FD2504S

HALF BRIDGE DRIVER

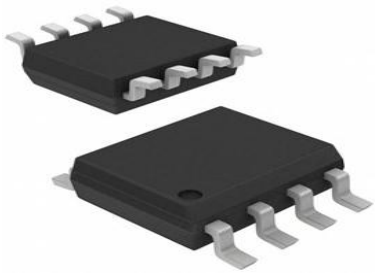
Description

The FD2504S is a high voltage, high speed power MOSFET and IGBT drivers with dependent high and low side referenced output channels. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates up to 650V.

Features

- Fully operational to +650V
- Gate driver supply range from 10V to 20V
- Tolerant to negative transient voltage, dv/dt immune
- Undervoltage lockout
- 3.3V,5V,15V logic input compatible
- Cross-conduction prevention logic
- Internal set deadtime
- High side output in phase with input
- Shut down input turns off both channels

Packages

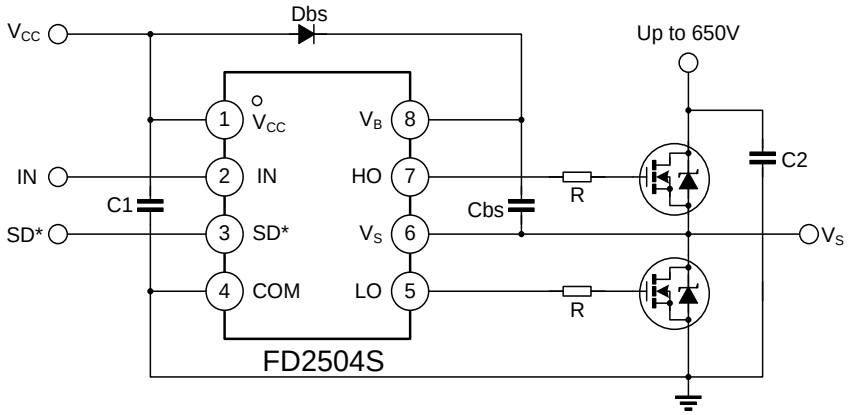


SOIC-8

Applications

- Motor drives
- DC-DC converters
- DC-AC inverter drives

Typical Connection



Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The thermal resistance and power dissipation ratings are measured under board mounted and still air condition.

Definition	Symbol	Min~Max	Units
High side floating supply voltage	V_B	-0.3～675	V
High side floating supply offset voltage	V_S	V_B-25～V_B+0.3	V
High side floating output voltage	V_{HO}	V_S-0.3～V_B+0.3	V
Low side and logic fixed supply voltage	V_{CC}	-0.3～25(+)	V
Low side output voltage	V_{LO}	-0.5～V_{CC}+0.3	V
Logic input voltage（IN,SD*）	V_{IN}	-0.5～V_{CC}+0.3	V
Allowable offset supply voltage transient	dV_S/dt	≤50	V/ns
Package power dissipation @T_A≤25°C	P_D	≤0.625	W
Thermal resistance, junction to ambient	R_{thJA}	≤200	°C/W
Junction temperature	T_j	≤150	°C
Storage temperature	T_{stg}	-55～150	°C

+ All supplies are fully tested at 25V and an internal 23V clamp exists for each supply.

Recommended Operating Conditions

For proper operation the device should be used within the recommended conditions. The V_S offset rating is tested with all supplies biased at a 15V differential.

Definition	Symbol	Min	Max	Units
High side floating supply voltage	V_B	V_S+10	V_S+20	V
High side floating supply offset voltage	V_S	-7	650	V
High side floating output voltage	V_{HO}	V_S	V_B	V
Low side and logic fixed supply voltage	V_{CC}	10	20	V
Low side output voltage	V_{LO}	0	V_{CC}	V
Logic input voltage（IN,SD*）	V_{IN}	0	V_{CC}	V
Ambient temperature	T_A	-40	125	°C

Static Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS}) =15V and TA =25°C unless otherwise specified. All the parameters are referenced to COM.

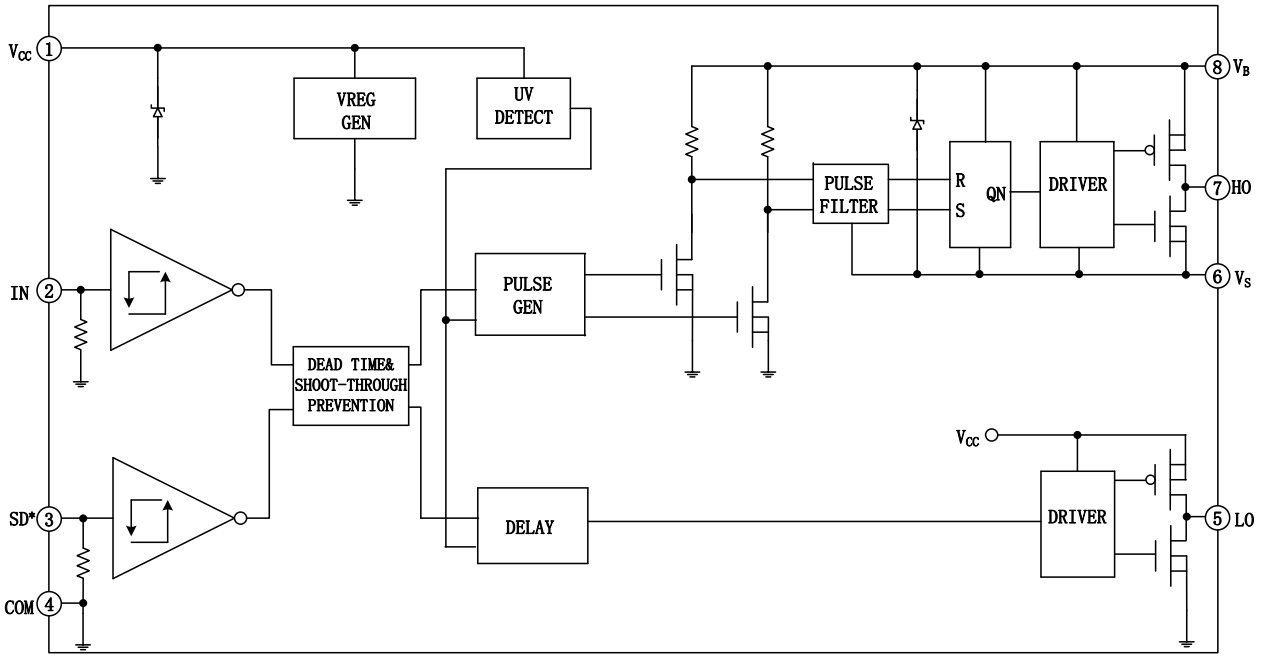
Definition	Symbol	Test conditions	Min.	Typ.	Max.	Units
Logic "1" input voltage	V_{IH}	V_{CC} = 10V to 20V	2.5	-	-	V
Logic "0" input voltage	V_{IL}		-	-	0.8	
SD input positive going threshold	$V_{SD,TH+}$	V_{CC} = 10V to 20V	2.5	-	-	
SD input negative going threshold	$V_{SD,TH-}$		-	-	0.8	
High level output voltage, V_{BIAS} - V_O	V_{OH}	I_O = 2mA	-	0.05	0.2	
low level output voltage, V_O	V_{OL}		-	0.02	0.1	
Offset supply leakage current	I_{LK}	V_B = V_S = 650V	-	-	10	uA
Quiescent V_{BS} supply current	I_{QBS}	V_{IN} = 0V or 5V	-	22	50	
Quiescent V_{CC} supply current	I_{QCC}		-	105	200	
Logic "1" input bias current	I_{IN+}	V_{IN} = 5V	-	20	40	
Logic "0" input bias current	I_{IN-}	V_{IN} = 0V	-	-	1	
V_{CC} supply undervoltage positive going threshold	V_{CCUV+}		8.1	9	9.9	V
V_{CC} supply undervoltage negative going threshold	V_{CCUV-}		7.5	8.3	9.1	
Output high short circuit pulsed current	I_{O+}	V_O=0V,PW≤10us	150	290	-	mA
Output low short circuit pulsed current	I_{O-}	V_O=15V,PW≤10us	300	600	-	

Dynamic Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS}) =15V, C_L=1000pF, and TA =25°C unless otherwise specified.

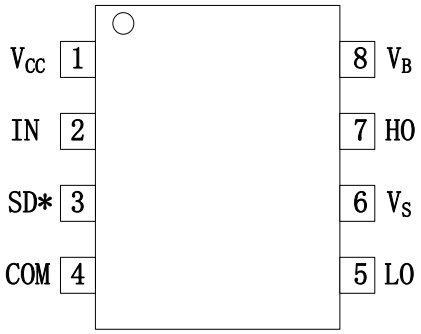
Definition	Symbol	Test conditions	Min.	Typ.	Max.	Units
Turn on propagation delay	ton	V_S=0V	-	660	820	ns
Turn off propagation delay	toff	V_S=600V	-	150	220	
Delay matching, HS & LS turn on/off	MT		-	0	50	
Turn on rise time	tr		-	70	140	
Turn on fall time	tf		-	35	70	
Shutdown propagation delay	tsd		-	160	220	
Deadtime , LS turn-off to HS turn-on & HS turn-on to LS turn-off	DT		400	520	650	

Functional Block Diagram



FD2504S

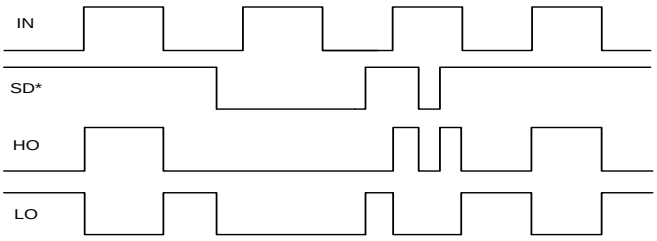
Lead Assignments



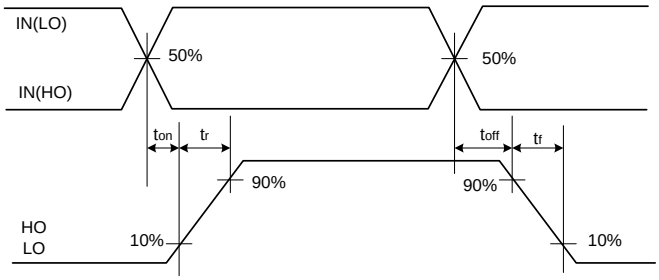
Lead definitions

Symbol	Description
V_{CC}	Low side and logic fixed supply
IN	Logic input for high and low side gate driver outputs(HO and LO),in phase with HO
SD*	Logic input for shutdown
COM	Low side return
LO	Low side gate drive output
V_S	High side floating supply return
HO	High side gate drive output
V_B	High side floating supply

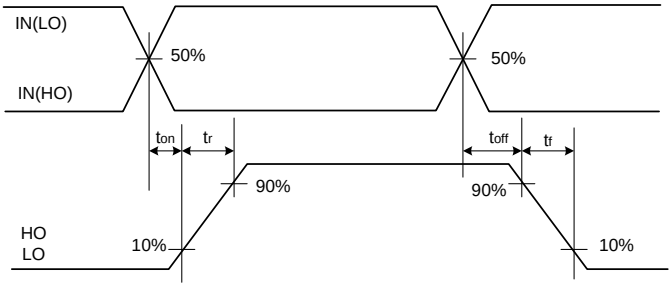
Input/Output Timing Diagram



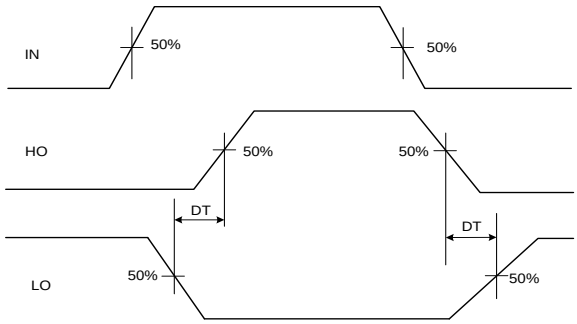
Switching Time Waveform Definitions



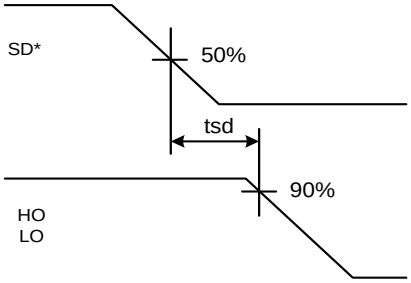
Delay Matching Waveform Definitions



Deadtime Waveform Definitions



Shutdown Waveform Definitions



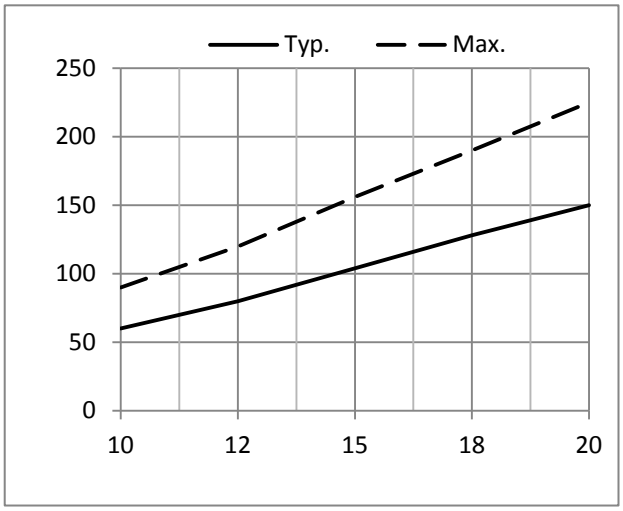


Figure 1A V_{CC} Supply Current vs Supply Voltage

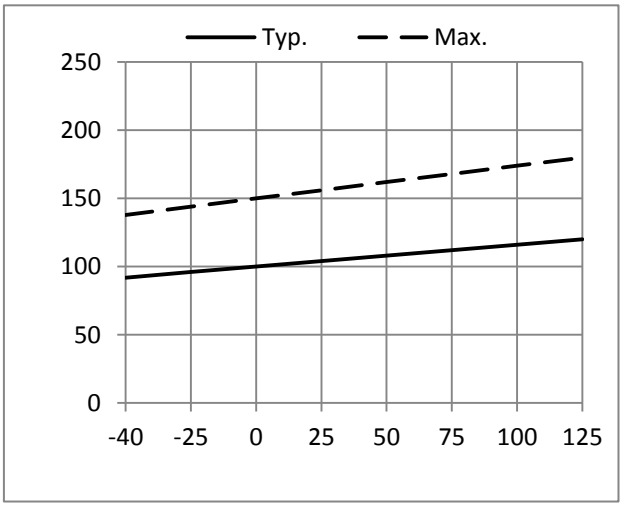


Figure 1B V_{CC} Supply Current vs Temperature

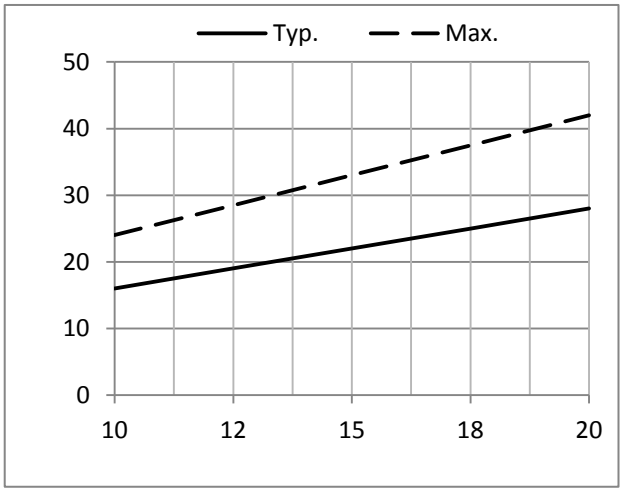


Figure 2A V_{BS} Supply Current vs Supply Voltage

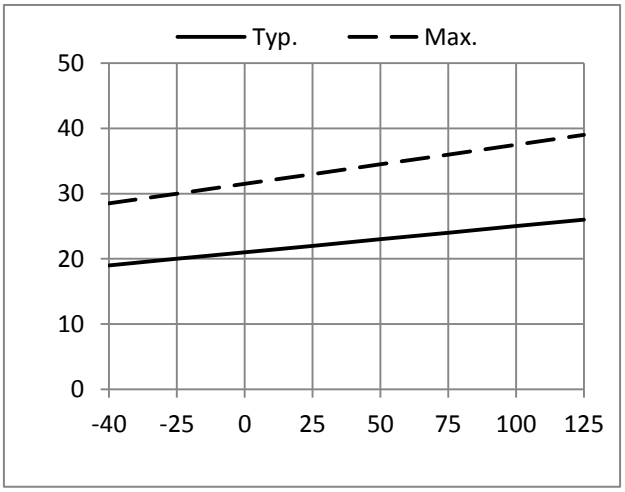


Figure 2B V_{BS} Supply Current vs Temperature

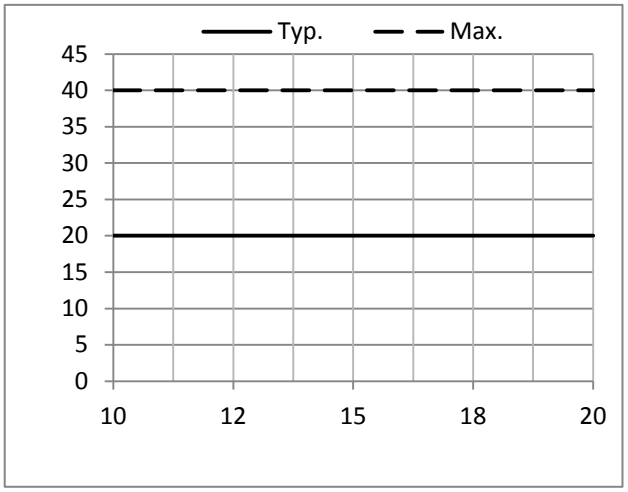


Figure 3A Logic "1" Input Current vs Supply Voltage

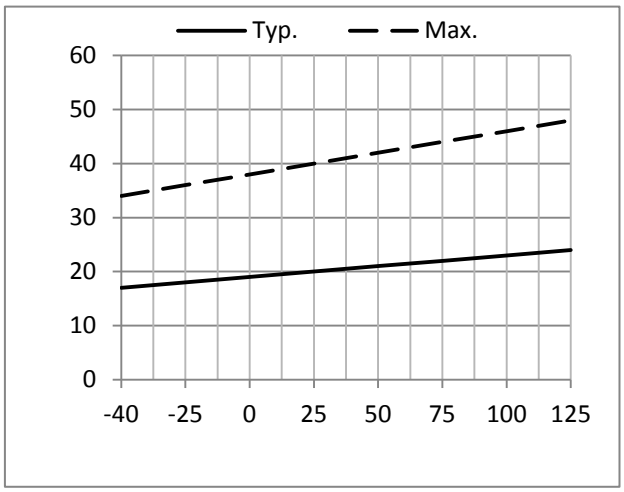


Figure 3B Logic "1" Input Current vs Temperature

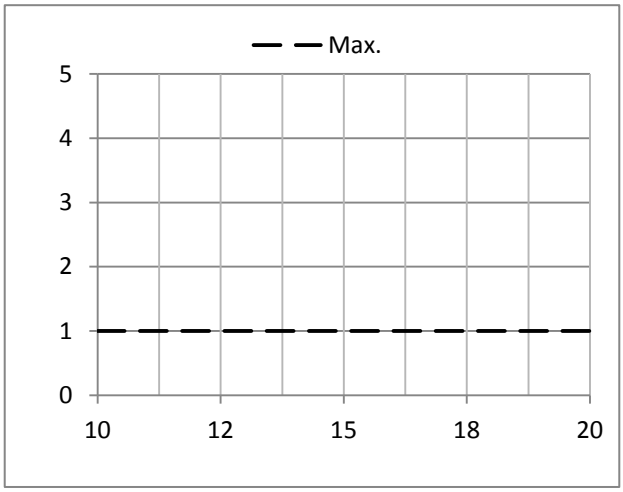


Figure 4A Logic "0" Input Current vs Supply Voltage

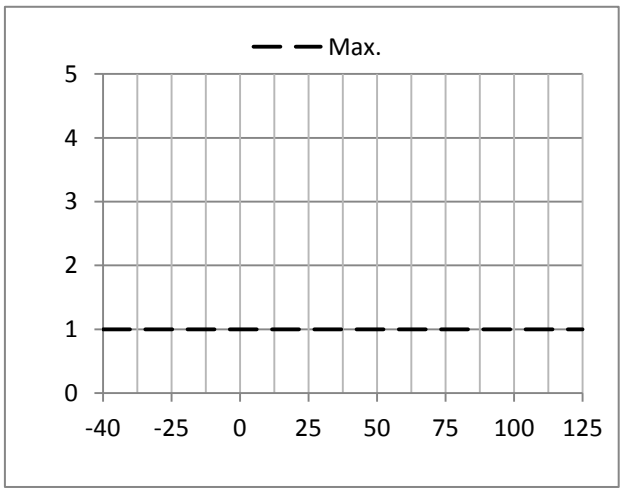


Figure 4B Logic "0" Input Current vs Temperature

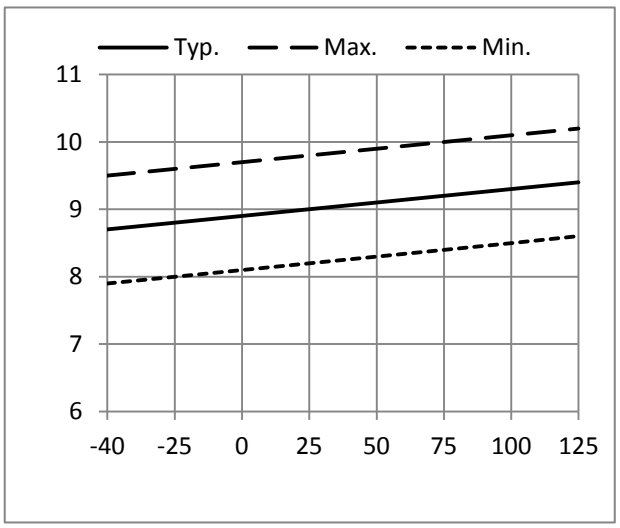


Figure 5A V_{CC} Undervoltage Threshold(+) vs Temperature

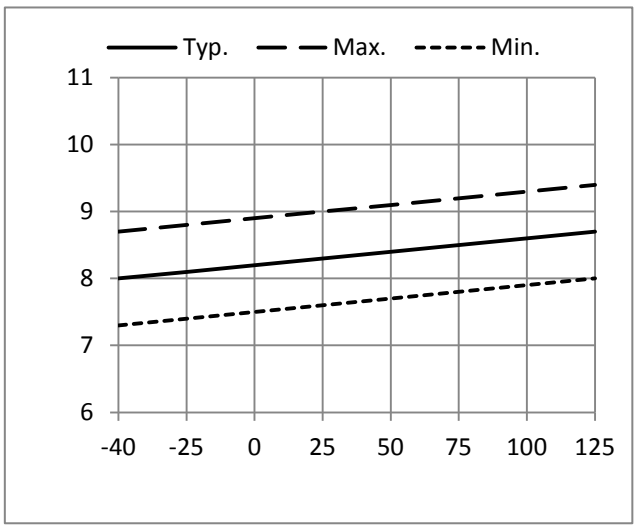


Figure 5B V_{CC} Undervoltage Threshold(-) vs Temperature

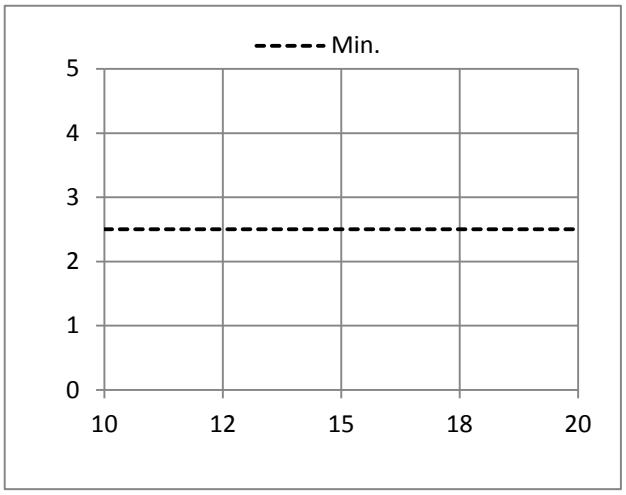


Figure 6A Logic “1” Input Voltage vs Supply Voltage

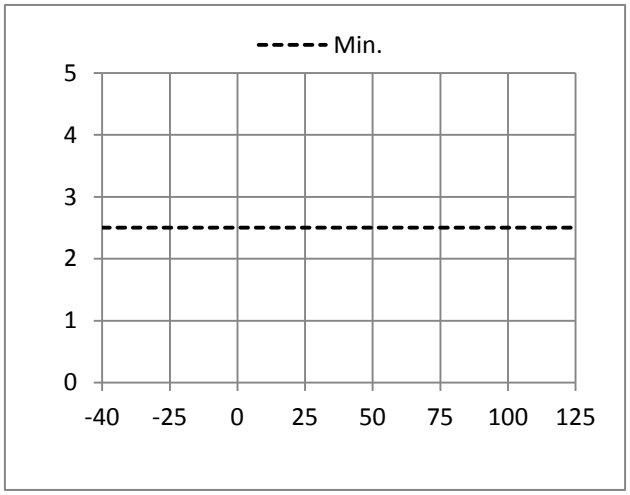


Figure 6B Logic “1” Input Voltage vs Temperature

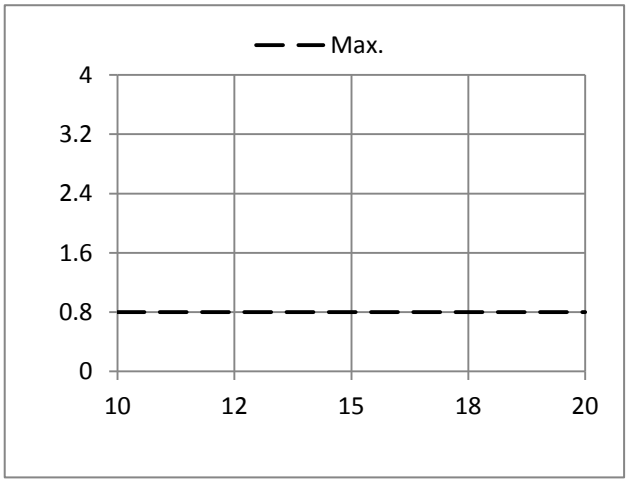


Figure 7A Logic “0” Input Voltage vs Supply Voltage

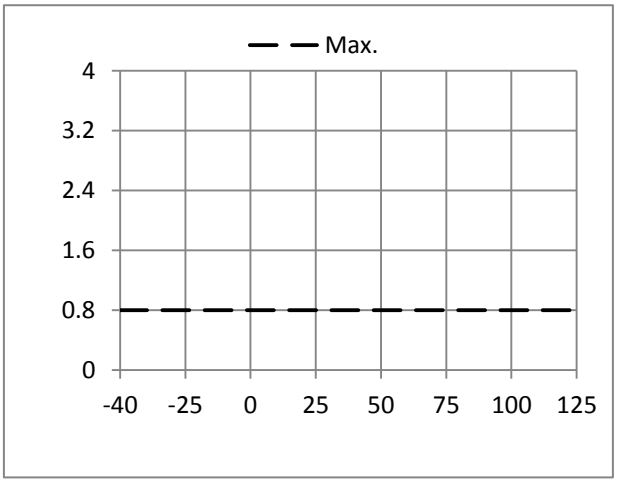


Figure 7B Logic “0” Input Voltage vs Temperature

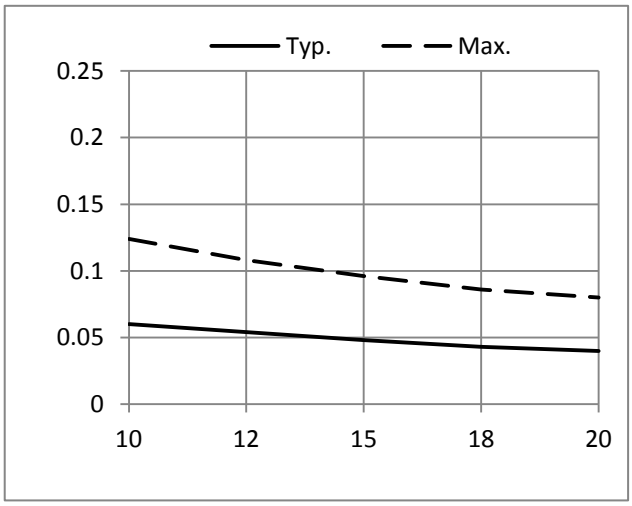


Figure 8A High Level Output Voltage vs Supply Voltage

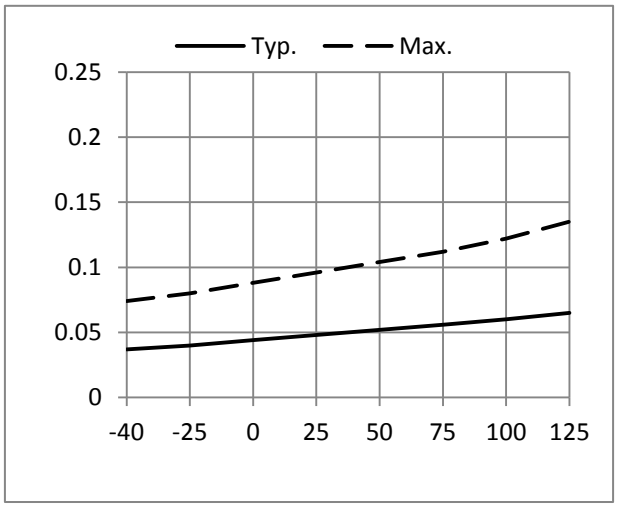


Figure 8B High Level Output Voltage vs Temperature

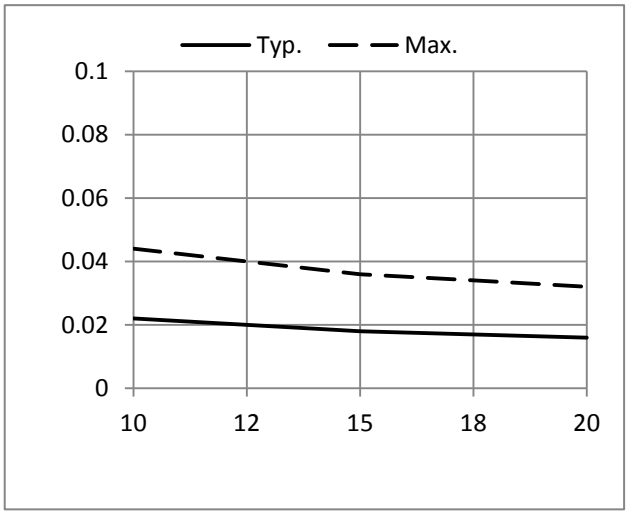


Figure 9A Low Level Output Voltage vs Supply Voltage

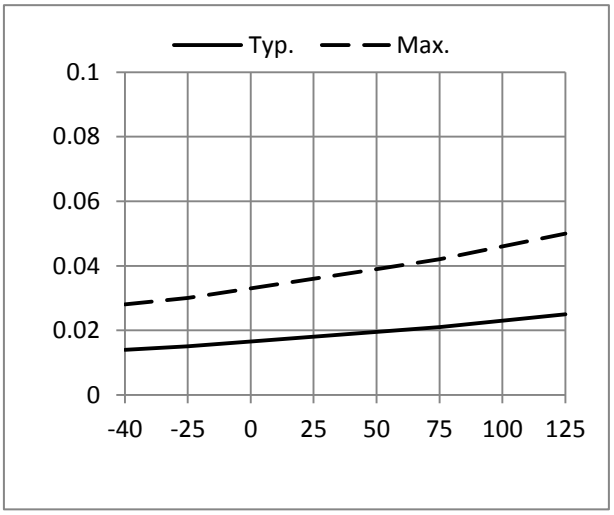


Figure 9B Low Level Output Voltage vs Temperature

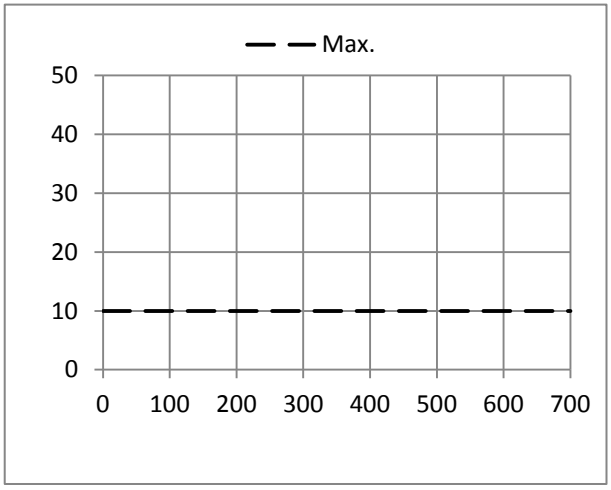


Figure 10A Offset Supply Current vs Voltage

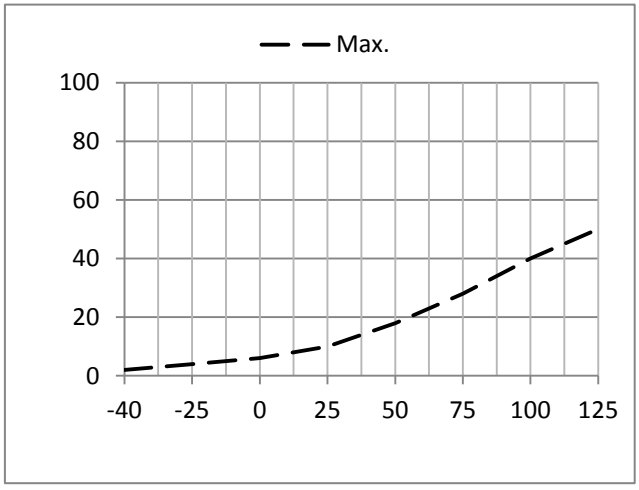


Figure 10B Offset Supply Current vs Temperature

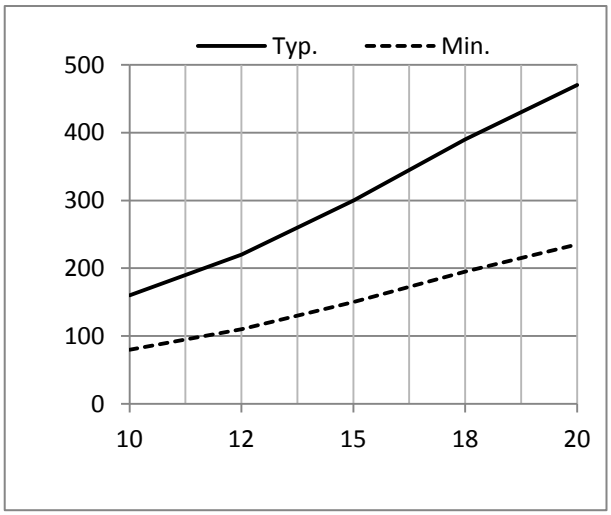


Figure 11A Output Source Current vs Supply Voltage

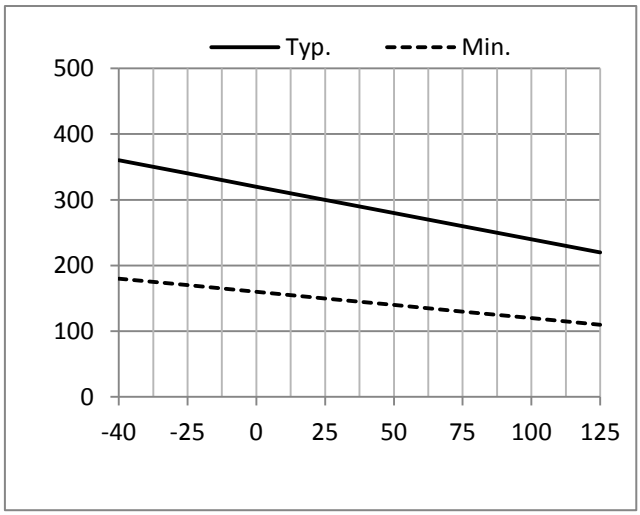


Figure 11B Output Source Current vs Temperature

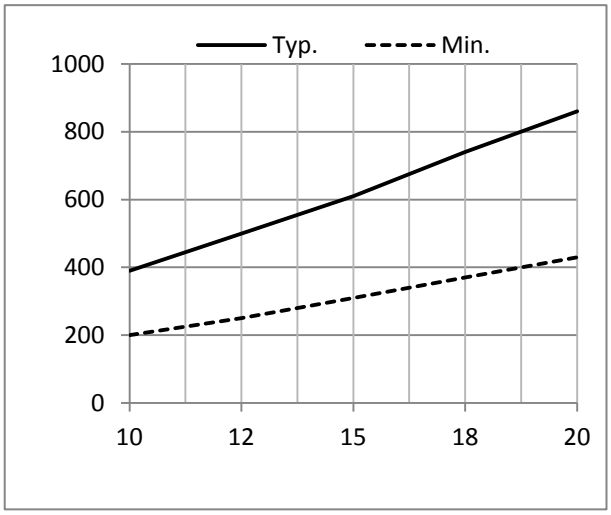


Figure 12A Output Sink Current vs Supply Voltage

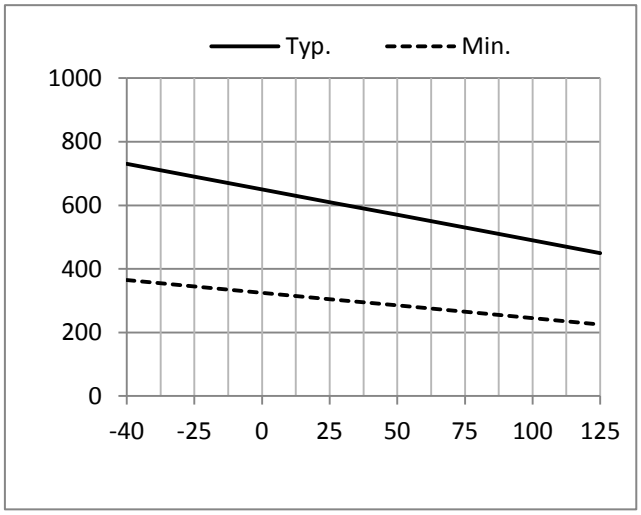


Figure 12B Output Sink Current vs Temperature

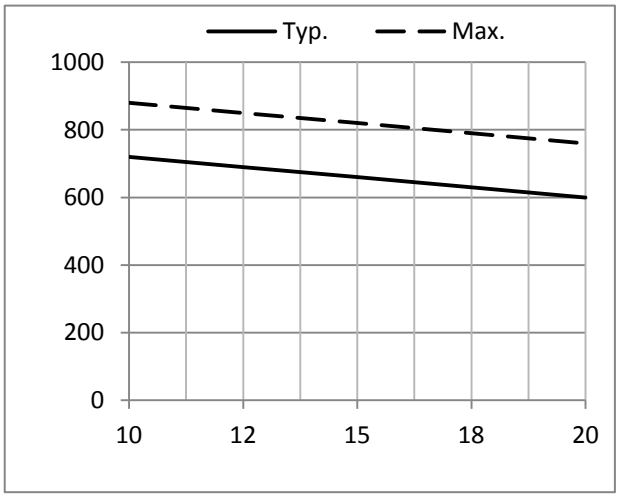


Figure 13A Turn On Time vs Supply Voltage

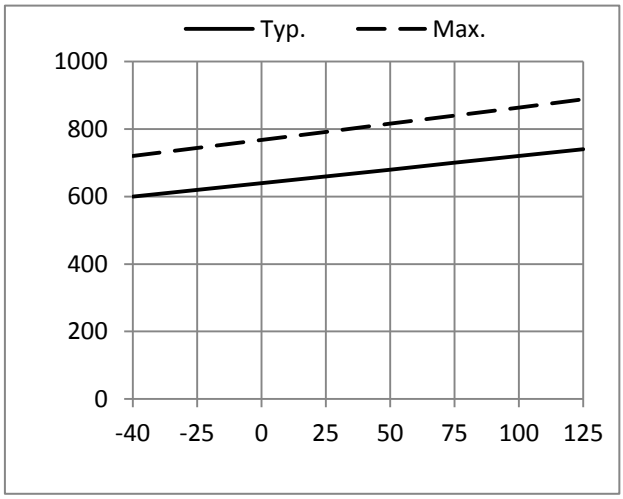


Figure 13B Turn On Time vs Temperature

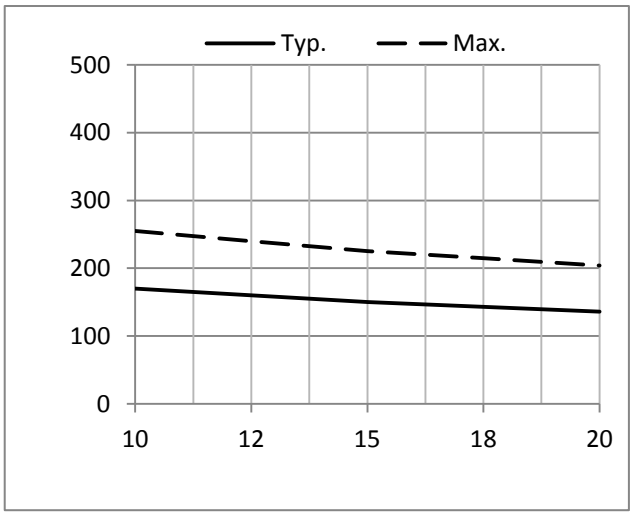


Figure 14A Turn Off Time vs Supply Voltage

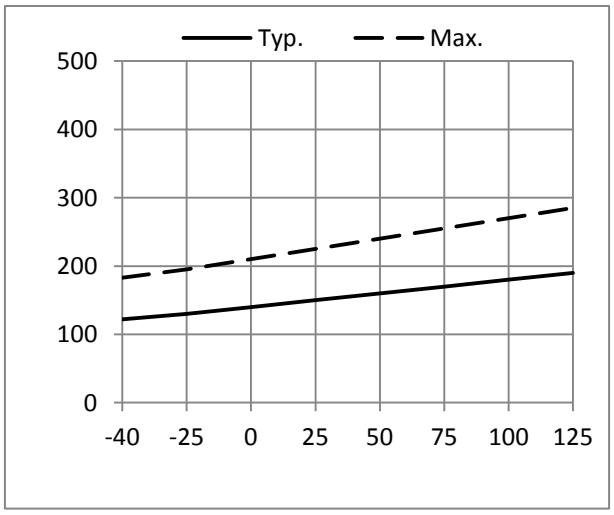


Figure 14B Turn Off Time vs Temperature

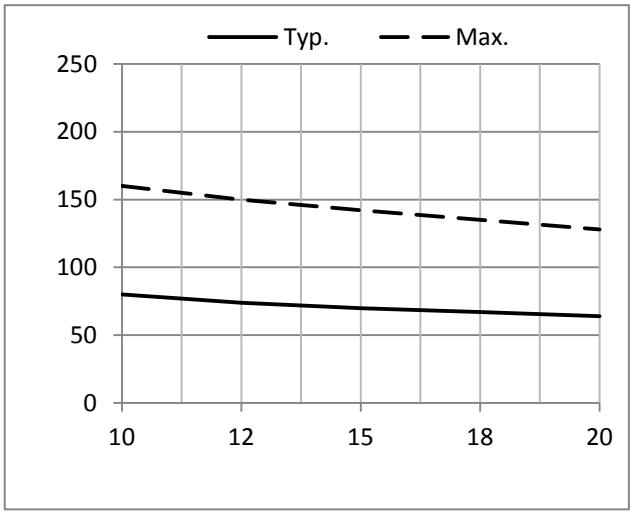


Figure15A Turn On Rise Time vs Supply Voltage

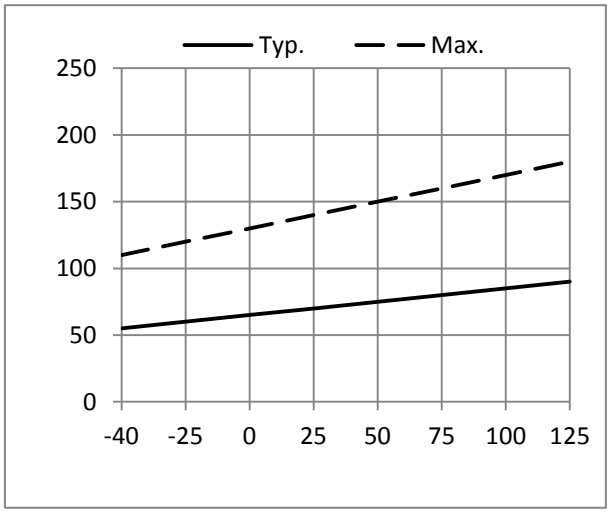


Figure 15B Turn On Rise Time vs Temperature

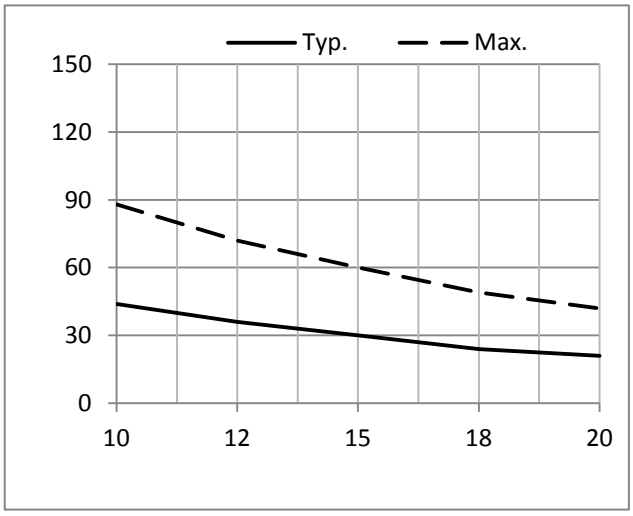


Figure 16A Turn Off Fall Time vs Supply Voltage

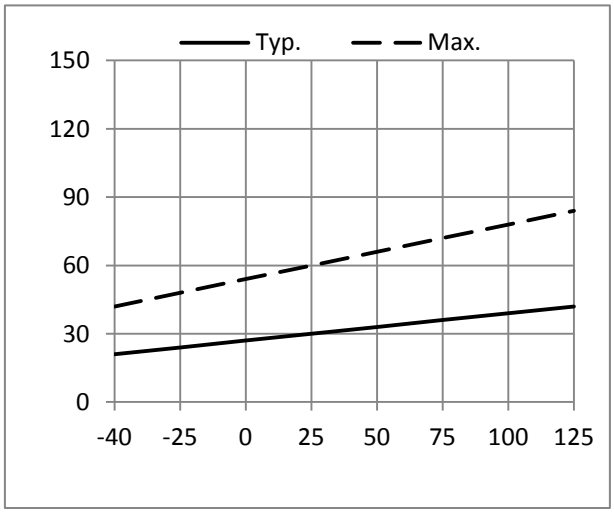


Figure 16B Turn Off Fall Time vs Temperature

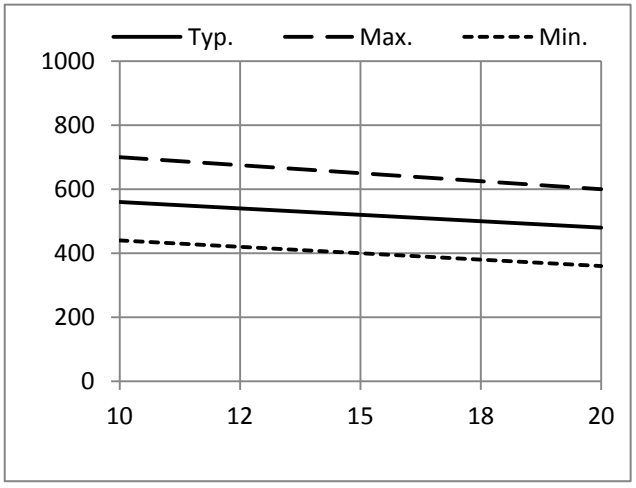


Figure 17A Deadtime vs Supply Voltage

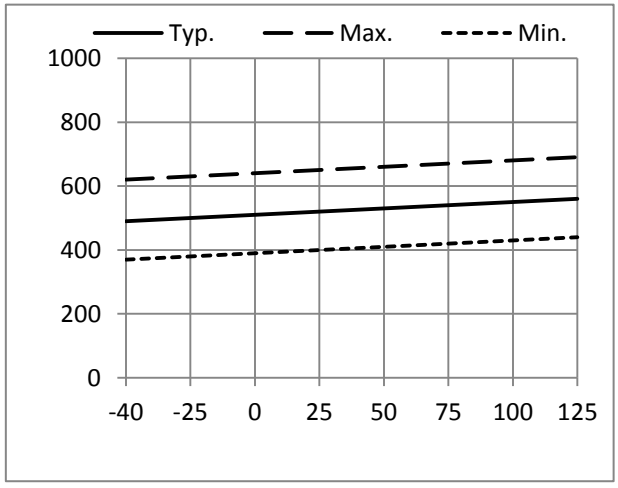


Figure 17B Deadtime vs Temperature

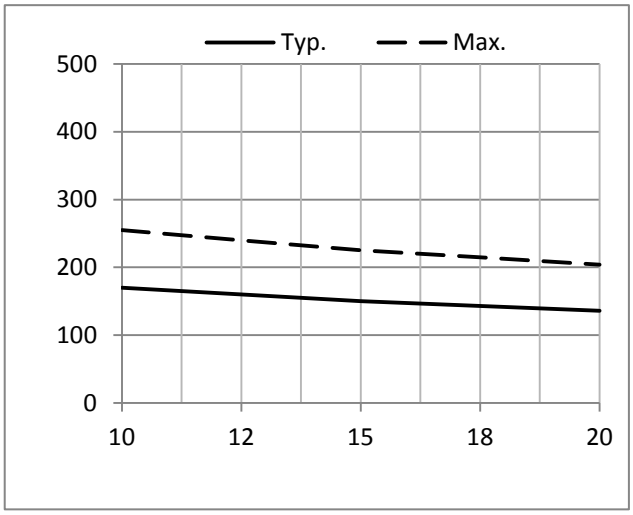


Figure 18A Shutdown time vs Supply Voltage

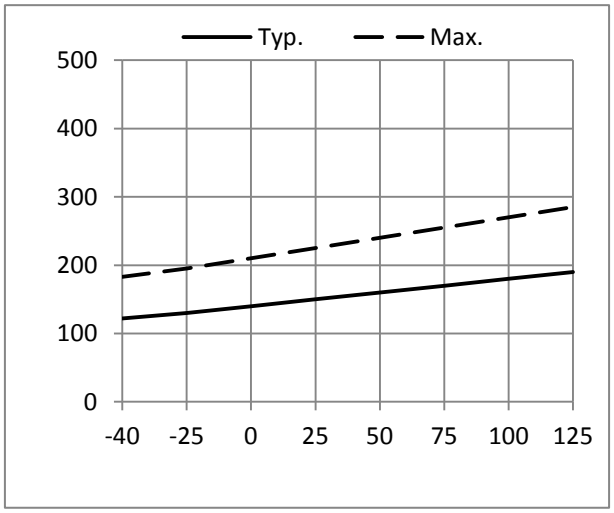


Figure 18B Shutdown time vs Temperature

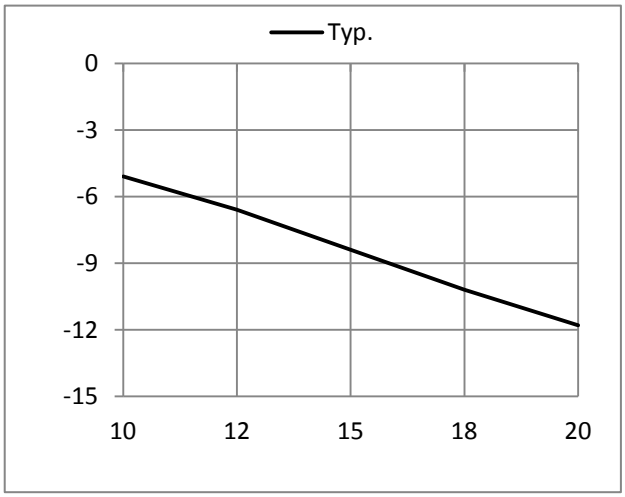


Figure 19A V_S Negative offset vs Supply Voltage

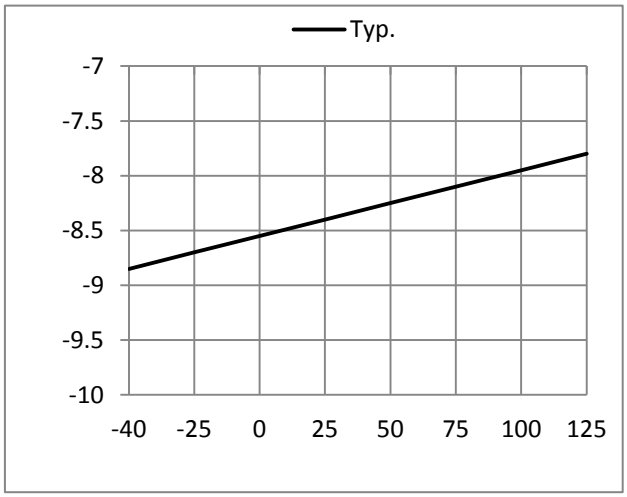
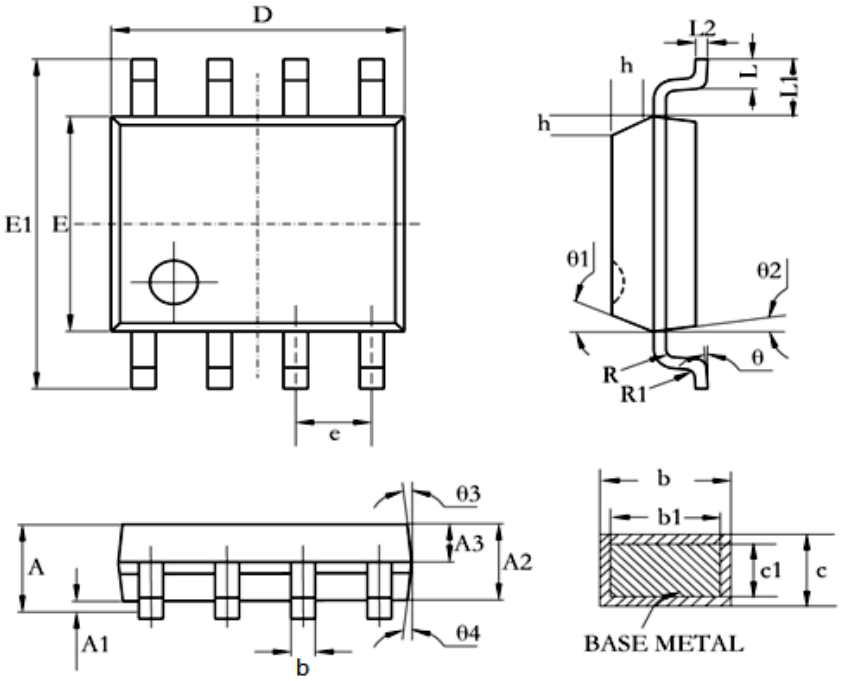


Figure 19B V_S Negative offset vs Temperature

Case outlines



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.36	1.55	1.75	0.053	0.061	0.069
A1	0.10	0.15	0.25	0.004	0.006	0.010
A2	1.25	1.40	1.65	0.049	0.055	0.065
A3	0.50	0.60	0.70	0.020	0.024	0.028
b	0.38	-	0.51	0.015	-	0.020
b1	0.37	0.42	0.47	0.015	0.017	0.019
c	0.17	-	0.25	0.007	-	0.010
c1	0.17	0.20	0.23	0.007	0.008	0.009
D	4.80	4.90	5.00	0.189	0.193	0.197
E1	5.80	6.00	6.20	0.228	0.236	0.244
E	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27BSC					
L	0.45	0.60	0.80	0.018	0.024	0.031
L1	1.04REF					
L2	0.25BSC					
R	0.07	-	-	0.003	-	-
R1	0.07	-	-	0.003	-	-
h	0.30	0.40	0.50	0.012	0.016	0.020
θ	0°	-	8°	0°	-	8°
θ1	15°	17°	19°	15°	17°	19°
θ2	11°	13°	15°	11°	13°	15°
θ3	15°	17°	19°	15°	17°	19°
θ4	11°	13°	15°	11°	13°	15°

8 Lead SOIC

Part Number	Package Type	Marking ID	Package Method	Quantity
FD2504S	SOP8	FD2504S	Tape&Reel	2500

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