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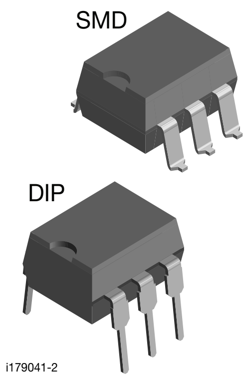
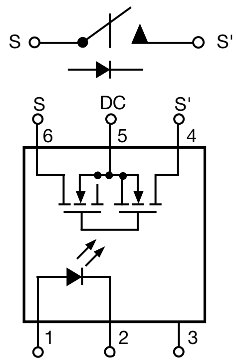
1 Form A Solid State Relay





FEATURES

- Current limit protection
- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 20 Ω, max. 25 Ω
- Load voltage 400 V
- Load current 120 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- SMD lead available on tape and reel
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS COMPLIANT

DESCRIPTION

The LH1535 is robust, ideal for telecom and ground fault applications. It is an SPST normally open switch (form A) that replaces electromechanical relays in many applications. It is constructed using a GaAIAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry and MOSFET switches. In addition, it employs current-limiting circuitry which meets FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

APPLICATIONS

- General telecom switching
- Instrumentation
- Industrial controls

Note

- See "solid state relays" (application note 56)

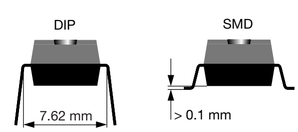
AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection
CSA: certification no. 093751
FIMKO: 25419

ORDERING INFORMATION

L H 1 5 3 5 # # # T R

PART NUMBER (L H 1 5 3 5) · ELECTR. VARIATION (#) · PACKAGE CONFIG. (# #) · TAPE AND REEL (T R)



PACKAGE	UL, CSA, FIMKO
SMD-6	LH1535AAB
SMD-6, tape and reel	LH1535AABTR
DIP-6, thru hole	LH1535AT

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
LED continuous forward current		I_F	50	mA
LED reverse voltage	$I_R \le 10\ \mu A$	V_R	8	V
OUTPUT				
DC or peak AC load voltage	$I_L \le 50\ \mu A$	V_L	400	V
Continuous DC load current, bidirectional operation		I_L	120	mA
Continuous DC load current, unidirectional operation		I_L	250	mA
Peak load current (single shot)	t = 100 ms	I_P	(1)	mA
SSR				
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Pin soldering temperature (2)	t = 10 s max.	T_{sld}	260	°C
Input to output isolation test voltage		V_{ISO}	5300	V_{RMS}
Output power dissipation (continuous)		P_{diss}	550	mW

Notes

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(1) Refer to current limit performance application note for a discussion on relay operation during transient currents.

(2) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}		0.75	2	mA
LED forward current, switch turn-off	V_L = ± 150 V, t = 100 ms	I_{Foff}	0.2	0.65		mA
LED forward voltage, switch turn-on	I_F = 10 mA	V_F	1.15	1.27	1.45	V
OUTPUT						
On-resistance AC/DC	I_F = 5 mA, I_L = 50 mA	R_{ON}	12	20	25	Ω
On-resistance DC	I_F = 5 mA, I_L = 100 mA	R_{ON}	3	6	6.25	Ω
Off-resistance	I_F = 0 mA, V_L = ± 100 V	R_{OFF}	0.5	200		GΩ
Current limit AC (1): pin 4 (±) to 6 (±)	I_F = 5 mA, V_L = ± 6 V, t = 5 ms	I_{LMT}	175	210	250	mA
Off-state leakage current	I_F = 0 mA, V_L = ± 100 V	I_O		0.5	200	nA
	I_F = 0 mA, V_L = ± 400 V	I_O		136		nA
Output capacitance	I_F = 0 mA, V_L = 1 V	C_O		21.6		pF
	I_F = 0 mA, V_L = 50 V	C_O		9		pF
Switch offset	I_F = 5 mA	V_{OS}		0.4		V
Breakdown voltage	I_F = 0 mA	V_{BR}		433		µV
TRANSFER						
Capacitance (input to output)	V_{ISO} = 1 V	C_{IO}		0.75		pF

Notes

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

(1) No DC mode current limit available.

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_F = 5 mA, I_L = 50 mA	t_{on}		0.7	2	ms
Turn-off time	I_F = 5 mA, I_L = 50 mA	t_{off}		0.6	2	ms

SAFETY AND INSULATION RATINGS					
PARAMETER		**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification		IEC 68 part 1		40/85/21	
Pollution degree		DIN VDE 0109		2	
Tracking resistance (comparative tracking index)		Insulation group IIIa	CTI	175	
Highest allowable overvoltage		Transient overvoltage	V_{IOTM}	8000	V_{peak}
Max. working insulation voltage		Recurring peak voltage	V_{IORM}	890	V_{peak}
Insulation resistance at 25 °C		V_{IO} = 500 V	R_{IS}	$\geq 10^{12}$	Ω
Insulation resistance at T_S			R_{IS}	$\geq 10^{9}$	Ω
Insulation resistance at 100 °C			R_{IS}	$\geq 10^{11}$	Ω
Partial discharge test voltage		Methode a, $V_{pd} = V_{IORM}$ x 1.875	V_{pd}	1669	V_{peak}
Safety limiting values - maximum values allowed in the event of a failure	Case temperature		T_{SI}	175	°C
	Input current		I_{SI}	300	mA
	Output power		P_{SO}	700	mW
Minimum external air gap (clearance)		Measured from input terminals to output terminals, shortest distance through air		≥ 7	mm
Minimum external tracking (creepage)		Measured from input terminals to output terminals, shortest distance path along body		≥ 7	mm

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

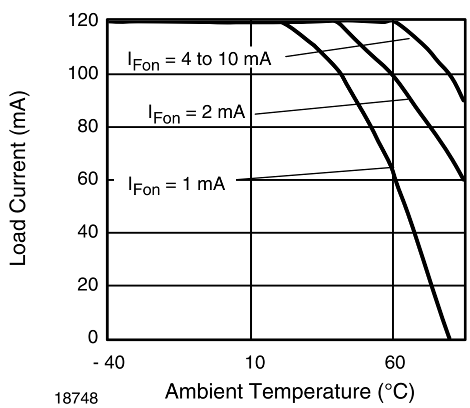


Fig. 1 - Recommended Operating Conditions

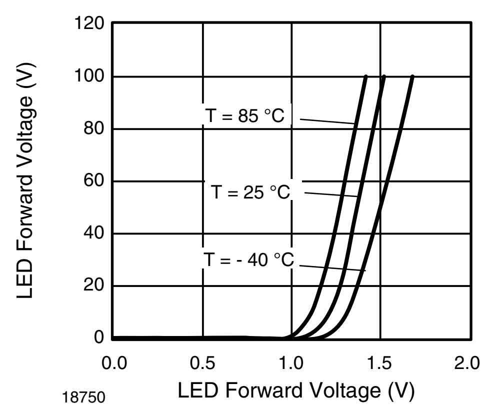


Fig. 3 - LED Forward Current vs. LED Forward Voltage

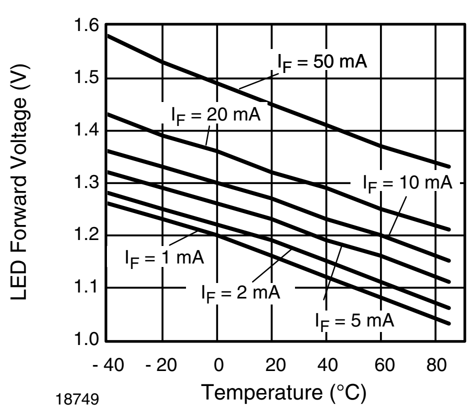


Fig. 2 - LED Voltage vs. Temperature

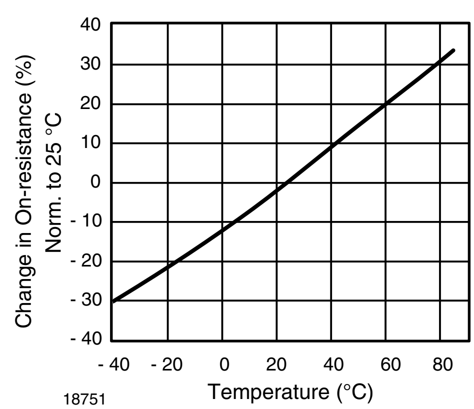


Fig. 4 - On-resistance vs. Temperature

For technical questions, contact: optocoupleranswers@vishay.com

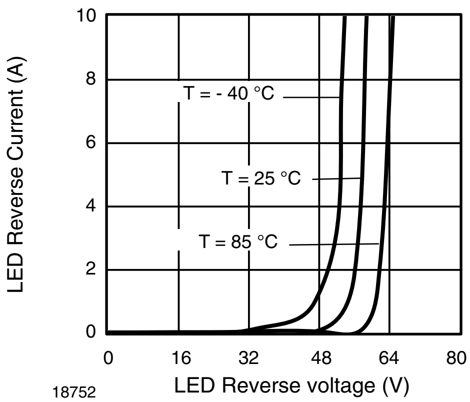


Fig. 5 - LED Reverse Current vs. LED Reverse Voltage

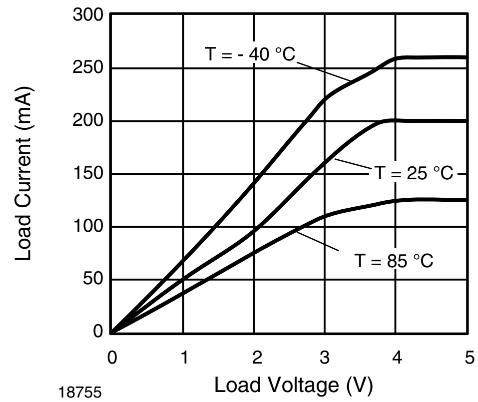


Fig. 8 - Load Current vs. Load Voltage

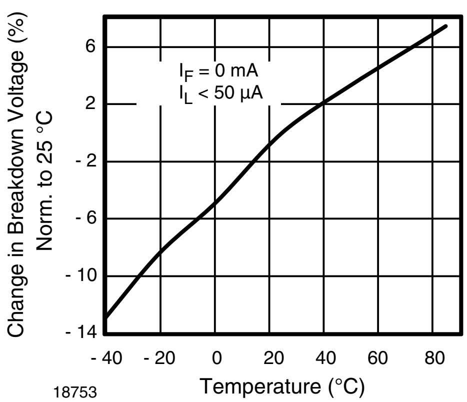


Fig. 6 - Switch Breakdown Voltage vs. Temperature

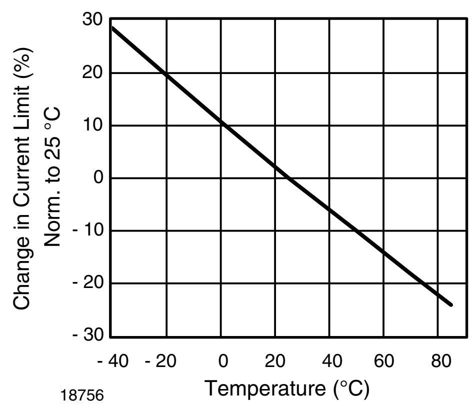


Fig. 9 - Current Limit vs. Temperature

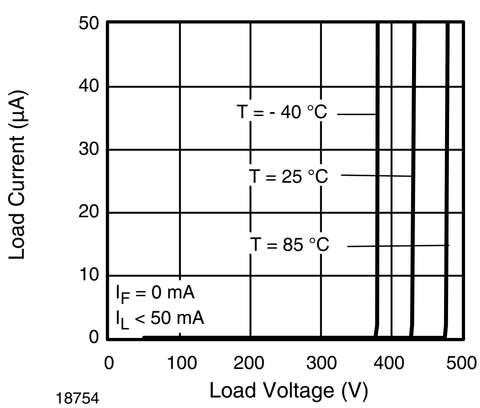


Fig. 7 - Switch Breakdown Voltage vs. Load Current

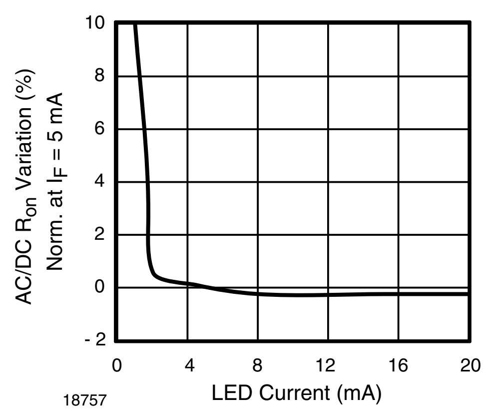


Fig. 10 - Variation in On-resistance vs. LED Current

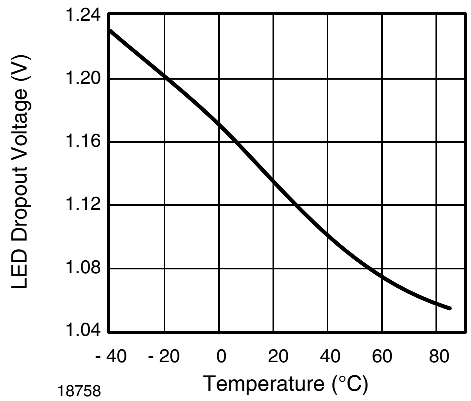


Fig. 11 - LED Dropout Voltage vs. Temperature

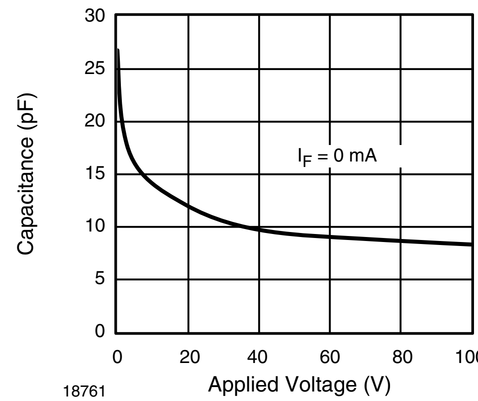


Fig. 14 - Switch Terminal Capacitance vs. Applied Voltage

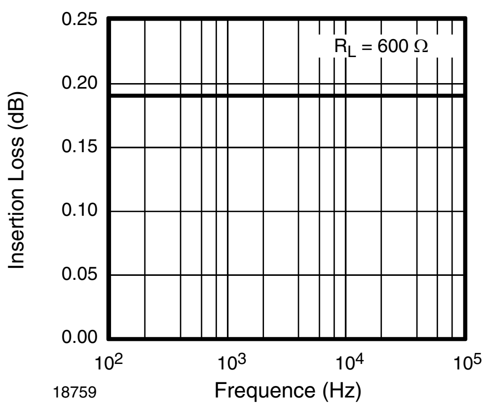


Fig. 12 - Insertion Loss vs. Frequency

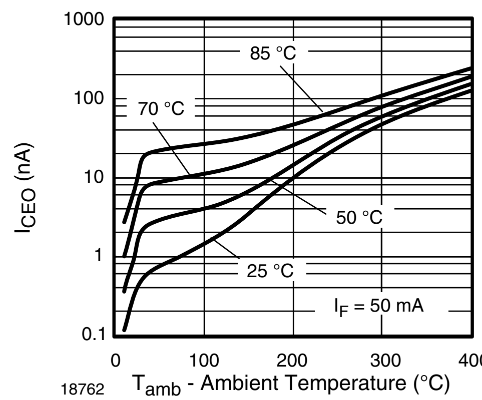


Fig. 15 - Leakage Current vs. Applied Voltage

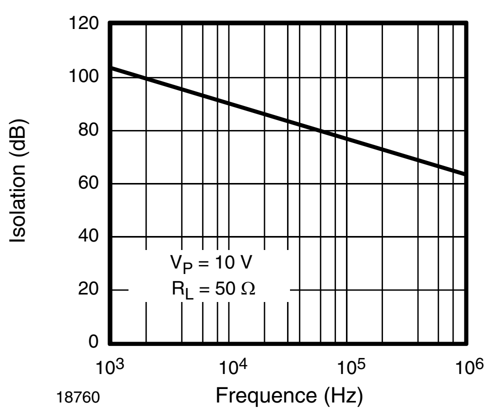


Fig. 13 - Output Isolation

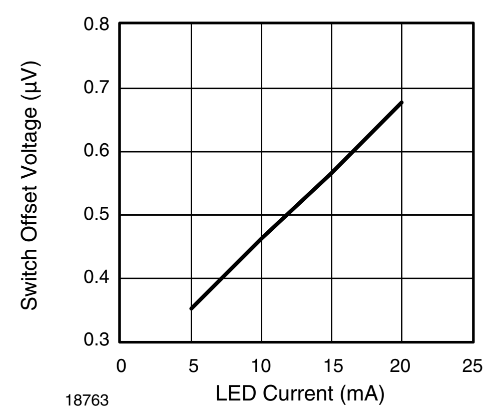


Fig. 16 - Switch Offset Voltage vs. LED Current

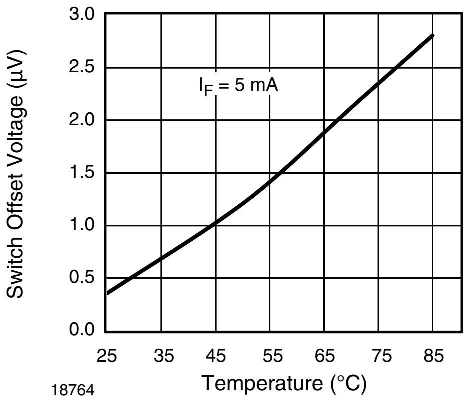


Fig. 17 - Switch Offset Voltage vs. Temperature

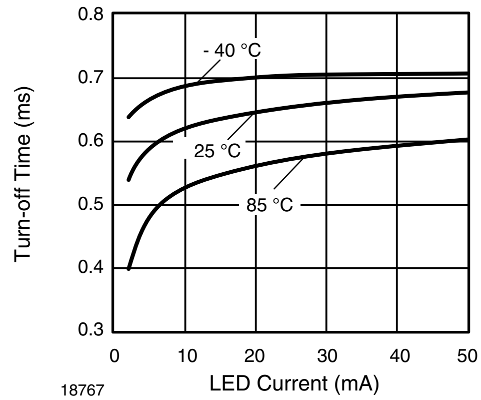


Fig. 20 - Turn-off Time vs. LED Current

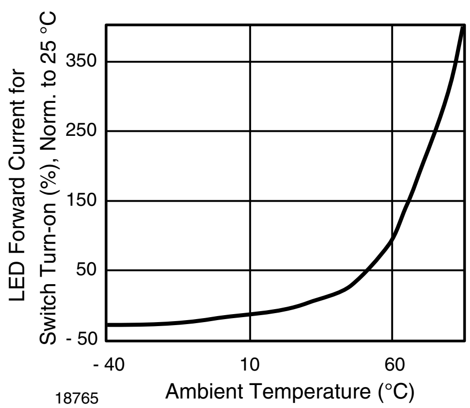


Fig. 18 - LED Current for Switch Turn-on vs. Temperature

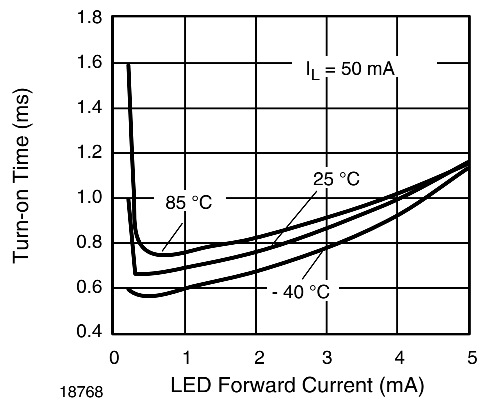


Fig. 21 - Turn-on Time vs. LED Current

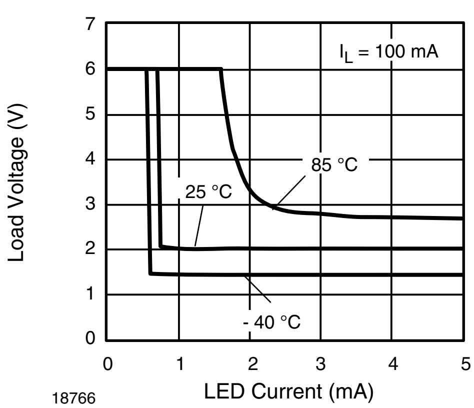


Fig. 19 - LED Current vs. Load Voltage

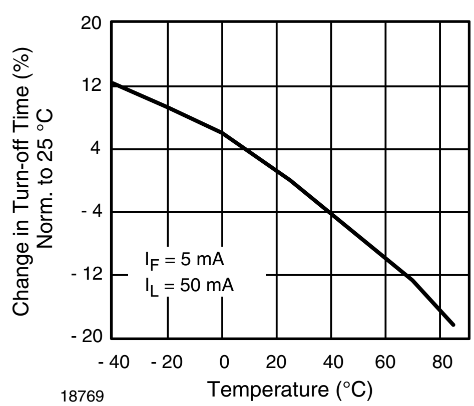


Fig. 22 - Turn-off Time vs. Temperature

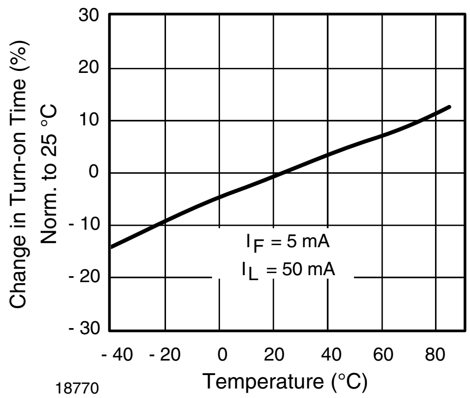
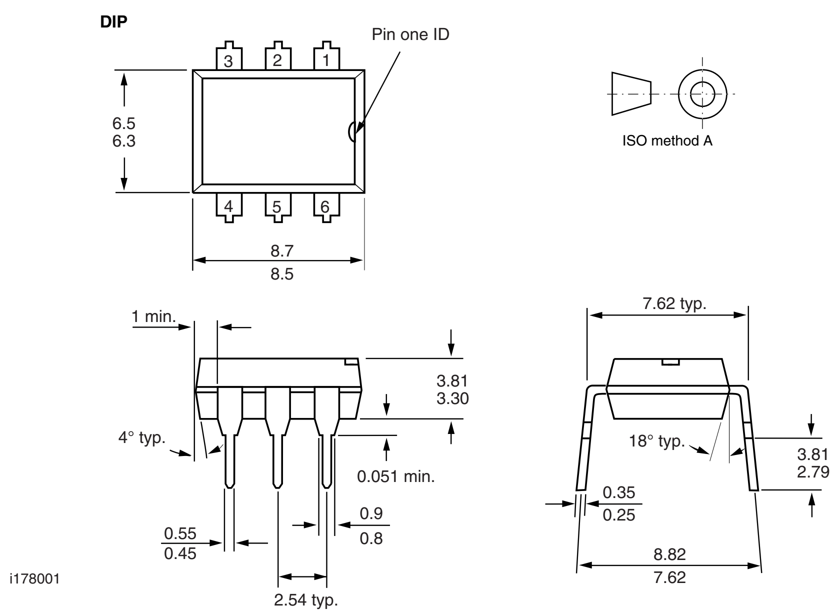
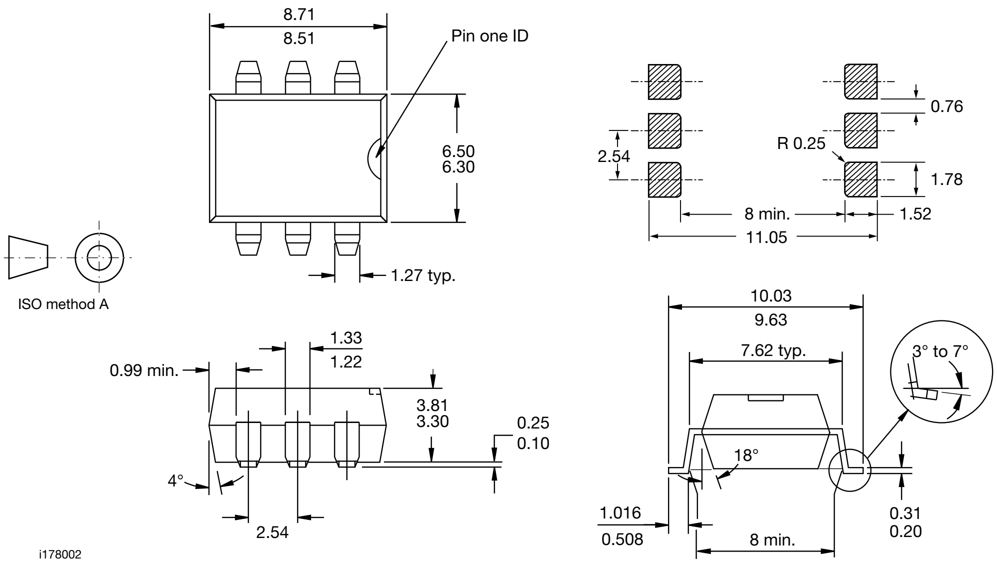


Fig. 23 - Turn-on Time vs. Temperature

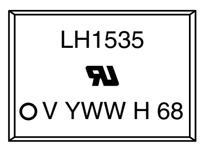
PACKAGE DIMENSIONS in millimeters



SMD



PACKAGE MARKING



Note

- Tape and reel suffix (TR) is not part of the package marking.

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