Descriptions

The DW8522 is a high efficiency step down (Buck) converter for LED driver IC which provide a solution for MR16, General lighting of flat panel displays and general DC voltage LED applications.
The DW8522 built in high-side current sensing circuit and protection circuit same as TSD, Current limit.
It can use PWM dimming and Analog dimming.
The DW8522 are available in a tiny DFN package and SOIC package.

Ordering Information

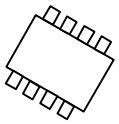
Device	Marking	Package	Operating Temp.
DW8522-T	DW8522	6 TDFN	-40~125℃
DW8522-S	DW8522	8 SOIC	-40~125℃

Features

- 4.5V to 40V Input Voltage Range
- Single Pin On/Off and Brightness Control Using DC Voltage and PWM
- Thermal Derating Function
- High-Side Current Sense
- 20KHz Maximum Dimming Frequency
- Hysteretic Buck Control : Low Parts Count
- Up to 2MHz Switching Frequency
- ±2.5% LED Current Accuracy
- 5V Internal Regulator
- -40 to 125℃ Operating Temperature Range

Package Information

6 TDFN



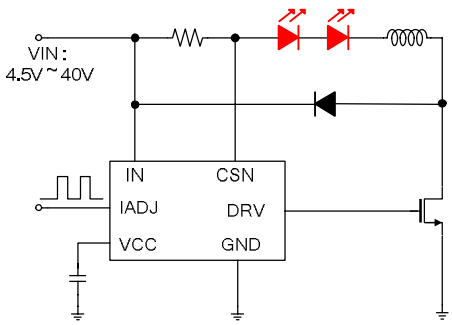
8 SOIC

Package	Size
6 TDFN	3.0 x 3.0 x 0.75 (mm)
8 SOIC	4.9 x 6.0 x 1.52 (mm)

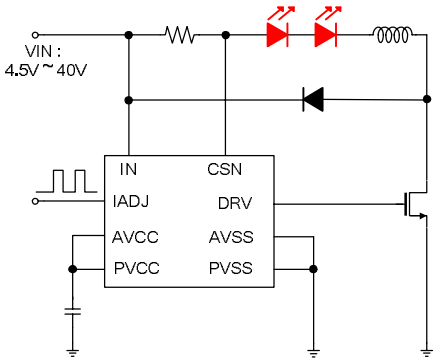
Applications

- MR16 Lighting
- Offline LED Lamps and fixtures
- General lighting of flat panel displays
- RGB backlighting LED driver
- Current stabilizer with DC/DC or AC/DC
- General purpose LED Lighting

Typical Application Circuit

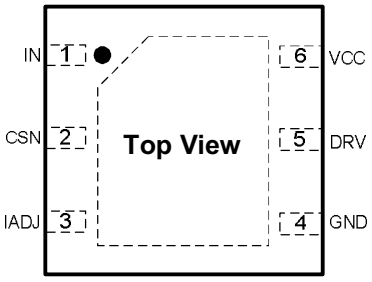


6 TDFN

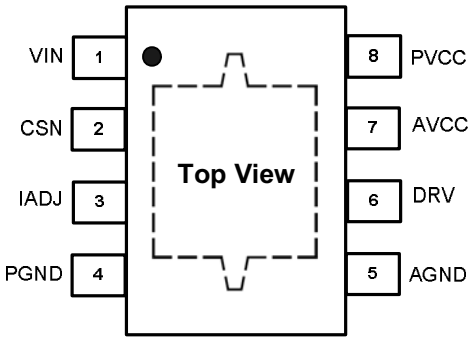


8 SOIC

Pin Connection



6 TDFN



8 SOIC

Pin Description

6 TDFN

Pin	Name	Description
1	IN	Supply voltage Input. (4.5V to 40V). Decouple to GND with 1uF or higher value capacitor.
2	CSN	Current sense input. Connect a resistor between IN and Sense.
3	IADJ	PWM/Analog dimming input. If not use dimming function, connect with VCC.
4	GND	Ground.
5	DRV	Gate drive output.
6	VCC	Regulator output. Decouple to GND with 1uF.

8 SOIC

Pin	Name	Description
1	IN	Supply voltage Input. (4.5V to 40V). Decouple to GND with 1uF or higher value capacitor.
2	CSN	Current sense input. Connect a resistor between IN and Sense.
3	IADJ	PWM/Analog dimming input. If not use dimming function, connect with PVCC or AVCC.
4	PVSS	Power Ground.
5	AVSS	Analog Ground.
6	DRV	Gate drive output.
7	PVCC	Power Regulator output. Decouple to PGND with 1uF.
8	AVCC	Analog Regulator output. Decouple to AGND with 1uF.

Absolute Maximum Ratings

Characteristics		Symbol	Value	Unit
Supply Input voltage, CSN Voltage		V_{IN}, V_{CSN}	51	V
DRV , VCC, IADJ Voltage		V_{DRV}, V_{VCC}, V_{IADJ}	-0.3 ~ 6	V
CSN to IN Voltage		V_{CSN_IN}	-0.3 ~ 0.3	V
Package Thermal Resistance(1)	6 TDFN	θ_{JA}	34.13	℃/W
	8 SOIC	θ_{JA}	73.84	℃/W
Operating Temperature		T_{OPR}	-40~125	℃
Storage Temperature		T_{STG}	-65~150	℃

Note 1. θja is measured in the convection at Ta=30℃ on a high effective thermal conductivity test board(4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.
2. PCB dimension is 100x100x1.6mm and 4 layers.

Recommended Operation Conditions

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	IN	4.5	-	40	V

Electrical Characteristics

IN=12V,VCC=IADJ,C_{VCC}=1uF,R_{CSN}=2ohm,Ta = -40℃~+125℃, unless otherwise specified. Typical values are at T_A=+25℃

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input voltage range	V_{IN}	-	4.5	-	40	V
Under voltage Lockout	UVLO	IN=CSN, V_{IN} rising from 4V until V_{DRV} > VCC-0.5V	-	-	5	V
Under voltage Lockout hysteresis	$UVLO_{HYS}$	IN=CSN, V_{IN} falling from 6V, V_{DRV} < 0.5V	-	-	0.5	V
Quiescent current	I_Q	DRV is open	-	-	1.5	mA
Current sense comparator						
CSN Voltage Threshold	V_{CSN}	-	195	200	205	mV
CSN threshold hysteresis	CSN_{HYS}	-	-	5	10	%
Current CSN input current	I_{CSN}	V_{IN}-V_{CSN}=200mV	-	-	10	uA
Propagation Delay to Output High	T_{PH}	Falling edge of (V_{IN}-V_{CSN}) from 0.26V to 0V to DRV high	-	80	-	ns
Propagation Delay to Output Low	T_{PL}	Rising edge of (V_{IN}-V_{CSN}) from 0.26V to 0.26V to DRV Low	-	80	-	ns
GATE Driver						
Source current	I_{Source}	V_{IN}=V_{CSN}, V_{DRV}=V_{CC}/2	-	0.5	-	A
Sink current	I_{Sink}	V_{CSN}=V_{IN}-0.25V, V_{DRV}=V_{CC}/2	-	0.5	-	A
Gate Driver Output-Voltage High	$V_{DRV,OH}$	-	VCC-0.5	-	-	V
Gate Driver Output-Voltage Low	$V_{DRV,OL}$	-	-	-	0.5	V
Regulator						
Regulator output voltage	V_{CC}	I_{VCC}=0.1mA to 10mA, V_{IN} = 5.5V to 40V	4.5	-	5.5	V
Current Limit	I_{LIM}	V_{IN}=5V, V_{CC}=0V	-	50	-	mA
		V_{IN}=5V, V_{CC}=4.5V	-	20	-	mA
Regulator output Delay time	$T_{Reg.}$	V_{CC}= 0 to 4.5V	-	-	1	ms
Thermal derating(1)	T_D	-	-	150	-	℃
Thermal derating hysteresis(1)	T_{DHYS}	-	-	25	-	℃

Note 1. Guaranteed by characterization and design

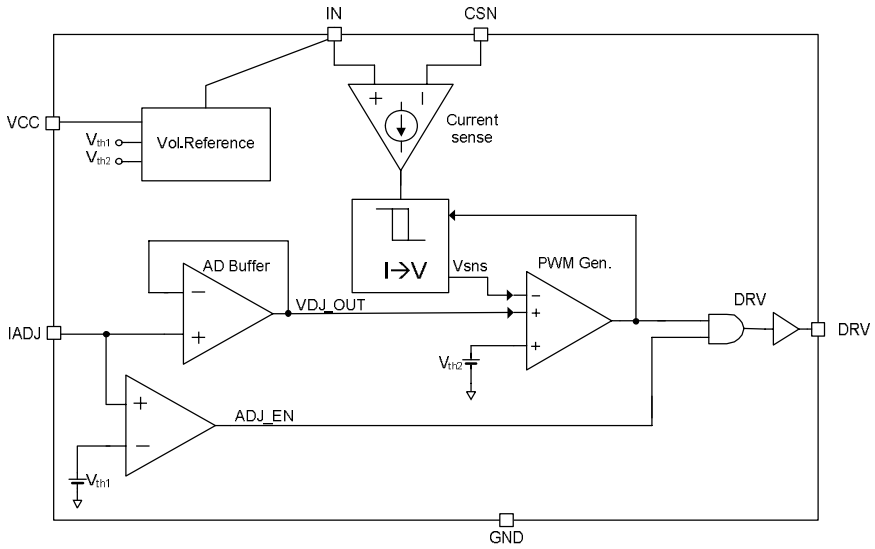
Electrical Characteristics

IN=12V,VCC=IADJ,C_{VCC}=1uF,R_{CSN}=2ohm,Ta = -40℃~+125℃, unless otherwise specified. Typical values are at T_A=+25℃

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dimming						
Dimming frequency	F_{DIM}	-	-	-	20	kHz
Dimming Input voltage High	V_{IH}	-	3	-	-	V
Dimming Input voltage low	V_{IL}	-	-	0.3	0.315	V
Maximum Duty	S_{Max}	-	-	-	95	%
Minimum Duty	S_{Min}	-	5	-	-	%
External control voltage range on IADJ pin for DC brightness control (1)	V_{IADJ}	-	-	0.3	2.5	V
DC voltage on ADJ pin to switch device from active (on) state to quiescent (off) state	$V_{IADJ,off}$	-	-	0.3	-	V

Note 1. 100% brightness corresponds to V_{IADJ}=2.5V . Driving the IADJ pin above V_{IADJ} will increase output current proportionally.

Block Diagram



Application Note

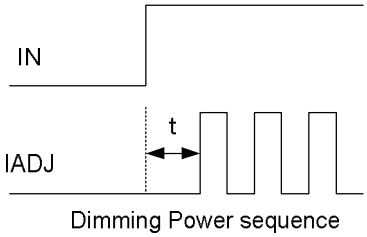
Setting Output Current

Iout[mA] = 200[mV] / R_{CSN}[ohm]

R_{CSN}(ohm)	Iout(mA)
0.2	1000
0.285	700
0.333	600
0.4	500
0.5	400
0.666	300
1	200

Powersequence

There is an electrostatic diode between IN and IADJ.
When dimming control, It must input IADJ signal after inputs IN. (t ≥ 1ms)
If not use Dimming control, IADJ connect to VCC.



Dimming Power sequence

Application Note (Continued)

UVLO

DW8522 operates when operation voltage is above 5V. If input voltage goes down below 5V during normal operation, certain level normal operation is preserved without prompt stop. Such function is called UVLO. IC operates normally up to 4.5V. IC can not operate normally below 4.5V.

Duty

It is ratio of input voltage and output voltage(LED Vf). Duty=Vout/Vin*100[%]
When input voltage is 12V and 2 pcs of LED Vf 3.0V are connected serially, total LED VF is 6V and Duty is 6V/12V*100=50%.
DW8522 operational Duty is around 95%.
If input voltage is 12V and LED Vf is 11V, Duty is around 91% and it can operate.
If input is 24V, output voltage is 22.8V. Duty is 95%.
When 95% Duty is over 95%, current can drop.

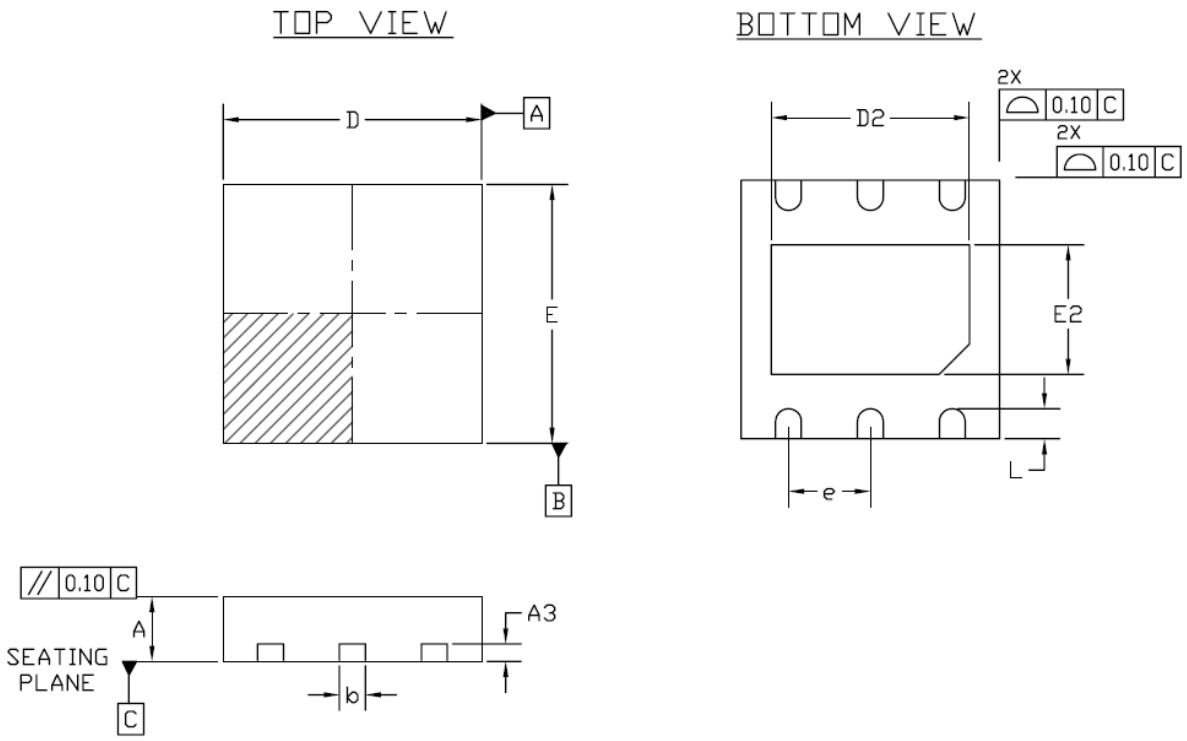
Dimming

DW8522 can support Analog and PWM Dimming.
0.3 ~ 2.5V are provided to No. 3 Pin, IADJ, output current can be adjusted. When directly PWM is provided, Dimming can be done. Recommended Dimming Frequency is around 20kHz.

Protection of Temperature

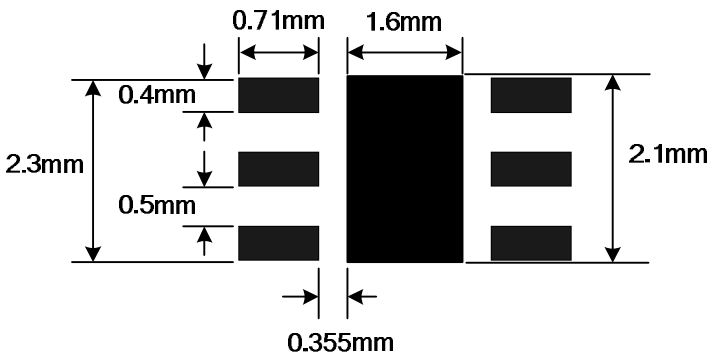
DW8522 has internal temperature protection circuit which has built-In Td(Thermal Derating).When IC internal Junction temperature goes over 150 degrees, current decreases up to 1/4 of the current. Temperature goes down because current decreases up to 1/4 of the current. The current goes to normal current.
If LED lighting products don't have temperature protection circuit, there could be safety Problem like fire.

Package Dimension (6 TDFN 3.0 x 3.0 x 0.75 mm)



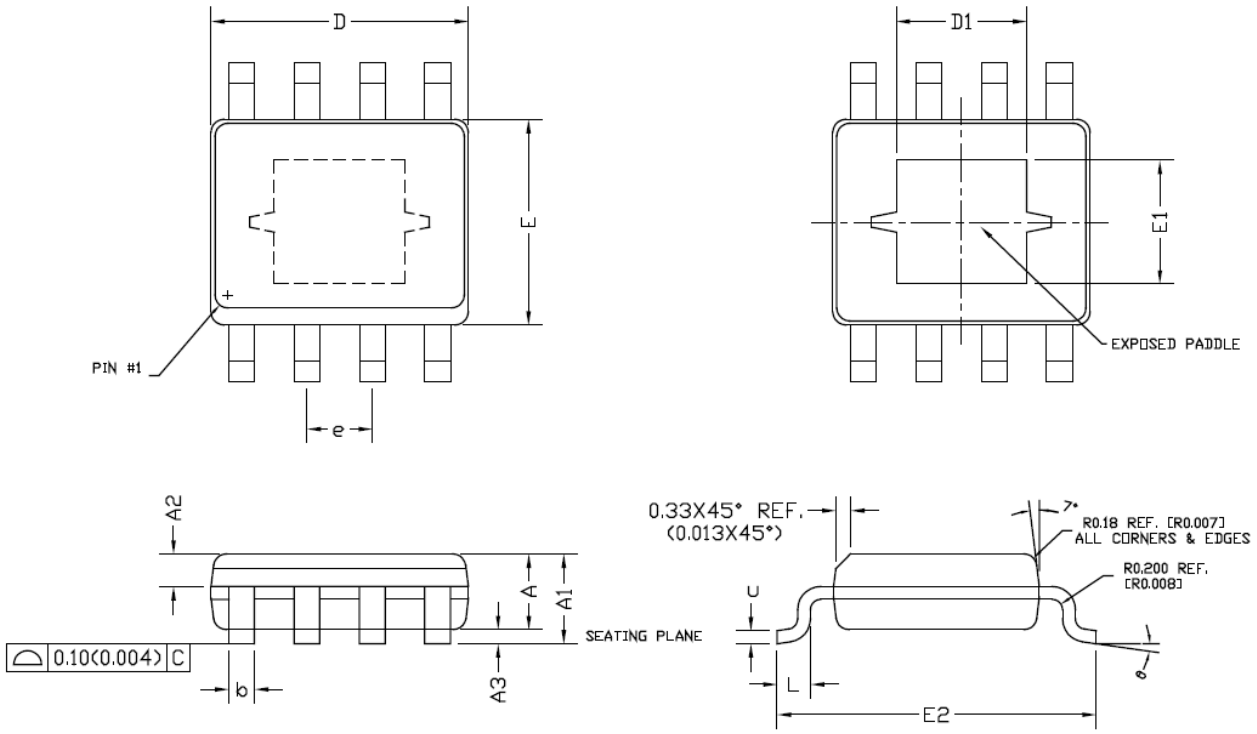
SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	SEE VARIATION "A"					
A3	0.203 REF			0.008 REF		
b	0.25	0.30	0.35	0.010	0.012	0.014
D	2.90	3.00	3.10	0.114	0.118	0.122
D2	2.25	2.30	2.35	0.089	0.091	0.093
E	2.90	3.00	3.10	0.114	0.118	0.122
E2	1.45	1.50	1.55	0.057	0.059	0.061
e	0.95 BSC			0.037 BSC		
L	0.30	0.35	0.40	0.012	0.014	0.016

Foot Print



SYMBOL	VARIATION "A"					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
TDFN	0.70	0.75	0.80	0.027	0.029	0.031
DFN	0.85	0.90	0.95	0.033	0.035	0.037

Package Dimension (8 SOIC 4.9 x 6.0 x 1.52 mm)



SIDE VIEW

SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A		1.473 REF.			0.058 REF.	
A1	1.473	1.523	1.573	0.058	0.060	0.062
A2		0.635 REF.			0.025 REF.	
A3	0.00	0.05	0.10	0.000	0.002	0.004
b	0.33	0.40	0.51	0.013	0.016	0.020
c	0.19	0.20	0.25	0.0070	0.008	0.010
D	4.80	4.90	5.00	0.189	1.93	0.196
E	3.80	3.90	4.00	0.149	0.153	0.157
E2	5.80	6.00	6.20	0.228	0.236	0.244
e		1.27 BSC.			0.050 BSC.	
L	0.400	0.835	1.27	0.014	0.033	0.050
θ	0°	4°	8°	0°	4°	8°

OPTION 1

	DIMENSIONS MILLIMETER	DIMENSIONS INCH
D1	2.54 TYP.	0.100 TYP.
E1	2.42 TYP.	0.095 TYP.

OPTION 2

	DIMENSIONS MILLIMETER	DIMENSIONS INCH
D1	3.20 TYP.	0.126 TYP.
E1	2.70 TYP.	0.106 TYP.

OPTION 3

	DIMENSIONS MILLIMETER	DIMENSIONS INCH
D1	2.30 TYP.	0.090 TYP.
E1	2.30 TYP.	0.090 TYP.