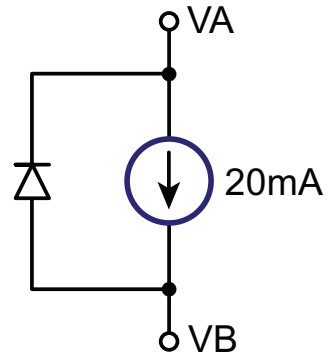
**Electrical Characteristics** ( $T_j = 25^\circ\text{C}$  unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
$V_{A-B}$	Operating voltage	5.0	-	220	V	---
$\Delta I_{A-B}/\Delta T$	$I_{A-B}$ temperature coefficient	-	0.01	-	%/ $^\circ\text{C}$	$V_{A-B} = 45\text{V}$ , $T_j = -40^\circ\text{C}$ to $+100^\circ\text{C}$
$R_{A-B}$	Dynamic resistance	-	300	-	k $\Omega$	---
$I_{AB}$	Output current	18	20	22	mA	$V_{AB} = 4.0 - 160\text{V}$
		18	-	25		$V_{AB} = 160 - 220\text{V}$ (Fig. 4)
		-	-	22		$V_{AB} = 0 - 4.0\text{V}$
$I_{OS}$	Turn-on overshoot current	-	25	-	mA	$V_T = 45\text{V}$ (Fig. 5)
$t_{OS}$	Overshoot duration	-	1	-	$\mu\text{s}$	$V_T = 45\text{V}$ (Fig. 5)
$t_{DLY}$	Turn-on delay	-	10	-	$\mu\text{s}$	$V_T = 45\text{V}$ (Fig. 5)
$t_{RISE}$	Turn-on rise time	-	200	-	ns	$V_T = 45\text{V}$ (Fig. 5)

**Fig. 1 Functional Circuit Diagram**



**Fig. 2 Equivalent Block Diagram**



**Fig. 3 Temperature Characteristics**

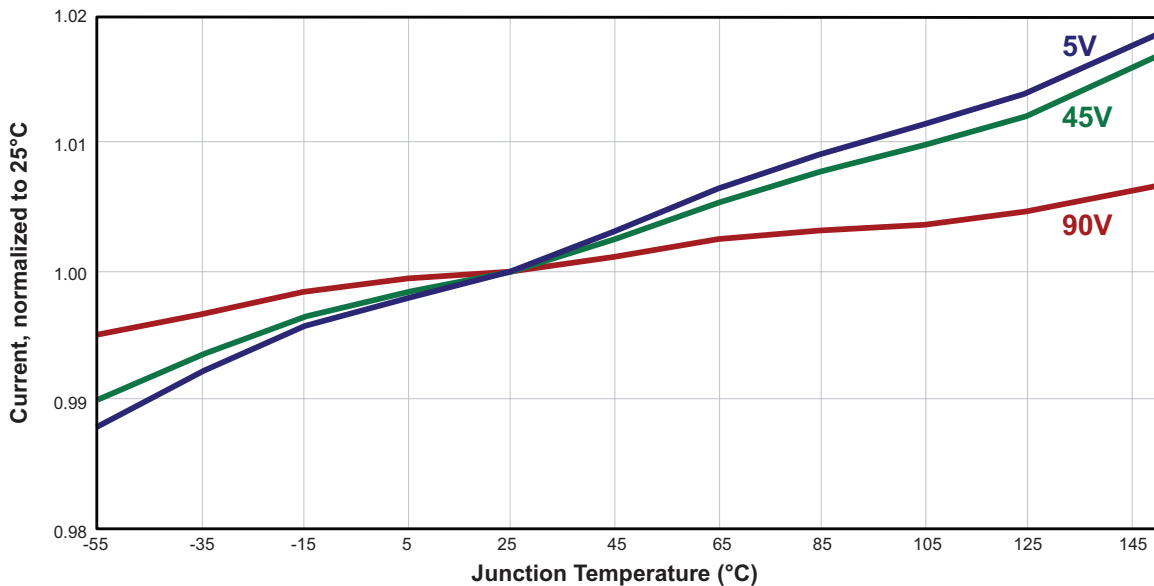


Fig. 4 Output Characteristics

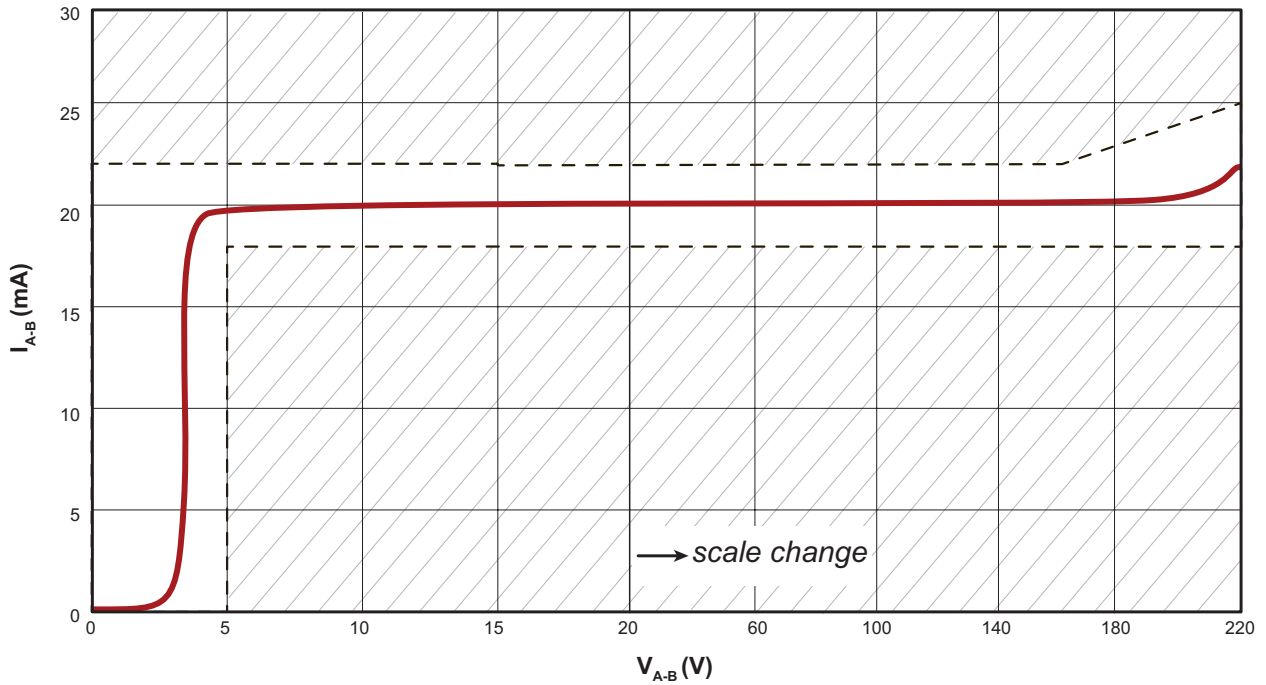


Fig. 5 Timing Diagram

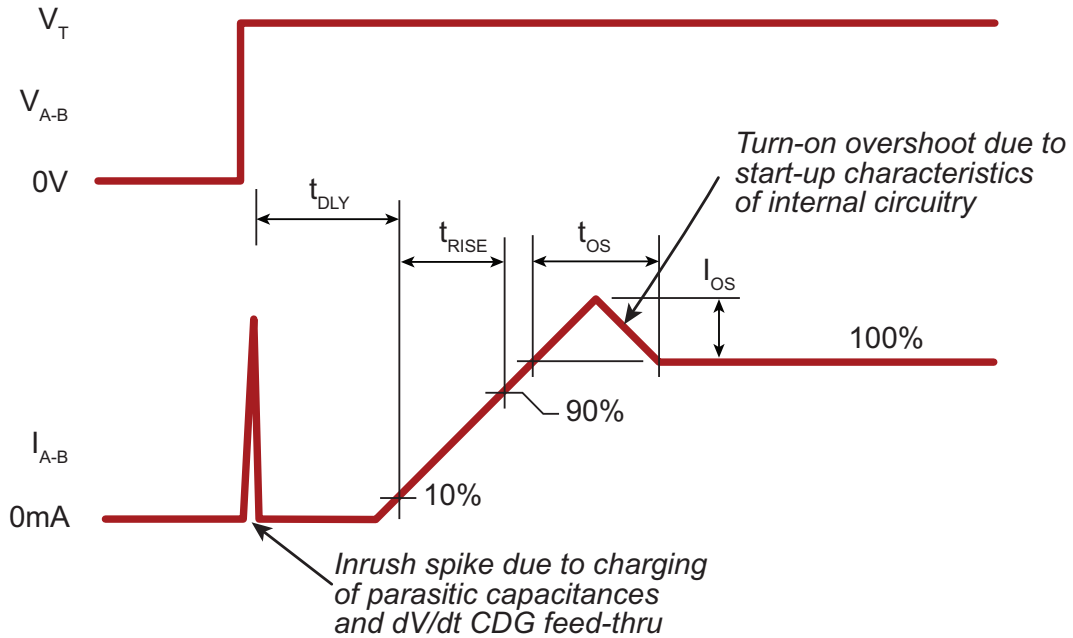


Fig. 6 Timing Test Circuit

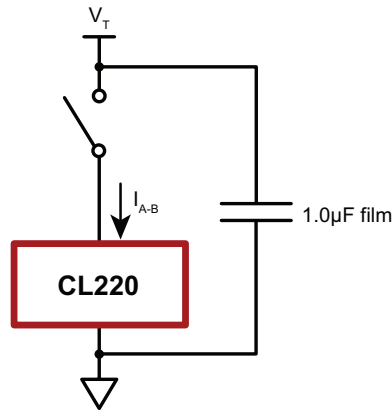


Fig. 7 CL220 for Multiple LED Strings

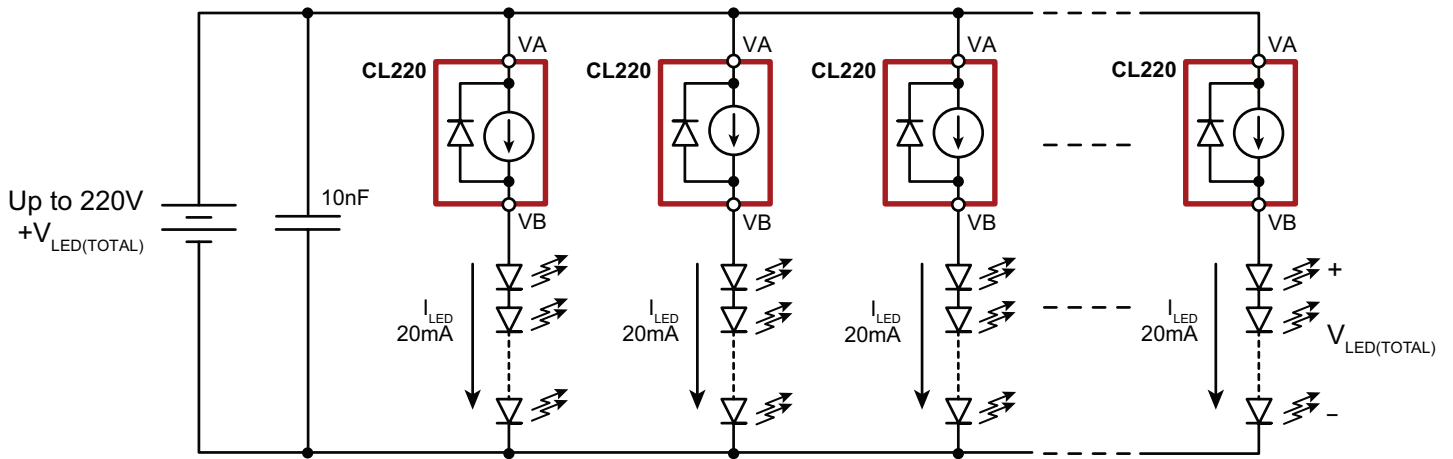
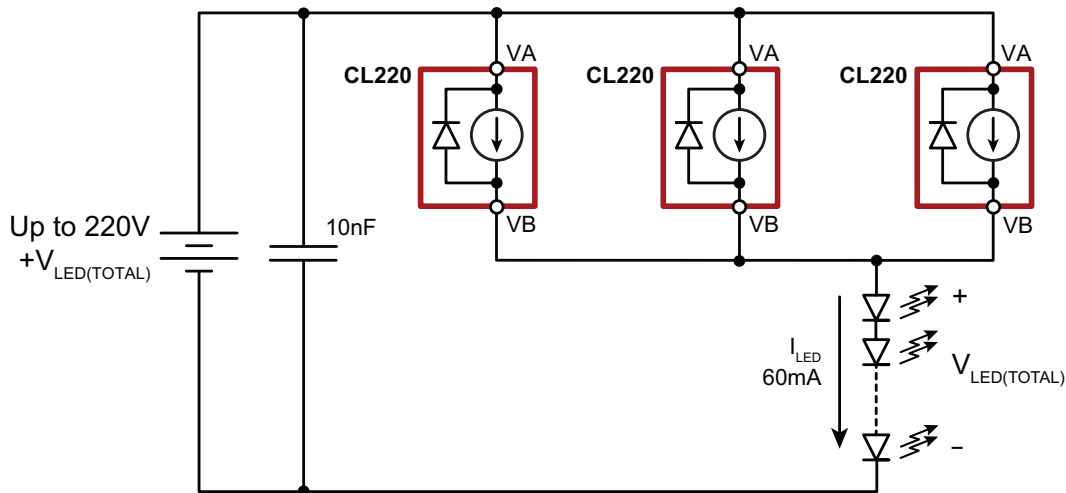
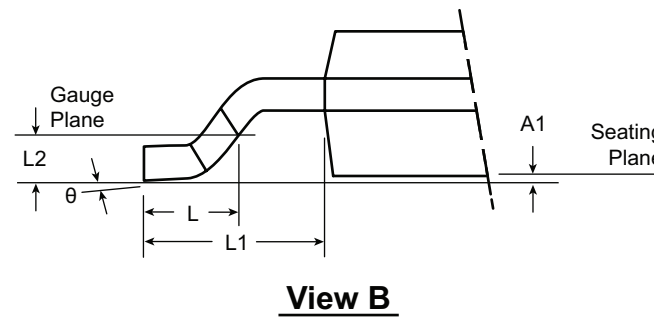
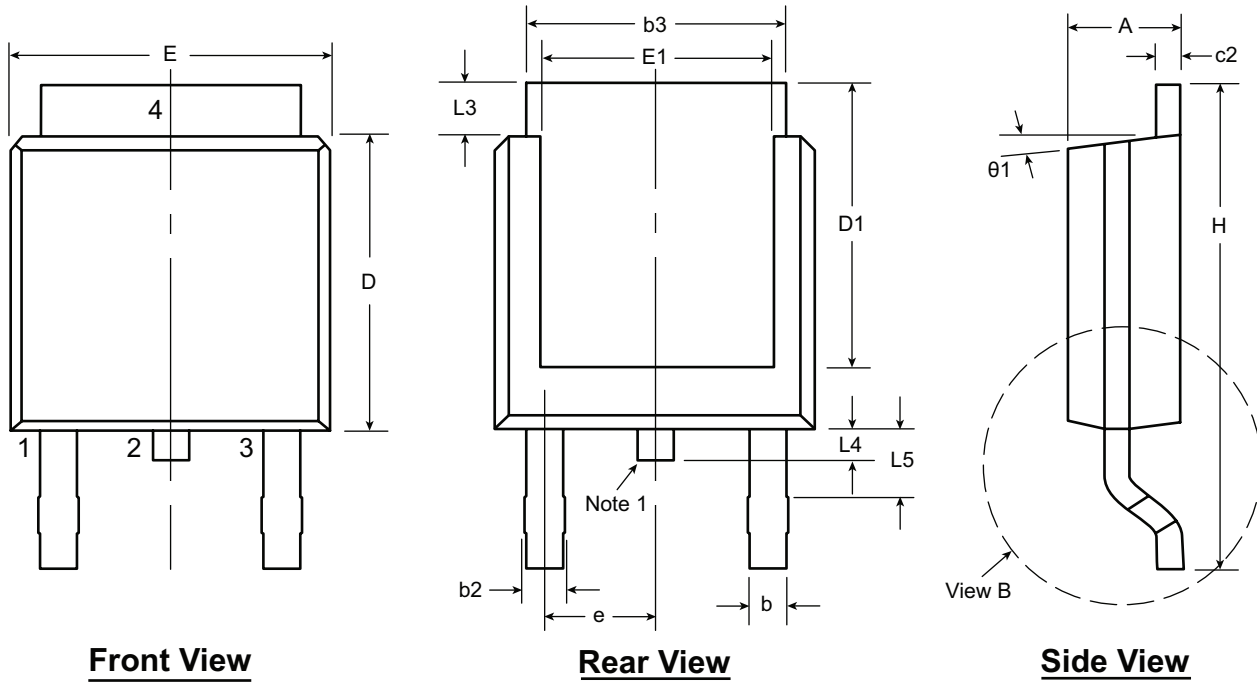


Fig. 8 CL220 for Higher Current



### 3-Lead TO-252 (D-PAK) Package Outline (K4)

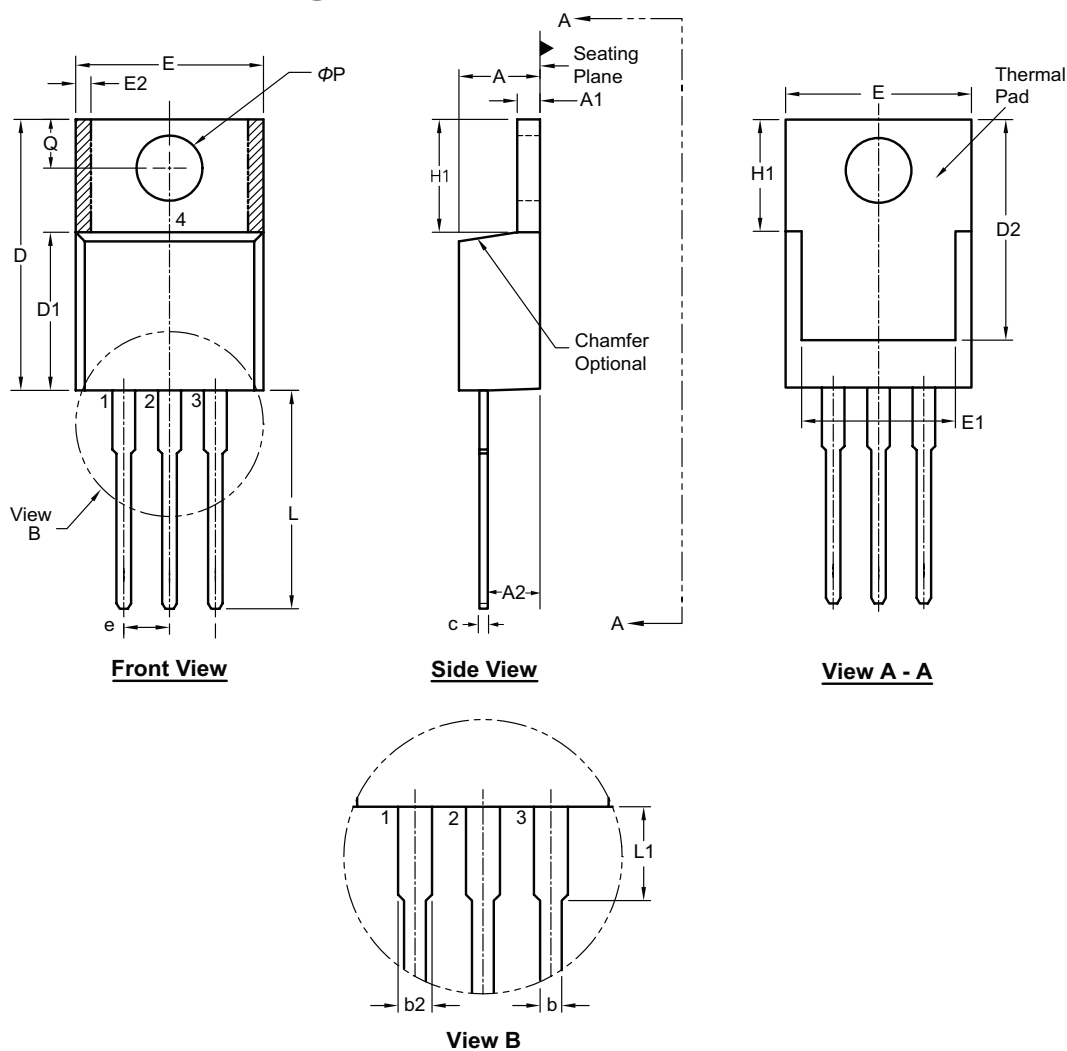


**Note:**  
 1. Although 4 terminal locations are shown, only 3 are functional. Lead number 2 was removed.

Symbol	A	A1	b	b2	b3	c2	D	D1	E	E1	e	H	L	L1	L2	L3	L4	L5	θ	θ1			
Dimension (inches)	MIN	.086	.000*	.025	.030	.195	.018	.235	.205	.250	.170	.090 BSC	.370	.055	.108 REF	.020 BSC	.035	.025*	.035†	0°	0°		
	NOM	-	-	-	-	-	-	.240	-	-	-		-	.060			-	-	-	-	-	-	-
	MAX	.094	.005	.035	.045	.215	.035	.245	.217*	.265	.200*		.410	.070			.050	.040	.060	10°	15°		

JEDEC Registration TO-252, Variation AA, Issue E, June 2004.  
 \* This dimension is not specified in the JEDEC drawing.  
 † This dimension differs from the JEDEC drawing.  
**Drawings not to scale.**  
**Supertex Doc. #: DSPD-3TO252K4, Version F040910.**

### 3-Lead TO-220 Package Outline (N5)



Symbol	A	A1	A2	b	b2	c	D	D1	D2	E	E1	E2	e	H1	L	L1	Q	ΦP		
Dimension (inches)	MIN	.140	.020	.080	.015	.045	.012 <sup>†</sup>	.560	.326 <sup>†</sup>	.474 <sup>†</sup>	.380	.270	0.20*	.100 BSC	.230	.500	.200*	.100	.139	
	NOM	-	-	-	.027	.057	-	-	-	-	-	-	-		-	-	-	-	-	-
	MAX	.190	.055	.120 <sup>†</sup>	.040	.070	.024	.650	.361 <sup>†</sup>	.507	.420	.350	.030		.270	.580	.250	.135	.161	

JEDEC Registration TO-220, Variation AB, Issue K, April 2002.

\* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

Supertex Doc. #: DSPD-3TO220N5, Version C041009.

(The package drawings in this data sheet may not reflect the most current specifications. For the latest package outline information go to <http://www.supertex.com/packaging.html>.)

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