



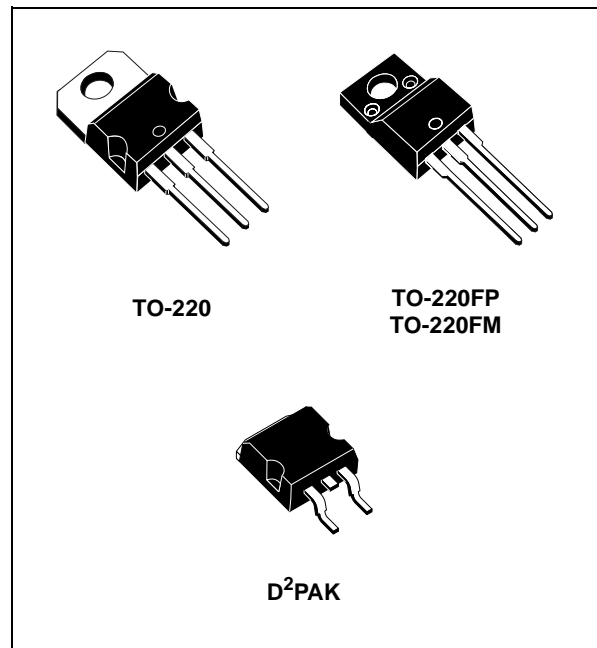
# L7800AB/AC SERIES

## PRECISION 1A REGULATORS

- OUTPUT CURRENT IN EXCESS OF 1A
- OUTPUT VOLTAGES OF 5; 6; 8; 9; 12; 15; 18; 20; 24V
- THERMAL OVERLOAD PROTECTION
- OUTPUT TRANSITION SOA PROTECTION
- 2% OUTPUT VOLTAGE TOLERANCE
- GUARANTEED IN EXTENDED TEMPERATURE RANGE

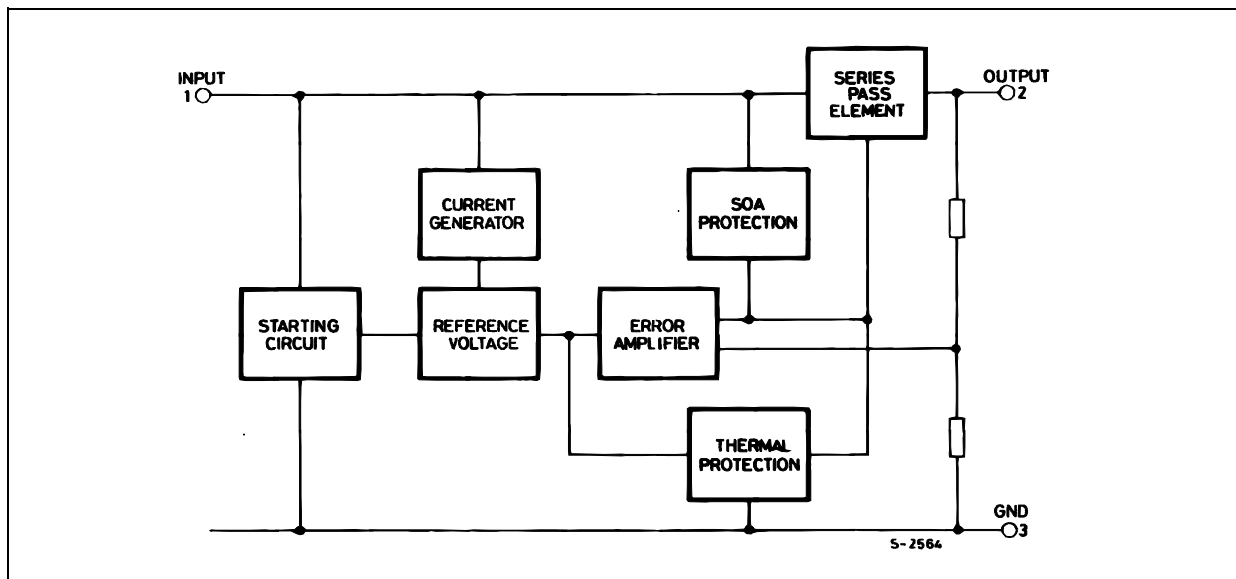
### DESCRIPTION

The L7800A series of three terminal positive regulators is available in TO-220, TO-220FP, TO-220FM and D<sup>2</sup>PAK packages and several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problem associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these



devices can be used with external components to obtain adjustable voltage and currents.

### SCHEMATIC DIAGRAM



# L7800AB/AC SERIES

## ABSOLUTE MAXIMUM RATINGS

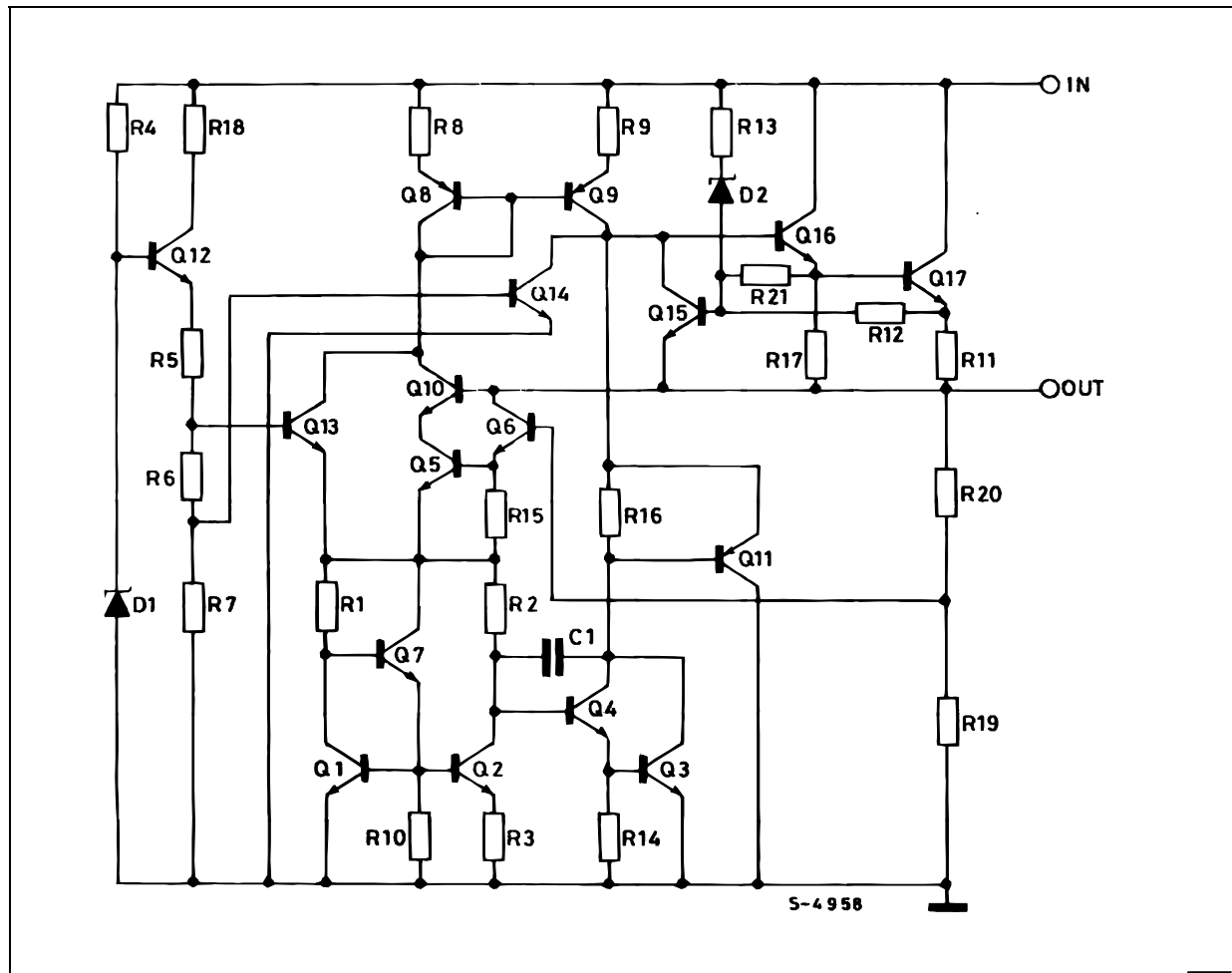
Symbol	Parameter	Value	Unit
$V_I$	DC Input Voltage (for $V_O= 5$ to $18V$ ) (for $V_O= 20, 24V$ )	35 40	V V
$I_O$	Output Current	Internally Limited	mA
$P_D$	Power Dissipation	Internally Limited	mW
$T_{stg}$	Storage Temperature Range	-65 to +150	°C
$T_{op}$	Operating Junction Temperature Range (for <b>L7800AC</b> ) (for <b>L7800AB</b> )	0 to +150 -40 to +125	°C °C

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

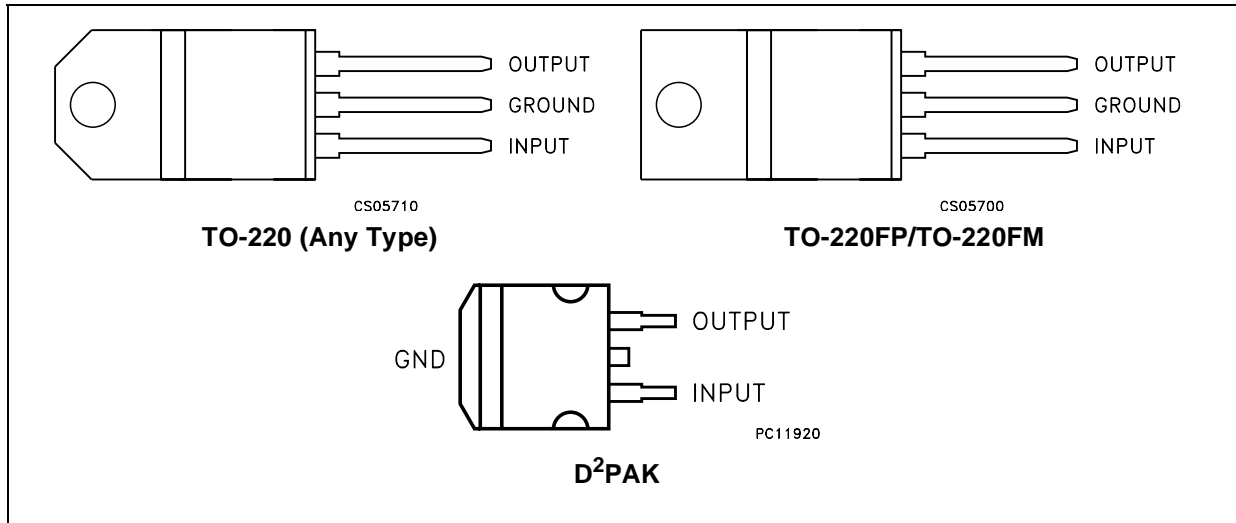
## THERMAL DATA

Symbol	Parameter	TO-220	TO-220FP	TO-220FM	D <sup>2</sup> PAK	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	3	5	5	3	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	50	60	60	62.5	°C/W

## SHEMATIC DIAGRAM



CONNECTION DIAGRAM (top view)

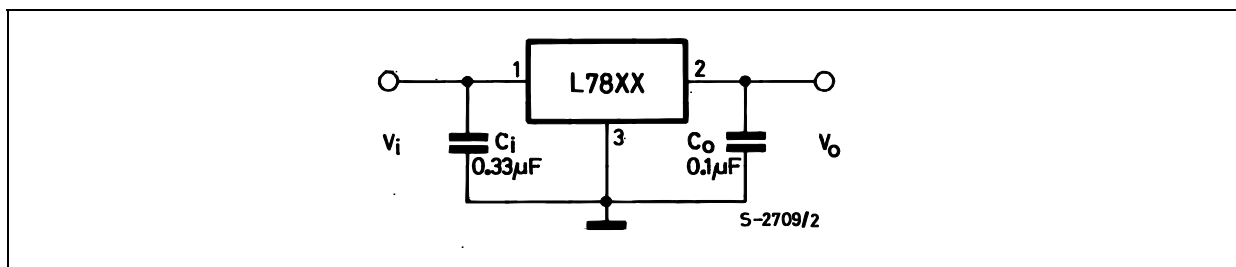


ORDERING CODES

TYPE	TO-220	TO-220FP	TO-220FM	D <sup>2</sup> PAK (A Type) (*)	D <sup>2</sup> PAK (C Type) (T & R)	OUTPUT VOLTAGE
L7805AB	L7805ABV	L7805ABP	L7805ABF	L7805ABD2T		5 V
L7805AC	L7805ACV	L7805ACP	L7805ACF	L7805ACD2T	L7805AC-D2TR	5 V
L7806AB	L7806ABV	L7806ABP	L7806ABF	L7806ABD2T		6 V
L7806AC	L7806ACV	L7806ACP	L7806ACF	L7806ACD2T		6 V
L7808AB	L7808ABV	L7808ABP	L7808ABF	L7808ABD2T		8 V
L7808AC	L7808ACV	L7808ACP	L7808ACF	L7808ACD2T		8 V
L7809AB	L7809ABV	L7809ABP	L7809ABF	L7809ABD2T		9 V
L7809AC	L7809ACV	L7809ACP	L7809ACF	L7809ACD2T		9 V
L7812AB	L7812ABV	L7812ABP	L7812ABF	L7812ABD2T		12 V
L7812AC	L7812ACV	L7812ACP	L7812ACF	L7812ACD2T		12 V
L7815AB	L7815ABV	L7815ABP	L7815ABF	L7815ABD2T		15 V
L7815AC	L7815ACV	L7815ACP	L7815ACF	L7815ACD2T		15 V
L7818AB	L7818ABV	L7818ABP	L7818ABF	L7818ABD2T		18 V
L7818AC	L7818ACV	L7818ACP	L7818ACF	L7818ACD2T		18 V
L7820AB	L7820ABV	L7820ABP	L7820ABF	L7820ABD2T		20 V
L7820AC	L7820ACV	L7820ACP	L7820ACF	L7820ACD2T		20 V
L7824AB	L7824ABV	L7824ABP	L7824ABF	L7824ABD2T		24 V
L7824AC	L7824ACV	L7824ACP	L7824ACF	L7824ACD2T		24 V

(\*) Available in Tape & Reel with the suffix "-TR".

APPLICATION CIRCUITS



# L7800AB/AC SERIES

## TEST CIRCUITS

Figure 1 : DC Parameter

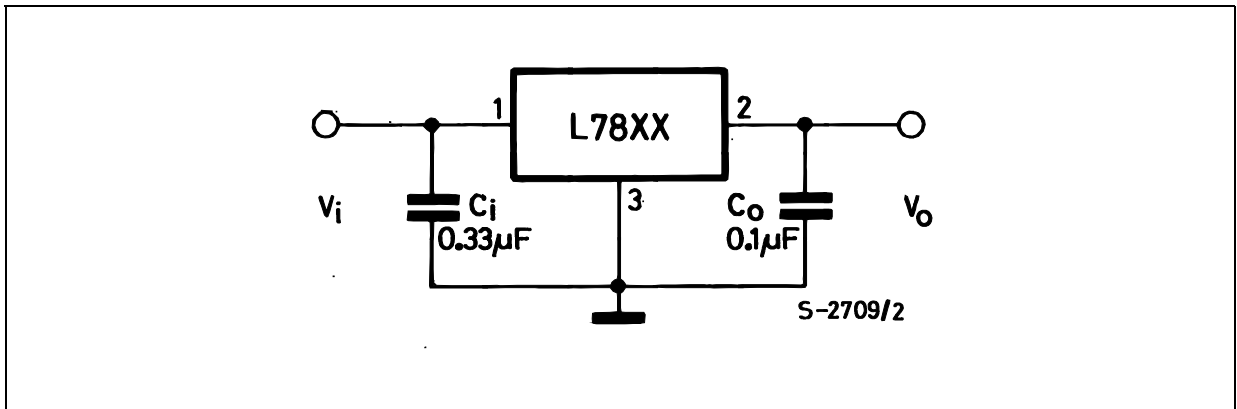


Figure 2 : Load Regulation

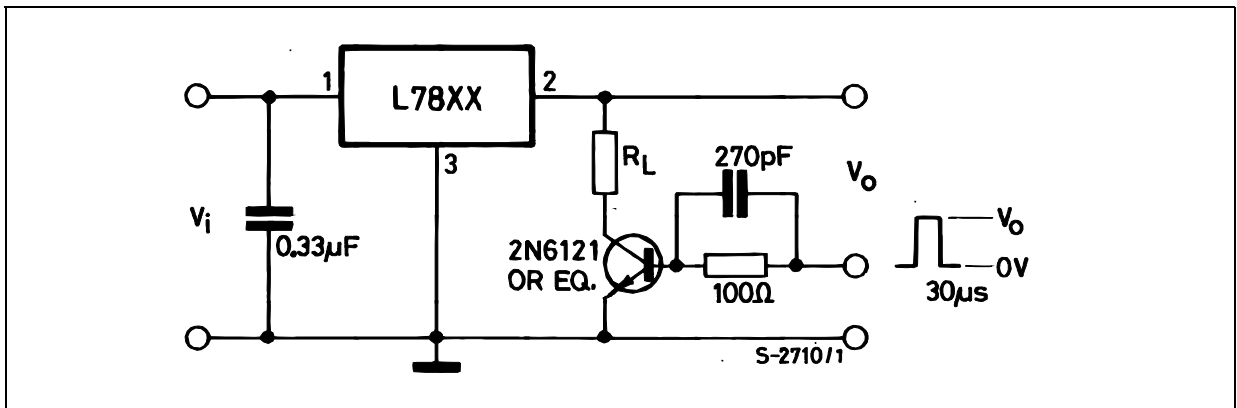
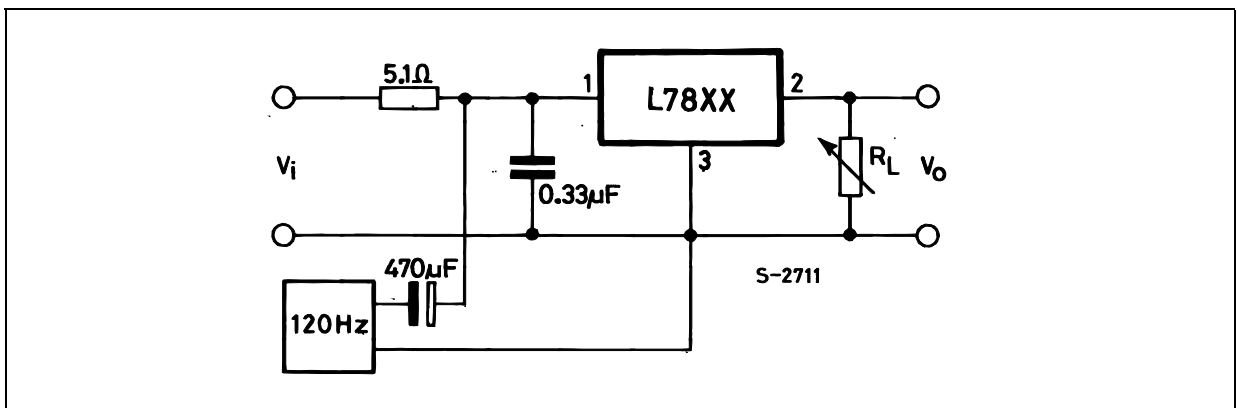


Figure 3 : Ripple Rejection



**ELECTRICAL CHARACTERISTICS OF L7805A** ( $V_I=10V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^{\circ}C$  (L7805AC),  $T_J = -40$  to  $125^{\circ}C$  (L7805AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^{\circ}C$	4.9	5	5.1	V
$V_O$	Output Voltage	$I_O = 5mA$ to $1A$ $P_O \leq 15W$ $V_I = 7.5$ to $20V$	4.8	5	5.2	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 7.5$ to $25V$ $I_O = 500$ mA		7	50	mV
		$V_I = 8$ to $12V$		10	50	mV
		$V_I = 8$ to $12V$ $T_J = 25^{\circ}C$		2	25	mV
		$V_I = 7.3$ to $20V$ $T_J = 25^{\circ}C$		7	50	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5mA$ to $1A$		25	100	mV
		$I_O = 5mA$ to $1.5A$ $T_J = 25^{\circ}C$		30	100	V
		$I_O = 250$ to $750mA$		8	50	V
$I_q$	Quiescent Current	$T_J = 25^{\circ}C$		4.3	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 8$ to $25V$ $I_O = 500$ mA			0.8	mA
		$V_I = 7.5$ to $20V$ $T_J = 25^{\circ}C$			0.8	mA
		$I_O = 5mA$ to $1A$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 8$ to $18V$ $f = 120Hz$ $I_O = 500mA$		68		dB
$V_d$	Dropout Voltage	$I_O = 1A$ $T_J = 25^{\circ}C$		2		V
eN	Output Noise Voltage	$T_A = 25^{\circ}C$ $B = 10Hz$ to $100KHz$		10		$\mu V/V_O$
$R_O$	Output Resistance	$f = 1KHz$		17		$m\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35V$ $T_A = 25^{\circ}C$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^{\circ}C$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1.1		mv/ $^{\circ}C$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## L7800AB/AC SERIES

**ELECTRICAL CHARACTERISTICS OF L7806A** ( $V_I=11V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ C$  (L7806AC),  $T_J = -40$  to  $125^\circ C$  (L7806AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ C$	5.88	6	6.12	V
$V_O$	Output Voltage	$I_O = 5mA$ to $1A$ $P_O \leq 15W$ $V_I = 8.6$ to $21V$	5.76	6	6.24	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 8.6$ to $25V$ $I_O = 500$ mA		9	60	mV
		$V_I = 9$ to $13V$		11	60	mV
		$V_I = 9$ to $13V$ $T_J = 25^\circ C$		3	30	mV
		$V_I = 8.3$ to $21V$ $T_J = 25^\circ C$		9	60	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5mA$ to $1A$		25	100	mV
		$I_O = 5mA$ to $1.5A$ $T_J = 25^\circ C$		30	100	V
		$I_O = 250$ to $750mA$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ C$		4.3	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 9$ to $25V$ $I_O = 500$ mA			0.8	mA
		$V_I = 8.6$ to $21V$ $T_J = 25^\circ C$			0.8	mA
		$I_O = 5mA$ to $1A$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 9$ to $19V$ $f = 120Hz$ $I_O = 500mA$		65		dB
$V_d$	Dropout Voltage	$I_O = 1A$ $T_J = 25^\circ C$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ C$ $B = 10Hz$ to $100KHz$		10		$\mu V/V_O$
$R_O$	Output Resistance	$f = 1KHz$		17		m $\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35V$ $T_A = 25^\circ C$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ C$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-0.8		mV/ $^\circ C$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

**ELECTRICAL CHARACTERISTICS OF L7808A** ( $V_I=14V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ\text{C}$  (L7808AC),  $T_J = -40$  to  $125^\circ\text{C}$  (L7808AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ\text{C}$	7.84	8	8.16	V
$V_O$	Output Voltage	$I_O = 5\text{mA to } 1\text{A}$ $P_O \leq 15\text{W}$ $V_I = 10.6$ to $23\text{V}$	7.7	8	8.3	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 10.6$ to $25\text{V}$ $I_O = 500\text{ mA}$		12	80	mV
		$V_I = 11$ to $17\text{V}$		15	80	mV
		$V_I = 11$ to $17\text{V}$ $T_J = 25^\circ\text{C}$		5	40	mV
		$V_I = 10.4$ to $23\text{V}$ $T_J = 25^\circ\text{C}$		12	80	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5\text{mA to } 1\text{A}$		25	100	mV
		$I_O = 5\text{mA to } 1.5\text{A}$ $T_J = 25^\circ\text{C}$		30	100	V
		$I_O = 250$ to $750\text{mA}$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ\text{C}$		4.3	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 11$ to $25\text{V}$ $I_O = 500\text{ mA}$			0.8	mA
		$V_I = 10.6$ to $23\text{V}$ $T_J = 25^\circ\text{C}$			0.8	mA
		$I_O = 5\text{mA to } 1\text{A}$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 11.5$ to $21.5\text{V}$ $f = 120\text{Hz}$ $I_O = 500\text{mA}$		62		dB
$V_d$	Dropout Voltage	$I_O = 1\text{A}$ $T_J = 25^\circ\text{C}$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ\text{C}$ $B = 10\text{Hz to } 100\text{KHz}$		10		$\mu\text{V}/V_O$
$R_O$	Output Resistance	$f = 1\text{KHz}$		18		$\text{m}\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35\text{V}$ $T_A = 25^\circ\text{C}$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ\text{C}$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-0.8		$\text{mV}/^\circ\text{C}$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## L7800AB/AC SERIES

**ELECTRICAL CHARACTERISTICS OF L7809A** ( $V_I=15V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ C$  (L7809AC),  $T_J = -40$  to  $125^\circ C$  (L7809AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ C$	8.82	9	9.18	V
$V_O$	Output Voltage	$I_O = 5mA$ to $1A$ $P_O \leq 15W$ $V_I = 10.6$ to $23V$	8.65	9	9.35	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 10.6$ to $25V$ $I_O = 500$ mA		12	90	mV
		$V_I = 11$ to $17V$		15	90	mV
		$V_I = 11$ to $17V$ $T_J = 25^\circ C$		5	45	mV
		$V_I = 10.4$ to $23V$ $T_J = 25^\circ C$		12	90	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5mA$ to $1A$		25	100	mV
		$I_O = 5mA$ to $1.5A$ $T_J = 25^\circ C$		30	100	V
		$I_O = 250$ to $750mA$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ C$		4.3	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 11$ to $25V$ $I_O = 500$ mA			0.8	mA
		$V_I = 10.6$ to $23V$ $T_J = 25^\circ C$			0.8	mA
		$I_O = 5mA$ to $1A$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 11.5$ to $21.5V$ $f = 120Hz$ $I_O = 500mA$		61		dB
$V_d$	Dropout Voltage	$I_O = 1A$ $T_J = 25^\circ C$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ C$ $B = 10Hz$ to $100KHz$		10		$\mu V/V_O$
$R_O$	Output Resistance	$f = 1KHz$		18		$m\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35V$ $T_A = 25^\circ C$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ C$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-0.8		$mV/^\circ C$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.



**ELECTRICAL CHARACTERISTICS OF L7812A** ( $V_I=19V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ\text{C}$  (L7812AC),  $T_J = -40$  to  $125^\circ\text{C}$  (L7812AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ\text{C}$	11.75	12	12.25	V
$V_O$	Output Voltage	$I_O = 5\text{mA to } 1\text{A}$ $P_O \leq 15\text{W}$ $V_I = 14.8$ to $27\text{V}$	11.5	12	12.5	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 14.8$ to $30\text{V}$ $I_O = 500\text{ mA}$		13	120	mV
		$V_I = 16$ to $22\text{V}$		16	120	mV
		$V_I = 16$ to $22\text{V}$ $T_J = 25^\circ\text{C}$		6	60	mV
		$V_I = 14.5$ to $27\text{V}$ $T_J = 25^\circ\text{C}$		13	120	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5\text{mA to } 1\text{A}$		25	100	mV
		$I_O = 5\text{mA to } 1.5\text{A}$ $T_J = 25^\circ\text{C}$		30	100	V
		$I_O = 250$ to $750\text{mA}$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ\text{C}$		4.4	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 15$ to $30\text{V}$ $I_O = 500\text{ mA}$			0.8	mA
		$V_I = 14.8$ to $27\text{V}$ $T_J = 25^\circ\text{C}$			0.8	mA
		$I_O = 5\text{mA to } 1\text{A}$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 15$ to $25\text{V}$ $f = 120\text{Hz}$ $I_O = 500\text{mA}$		60		dB
$V_d$	Dropout Voltage	$I_O = 1\text{A}$ $T_J = 25^\circ\text{C}$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ\text{C}$ $B = 10\text{Hz to } 100\text{KHz}$		10		$\mu\text{V}/V_O$
$R_O$	Output Resistance	$f = 1\text{KHz}$		18		$\text{m}\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35\text{V}$ $T_A = 25^\circ\text{C}$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ\text{C}$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1		$\text{mV}/^\circ\text{C}$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## L7800AB/AC SERIES

**ELECTRICAL CHARACTERISTICS OF L7815A** ( $V_I=23V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ\text{C}$  (L7815AC),  $T_J = -40$  to  $125^\circ\text{C}$  (L7815AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ\text{C}$	14.7	15	15.3	V
$V_O$	Output Voltage	$I_O = 5\text{mA to } 1\text{A}$ $P_O \leq 15\text{W}$ $V_I = 17.9$ to $30\text{V}$	14.4	15	15.6	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 17.9$ to $30\text{V}$ $I_O = 500\text{ mA}$		13	150	mV
		$V_I = 20$ to $26\text{V}$		16	150	mV
		$V_I = 20$ to $26\text{V}$ $T_J = 25^\circ\text{C}$		6	75	mV
		$V_I = 17.5$ to $30\text{V}$ $T_J = 25^\circ\text{C}$		13	150	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5\text{mA to } 1\text{A}$		25	100	mV
		$I_O = 5\text{mA to } 1.5\text{A}$ $T_J = 25^\circ\text{C}$		30	100	V
		$I_O = 250$ to $750\text{mA}$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ\text{C}$		4.4	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 17.5$ to $30\text{V}$ $I_O = 500\text{ mA}$			0.8	mA
		$V_I = 17.5$ to $30\text{V}$ $T_J = 25^\circ\text{C}$			0.8	mA
		$I_O = 5\text{mA to } 1\text{A}$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 18.5$ to $28.5\text{V}$ $f = 120\text{Hz}$ $I_O = 500\text{mA}$		58		dB
$V_d$	Dropout Voltage	$I_O = 1\text{A}$ $T_J = 25^\circ\text{C}$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ\text{C}$ $B = 10\text{Hz to } 100\text{KHz}$		10		$\mu\text{V}/V_O$
$R_O$	Output Resistance	$f = 1\text{KHz}$		19		$\text{m}\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35\text{V}$ $T_A = 25^\circ\text{C}$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ\text{C}$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1		$\text{mV}/^\circ\text{C}$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

**ELECTRICAL CHARACTERISTICS OF L7818A** ( $V_I=27V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ\text{C}$  (L7818AC),  $T_J = -40$  to  $125^\circ\text{C}$  (L7818AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ\text{C}$	17.64	18	18.36	V
$V_O$	Output Voltage	$I_O = 5\text{mA to } 1\text{A}$ $P_O \leq 15\text{W}$ $V_I = 21$ to $33\text{V}$	17.3	18	18.7	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 21$ to $33\text{V}$ $I_O = 500\text{ mA}$		25	180	mV
		$V_I = 24$ to $30\text{V}$		28	180	mV
		$V_I = 24$ to $30\text{V}$ $T_J = 25^\circ\text{C}$		10	90	mV
		$V_I = 20.6$ to $33\text{V}$ $T_J = 25^\circ\text{C}$		5	180	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5\text{mA to } 1\text{A}$		25	100	mV
		$I_O = 5\text{mA to } 1.5\text{A}$ $T_J = 25^\circ\text{C}$		30	100	V
		$I_O = 250$ to $750\text{mA}$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ\text{C}$		4.5	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 21$ to $33\text{V}$ $I_O = 500\text{ mA}$			0.8	mA
		$V_I = 21$ to $33\text{V}$ $T_J = 25^\circ\text{C}$			0.8	mA
		$I_O = 5\text{mA to } 1\text{A}$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 22$ to $32\text{V}$ $f = 120\text{Hz}$ $I_O = 500\text{mA}$		57		dB
$V_d$	Dropout Voltage	$I_O = 1\text{ A}$ $T_J = 25^\circ\text{C}$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ\text{C}$ $B = 10\text{Hz to } 100\text{KHz}$		10		$\mu\text{V}/V_O$
$R_O$	Output Resistance	$f = 1\text{KHz}$		19		$\text{m}\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35\text{V}$ $T_A = 25^\circ\text{C}$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ\text{C}$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1		$\text{mV}/^\circ\text{C}$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## L7800AB/AC SERIES

**ELECTRICAL CHARACTERISTICS OF L7820A** ( $V_I=28V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ C$  (L7820AC),  $T_J = -40$  to  $125^\circ C$  (L7820AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ C$	19.6	20	20.4	V
$V_O$	Output Voltage	$I_O = 5mA$ to $1A$ $P_O \leq 15W$ $V_I = 23$ to $35V$	19.2	20	20.8	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 23$ to $35V$ $I_O = 500$ mA			200	mV
		$V_I = 26$ to $32V$			200	mV
		$V_I = 26$ to $32V$ $T_J = 25^\circ C$			100	mV
		$V_I = 23$ to $32V$ $T_J = 25^\circ C$			200	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5mA$ to $1A$		25	100	mV
		$I_O = 5mA$ to $1.5A$ $T_J = 25^\circ C$		30	100	V
		$I_O = 250$ to $750mA$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ C$		4.5	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 23$ to $35V$ $I_O = 500$ mA			0.8	mA
		$V_I = 23$ to $35V$ $T_J = 25^\circ C$			0.8	mA
		$I_O = 5mA$ to $1A$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 24$ to $35V$ $f = 120Hz$ $I_O = 500mA$		56		dB
$V_d$	Dropout Voltage	$I_O = 1$ A $T_J = 25^\circ C$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ C$ $B = 10Hz$ to $100KHz$		10		$\mu V/V_O$
$R_O$	Output Resistance	$f = 1KHz$		20		m $\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35V$ $T_A = 25^\circ C$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ C$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1		mV/ $^\circ C$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

**ELECTRICAL CHARACTERISTICS OF L7824A** ( $V_I=33V$ ,  $I_O=1A$ ,  $T_J = 0$  to  $150^\circ C$  (L7824AC),  $T_J = -40$  to  $125^\circ C$  (L7824AB), unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^\circ C$	23.5	24	24.5	V
$V_O$	Output Voltage	$I_O = 5mA$ to $1A$ $P_O \leq 15W$ $V_I = 27.3$ to $38V$	23	24	25	V
$\Delta V_O$ (*)	Line Regulation	$V_I = 27$ to $38V$ $I_O = 500$ mA		31	240	mV
		$V_I = 30$ to $36V$		35	240	mV
		$V_I = 30$ to $36V$ $T_J = 25^\circ C$		14	120	mV
		$V_I = 26.7$ to $38V$ $T_J = 25^\circ C$		31	240	mV
$\Delta V_O$ (*)	Load Regulation	$I_O = 5mA$ to $1A$		25	100	mV
		$I_O = 5mA$ to $1.5A$ $T_J = 25^\circ C$		30	100	V
		$I_O = 250$ to $750mA$		10	50	V
$I_q$	Quiescent Current	$T_J = 25^\circ C$		4.6	6	mA
					6	mA
$\Delta I_q$	Quiescent Current Change	$V_I = 27.3$ to $38V$ $I_O = 500$ mA			0.8	mA
		$V_I = 27.3$ to $38V$ $T_J = 25^\circ C$			0.8	mA
		$I_O = 5mA$ to $1A$			0.5	mA
SVR	Supply Voltage Rejection	$V_I = 28$ to $38V$ $f = 120Hz$ $I_O = 500mA$		54		dB
$V_d$	Dropout Voltage	$I_O = 1$ A $T_J = 25^\circ C$		2		V
eN	Output Noise Voltage	$T_A = 25^\circ C$ $B = 10Hz$ to $100KHz$		10		$\mu V/V_O$
$R_O$	Output Resistance	$f = 1KHz$		20		m $\Omega$
$I_{sc}$	Short Circuit Current	$V_I = 35V$ $T_A = 25^\circ C$		0.2		A
$I_{scp}$	Short Circuit Peak Current	$T_J = 25^\circ C$		2.2		A
$\Delta V_O/\Delta T$	Output Voltage Drift			-1.5		mV/ $^\circ C$

(\*) Load and Line Regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

APPLICATION INFORMATION

DESIGN CONSIDERATION

The L7800A Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short-circuit Protection that limits the maximum current the circuit will pass, and Output transistor Safe-Area Compensation that reduces the output short-circuit current as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with capacitor if the regulator is connected to the power supply filter with long lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33mF or larger tantalum, mylar or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtained with the arrangement is 2V greater than the regulator voltage.

The circuit of figure 6 can be modified to provide supply protection against short circuit by adding a short circuit sense resistor, R<sub>sc</sub>, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three terminal regulator Therefore a four ampere plastic power transistor is specified.

Figure 4 : DC Parameter

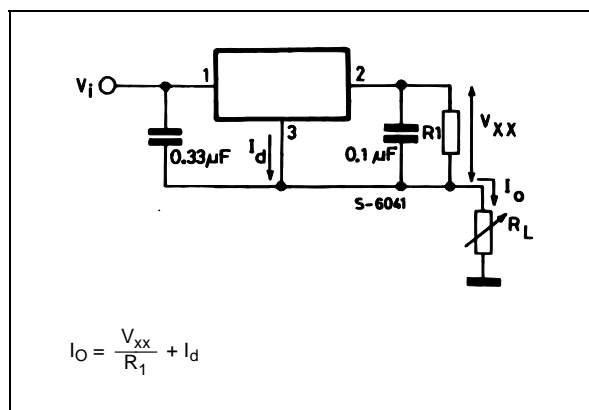


Figure 5 : DC Parameter

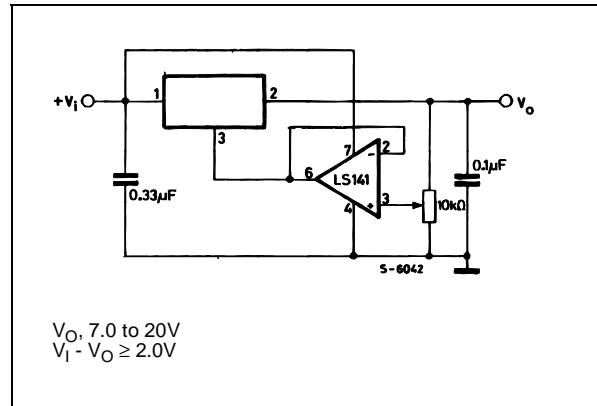


Figure 6 : DC Parameter

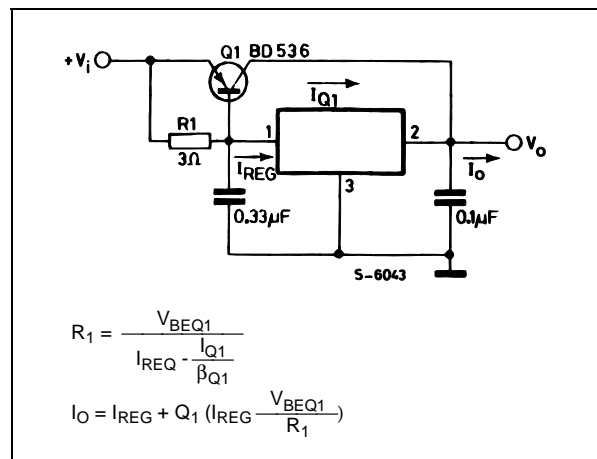
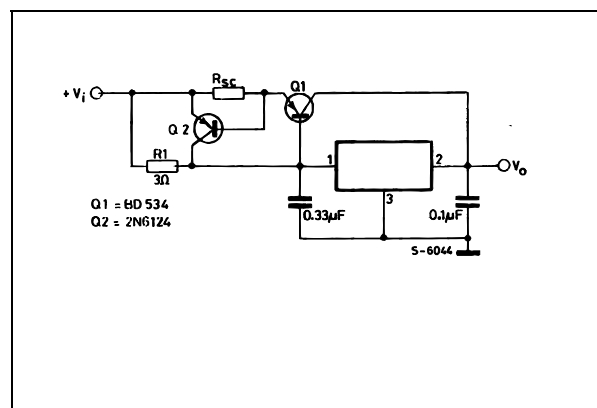
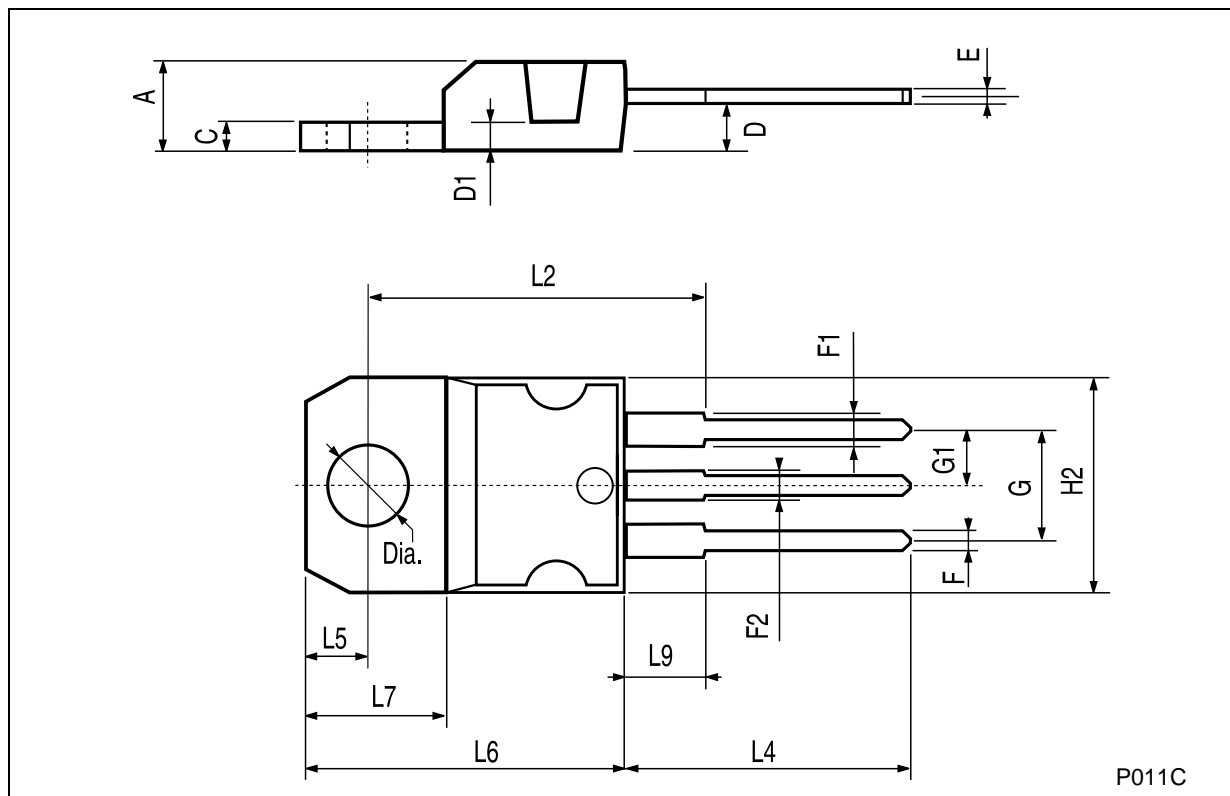


Figure 7 : DC Parameter



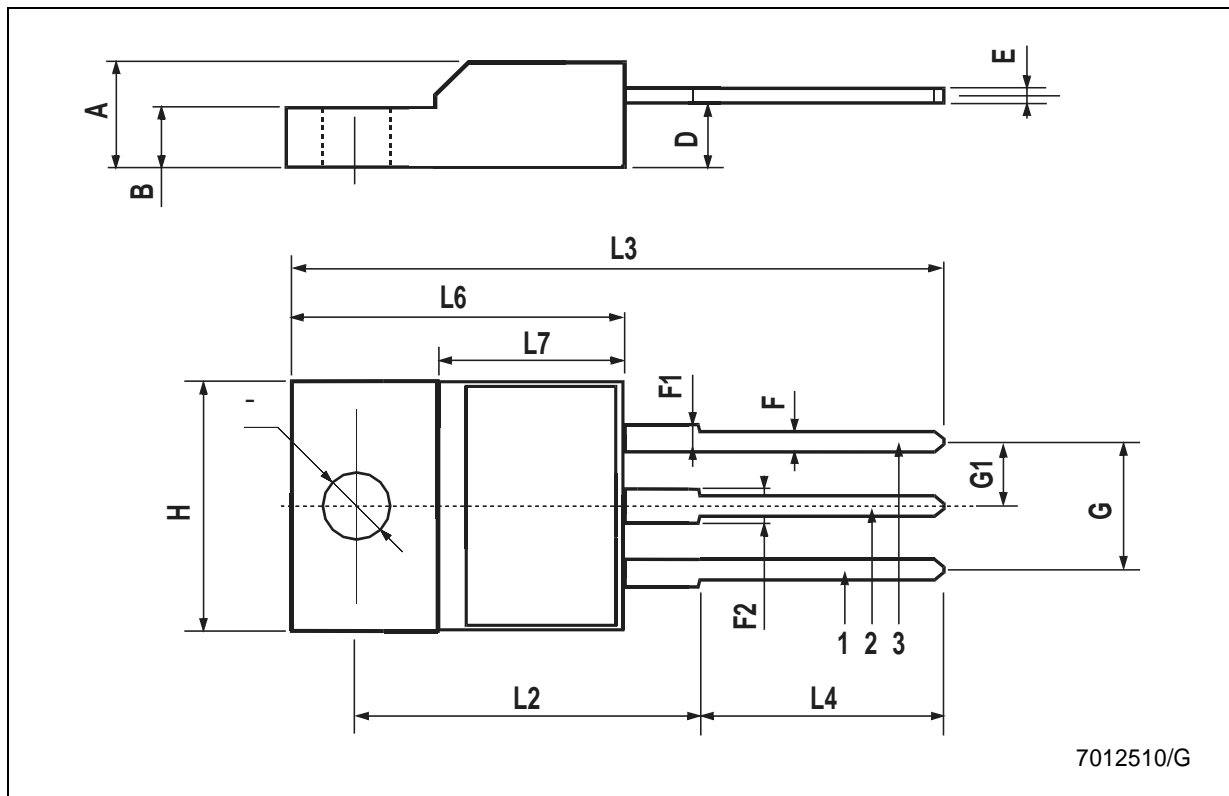
## TO-220 MECHANICAL DATA

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



**TO-220FP MECHANICAL DATA**

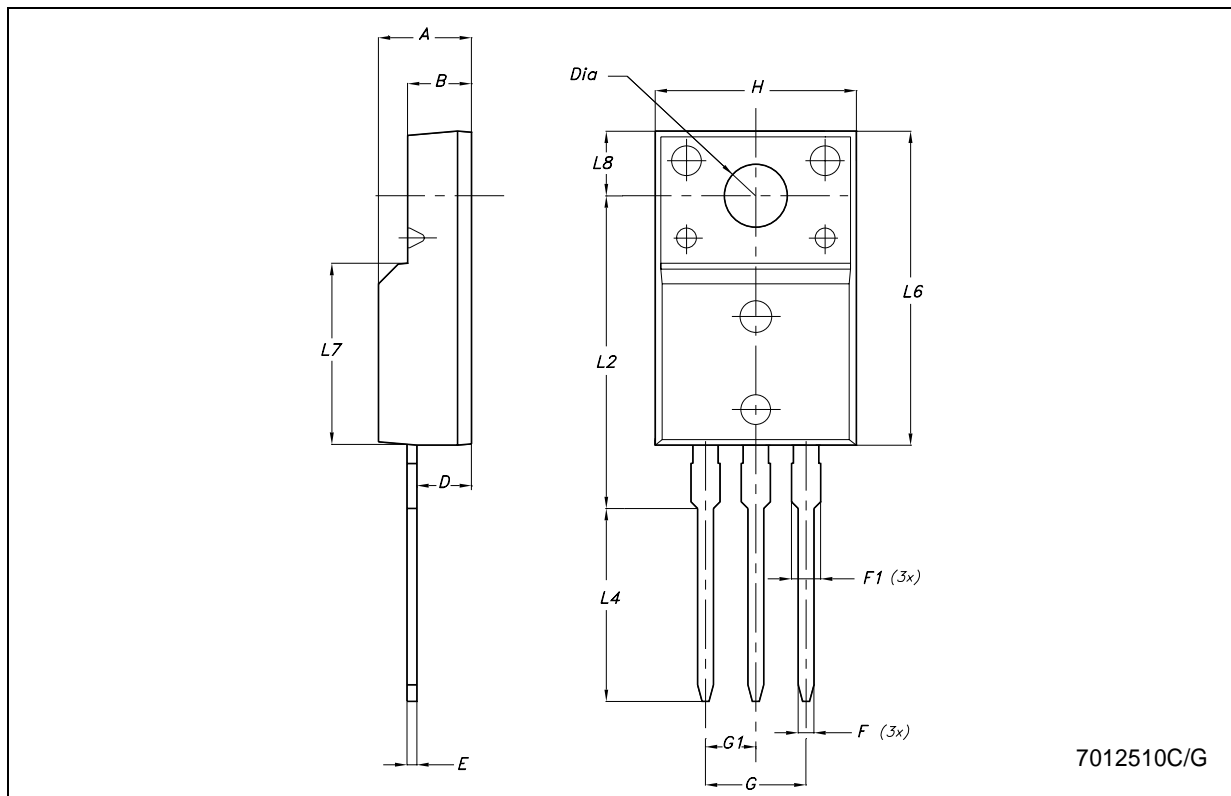
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.70	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.50	0.045		0.059
F2	1.15		1.50	0.045		0.059
G	4.95		5.2	0.194		0.204
G1	2.4		2.7	0.094		0.106
H	10.0		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
DIA.	3		3.2	0.118		0.126





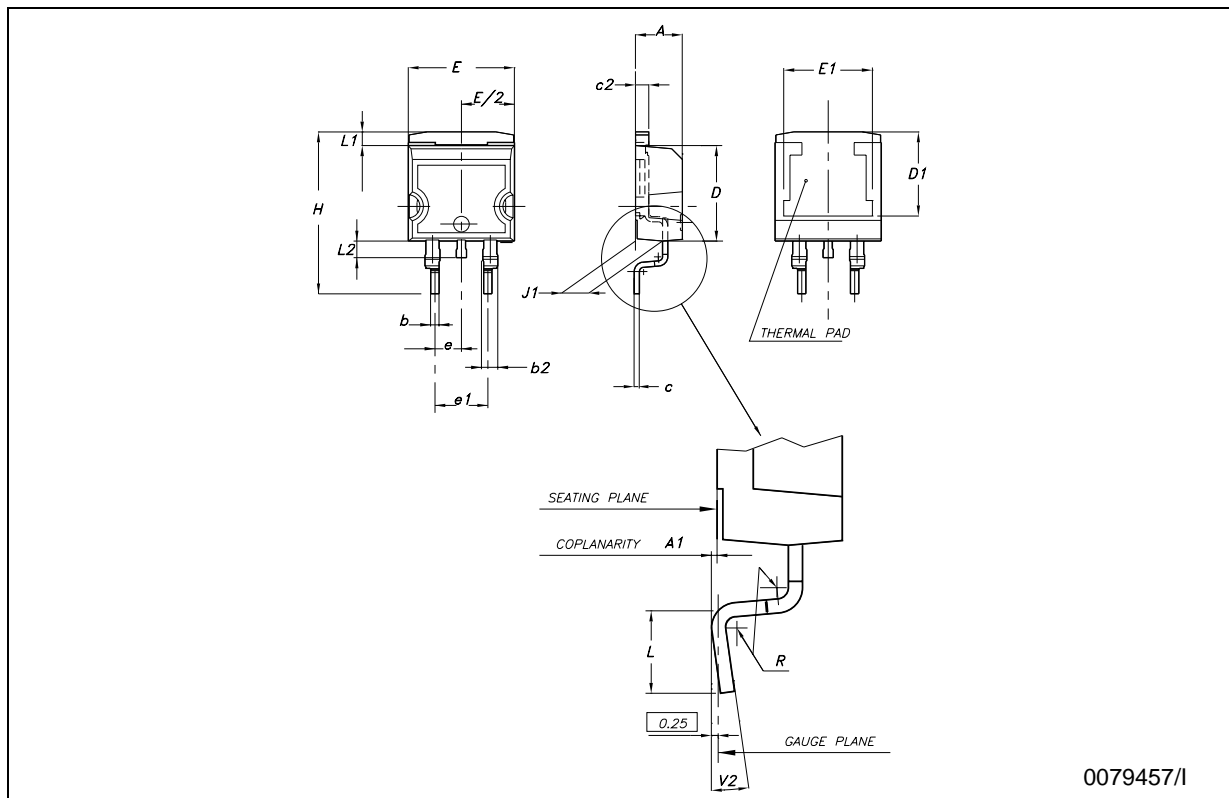
## TO-220FM MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.50		4.90	0.177		0.193
B	3.04		3.44	0.120		0.135
D	2.56		2.96	0.101		0.117
E	0.45	0.50	0.60	0.018	0.020	0.024
F	0.70		0.90	0.028		0.035
F1			1.47			0.058
G		5.08			0.200	
G1	2.34	2.54	2.74	0.092	0.100	0.108
H	9.96		10.36	0.392		0.408
L2		15.8			0.622	
L4	9.45		10.05	0.372		0.396
L6	15.67		16.07	0.617		0.633
L7	8.99		9.39	0.354		0.370
L8		3.30			0.130	
DIA.	3.08		3.28	0.121		0.129



**D<sup>2</sup>PAK (A TYPE) MECHANICAL DATA**

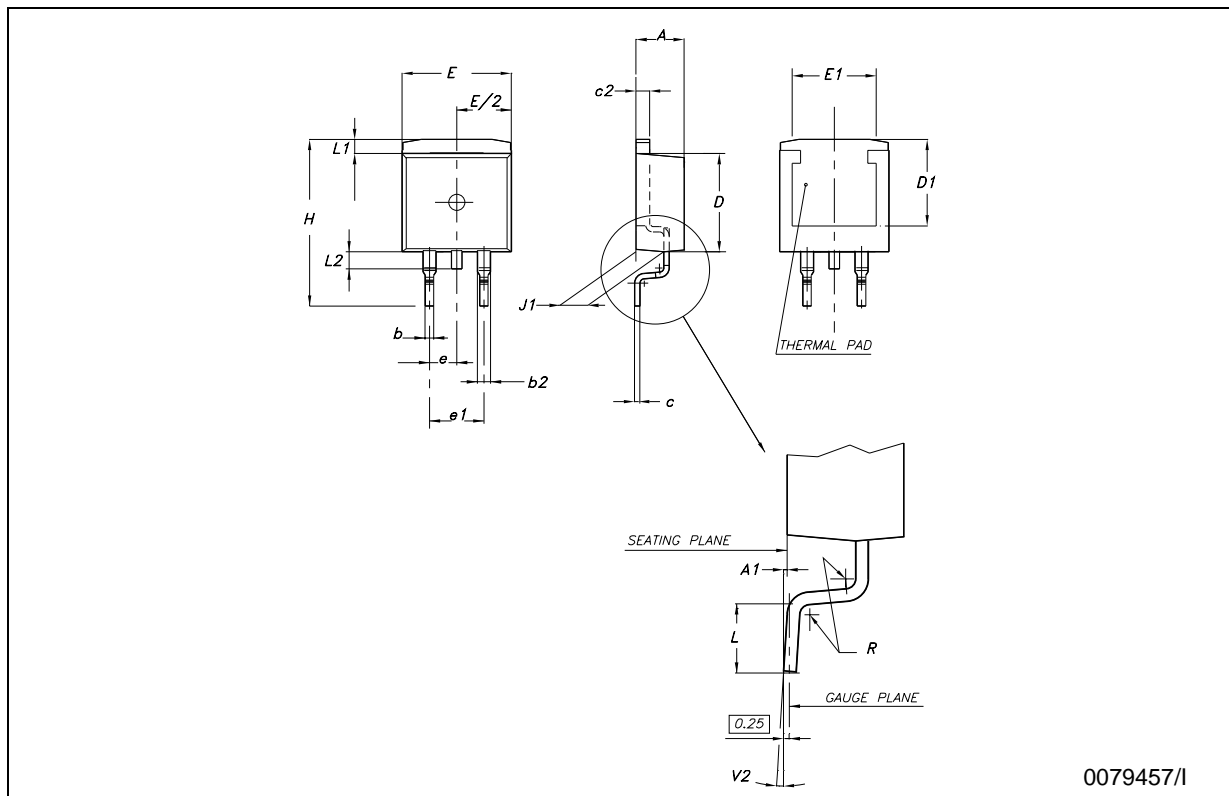
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.7		0.93	0.027		0.036
b2	1.14		1.7	0.044		0.067
c	0.45		0.6	0.017		0.023
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	8			0.315		
E	10		10.4	0.393		0.409
E1	8.5			0.335		
e		2.54			0.100	
e1	4.88		5.28	0.192		0.208
H	15		15.85	0.590		0.624
J1	2.49		2.69	0.098		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.4	0.050		0.055
L2	1.3		1.75	0.051		0.069
R		0.4			0.016	
V2	0°		8°	0°		8°



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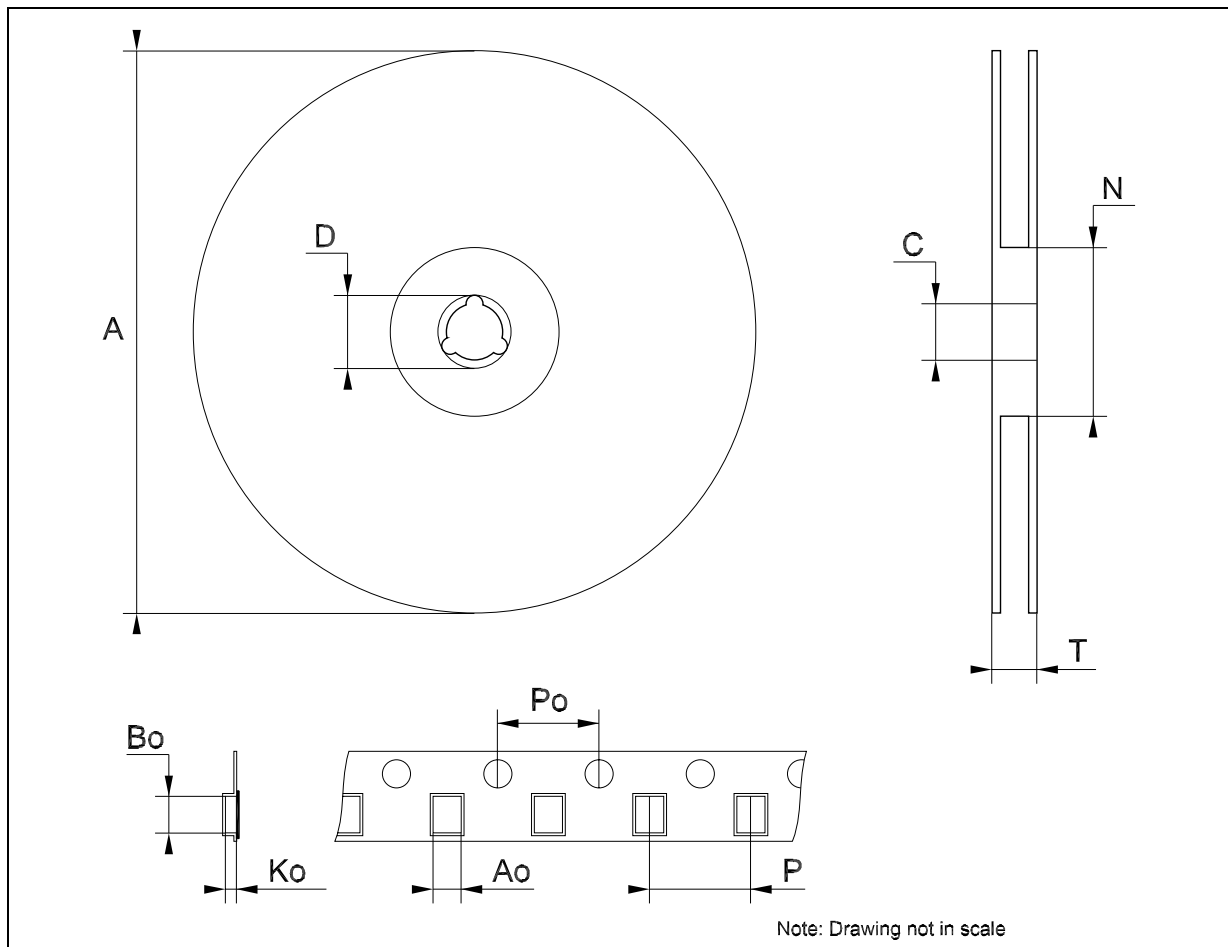
D<sup>2</sup>PAK (C TYPE) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.3		4.7	0.169		0.185
A1	0		0.20	0.000		0.008
b	0.70		0.90	0.028		0.035
b2	1.17		1.37	0.046		0.054
c	0.45	0.50	0.6	0.018	0.020	0.024
c2	1.25	1.30	1.40	0.049	0.051	0.055
D	9.0	9.2	9.4	0.354	0.362	0.370
D1	7.5			0.295		
E	9.8		10.2	0.386		0.402
E1	7.5			0.295		
e		2.54			0.100	
e1		5.08			0.200	
H	15	15.30	15.60	0.591	0.602	0.614
J1	2.20		2.60	0.087		0.102
L	1.79		2.79	0.070		0.110
L1	1.0		1.4	0.039		0.055
L2	1.2		1.6	0.047		0.063
R		0.3			0.012	
V2	0°		3°	0°		3°



**Tape & Reel D<sup>2</sup>PAK-P<sup>2</sup>PAK-D<sup>2</sup>PAK/A-P<sup>2</sup>PAK/A MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	10.50	10.6	10.70	0.413	0.417	0.421
Bo	15.70	15.80	15.90	0.618	0.622	0.626
Ko	4.80	4.90	5.00	0.189	0.193	0.197
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	11.9	12.0	12.1	0.468	0.472	0.476



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