T2525

IR Receiver ASSP

DATASHEET

Features

- No external components except PIN diode
- Supply-voltage range: 4.5V to 5.5V
- Highest sensitivity due to automatic sensitivity adaption (AGC) and automatic strong signal adaption (ATC)
- Highest immunity against disturbances from daylight and lamps
- Available for carrier frequencies between 30kHz to 56kHz; adjusted by zener diode fusing
- TTL and CMOS compatible
- Suitable minimum burst length ≥ 10 pulses/burst

Applications

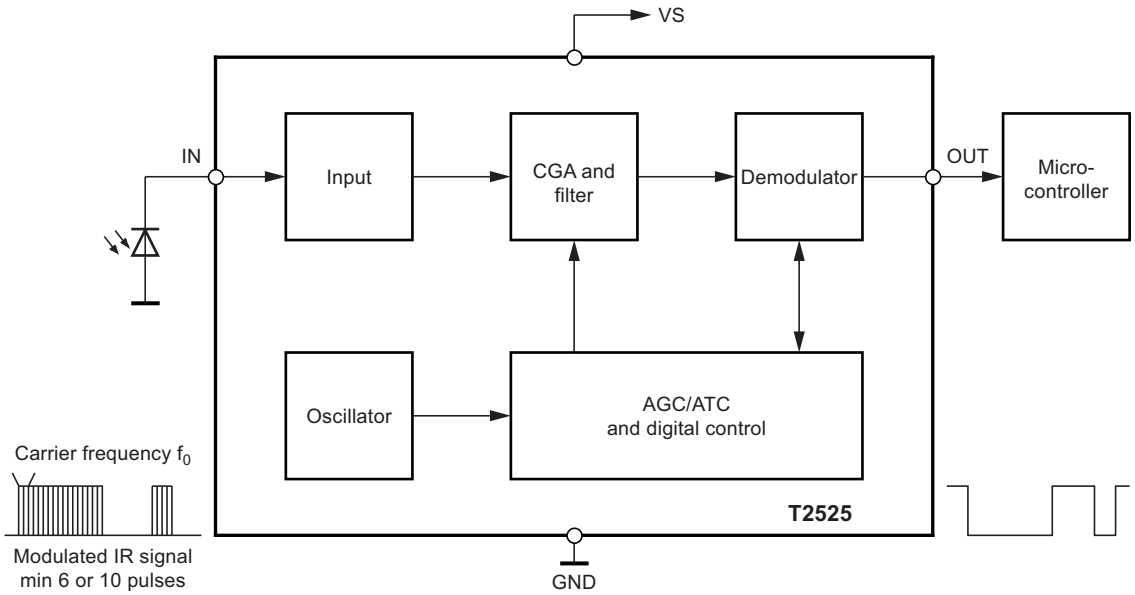
- Home entertainment applications (audio/video)
- Home appliances
- Remote control equipment

1. Description

The Atmel® IC T2525 is a complete IR receiver for data communication that was developed and optimized for use in carrier-frequency-modulated transmission applications. The IC offers highest sensitivity as well as highest suppression of noise from daylight and lamps. The T2525 is available with broadest range of carrier frequencies (30, 33, 36, 37, 38, 40, 44, 56kHz) and 3 different noise suppression regulation types (standard, lamp, short burst) covering requirements of high-end remote control solutions (please refer to selection guide available for T2525/T2526). The T2525 operates in a supply voltage range of 4.5V to 5.5V.

The function of T2525 can be described using the block diagram (see Figure 1-1 on page 2). The input stage meets two main functions. First, it provides a suitable bias voltage for the PIN diode. Secondly, the pulsed photo-current signals are transformed into a voltage by a special circuit which is optimized for low-noise applications. After amplification by a **C**ontrolled **G**ain **A**mplifier (CGA), the signals have to pass a tuned integrated narrow bandpass filter with a center frequency f_0 which is equivalent to the chosen carrier frequency of the input signal. The demodulator is used to convert the input burst signal into a digital envelope output pulse and to evaluate the signal information quality, i.e., unwanted pulses will be suppressed at the output pin. All this is done by means of an integrated dynamic feedback circuit which varies the gain as a function of the present environmental condition (ambient light, modulated lamps etc.). Other special features are used to adapt to the current application to secure best transmission quality.

Figure 1-1. Block Diagram



2. Pin Description

Table 2-1. Pin Description

Symbol	Function
VS	Supply voltage
OUT	Data output
IN	Input PIN diode
GND	Ground

3. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Symbol	Value	Unit
Supply voltage	V_S	–0.3 to +6	V
Supply current	I_S	3	mA
Input voltage	V_{IN}	–0.3 to V_S	V
Input DC current at V_S = 5V	I_{IN}	0.75	mA
Output voltage	V_O	–0.3 to V_S	V
Output current	I_O	10	mA
Operating temperature	T_{amb}	–25 to +85	°C
Storage temperature	T_{stg}	–40 to +125	°C
Power dissipation at T_{amb} = 25°C	P_{tot}	30	mW

4. Electrical Characteristics

T_{amb} = 25°C, V_S = 5V unless otherwise specified.

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
1	Supply							
1.1	Supply-voltage range		V_S	4.5	5	5.5	V	C
1.2	Supply current	I_{IN} = 0	I_S	0.8	1.1	1.4	mA	B
2	Output							
2.1	Internal pull-up resistor(1)	T_{amb} = 25°C; see Figure 5-7 on page 7	R_{PU}		30/40		kΩ	A
2.2	Output voltage low	I_L = 2mA; see Figure 5-7 on page 7	V_{OL}			250	mV	B
2.3	Output voltage high		V_{OH}	V_S – 0.25		Vs	V	B
2.4	Output current clamping	R_2 = 0; see Figure 5-7 on page 7	I_{OCL}		8		mA	B
3	Input							
3.1	Input DC current	V_{IN} = 0; see Figure 5-7 on page 7	I_{IN_DCMAX}	–85			µA	C
3.2	Input DC current; Figure 5-2 on page 5	V_{IN} = 0; V_s = 5V, T_{amb} = 25°C	I_{IN_DCMAX}	–530	–960		µA	B
3.3	Minimum detection threshold current; Figure 5-1 on page 5	Test signal: see Figure 5-6 on page 7 V_S = 5V, T_{amb} = 25°C, I_{IN_DC} = 1µA; square pp, burst N = 16, f = f_0; t_{PER} = 10ms, Figure 5-6 on page 7; BER = 50(2)	I_{Eemin}		–500		pA	B

*) Type means: A =100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes:
1. Depending on version, see “Ordering Information”
2. BER = Bit Error Rate; e.g., BER = 5% means that with P = 20 at the input pin 19...21 pulses can appear at the pin OUT
3. After transformation of input current into voltage

4. Electrical Characteristics (Continued)

T_{amb} = 25°C, V_S = 5V unless otherwise specified.

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
3.4	Minimum detection threshold current with AC current disturbance IIN_AC100 = 3µA at 100Hz	Test signal: see Figure 5-6 on page 7 V_S = 5V, T_{amb} = 25°C, I_{IN_DC} = 1µA, square pp, burst N = 16, f = f_0; t_{PER} = 10ms, Figure 5-6 on page 7; BER = 50%(2)	I_{Eemin}		–750		pA	C
3.5	Maximum detection threshold current with V_{IN} > 0V	Test signal: see Figure 5-6 on page 7 V_S = 5V, T_{amb} = 25°C, I_{IN_DC} = 1µA; square pp, burst N = 16, f = f_0; t_{PER} = 10ms, Figure 5-6 on page 7; BER = 5%(2)	I_{Eemax}	–400			µA	D
4	Controlled Amplifier and Filter							
4.1	Maximum value of variable gain (CGA)		G_{VARMAX}		51		dB	D
4.2	Minimum value of variable gain (CGA)		G_{VARMIN}		–5		dB	D
4.3	Total internal amplification(3)		G_{MAX}		71		dB	D
4.4	Center frequency fusing accuracy of bandpass	V_S = 5V, T_{amb} = 25°C	f_{0_FUSE}	–3	f_0	+3	%	A
4.5	Overall accuracy center frequency of bandpass		f_0	–6.7	f_0	+4.1	%	C
4.6	BPF bandwidth: type N0 - N3	–3 dB; f_0 = 38kHz; see Figure 5-4 on page 6	B		3.5		kHz	C
	BPF bandwidth: type N6, N7	–3 dB; f_0 = 38kHz Figure 5-4 on page 6	B		5.4		kHz	C

*) Type means: A =100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes:
1. Depending on version, see “Ordering Information”
2. BER = Bit Error Rate; e.g., BER = 5% means that with P = 20 at the input pin 19...21 pulses can appear at the pin OUT
3. After transformation of input current into voltage

4.1 ESD

All pins ⇒ 2000V HBM; 200V MM, MIL-STD-883C, Method 3015.7

4.2 Reliability

Electrical qualification (1000h) in molded SO8 plastic package

5. Typical Electrical Curves at T_{amb} = 25°C

Figure 5-1. I_{Eemin} versus I_{IN_DC}, V_S = 5V

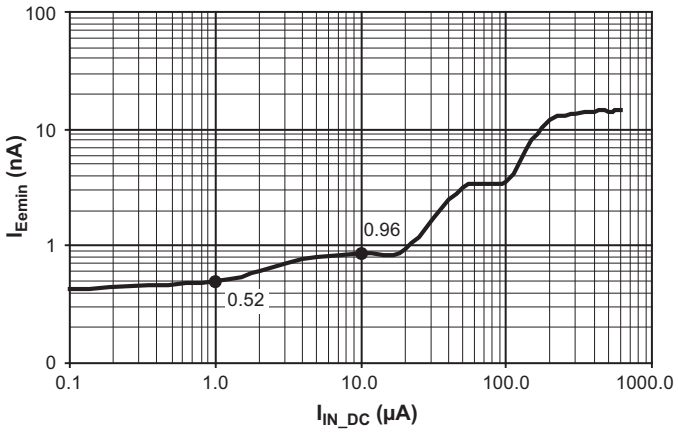


Figure 5-2. V_{IN} versus I_{IN_DC}, V_S = 5V

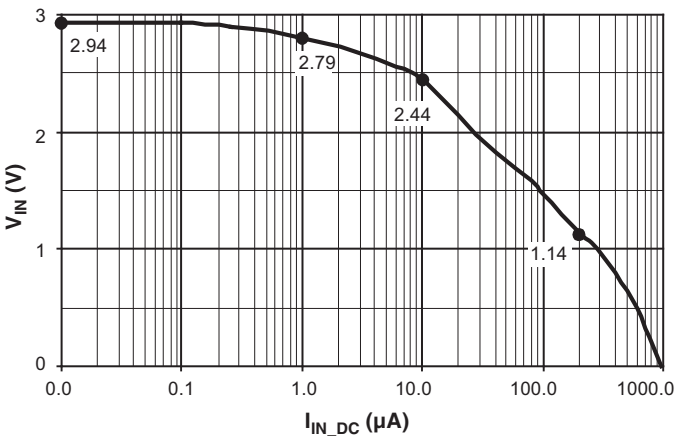


Figure 5-3. Data Transmission Rate, V_S = 5V

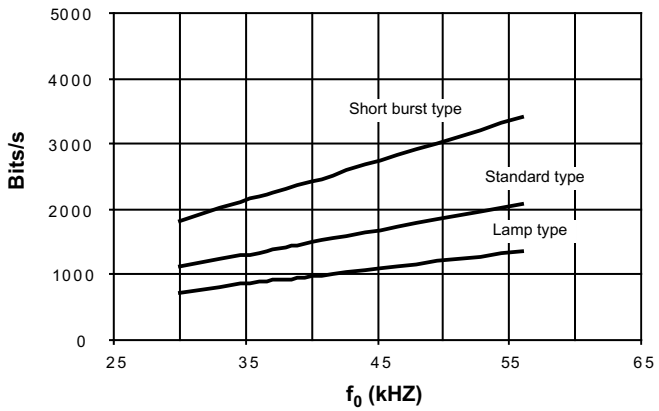
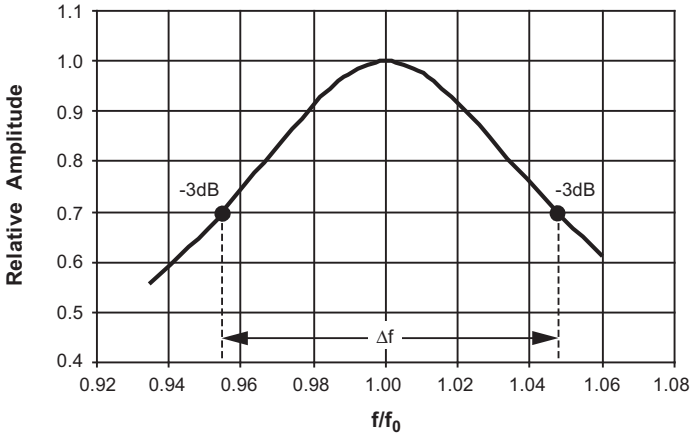
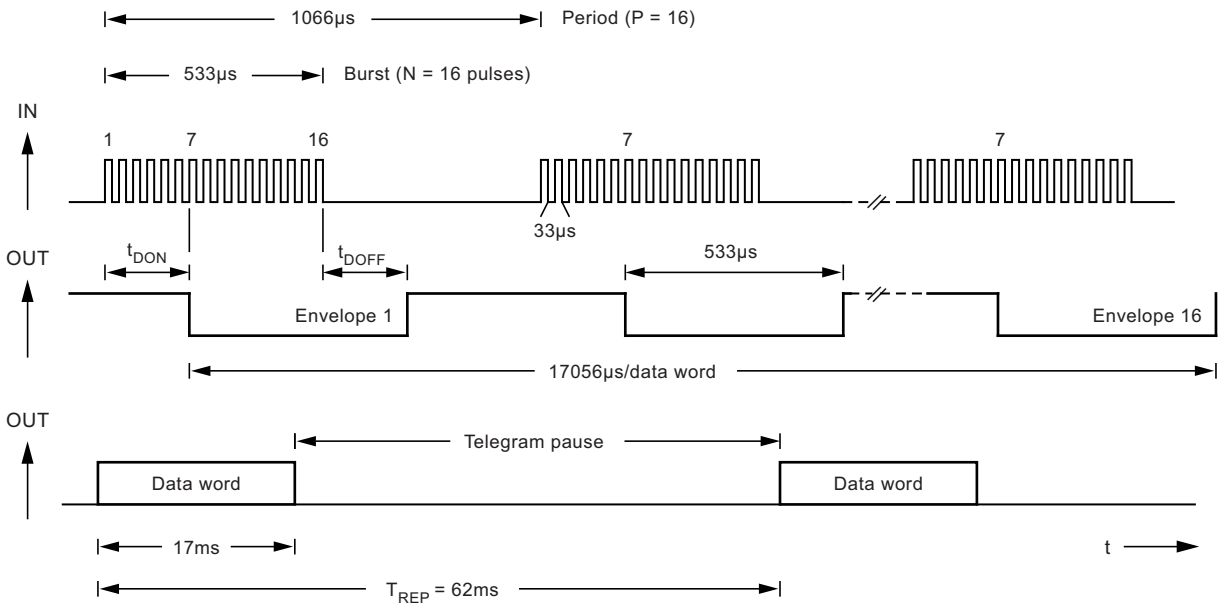


Figure 5-4. Typical Bandpass Curve



$Q = f_0/\Delta f$; Δf = -3 dB values. Example: Q = 1/(1.047 – 0.954) = 11

Figure 5-5. Illustration of Used Terms



Example: f = 30kHz, burst with 16 pulses, 26 periods

Example: f = 30kHz, burst with 16 pulses, 16 periods

Figure 5-6. Test Circuit

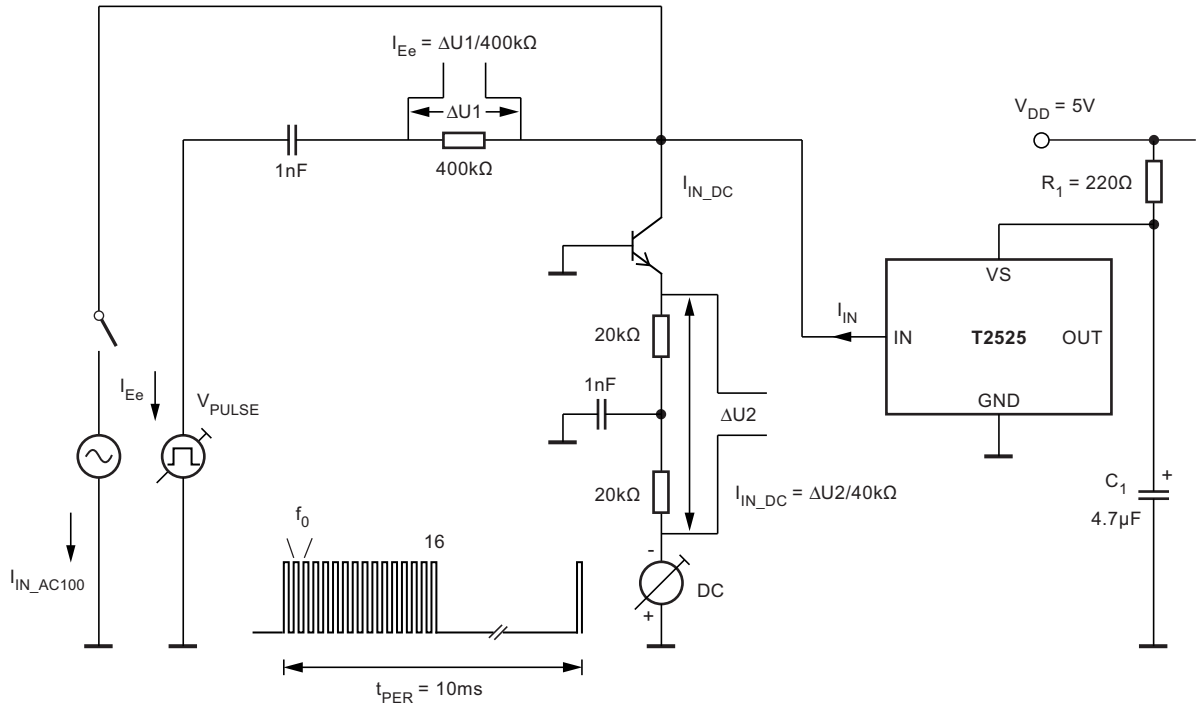
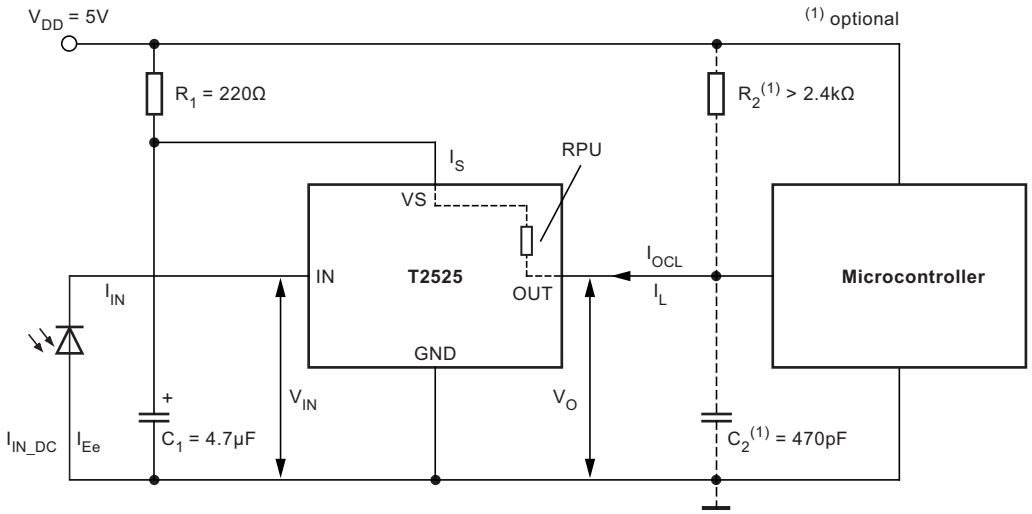
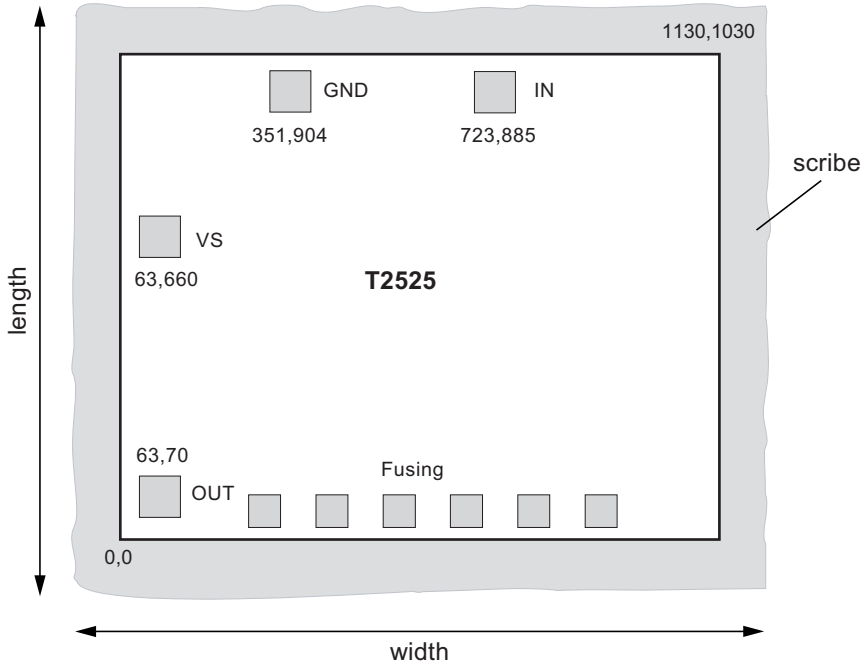


Figure 5-7. Application Circuit



6. Chip Dimensions

Figure 6-1. Chip Size in µm



Note: Pad coordinates are for lower left corner of the pad in µm from the origin 0,0

Dimensions	Length inclusive scribe	1.15mm
	Width inclusive scribe	1.29mm
	Thickness	290µ ±5%
	Pads	90µ × 90µ
	Fusing pads	70µ × 70µ
Pad metallurgy	Material	AlCu/AlSiTi(1)
	Thickness	0.8µm
Finish	Material	Si_3N_4/SiO_2
	Thickness	0.7/0.3µm

Note: Value depends on manufacture location.

7. Ordering Information

Delivering: unsawn wafers (DDW) in box.

Extended Type Number	PL[2]	R_{PU}[3]	D[4]	Type[5]
T2525S0xx[1]C-DDW	2	30	2090	**Standard type:** ≥ 10 pulses, enhanced sensibility, high data rate
T2525S1xx[1]C-DDW	1	30	2090	**Standard type:** ≥ 10 pulses, enhanced sensibility, high data rate
T2525S2xx[1]C-DDW	2	40	1373	**Lamp type:** ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
T2525S3xx[1]C-DDW	1	40	1373	**Lamp type:** ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
T2525S6xx[1]C-DDW	2	30	3415	**Short burst type:** ≥ 6 pulses, enhanced data rate
T2525S7xx[1]C-DDW	1	30	3415	**Short burst type:** ≥ 6 pulses, enhanced data rate

Notes:
1. xx means the used carrier frequency value f_0 30, 33, 36, 38, 40, 44, 56 kHz.
2. Two pad layout versions (see Figure 8-1 and Figure 8-2) available for different assembly demand
3. Integrated pull-up resistor at pin OUT (see “Electrical Characteristics”)
4. Typical data transmission rate up to bit/s with f_0 = 56 kHz, V_S = 5V (see Figure 5-3 on page 5)
5. On request: noise type, data rate type

8. Pad Layout

Figure 8-1. Pad Layout 1

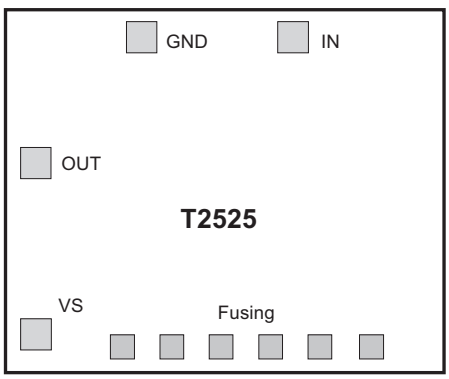
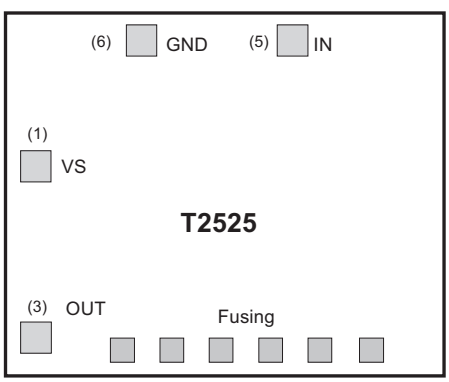


Figure 8-2. Pad Layout 2



9. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4657I-AUTO-04/14	• Put datasheet in the latest template
4657H-AUTO-05/10	• Features on page 1 changed • Section 1 “Description” on page 1 changed • Section 2 “Pin Description” on page 3 changed • Section 4 “Thermal Resistance” on page 3 deleted • Section 4 “Electrical Characteristics” on pages 4 to 5 changed • Figure 5-3 “Data Transmission Rate, V_S = 5V” on page 6 changed
4657G-AUTO-09/09	• Put datasheet in the latest template • Ordering Information table changed
4657F-AUTO-10/06	• Features on page 1 changed • Applications on page 1 changed • Section 1 “Description” on page 1 changed • Section 5 “Electrical Characteristics” number 3.3 and 3.4 on page 4 changed • Section 8 “Ordering Information” on page 10 changed • Section 9 “Pad Layout” on page 10 changed
4657E-AUTO-04/06	• Put datasheet in the latest template • Section 8 “Ordering Information” on page 10 changed

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