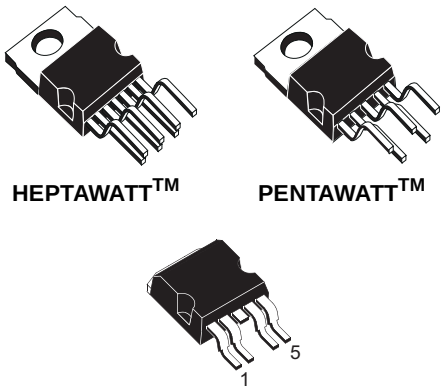
LD1580

7 A VERY LOW DROP POSITIVE VOLTAGE REGULATOR ADJUSTABLE AND FIXED

PRELIMINARY DATA

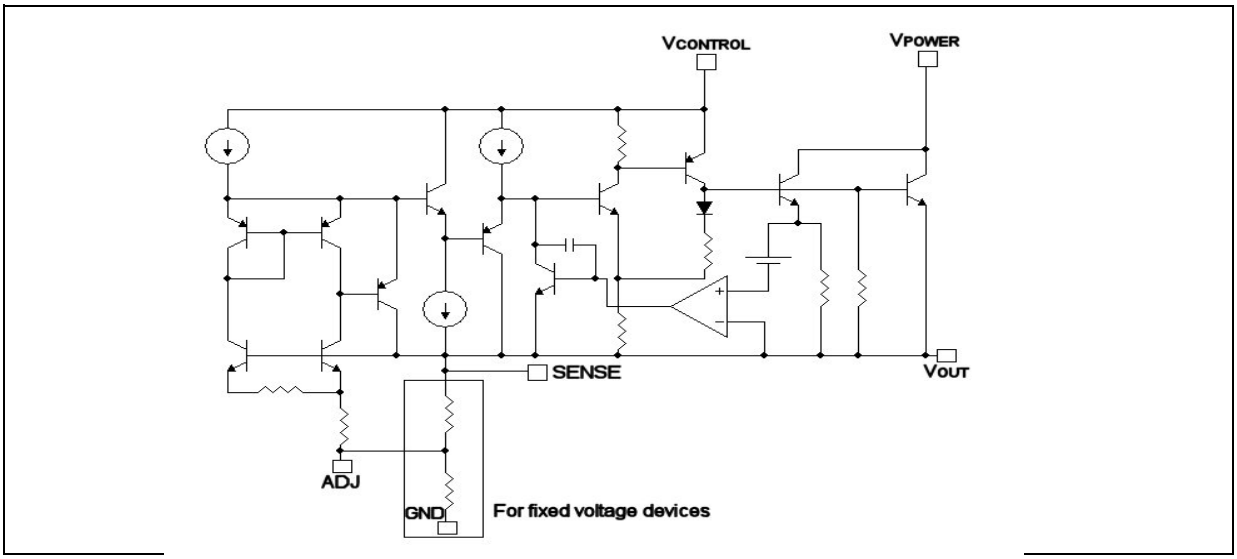
- OUTPUT CURRENT LIMIT
- LOW DROPOUT VOLTAGE: TYPICALLY 400mV AT 7A OUTPUT CURRENT
- OUTPUT VOLTAGE REMOTE SENSE PIN
- FAST TRANSIENT RESPONSE
- THERMAL SHUTDOWN PROTECTION WITH HYSTERESIS
- WIDE OPERATING TEMPERATURE RANGE -40°C TO 125°C
- NO SUPPLY SEQUENCING PROBLEMS IN DUAL SUPPLY MODE
- OUTPUT VOLTAGES AVAILABLE 1.5 V, 1.8V, 2.5 V, 3.0 V, 3.3 V ADJUSTABLE.



DESCRIPTION

The LD1580 is a very low dropout positive linear voltage regulator particularly suitable in applications requiring output currents up to 7 A.
The LD1580 typical dropout voltage is 400mV at 7A while it decreases at lighter loads.
This very low dropout is achieved thanks to a second input voltage pin, named $V_{CONTROL}$, which is also responsable of the output power stage driving.
The LD1580 is provided with an output voltage remote sense pin which reduces dramatically any output voltage variations that could occur due to load changes.
On fixed voltage devices, the ADJ pin is still available. A small capacitor on this pin helps to improve transient response.

SCHEMATIC DIAGRAM



The LD1580 also features a built-in output current limit function and a thermal shutdown protection with hysteresis which prevents from excessive power dissipation in case of insufficient heatsinking. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within ±2% at the maximum output current and over the full temperature range.

ABSOLUTE MAXIMUM RATINGS

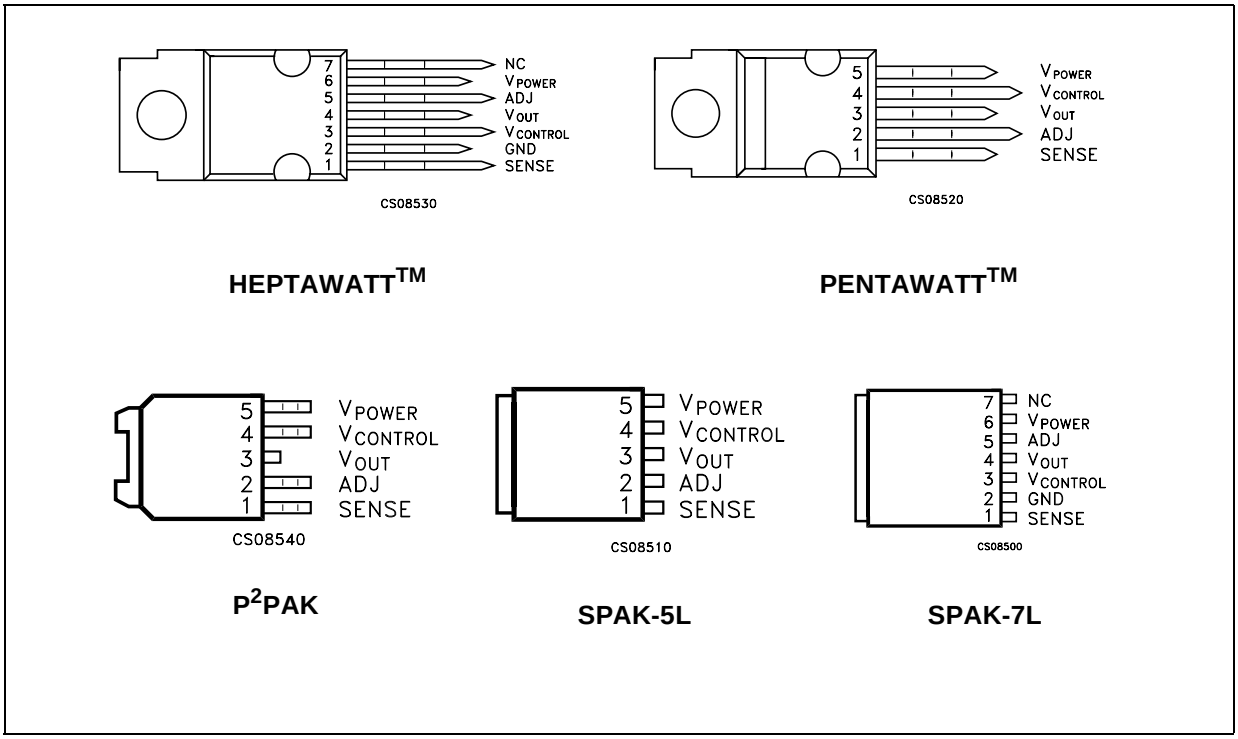
Symbol	Parameter	Value	Unit
V_{POWER}	DC V_{POWER} voltage	from -0.3 to 6	V
$V_{CONTROL}$	DC $V_{CONTROL}$ voltage	from -0.3 to 13	V
I_{OUT}	Output Current	Internally Limited	A
P_D	Power Dissipation	Internally Limited	W
T_{stg}	Storage Temperature Range	-55 to +150	°C
T_{op}	Operating Junction Temperature 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	PENTAWATT™ HEPTAWATT™	P²PAK	SPAK-5L SPAK-7L	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	3	3	2	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	50	62.5	TBD	°C/W

CONNECTION DIAGRAM (top view)

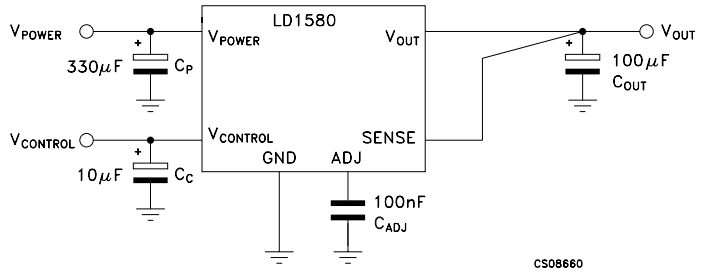


ORDERING CODES

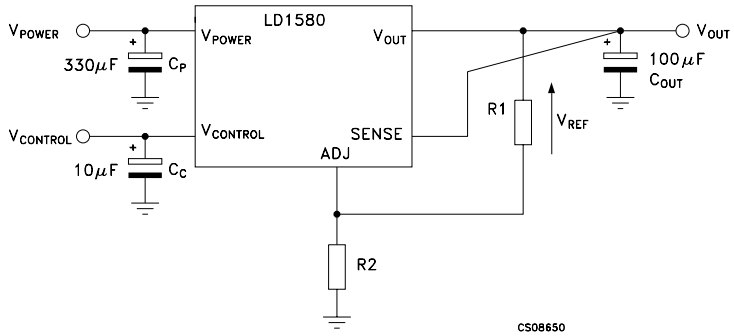
P^2PAK (*)	PENTAWATT	SPAK-5L (*)	SPAK-7L (*)	HEPTAWATT	OUTPUT VOLTAGE
			LD1580K7-15	LD1580V7V15	1.5V
			LD1580K7-18	LD1580V7V18	1.8V
			LD1580K7-25	LD1580V7V25	2.5V
			LD1580K7-30	LD1580V7V30	3.0V
			LD1580K7-33	LD1580V7V33	3.3V
LD1580P2T	LD1580V5V	LD1580K5			Adjustable

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

TYPICAL APPLICATION CIRCUITS FOR FIXED VERSION



TYPICAL APPLICATION CIRCUITS FOR ADJUSTABLE VERSION



$$V_O = V_{REF}\left(1 + \frac{R_2}{R_1}\right)$$

ELECTRICAL CHARACTERISTICS FOR LD1580xx15 (T_j = -40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=4 V, V_{POWER}=2.3 V T_j=25 °C, I_{OUT}=0 mA	1.485	1.5	1.515	V
		$V_{CONTROL}$=3 V to 12 V V_{POWER}=2.1 V to 5.5 V I_{OUT}=0 to 7 A	1.470	1.5	1.530	
ΔV_O	Line Regulation	$V_{CONTROL}$=2.65 V to 12 V V_{POWER}=2 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=4 V, V_{POWER}=2.3 V I_{OUT}=0 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=4 V, V_{POWER}=2.3 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=4 V, V_{POWER}=2.3 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=4 V, V_{POWER}=2 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=4 V, V_{POWER}=2.3 V I_{OUT}=7 A		60	120	
I_Q	Quiescent Current	$V_{CONTROL}$=4 V, V_{POWER}=2.3 V I_{OUT}=0 A		5	10	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=4 V, V_{POWER}=2.3 V (Note 1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=4 V Avg, V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	60	80		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=2.3 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=2.3 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=2.3 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=2.3 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=4 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=4 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=4 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

ELECTRICAL CHARACTERISTICS FOR LD1580xx18 (T_j = -40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=4 V, V_{POWER}=2.6 V T_j=25 °C, I_{OUT}=0 mA	1.782	1.8	1.818	V
		$V_{CONTROL}$=3.3 V to 12 V V_{POWER}=2.4 V to 5.5 V I_{OUT}=0 to 7 A	1.764	1.8	1.836	
ΔV_O	Line Regulation	$V_{CONTROL}$=2.95 V to 12 V V_{POWER}=2.3 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V I_{OUT}=0 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=4.3 V, V_{POWER}=2.3 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V I_{OUT}=7 A		60	120	
I_Q	Quiescent Current	$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V I_{OUT}=0 A		5	10	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=4.3 V, V_{POWER}=2.6 V (Note 1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=4.3 V Avg, V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	58.4	78.4		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=2.6 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=2.6 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=2.6 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=2.6 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=4.3 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=4.3 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=4.3 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

ELECTRICAL CHARACTERISTICS FOR LD1580xx25 (T_j = -40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=5 V, V_{POWER}=3.3 V T_j=25 °C, I_{OUT}=0 mA	2.475	2.5	2.525	V
		$V_{CONTROL}$=4 V to 12 V V_{POWER}=3.1 V to 5.5 V I_{OUT}=0 to 7 A	2.450	2.5	2.550	
ΔV_O	Line Regulation	$V_{CONTROL}$=3.65 V to 12 V V_{POWER}=3 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=5 V, V_{POWER}=3.3 V I_{OUT}=0 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=5 V, V_{POWER}=3.3 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=5 V, V_{POWER}=3.3 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=5 V, V_{POWER}=3 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=5 V, V_{POWER}=3.3 V I_{OUT}=7 A		60	120	
I_Q	Quiescent Current	$V_{CONTROL}$=5 V, V_{POWER}=3.3 V I_{OUT}=0 A		5	10	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=5 V, V_{POWER}=3.3 V (Note1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=5 V Avg, V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	55.5	75.5		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=3.3 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=3.3 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=3.3 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=3.3 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=5 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=5 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=5 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

ELECTRICAL CHARACTERISTICS FOR LD1580xx30 (T_j = -40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V T_j=25 °C, I_{OUT}=0 mA	2.970	3	3.030	V
		$V_{CONTROL}$=4.5 V to 12 V V_{POWER}=3.6 V to 5.5 V I_{OUT}=0 to 7 A	2.940	3	3.060	
ΔV_O	Line Regulation	$V_{CONTROL}$=4.15 V to 12 V V_{POWER}=3.5 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V I_{OUT}=0 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=5.5 V, V_{POWER}=3.5 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V I_{OUT}=7 A		60	120	
I_Q	Quiescent Current	$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V I_{OUT}=0 A		5	10	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=5.5 V, V_{POWER}=3.8 V (Note 1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=5.5 V Avg, V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	54	74		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=3.8 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=3.8 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=3.8 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=3.8 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=5.5 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=5.5 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=5.5 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

ELECTRICAL CHARACTERISTICS FOR LD1580xx33 (T_j = -40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V T_j=25 °C, I_{OUT}=0 mA	3.267	3.3	3.333	V
		$V_{CONTROL}$=4.8 V to 12 V V_{POWER}=3.9 V to 5.5 V I_{OUT}=0 to 7 A	3.234	3.3	3.366	
ΔV_O	Line Regulation	$V_{CONTROL}$=4.45 V to 12 V V_{POWER}=3.8 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V I_{OUT}=0 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=5.8 V, V_{POWER}=3.8 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V I_{OUT}=7 A		60	120	
I_Q	Quiescent Current	$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V I_{OUT}=0 A		5	10	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=5.8 V, V_{POWER}=4.1 V (Note 1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=5.8 V Avg, V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	53.1	73.1		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=4.1 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=4.1 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=4.1 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=4.1 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=5.8 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=5.8 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=5.8 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

ELECTRICAL CHARACTERISTICS FOR LD1580 (T_j = - 40 °C to 125 °C, C_P=330 µF, C_C=10 µF, C_{OUT}=100 µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_{CONTROL}$=2.75 V, V_{POWER}=2 V T_j=25 °C, I_{OUT}=10 mA	1.237	1.250	1.263	V
		$V_{CONTROL}$=2.7 V to 12 V V_{POWER}=2.05 V to 5.5 V I_{OUT}=0.01 to 7 A	1.225	1.250	1.275	
ΔV_O	Line Regulation	$V_{CONTROL}$=2.5 V to 12 V V_{POWER}=1.75 V to 5.5 V I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load Regulation	$V_{CONTROL}$=2.75 V, V_{POWER}=2.1 V I_{OUT}=0.01 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ Pin Current	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=2.75 V, V_{POWER}=1.75 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=7 A		60	120	
I_{ADJ}	Adjust Pin Current	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=10 mA		50	120	mA
I_{OUT}	Output Current Limit	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V (Note 1)	8	9		A
SVR	Supply Voltage Rejection	$V_{CONTROL}$=V_{POWER}=3.75 V Avg V_{RIPPLE}=1 V_{P-P} I_{OUT}=4 A, T_j=25 °C	61.5	81.5		dB
V_{DC}	Minimun $V_{CONTROL}$ Voltage ($V_{CONTROL}$-V_O)	V_{POWER}=2.05 V, I_{OUT}=100 mA (Note 2)		0.95	1.15	V
		V_{POWER}=2.05 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=2.05 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=2.05 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimun V_{POWER} Voltage (V_{POWER}-V_O)	$V_{CONTROL}$=2.75 V, I_{OUT}=1 A (Note 2)		0.05	0.15	V
		$V_{CONTROL}$=2.75 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=2.75 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown Temperature Threshold			170		°C
T_{HYST}	Thermal Shutdown Hysteresis			5		°C

Note 1: Measured when the V_{OUT} voltage drops below 100mV with respect to its nominal value.
Note 2: Measured when the V_{OUT} voltage drops below 2% with respect to its nominal value.

TYPICAL CHARACTERISTICS (unless otherwise specified T_j=25°C, C_P=330µF, C_C=10µF, C_{OUT}=100µF)

Figure 1 : Output Voltage vs Temperature

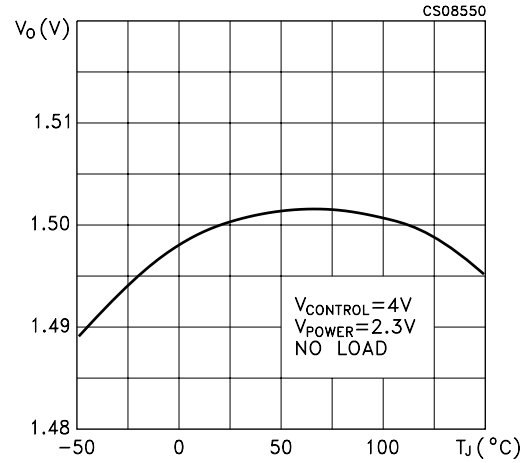


Figure 2 : Minimun $V_{CONTROL}$ Voltage vs Temperature

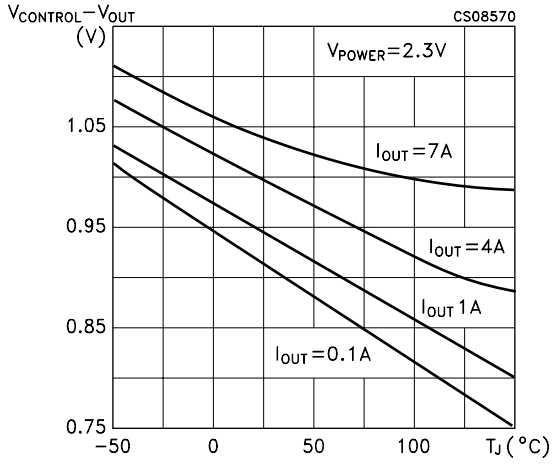


Figure 3 : Minimun V_{POWER} Voltage vs Output Current

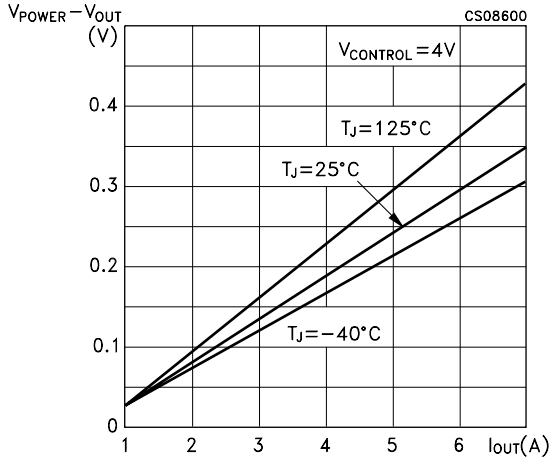


Figure 4 : Output Voltage vs Temperature

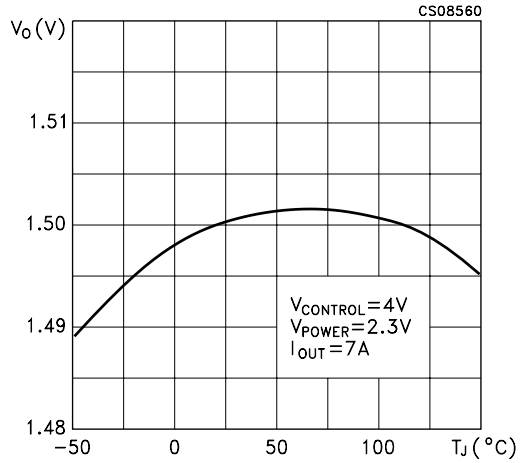


Figure 5 : $V_{CONTROL}$ Pin Current vs Temperature

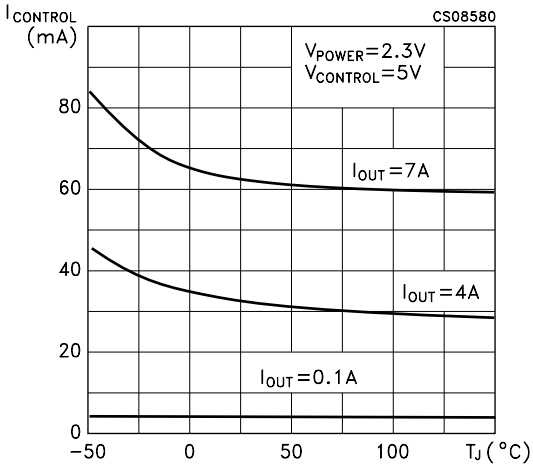


Figure 6 : Minimun V_{POWER} Voltage vs Temperature

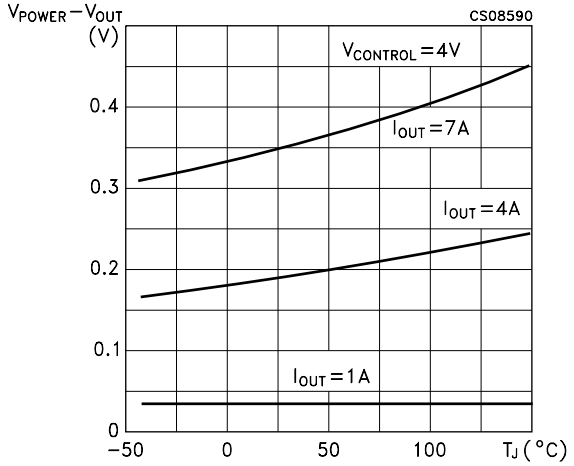


Figure 7 : $V_{CONTROL}$ Pin Current vs Output Current

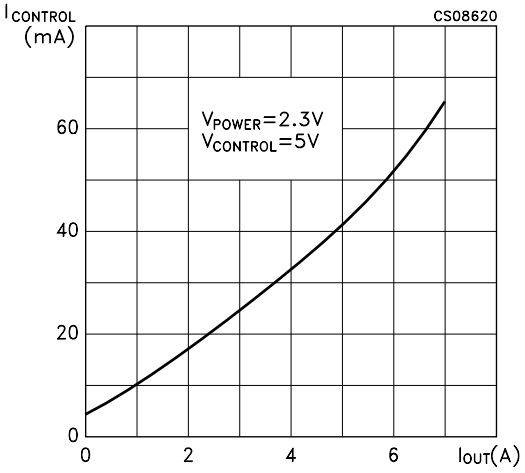


Figure 8 : Output Current Limit vs Temperature

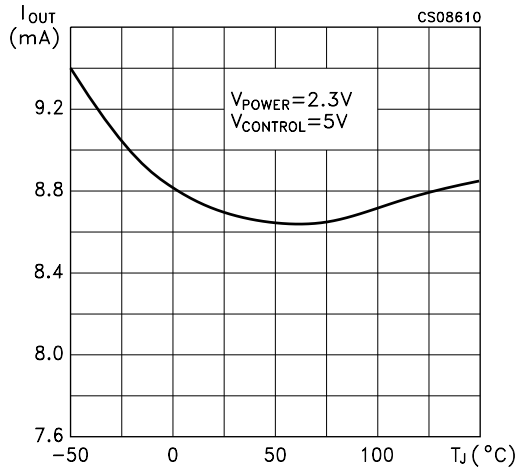


Figure 9 : Quiescent Current vs Temperature

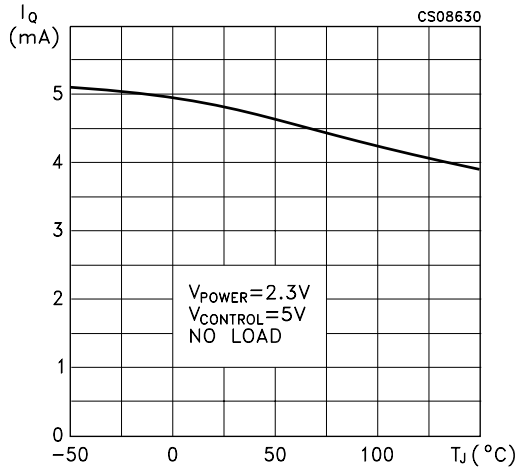


Figure 10 : Supply Voltage Rejection vs Output Current

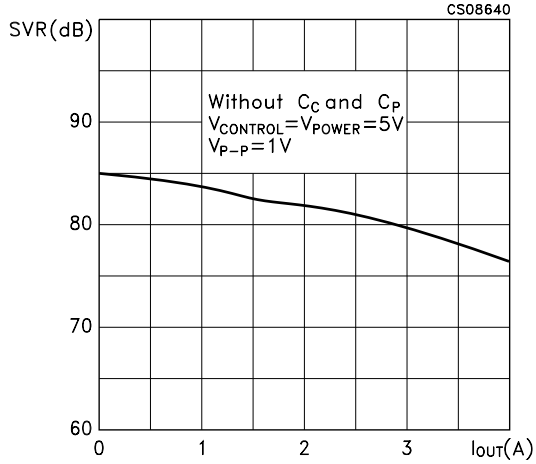
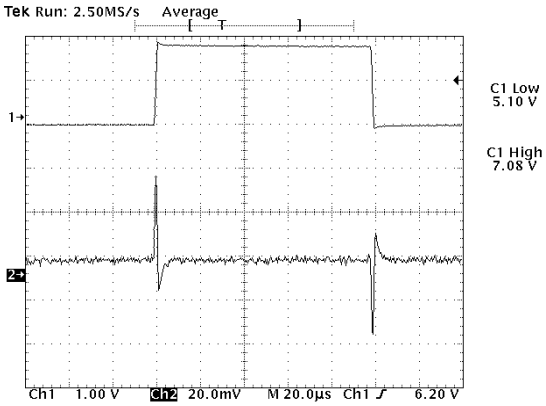
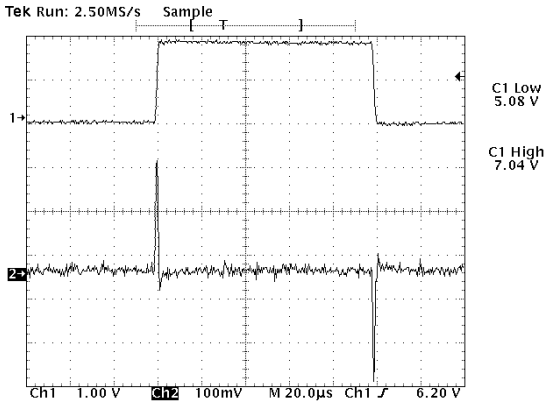


Figure 11 : Line Transient Response



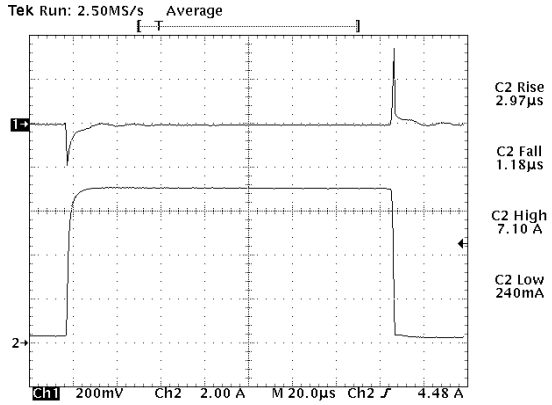
V_{POWER}=3.3V, $V_{CONTROL}$=5 to 7V, I_{OUT}=1A

Figure 12 : Line Transient Response



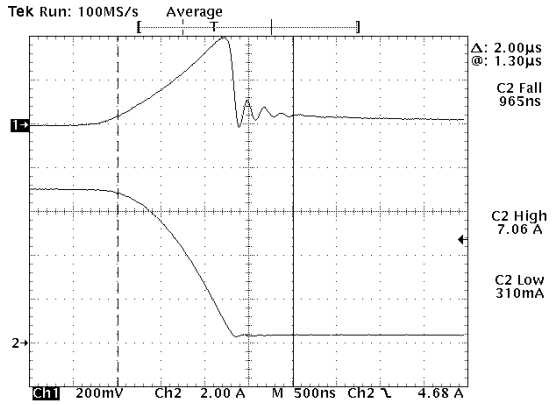
V_{POWER}=$V_{CONTROL}$=5 to 7V, I_{OUT}=1A

Figure 13 : Load transient Response



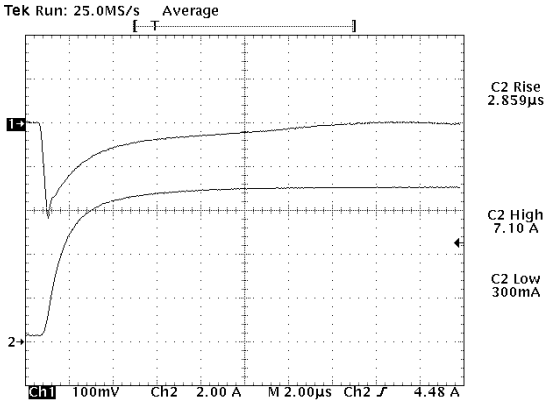
V_{POWER}=$V_{CONTROL}$=5V

Figure 14 : Load transient Response



V_{POWER}=$V_{CONTROL}$=5V

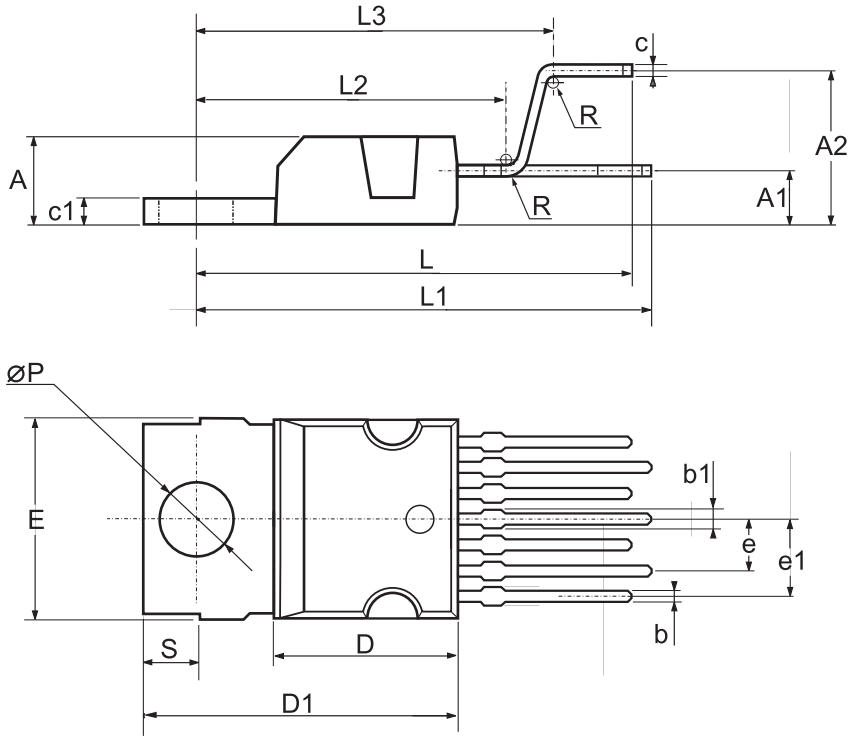
Figure 15 : Load transient Response



V_{POWER}=$V_{CONTROL}$=5V

HEPTAWATT (VERTICAL) MECHANICAL DATA

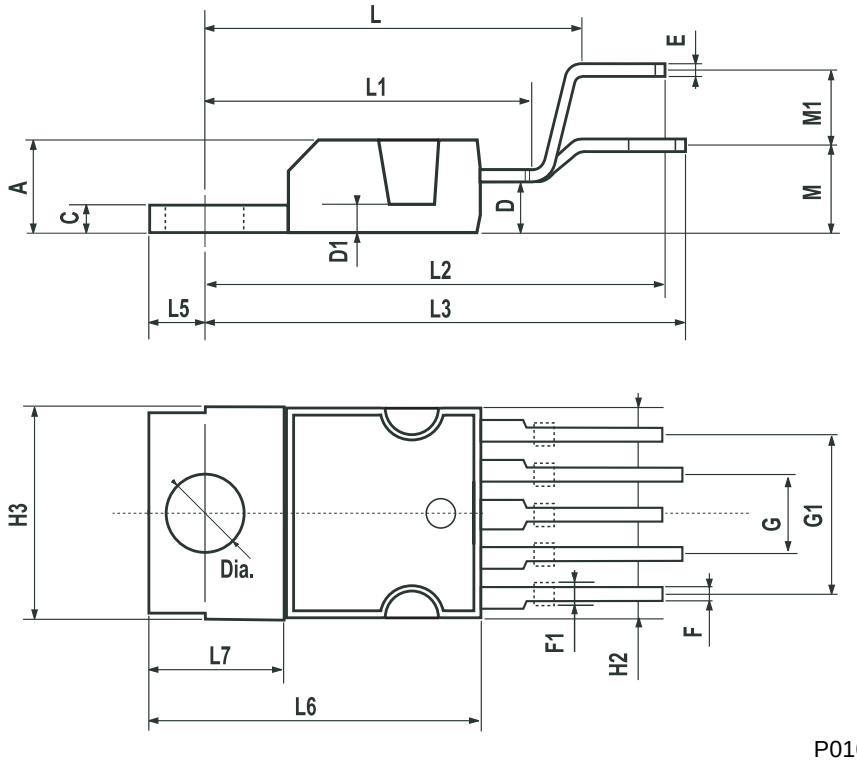
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.6		0.8	0.024		0.031
F1			0.9			0.035
G	2.41	2.54	2.67	0.095	0.100	0.105
G1	4.91	5.08	5.21	0.193	0.200	0.205
G2	7.49	7.62	7.8	0.295	0.300	0.307
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L		16.97			0.668	
L1		14.92			0.587	
L2		21.54			0.848	
L3		22.62			0.891	
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
M		2.8			0.110	
M1		5.08			0.200	
Dia1	3.65		3.85	0.144		0.152



P023A

PENTAWATT (VERTICAL) MECHANICAL DATA

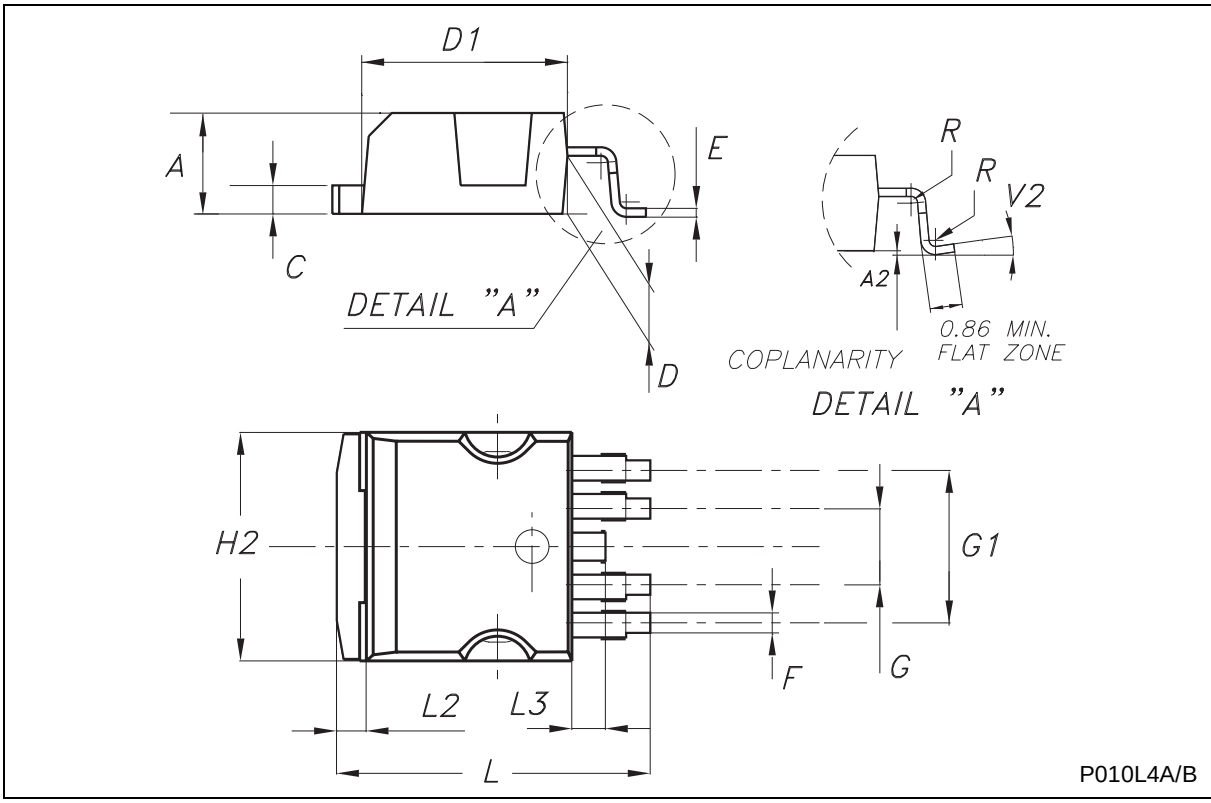
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.8		1.05	0.031		0.041
F1	1		1.4	0.039		0.055
G	3.2	3.4	3.6	0.126	0.134	0.142
G1	6.6	6.8	7	0.260	0.268	0.276
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L		17.85			0.703	
L1		15.75			0.620	
L2		21.4			0.843	
L3		22.5			0.886	
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
M		4.5			0.177	
M1		4			0.157	
Dia1	3.65		3.85	0.144		0.152



P010E

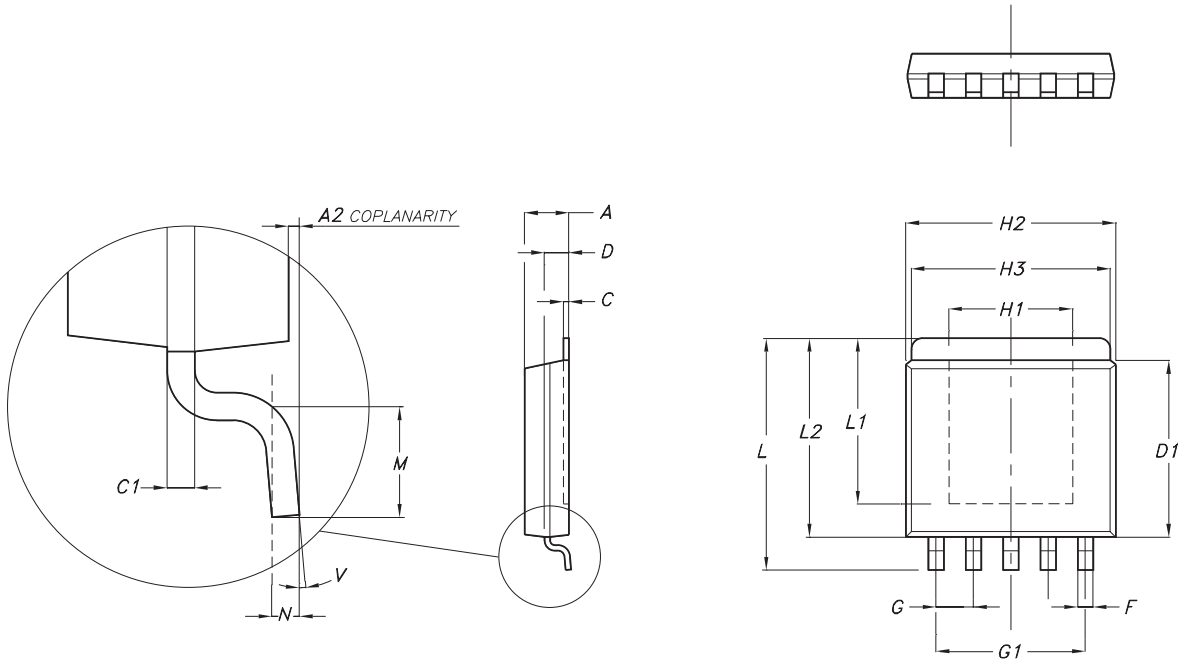
P^2PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.30		4.80	0.169		0.188
A2	0.03		0.23	0.001		0.009
C	1.17		1.37	0.046		0.053
D	2.40		2.80	0.094		0.110
D1	8.95		9.35	0.352		0.368
E	0.35		0.55	0.013		0.021
F	0.80		1.05	0.031		0.041
G	3.20		3.60	0.126		0.142
G1	6.60		7.00	0.260		0.275
H2			10.40			0.409
L	13.59		14.39	0.535		0.566
L2	1.27		1.40	0.050		0.055
L3	1.30		1.70	0.051		0.067
R		0.30			0.012	
V2	0°		8°	0°		8°



SPAK-5L MECHANICAL DATA

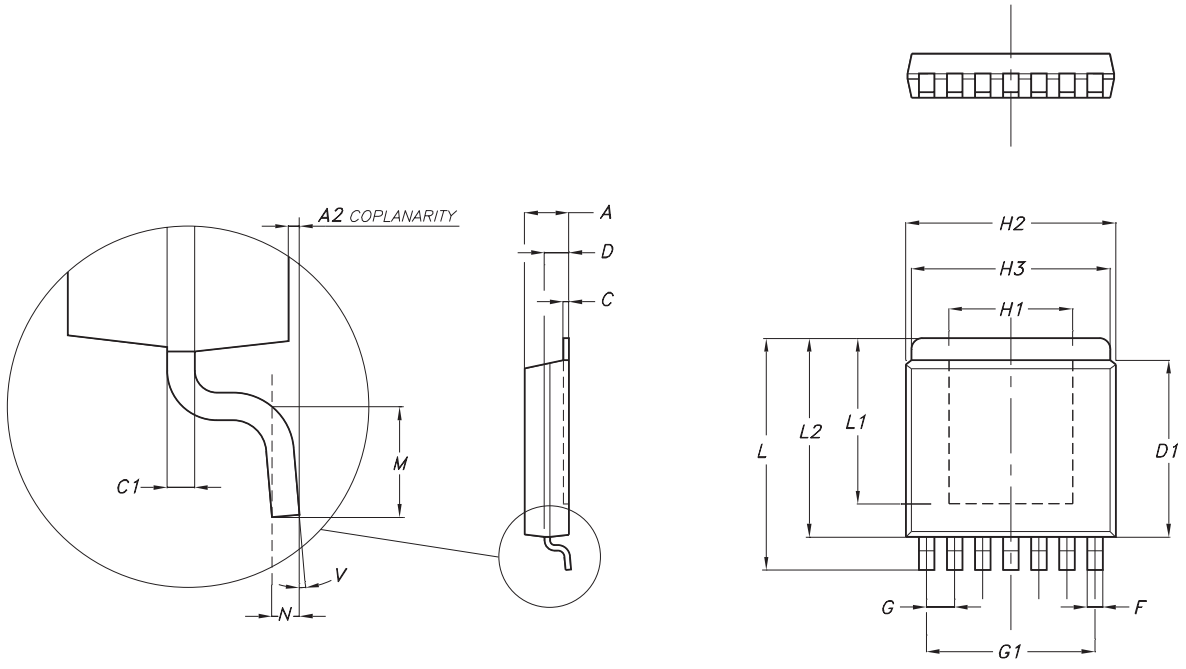
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.78		2.03	0.070		0.080
A2	0.03		0.13	0.001		0.005
C		0.25			0.010	
C1		0.25			0.010	
D	1.02		1.27	0.040		0.050
D1	7.87		8.13	0.310		0.320
F	0.63		0.79	0.025		0.031
G		1.69			0.067	
G1		6.8			0.268	
H1		5.59			0.220	
H2	9.27		9.52	0.365		0.375
H3	8.89		9.14	0.350		0.360
L	10.41		10.67	0.410		0.420
L1		7.49			0.295	
L2	8.89		9.14	0.350		0.360
M	0.79		1.04	0.031		0.041
N		0.25			0.010	
V	3°		6°	3°		6°



PO13F1/B

SPAK-7L MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.78		2.03	0.070		0.080
A2	0.03		0.13	0.001		0.005
C		0.25			0.010	
C1		0.25			0.010	
D	1.02		1.27	0.040		0.050
D1	7.87		8.13	0.310		0.320
F	0.63		0.79	0.025		0.031
G		1.27			0.050	
G1		7.62			0.3	
H1		5.59			0.220	
H2	9.27		9.52	0.365		0.375
H3	8.89		9.14	0.350		0.360
L	10.41		10.67	0.410		0.420
L1		7.49			0.295	
L2	8.89		9.14	0.350		0.360
M	0.79		1.04	0.031		0.041
N		0.25			0.010	
V	3°		6°	3°		6°



PO13F2/A