



## KD1083

### 7.5A LOW DROP POSITIVE VOLTAGE REGULATOR ADJUSTABLE AND FIXED

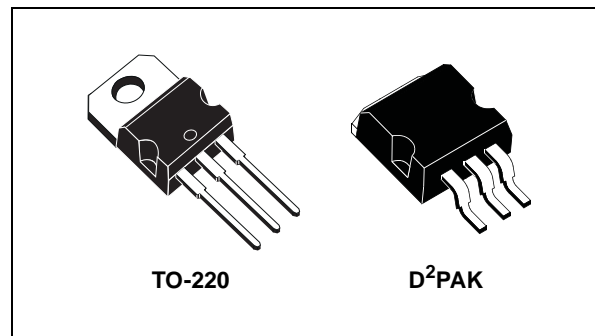
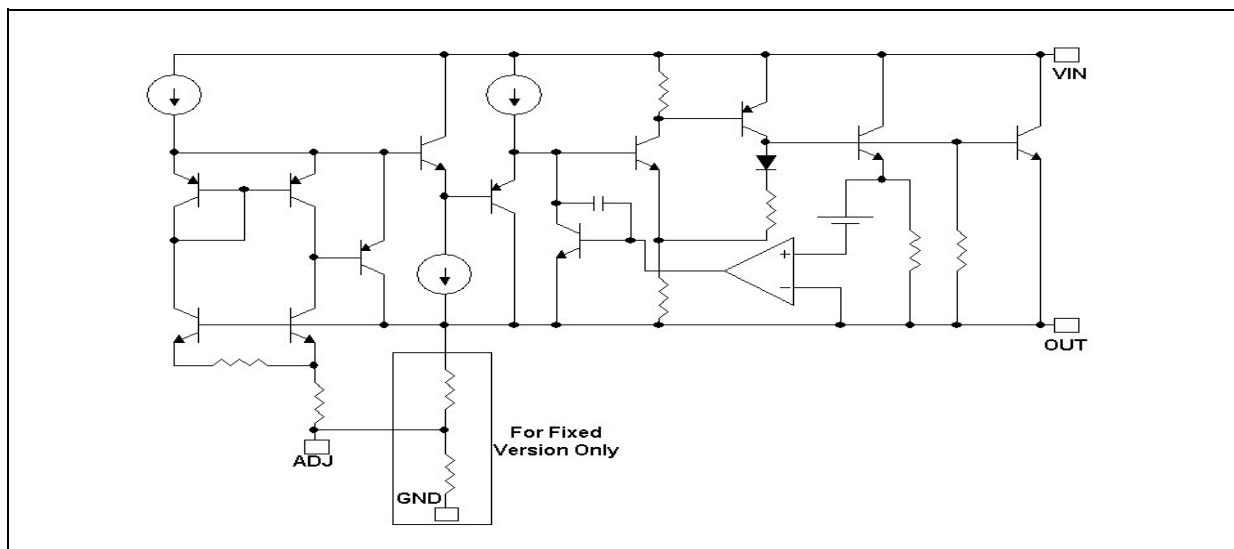
PRELIMINARY DATA

- THREE TERMINAL ADJUSTABLE OR FIXED OUTPUT VOLTAGE 1.5V, 1.8V, 2.5V, 3.0, 3.3V
- OUTPUT CURRENT UP TO 7.5A
- 1.4V MAX DROPOUT VOLTAGE AT FULL LOAD
- LINE REGULATION: MAX 0.2% OVER FULL TEMPERATURE RANGE
- LOAD REGULATION: MAX 0.5% OVER FULL TEMPERATURE RANGE
- OUTPUT CURRENT LIMIT
- THERMAL SHUTDOWN PROTECTION WITH HYSTERESIS
- WIDE OPERATING TEMPERATURE RANGE -40°C TO 125°C
- PINOUT COMPATIBILITY WITH STANDARD ADJUSTABLE VREG

#### DESCRIPTION

The KD1083 is a low drop linear voltage regulator, proposed both in adjustable and fixed version and designed for use in applications requiring output currents up to 7.5A. Dropout voltage is guaranteed not to exceed 1.4V at maximum output current while it decreases at lighter loads. The KD1083 also features an on-chip output current limit function and a thermal shutdown protection with hysteresis, preventing from excessive power dissipation in case of

#### SCHEMATIC DIAGRAM



insufficient heatsinking. The KD1083 is fully pin to pin compatible with the older 3-terminal adjustable regulators, but it has better performances in terms of drop and output voltage precision.

On chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 2\%$  at 25°C and 2% over the full temperature range. Unlike voltage regulators using a PNP transistor as series pass element in which a considerable fraction of the output current is wasted as quiescent current, the LD1083 quiescent current flows almost entirely into the load, improving the efficiency.

Only a 10 $\mu$ F minimum capacitor is required for output stability.

# KD1083

## ABSOLUTE MAXIMUM RATINGS

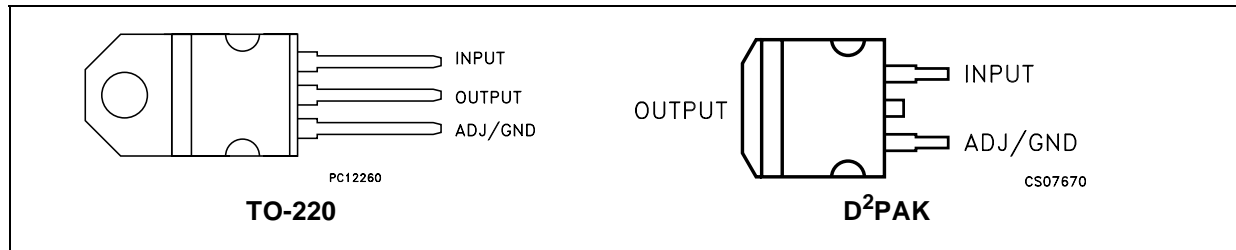
Symbol	Parameter	Value	Unit
$V_{IN}$	DC Input to Output Voltage	from -0.3 to 10	V
$I_O$	Output Current	Internally Limited	A
$P_D$	Power Dissipation	Internally Limited	W
$T_{stg}$	Storage Temperature Range	-55 to +150	°C
$T_{op}$	Operating Junction Temperature Range	-40 to +125	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

## THERMAL DATA

Symbol	Parameter	TO-220	D <sup>2</sup> PAK	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	3	3	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	50	62.5	°C/W

## CONNECTION DIAGRAM (top view)

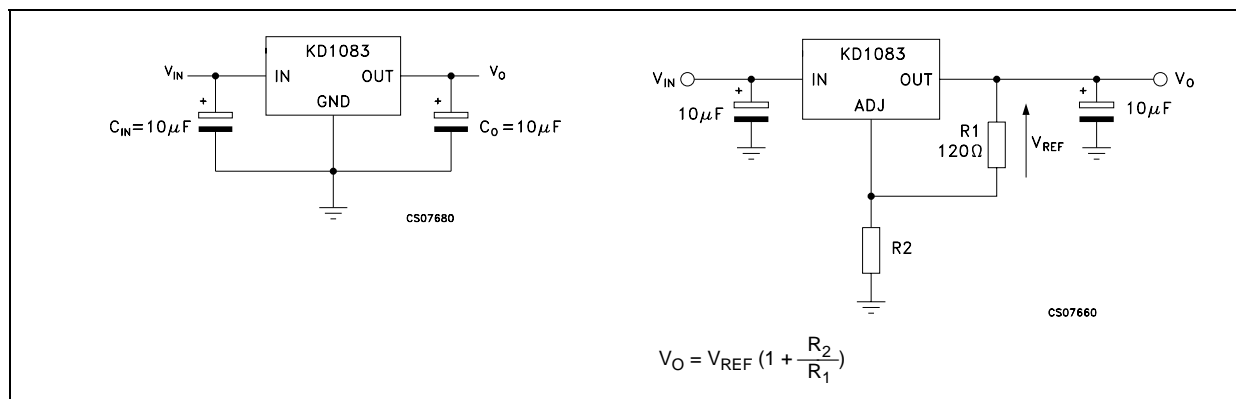


## ORDERING CODES

TO-220	D <sup>2</sup> PAK(*)	OUTPUT VOLTAGE
KD1083V15	KD1083D2T15	1.5V
KD1083V18	KD1083D2T18	1.8V
KD1083V25	KD1083D2T25	2.5V
KD1083V30	KD1083D2T30	3.0V
KD1083V33	KD1083D2T33	3.3V
KD1083V	KD1083D2T	Adjustable

(\*) Available in Tape & Reel with the suffix "R" for fixed version and "-R" for adjustable version.

## TYPICAL APPLICATION CIRCUITS



**ELECTRICAL CHARACTERISTICS OF KD1083** ( $V_{IN}=3V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{REF}$	Reference Voltage	$I_O=10mA$ , $(V_{IN}-V_O) = 3V$ , $T_j = 25^\circ C$	1.237	1.25	1.262	V
		$I_O = 0.01$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $5.75V$ (note1)	1.225	1.25	1.275	V
$\Delta V_{REF}$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $5.75V$		0.015	0.2	%
$\Delta V_{REF}$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 10mA$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $5.75V$		8.5		A
$I_{O(min)}$	Minimum Load Current	$(V_{IN}-V_O) = 1.5$ to $5.75V$		5	10	mA
$I_{ADJ}$	Adjust Pin Current	$I_O = 10mA$ to $7.5A$		40	80	$\mu A$
$\Delta I_{ADJ}$	Adjust Pin Current Change	$I_O = 10mA$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $5.75V$		0.2	5	$\mu A$
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O)=3V$ , $V_{PP}=1V$	60	75		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f = 10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O) = 3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF KD1083#15** ( $V_{IN}=3.25V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$I_O=10mA$ , $(V_{IN}-V_O)=3V$ , $T_j = 25^\circ C$	1.485	1.5	1.515	V
		$I_O = 0$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $5.5V$ (note1)	1.47	1.5	1.53	V
$\Delta V_O$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $5.5V$		0.015	0.2	%
$\Delta V_O$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 0$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $5.5V$		8.5		A
$I_d$	Quiescent Current	$(V_{IN}-V_O) = 1.5$ to $5.5V$ , $I_O=0A$		5	10	mA
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O) = 3V$ , $V_{PP}=1V$	58.6	73.4		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f = 10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O)=3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

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**ELECTRICAL CHARACTERISTICS OF KD1083#18**( $V_{IN}=3.5V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$I_O=10mA$ , $(V_{IN}-V_O)=3V$ , $T_j = 25^\circ C$	1.782	1.8	1.818	V
		$I_O = 0$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $5.2V$ (note1)	1.764	1.8	1.836	V
$\Delta V_O$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $5.2V$		0.015	0.2	%
$\Delta V_O$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 0$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $5.2V$		8.5		A
$I_d$	Quiescent Current	$(V_{IN}-V_O) = 1.5$ to $5.2V$ , $I_O=0A$		5	10	mA
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O) = 3V$ , $V_{PP}=1V$	57	71.8		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f = 10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O)=3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF KD1083#25** ( $V_{IN}=4.25V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$I_O=10mA$ , $(V_{IN}-V_O)=3V$ , $T_j = 25^\circ C$	2.475	2.5	2.525	V
		$I_O = 0$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $4.5V$ (note 1)	2.45	2.5	2.55	V
$\Delta V_O$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $4.5V$		0.015	0.2	%
$\Delta V_O$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 0$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $4.5V$		8.5		A
$I_d$	Quiescent Current	$(V_{IN}-V_O) = 1.5$ to $4.5V$ , $I_O=0A$		5	10	mA
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O) = 3V$ , $V_{PP}=1V$	54.1	68.9		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f = 10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O)=3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF KD1083#30** ( $V_{IN}=4.75V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$I_O=10mA$ , $(V_{IN}-V_O)=3V$ , $T_j = 25^\circ C$	2.97	3.0	3.03	V
		$I_O = 0$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $4V$ (note 1)	2.94	3	3.06	V
$\Delta V_O$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $4V$		0.015	0.2	%
$\Delta V_O$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 0$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $4V$		8.5		A
$I_d$	Quiescent Current	$(V_{IN}-V_O) = 1.5$ to $4V$ , $I_O=0A$		5	10	mA
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O) = 3V$ , $V_{PP}=1V$	52.5	67.3		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f=10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O)=3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

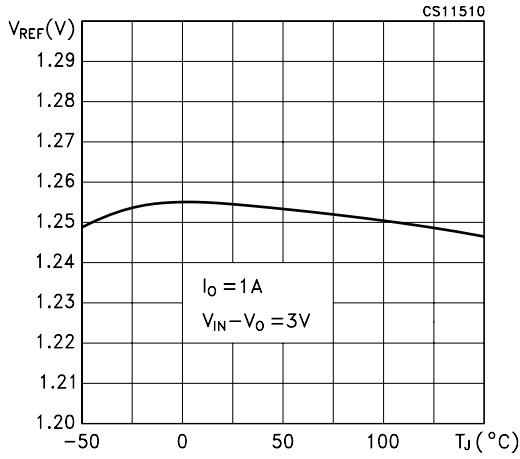
**ELECTRICAL CHARACTERISTICS OF KD1083#33** ( $V_{IN}=5.0V$ ,  $C_I = C_O = 10\mu F$ ,  $T_j = -40$  to  $125^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$I_O=10mA$ , $(V_{IN}-V_O)=3V$ , $T_j = 25^\circ C$	3.267	3.3	3.333	V
		$I_O = 0$ to $7.5A$ , $(V_{IN}-V_O) = 1.5$ to $3.7V$ (note 1)	3.234	3.3	3.366	V
$\Delta V_O$	Line Regulation	$I_O=10mA$ , $(V_{IN}-V_O) = 1.5$ to $3.7V$		0.015	0.2	%
$\Delta V_O$	Load Regulation	$(V_{IN}-V_O)=3V$ , $I_O = 0$ to $7.5A$		0.3	0.5	%
$V_d$	Dropout Voltage	$\Delta V_O=2\%$ , $I_O=7.5A$		1.05	1.4	V
$I_{sc}$	Short Circuit Current	$(V_{IN}-V_O) = 1.5$ to $3.7V$		8.5		A
$I_d$	Quiescent Current	$(V_{IN}-V_O) = 1.5$ to $3.7V$ , $I_O=0A$		5	10	mA
SVR	Supply Voltage Rejection	$f = 120$ Hz, $C_O = 25 \mu F$ , $I_O = 7.5A$ , $(V_{IN}-V_O) = 3V$ , $V_{PP}=1V$	51.7	66.5		dB
eN	RMS Output Noise Voltage (% of $V_O$ )	$T_A = 25^\circ C$ , $f=10Hz$ to $10kHz$ , $I_O=10mA$ , $(V_{IN}-V_O)=3V$		0.003		%
$T_{SHDN}$	Thermal Shutdown Threshold			175		$^\circ C$
$T_{HYST}$	Thermal Shutdown Hysteresis			5		$^\circ C$

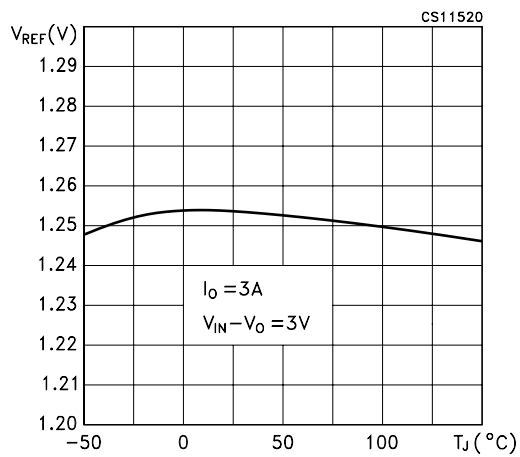
NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**TYPICAL CHARACTERISTICS** ( $C_I=C_O=10\mu\text{F}$ (tantalum), unless otherwise specified)

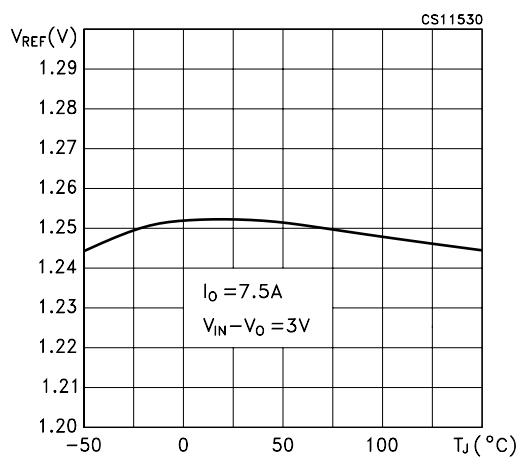
**Figure 1 : Reference Voltage vs Temperature**



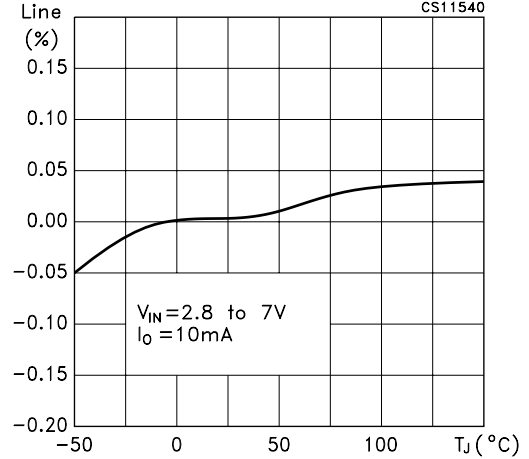
**Figure 2 : Reference Voltage vs Temperature**



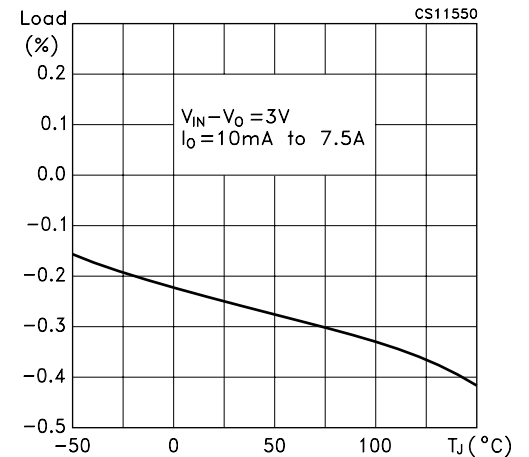
**Figure 3 : Reference Voltage vs Temperature**



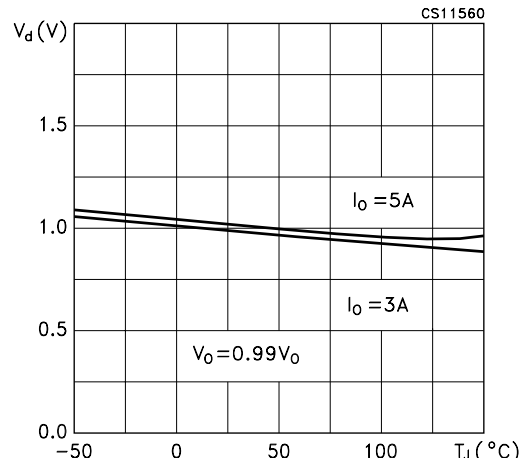
**Figure 4 : Line Regulation vs Temperature**



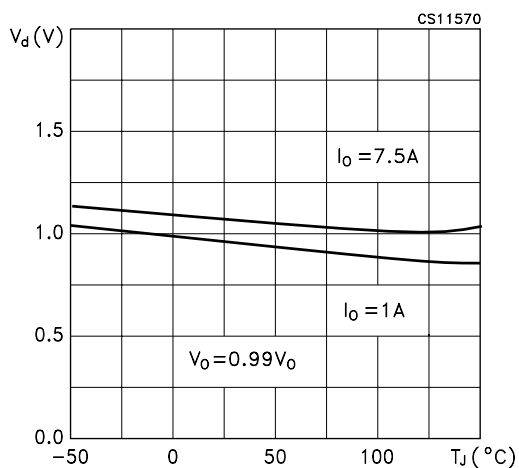
**Figure 5 : Load Regulation vs Temperature**



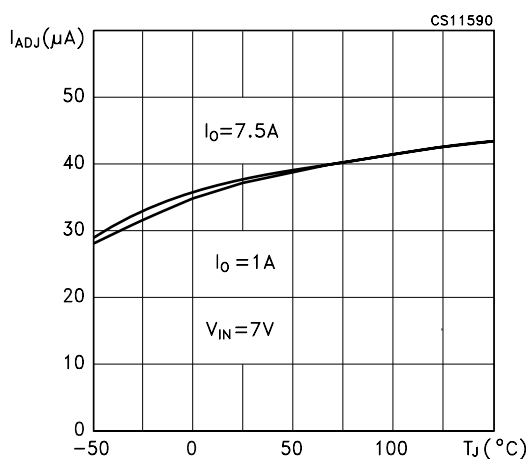
**Figure 6 : Dropout Voltage vs Temperature**



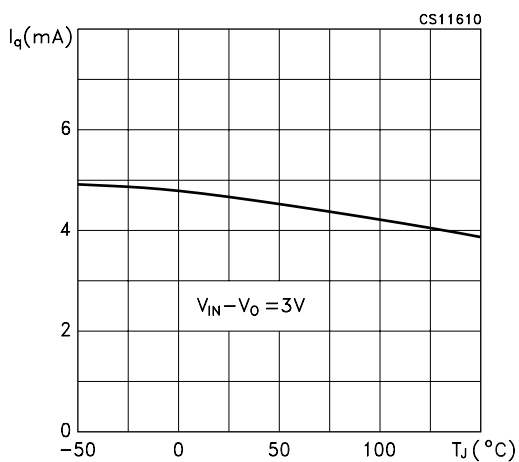
**Figure 7 : Dropout Voltage vs Temperature**



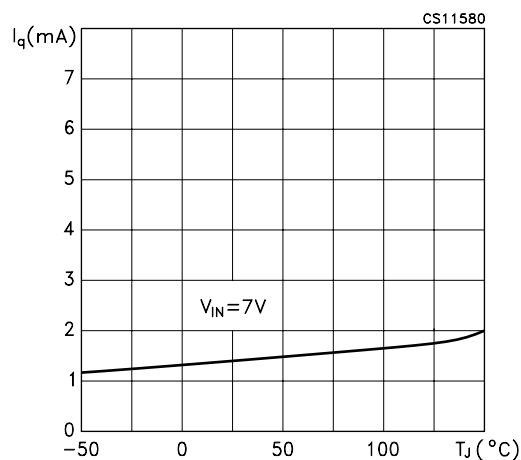
**Figure 8 : Adjust Pin Current vs Temperature**



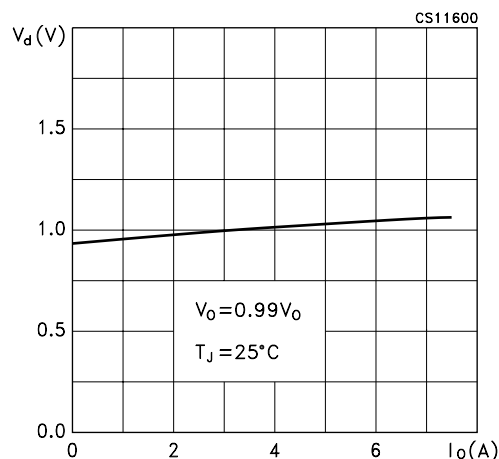
**Figure 9 : Quiescent Current vs Temperature**



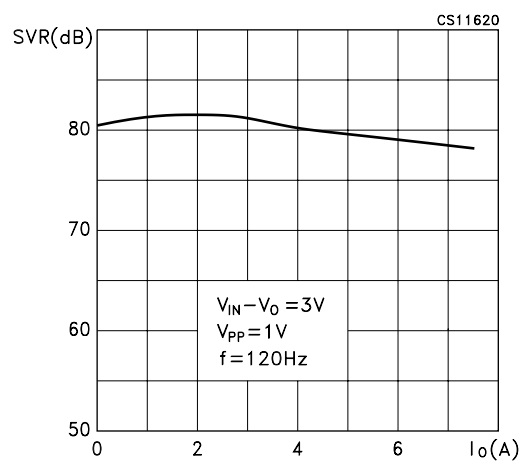
**Figure 10 : Minimum Load Current vs Temperature**



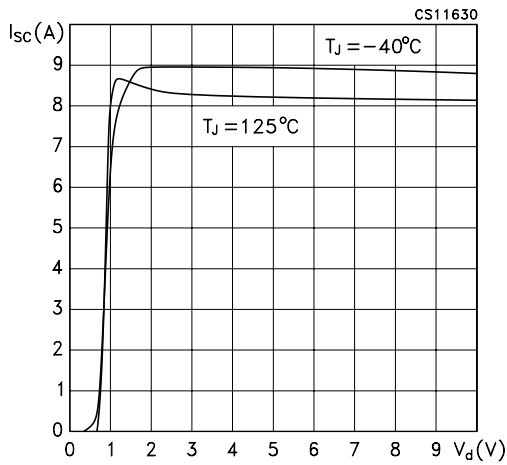
**Figure 11 : Dropout Voltage vs Output Current**



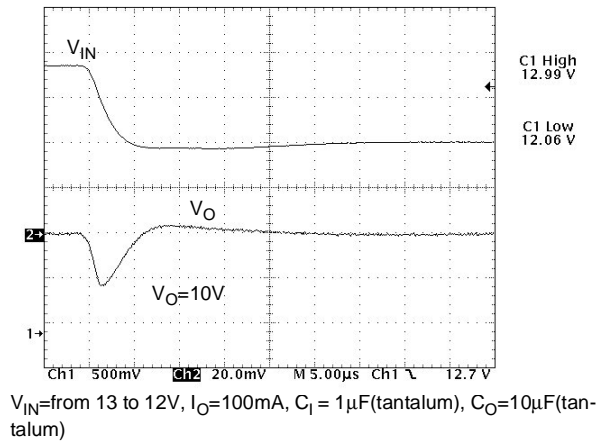
**Figure 12 : Supply Voltage Rejection vs Output Current**



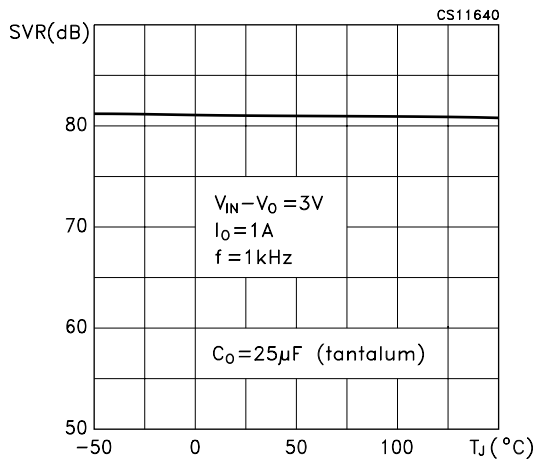
**Figure 13 : Short Circuit Current vs Dropout Voltage**



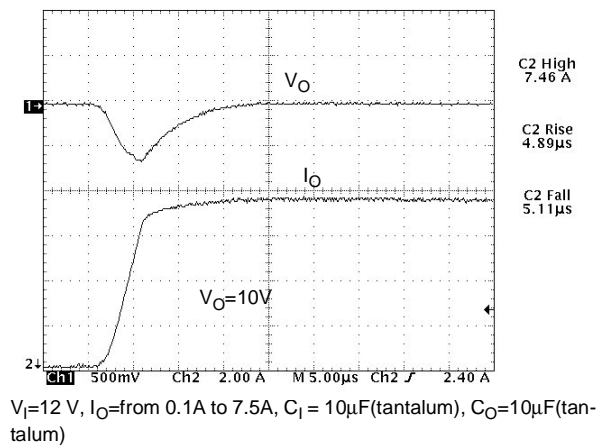
**Figure 16 : Line Transient**



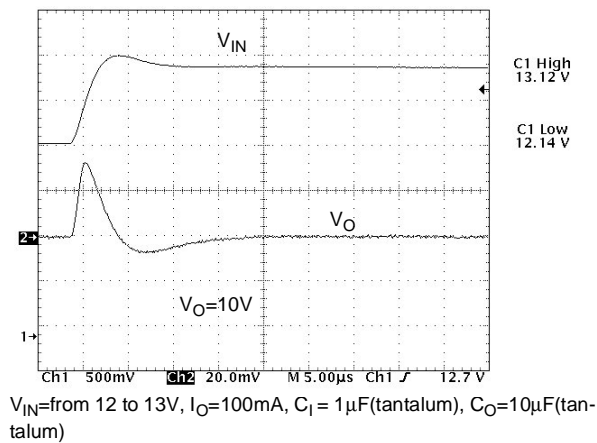
**Figure 14 : Supply Voltage Rejection vs Temperature**



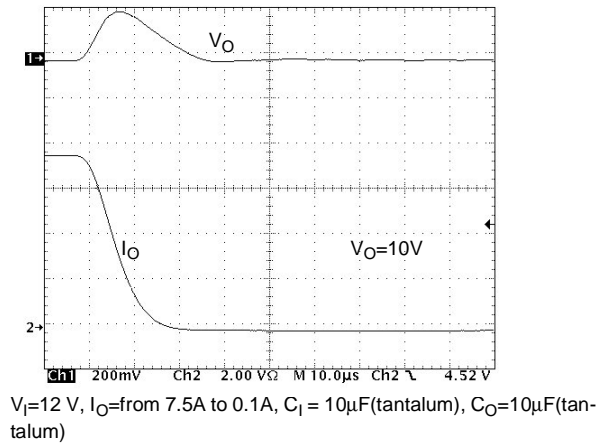
**Figure 17 : Load Transient**



**Figure 15 : Line Transient**



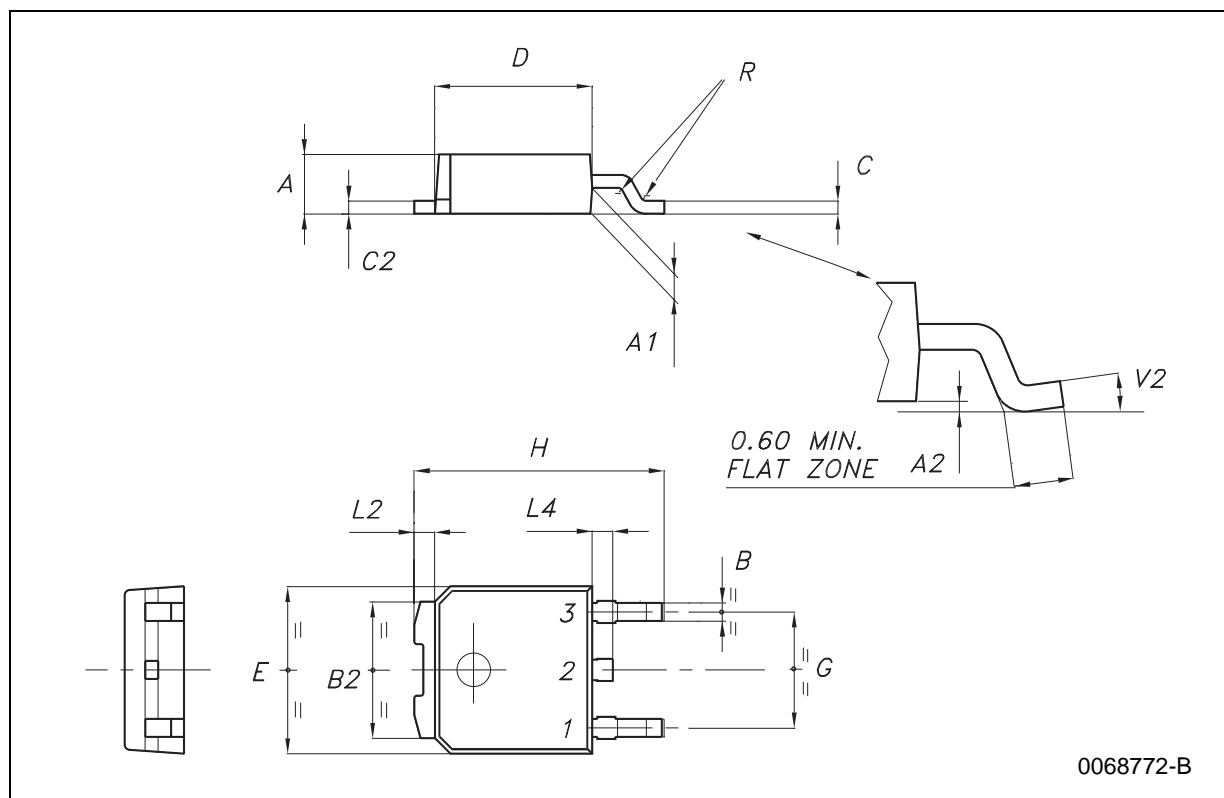
**Figure 18 : Load Transient**





**DPAK MECHANICAL DATA**

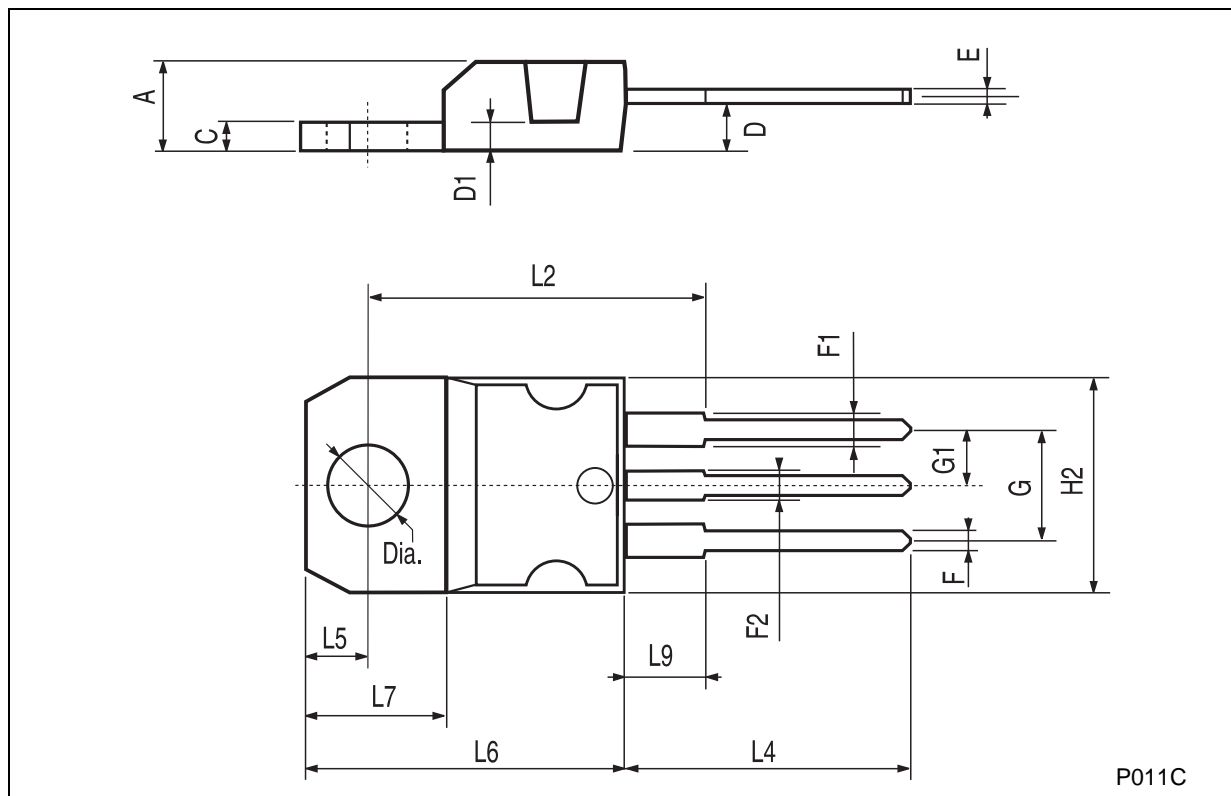
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



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**TO-220 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

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