Three-Terminal Positive Voltage Regulators

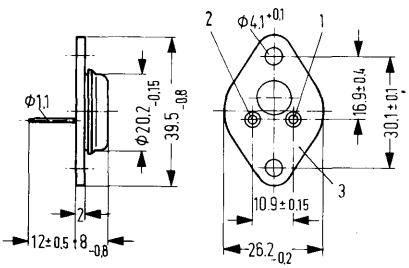
TDB 7800 -7800
TDB 7800 T-7800
TDC 7800 -7800

TDB 7800 and TDC 7800 are monolithic three-terminal positive regulators in packages similar to 3 A 2 DIN 41872 (TO-3). These regulators employ internal current limiting, thermal shutdown and safe-area compensation, without external components. If adequate heat sinking is provided, they can deliver over 1 A output current. These devices can be used with external components to obtain adjustable output voltages and currents and also as the power pass element in precision regulators.

Output voltages: 5V, 6V, 8V, 12V, 15V, 18V and 24V in TO-3 and TO-220 packages.

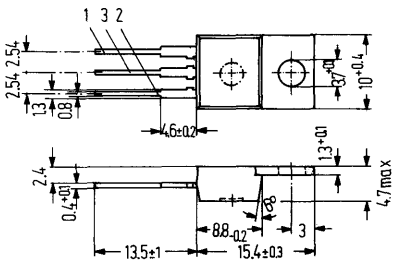
Package outlines

for TDB 7800 and TDC 7800



3 A 2 DIN 41872 (TO-3)
Weight approx 16.5 g

for TDB 7800 T



TO-220 AB
Weight approx 18 g
Pin 3 electrically connected with heat sinking

Dimensions in mm

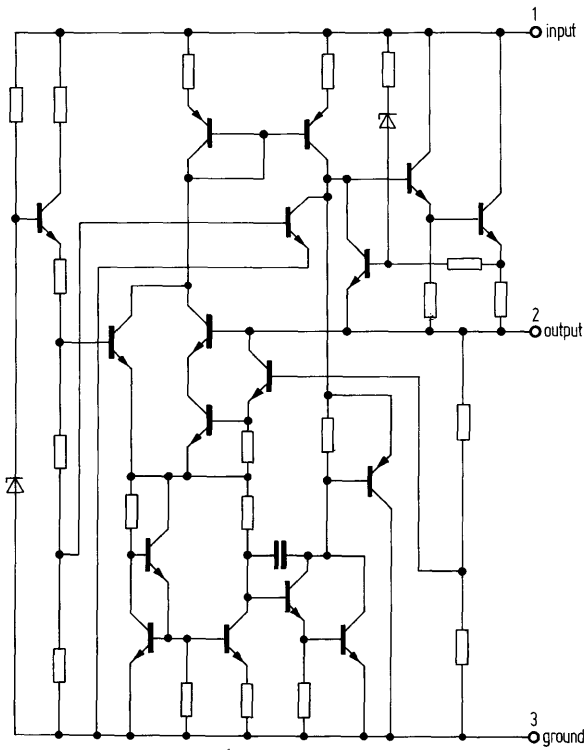
Maximum ratings

		TDB 7800 TDB 7800 T TDC 7800	
Input voltage (V_q = 5 to 18 V)	V_i	35	V
(V_q = 24 V)	V_i	40	V
Junction temperature	T_j	150	°C
Storage temperature	T_s	−65 to +150	°C
Thermal resistance:			
System-case: TDB 7800, TDC 7800	$R_{thScase}$	4	K/W
System-case: TDB 7800 T	$R_{thScase}$	4	K/W
System-ambient air: TDB 7800, TDC 7800	R_{thSamb}	35	K/W
System-ambient air: TDB 7800 T	R_{thSamb}	50	K/W

Range of operation

Ambient temperature in operation			
TDB 8700; TDB 8700 T	T_{amb}	0 to +85	°C
TDC 7800	T_{amb}	−55 to +125	°C

Circuit



Type	Ordering codes
TDB 7805	Q67000-A1047
TDB 7805 T	Q67000-A1048
TDC 7805	Q67000-A1049

Operating characteristics
(V_i = 10 V; I_q = 500 mA
T_{amb} = 25 °C)

		TDB 7805 / TDB 7805 T			TDC 7805			
		min	typ	max	min	typ	max	
Output voltage	V_q	4.8	5.0	5.2	4.8	5.0	5.2	V
Line regulation:								
7 V ≤V_i ≤25 V			3	100		3	50	mV
8 V ≤V_i ≤12 V			1	50		1	25	mV
Load regulation:								
5 mA ≤I_q ≤1.5 A			15	100		15	50	mV
250 mA ≤I_q ≤750 mA			5	50		5	25	mV
Output voltage:								
P ≤15 W 7.0 V ≤V_i ≤20 V	V_q	4.75		5.25				V
5 mA ≤I_q ≤1.0 A								
0 °C ≤T_{amb} ≤70 °C								
P ≤15 W 8.0 V ≤V_i ≤20 V	V_q				4.65		5.35	V
5 mA ≤I_q ≤1.0 A								
–55 °C ≤T_{amb} ≤+125 °C								
Quiescent current			4.2	8.0		4.2	6.0	mA
Quiescent current change								
0 °C ≤T_{amb} ≤+70 °C:								
7 V ≤V_i ≤25 V				1.3				mA
5 mA ≤I_q ≤1.0 A				.5				mA
–55 °C ≤T_{amb} ≤+125 °C:								
8 V ≤V_i ≤25 V							.8	mA
5 mA ≤I_q ≤1.0 A							.5	mA
Output noise voltage:								
10 Hz ≤f ≤100 kHz			40			40		µV
Long term stability:								
0 °C ≤T_{amb} ≤+70 °C				20				mV/ 1000 h
–55 °C ≤T_{amb} ≤+125 °C							20	mV/ 1000 h
Ripple rejection								
(f = 120 Hz; 8 V ≤V_i ≤18 V)								
0 °C ≤T_{amb} ≤+70 °C		62	78					dB
–55 °C ≤T_{amb} ≤+125 °C					68	78		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		750			750		mA
Peak output current	I_q		2.2			2.2		A
Output resistance (f = 1 kHz)								
0 °C ≤T_{amb} ≤+70 °C	R_q		17					mΩ
–55 °C ≤T_{amb} ≤+125 °C	R_q					17		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0 °C ≤T_{amb} ≤+70 °C	α_E		–1.1					mV/K
0 °C ≤T_{amb} ≤+125 °C	α_E					–1.1		mV/K

Type	Ordering codes
TDB 7806	Q67000-A1050
TDB 7806 T	Q67000-A1051
TDC 7806	Q67000-A1052

Operating characteristics
($V_i = 11$ V; $I_q = 500$ mA; $T_{amb} = 25$ °C)

		TDB 7806 / TDB 7806 T			TDC 7806			
		min	typ	max	min	typ	max	
Output voltage	V_q	5.75	6.0	6.25	5.75	6.0	6.25	V
Line regulation:								
8 V ≤ V_i ≤ 25 V			5	120		5	60	mV
9 V ≤ V_i ≤ 13 V			1.5	60		1.5	30	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			14	120		14	60	mV
250 mA ≤ I_q ≤ 750 mA			4	60		4	30	mV
Output voltage:								
$P \leq 15$ W 8 V ≤ V_i ≤ 25 V	V_q	5.7		6.3				V
5 mA ≤ I_q ≤ 1.0 A								
0 °C ≤ T_{amb} ≤ 70 °C								
$P \leq 15$ W 9 V ≤ V_i ≤ 21 V	V_q				5.65		6.35	V
5 mA ≤ I_q ≤ 1.0 A								
−55 °C ≤ T_{amb} ≤ +125 °C								
Quiescent current			4.3	8.0		4.3	6.0	mA
Quiescent current change								
0 °C ≦ T_{amb} ≤ +70 °C:								
8 V ≤ V_i ≤ 25 V				1.3				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55 °C ≤ T_{amb} ≤ +125 °C:								
9 V ≤ V_i ≤ 25 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			45			45		µV
Long term stability:								
0 °C ≤ T_{amb} ≤ +70 °C				24				mV/1000 h
−55 °C ≤ T_{amb} ≤ +125 °C							24	mV/1000 h
Ripple rejection (f = 120 Hz; 9 V ≤ V_i ≤ 19 V)								
0 °C ≤ T_{amb} ≤ +70 °C		59	75					dB
−55 °C ≤ T_{amb} ≤ +125 °C					65	75		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		550			550		mA
Peak output current	I_q		2.2			2.2		A
Output resistance (f = 1 kHz)								
0 °C ≤ T_{amb} ≤ +70 °C	R_q		19					mΩ
−55 °C ≤ T_{amb} ≤ +125 °C	R_q					19		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0 °C ≤ T_{amb} ≤ +70 °C	α_E		−.8					mV/K
0 °C ≤ T_{amb} ≤ +125 °C	α_E					−.8		mV/K

Type	Ordering codes
TDB 7808	Q67000-A1053
TDB 7808 T	Q67000-A1054
TDC 7808	Q67000-A1055

Operating characteristics
(V_i = 14 V; I_q = 500 mA; T_{amb} = 25 °C)

		TDB 7808 / TDB 7808 T			TDC 7808			
		min	typ	max	min	typ	max	
Output voltage	V_q	7.7	8.0	8.3	7.7	8.0	8.3	V
Line regulation:								
10.5 V ≤ V_i ≤ 25 V			6	160		6	80	mV
11 V ≤ V_i ≤ 17 V			2	80		2	40	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			12	160		12	80	mV
250 mA ≤ I_q ≤ 750 mA			4	80		4	40	mV
Output voltage:								
P ≤ 15 W 10.5 V ≤ V_i ≤ 23 V	V_q	7.6		8.4				V
5 mA ≤ I_q ≤ 1.0 A								
0 °C ≤ T_{amb} ≤ 70 °C								
P ≤ 15 W 11.5 V ≤ V_i ≤ 23 V	V_q				7.6		8.4	V
5 mA ≤ I_q ≤ 1.0 A								
−55 °C ≤ T_{amb} ≤ +125 °C								
Quiescent current			4.3	8.0		4.3	6.0	mA
Quiescent current change								
0 °C ≤ T_{amb} ≤ +70 °C:								
10.5 V ≤ V_i ≤ 25 V				1.0				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55 °C ≤ T_{amb} ≤ +125 °C:								
11.5 V ≤ V_i ≤ 25 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			52			52		μV
Long term stability:								
0 °C ≤ T_{amb} ≤ +70 °C				32				mV/1000 h
−55 °C ≤ T_{amb} ≤ +125 °C							32	mV/1000 h
Ripple rejection								
(f = 120 Hz; 11.5 V ≤ V_i ≤ 21.5 V)								
0 °C ≤ T_{amb} ≦ +70 °C		56	72					dB
−55 °C ≦ T_{amb} ≤ +125 °C					62	72		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		450			450		mA
Peak output current	I_q		2.2			2.2		A
Output resistance (f = 1 kHz)								
0 °C ≤ T_{amb} ≤ +70 °C	R_q		16					mΩ
−55 °C ≤ T_{amb} ≤ +125 °C	R_q					16		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0 °C ≤ T_{amb} ≤ +70 °C	α_E		−.8					mV/K
0 °C ≤ T_{amb} ≤ +125 °C	α_E						−.8	mV/K

Type	Ordering codes
TDB 7812	Q67000-A1056
TDB 7812 T	Q67000-A1057
TDC 7812	Q67000-A1058

Operating characteristics
(V_i = 19 V; I_q = 500 mA; T_{amb} = 25 °C)

		TDB 7812 / TDB 7812 T			TDC 7812			
		min	typ	max	min	typ	max	
Output voltage	V_q	11.5	12	12.5	11.5	12	12.5	V
Line regulation:								
14.5 V ≤ V_i ≤ 30 V			10	240		10	120	mV
16 V ≤ V_i ≤ 22 V			3	120		3	60	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			12	240		12	120	mV
250 mA ≤ I_q ≤ 750 mA			4	120		4	60	mV
Output voltage:								
P ≤ 15 W 14.5 V ≤ V_i ≤ 27 V	V_q	11.4		12.6				V
5 mA ≤ I_q ≤ 1.0 A								
0 °C ≤ T_{amb} ≤ 70 °C								
P ≤ 15 W 15.5 V ≤ V_i ≤ 27 V	V_q				11.4		12.6	V
5 mA ≤ I_q ≤ 1.0 A								
−55 °C ≤ T_{amb} ≤ +125 °C								
Quiescent current			4.3	8.0		4.3	6.0	mA
Quiescent current change								
0 °C ≤ T_{amb} ≤ +70 °C:								
14.5 V ≤ V_i ≤ 30 V				1.0				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55 °C ≤ T_{amb} ≤ +125 °C:								
15 V ≤ V_i ≤ 30 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			75			75		μV
Long term stability:								
0 °C ≤ T_{amb} ≤ +70 °C				48				mV/1000 h
−55 °C ≤ T_{amb} ≤ +125 °C							48	mV/1000 h
Ripple rejection								
(f = 120 Hz; 15 V ≤ V_i ≤ 25 V)								
0 °C ≤ T_{amb} ≤ +70 °C		55	71					dB
−55 °C ≤ T_{amb} ≤ +125 °C					61	71		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		350			350		mA
Peak output current	I_q		2.2			2.2		A
Output resistance (f = 1 kHz)								
0 °C ≤ T_{amb} ≤ +70 °C	R_q		18					mΩ
−55 °C ≤ T_{amb} ≤ +125 °C	R_q					18		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0 °C ≤ T_{amb} ≤ +70 °C	α_E		−1.0					mV/K
0 °C ≤ T_{amb} ≤ +125 °C	α_E					−1.0		mV/K

Type	Ordering codes
TDB 7815	Q67000-A1059
TDB 7815 T	Q67000-A1060
TDC 7815	Q67000-A1061

Operating characteristics
(V_i = 23 V; I_q = 500 mA; T_{amb} = 25 °C)

		TDB 7815 / TDB 7815 T			TDC 7815			
		min	typ	max	min	typ	max	
Output voltage	V_q	14.4	15	15.6	14.4	15	15.6	V
Line regulation:								
17.5 V ≤ V_i ≤ 30 V			11	300		11	150	mV
20 V ≤ V_i ≤ 26 V			3	150		3	75	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			12	150		12	150	mV
250 mA ≤ I_q ≤ 750 mA			4	75		4	75	mV
Output voltage:								
P ≤ 15 W 17.5 V ≤ V_i ≤ 30 V	V_q	14.25		15.75				V
5 mA ≤ I_q ≤ 1.0 A								
0 °C ≤ T_{amb} ≤ 70 °C								
P ≤ 15 W 18.5 V ≤ V_i ≤ 30 V	V_q				14.25		15.75	V
5 mA ≤ I_q ≤ 1.0 A								
−55 °C ≤ T_{amb} ≤ +125 °C								
Quiescent current			4.4	8.0		4.4	6.0	mA
Quiescent current change								
0 °C ≦ T_{amb} ≦ +70 °C:								
17.5 V ≤ V_i ≤ 30 V				1.0				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55 °C ≤ T_{amb} ≦ +125 °C:								
18.5 V ≤ V_i ≤ 30 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			90			90		µV
Long term stability:								
0 °C ≤ T_{amb} ≦ +70 °C				60				mV/1000 h
−55 °C ≤ T_{amb} ≦ +125 °C							60	mV/1000 h
Ripple rejection								
(f = 120 Hz; 18.5 V ≤ V_i ≦ 28.5 V)								
0 °C ≤ T_{amb} ≦ +70 °C		54	70					dB
−55 °C ≦ T_{amb} ≦ +125 °C					60	70		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		230			230		mA
Peak output current	I_q		2.1			2.1		A
Output resistance (f = 1 kHz)								
0 °C ≤ T_{amb} ≦ +70 °C	R_q		19					mΩ
−55 °C ≤ T_{amb} ≦ +125 °C	R_q					19		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0 °C ≤ T_{amb} ≦ +70 °C	α_E		−1.0					mV/K
0 °C ≤ T_{amb} ≦ +125 °C	α_E					−1.0		mV/K

Type	Ordering codes
TDB 7818	Q67000-A1062
TDB 7818 T	Q67000-A1063
TDC 7818	Q67000-A1064

Operating characteristics
($V_i = 27$ V; $I_q = 500$ mA; $T_{amb} = 25°C$)

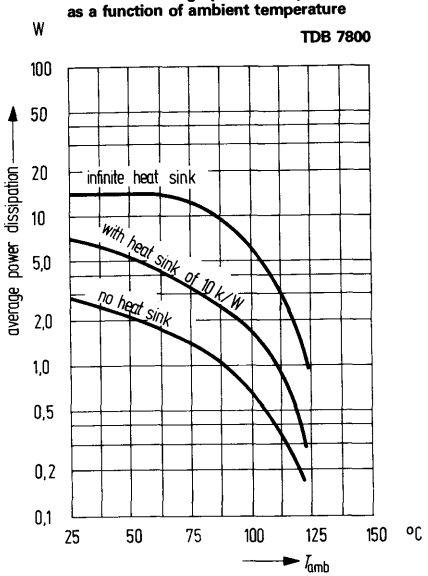
		TDB 7818 / TDB 7818 T			TDC 7818			
		min	typ	max	min	typ	max	
Output voltage	V_q	17.3	18	18.7	17.3	18	18.7	V
Line regulation:								
21 V ≤ V_i ≤ 33 V			15	360		15	180	mV
24 V ≤ V_i ≤ 30 V			5	180		5	90	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			12	360		12	180	mV
250 mA ≤ I_q ≤ 750 mA			4	180		4	90	mV
Output voltage:								
$P \leq 15$ W 21 V ≤ V_i ≤ 33 V	V_q	17.1		18.9				V
5 mA ≤ I_q ≤ 1.0 A								
0°C ≤ T_{amb} ≤ 70°C								
$P \leq 15$ W 22 V ≤ V_i ≤ 33 V	V_q				17.1		18.9	V
5 mA ≤ I_q ≤ 1.0 A								
−55°C ≤ T_{amb} ≤ +125°C								
Quiescent current			4.5	8.0		4.5	6.0	mA
Quiescent current change								
0°C ≤ T_{amb} ≤ +70°C:								
21 V ≤ V_i ≤ 33 V				1.0				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55°C ≤ T_{amb} ≤ +125°C:								
22 V ≤ V_i ≤ 33 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			110			110		µV
Long term stability:								
0°C ≤ T_{amb} ≤ +70°C				72				mV/1000 h
−55°C ≤ T_{amb} ≤ +125°C							72	mV/1000 h
Ripple rejection								
(f = 120 Hz; 22 V ≤ V_i ≤ 32 V)								
0°C ≤ T_{amb} ≤ +70°C		53	69					dB
−55°C ≤ T_{amb} ≤ +125°C					59	69		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		200			200		mA
Peak output current	I_q		2.1			2.1		A
Output resistance (f = 1 kHz)								
0°C ≤ T_{amb} ≤ +70°C	R_q		22					mΩ
−55°C ≤ T_{amb} ≤ +125°C	R_q					22		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0°C ≤ T_{amb} ≤ +70°C	α_E		−1.0					mV/K
0°C ≤ T_{amb} ≤ +125°C	α_E					−1.0		mV/K

Type	Ordering codes
TDB 7824	Q67000-A1065
TDB 7824 T	Q67000-A1066
TDC 7824	Q67000-A1067

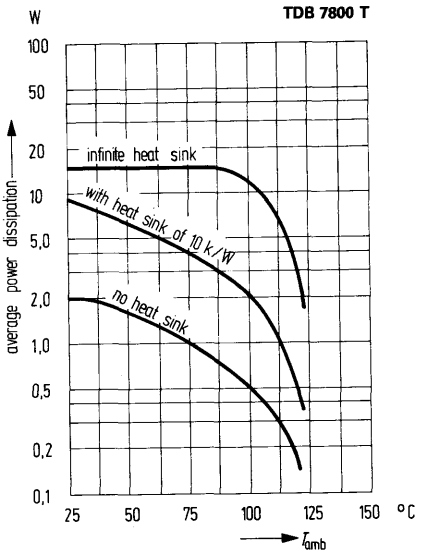
Operating characteristics
($V_i = 33$ V; $I_q = 500$ mA; $T_{amb} = 25$°C)

		TDB 7824 / TDB 7824 T			TDC 7824			
		min	typ	max	min	typ	max	
Output voltage	V_q	23	24	25	23	24	25	V
Line regulation:								
27 V ≤ V_i ≤ 38 V			18	480		18	240	mV
30 V ≤ V_i ≤ 36 V			6	240		6	120	mV
Load regulation:								
5 mA ≤ I_q ≤ 1.5 A			12	480		12	240	mV
250 mA ≤ I_q ≤ 750 mA			4	240		4	120	mV
Output voltage:								
$P \leq 15$ W 27 V ≤ V_i ≤ 38 V	V_q	22.8		25.2				V
5 mA ≤ I_q ≤ 1.0 A								
0°C ≤ T_{amb} ≤ 70°C								
$P \leq 15$ W 28 V ≤ V_i ≤ 38 V	V_q				22.8		25.2	V
5 mA ≤ I_q ≤ 1.0 A								
−55°C ≤ T_{amb} ≤ +125°C								
Quiescent current			4.6	8.0		4.6	8.0	mA
Quiescent current change								
0°C ≦ T_{amb} ≤ +70°C:								
27 V ≤ V_i ≤ 38 V				1.0				mA
5 mA ≤ I_q ≤ 1.0 A				.5				mA
−55°C ≤ T_{amb} ≤ +125°C:								
28 V ≤ V_i ≤ 38 V							.8	mA
5 mA ≤ I_q ≤ 1.0 A							.5	mA
Output noise voltage: 10 Hz ≤ f ≤ 100 kHz			170			170		µV
Long term stability:								
0°C ≤ T_{amb} ≤ +70°C				96				mV/1000 h
−55°C ≤ T_{amb} ≤ +125°C							96	mV/1000 h
Ripple rejection (f = 120 Hz; 28 V ≤ V_i ≤ 38 V)								
0°C ≤ T_{amb} ≤ +70°C		50	66					dB
−55°C ≤ T_{amb} ≤ +125°C					56	66		dB
Dropout voltage (I_q = 1.0 A)			2.0			2.0		V
Short circuit current	I_{qsc}		150			150		mA
Peak output current	I_q		2.1			2.1		A
Output resistance (f = 1 kHz)								
0°C ≤ T_{amb} ≤ +70°C	R_q		28					mΩ
−55°C ≤ T_{amb} ≤ +125°C	R_q					28		mΩ
Temperature coefficient of V_q (I_q = 5 mA)								
0°C ≤ T_{amb} ≤ +70°C	α_E		−1.5					mV/K
0°C ≤ T_{amb} ≤ +125°C	α_E					−1.5		mV/K

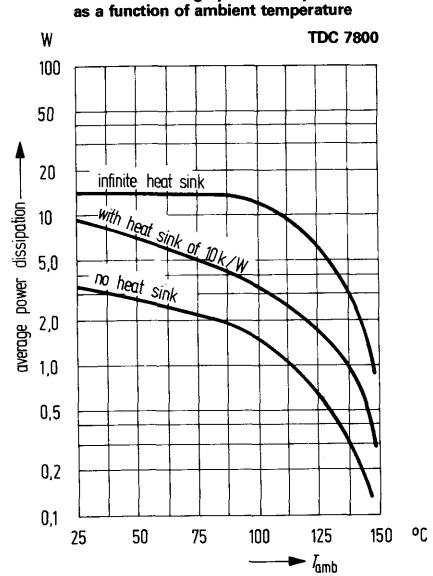
Maximum average power dissipation as a function of ambient temperature



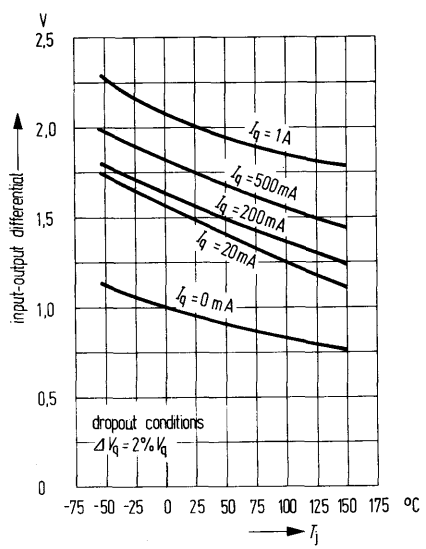
Maximum average power dissipation as a function of ambient temperature



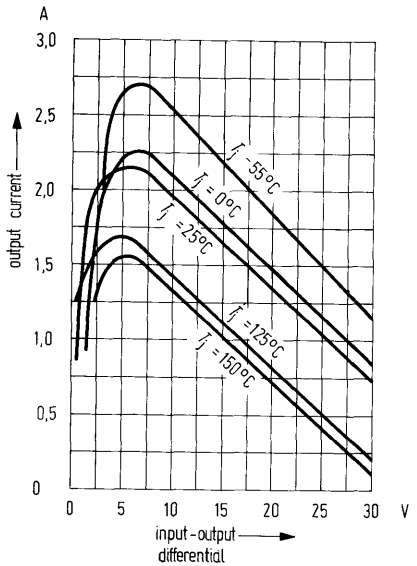
Maximum average power dissipation as a function of ambient temperature



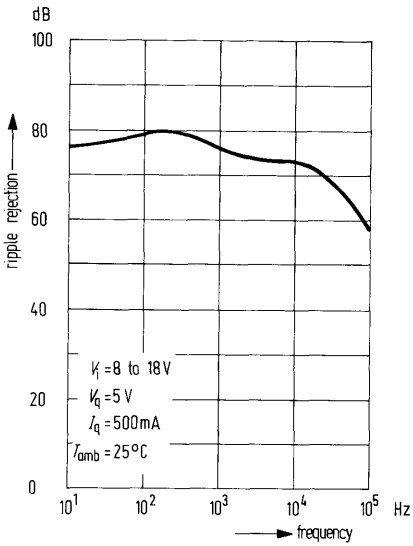
Dropout voltage as a function of junction temperature



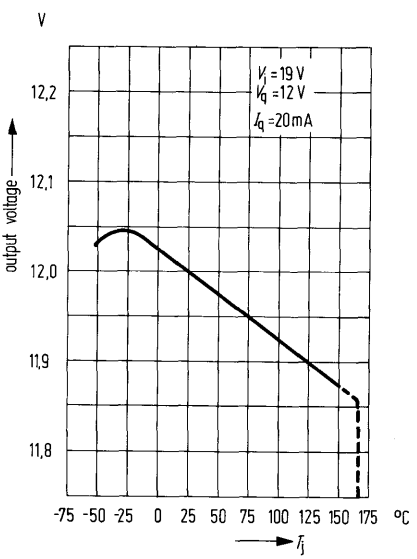
Peak output current as a function of input/output differential voltage



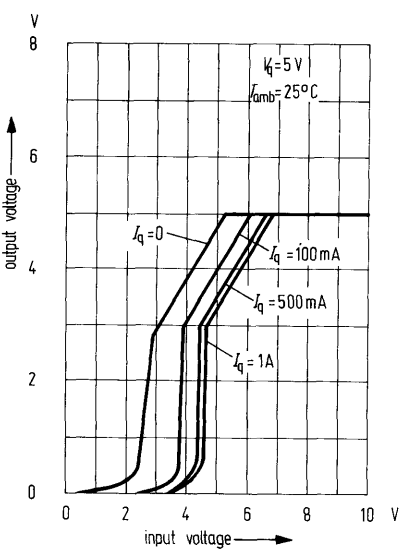
Ripple rejection as a function frequency



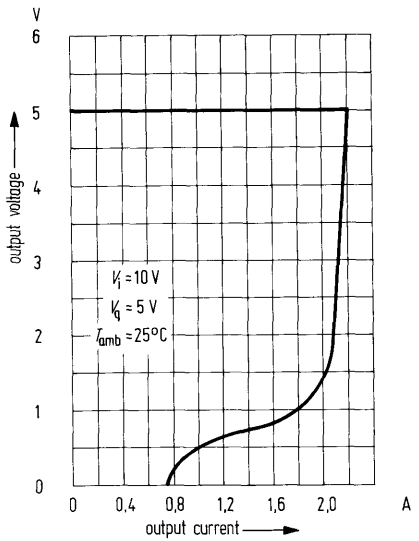
Output voltage as a function of junction temperature



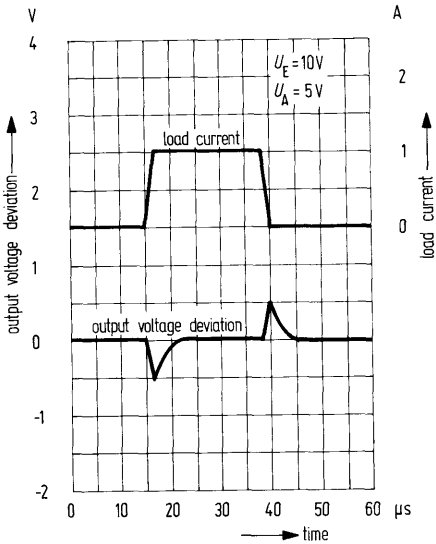
Dropout characteristics



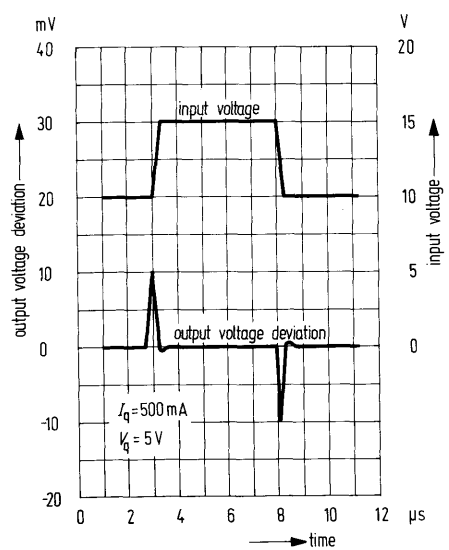
Current limiting characteristics



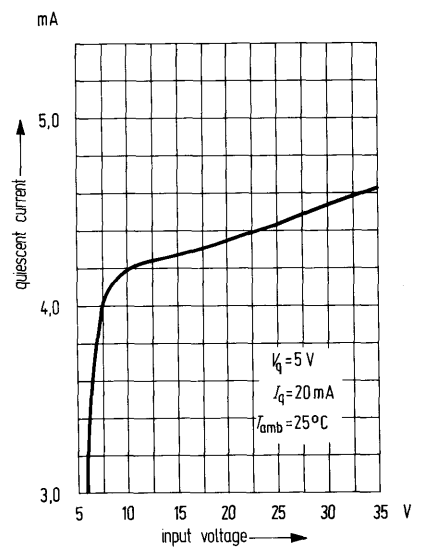
Load transient response



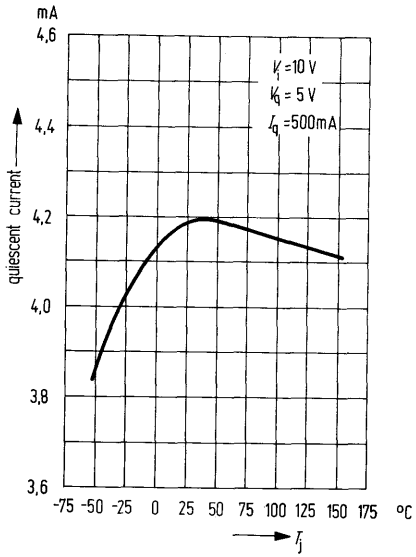
Line transient response



Quiescent current as a function of input voltage



Quiescent current as a function of temperature



Output impedance as a function of frequency