Pin Configuration

M Package
(SOIC-8)

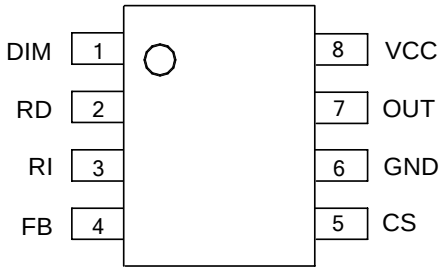

Figure 2. Pin Configuration of AP1681 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	DIM	Dimming control signal input
2	RD	Full brightness level setting
3	RI	Full dimming level setting
4	FB	The feedback voltage sensing from the auxiliary winding
5	CS	Primary current sensing
6	GND	Ground. Current return for gate driver and control circuits of the IC
7	OUT	Gate driver output
8	VCC	Supply voltage of gate driver and control circuits of the IC

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Functional Block Diagram

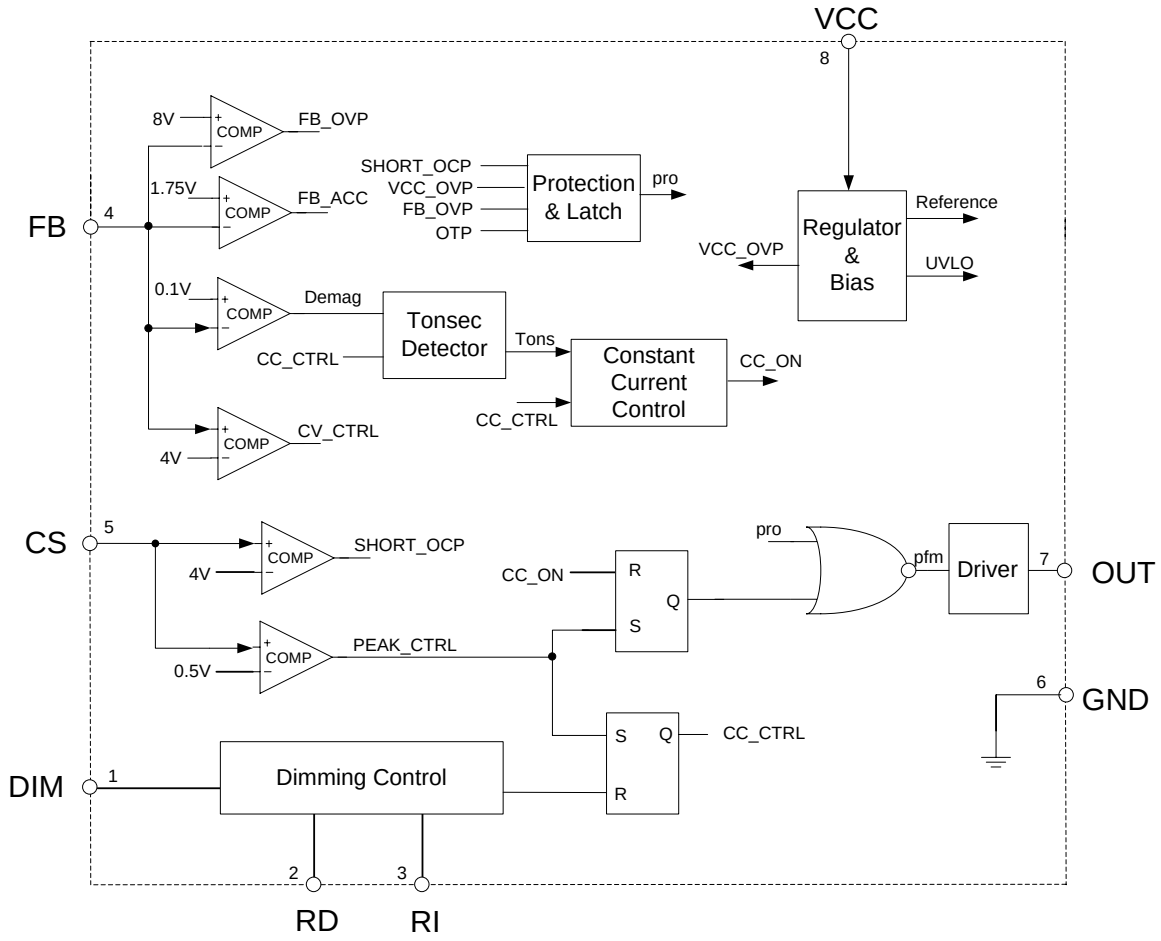

Figure 3. Functional Block Diagram of AP1681

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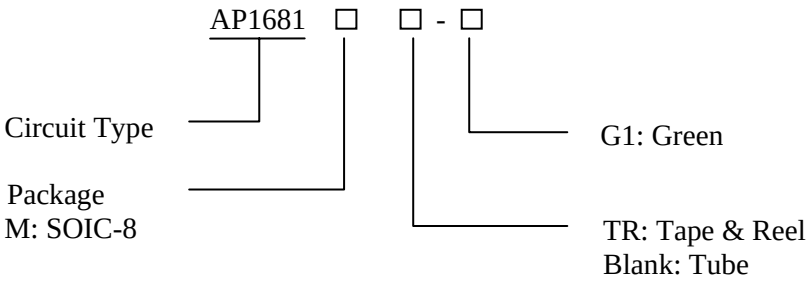
Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOIC-8	-40 to 105°C	AP1681M-G1	1681M-G1	Tube
		AP1681MTR-G1	1681M-G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

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Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	-0.3 to 30	V
Driver Output Current	I_{OUT}	±300	mA
Voltage at RD, RI, DIM, CS	V_{RD}, V_{RI}, V_{DIM}, V_{CS}	-0.3 to 7	V
FB Input Voltage	V_{FB}	-40 to 10	V
Operating Junction Temperature	T_J	150	ºC
Storage Temperature	T_{STG}	-65 to 150	ºC
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	300	ºC
Power Dissipation at T_A=50°C	P_D	0.65	W
Thermal Resistance (Junction-to-Ambient)	θ_{JA}	150	°C/W
ESD (Machine Model)		200	V
ESD (Human Body Model)		4000	V

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	V_{CC}	10.8	21.5	V
Ambient Temperature	T_A	-40	105	ºC

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Electrical Characteristics

V_{CC} =15V, T_A=25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
UVLO Section						
Start-up Threshold	V_{TH} (ST)		16.5	19	21.5	V
Minimal Operating Voltage	V_{OPR} (Min)	After turn on	7.2	9	10.8	
Standby Current Section						
Start-up Current	I_{ST}	V_{CC}=V_{TH} (ST)-0.5V, Before start up		1.7	10	μA
Operating Current	I_{CC}	Static	700	900	1100	
Drive Output Section						
Output High Level Voltage	V_{OH}	$I_{GD-SOURCE}$=20mA V_{CC}=12V	8			V
Output Low Level Voltage	V_{OL}	$I_{GD-SINK}$=20mA V_{CC}=12V			1	V
Output Voltage Rise Time	t_R	C_L=1nF	120	220	320	ns
Output Voltage Fall Time	t_F	C_L=1nF	30	50	90	ns
Output Clamp Voltage	$V_{O-CLAMP}$	$I_{GD-SOURCE}$=5mA V_{CC}=20V	11	13	15	V
UVLO Saturation Voltage	V_{UVLO}	V_{CC}=0 to V_{CC-ON} I_{SINK}=10mA			1	V
Maximum Switch On-time	t_{ONP_MAX}			16.5		μs
DIM Input Section						
Voltage Gain to RI		$\Delta V_{RI}/\Delta V_{DIM}$	-1.2	-1.1	-1.0	
Internal Source Current			11	20	35	μA
Reload Threshold			0.8	1	1.25	V
RD and RI Section						
RD Pin Voltage	V_{RD}		1.3	1.5	1.75	V
Maximum RD Current				150		μA
Maximum RI Current				250		μA
Current Sense Section						
Current Sense Voltage	V_{CS}		450	500	560	mV
Maximum CS Current		V_{DIM}=0		120		μA
Leading Edge Blanking				600		ns

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Electrical Characteristics (Continued)

V_{CC} =15V, T_A=25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Feedback Input Section						
CV Feedback Threshold	V_{FB-CV}		3.0	4.0	5.0	V
FB Pin Input Leakage Current	I_{FB}	V_{FB}=4V	1.0	2	3.0	μA
Acceleration Start Threshold			1.35	1.75	2.15	V
Over Voltage Protection	V_{FB-OVP}		6.5	8	9.5	V
Over Temperature Protection Section						
Shutdown Temperature				140		°C
Temperature Hysteresis				20		°C

Typical Performance Characteristics

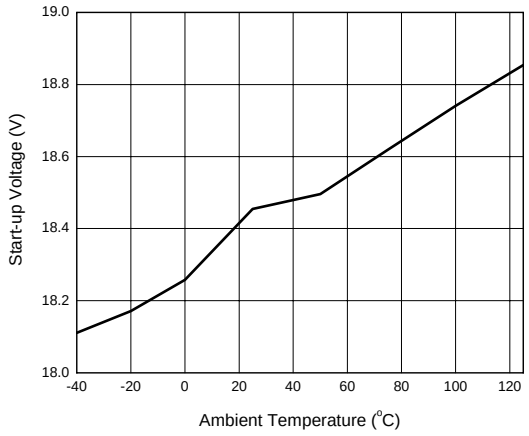

Figure 4. Start-up Voltage vs. Ambient Temperature

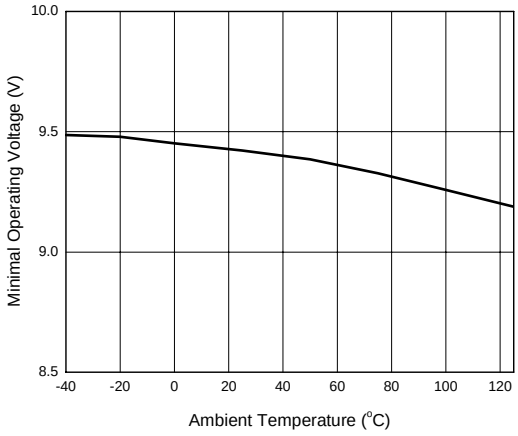

Figure 5. Minimal Operating Voltage vs. Ambient Temperature

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Typical Performance Characteristics (Continued)

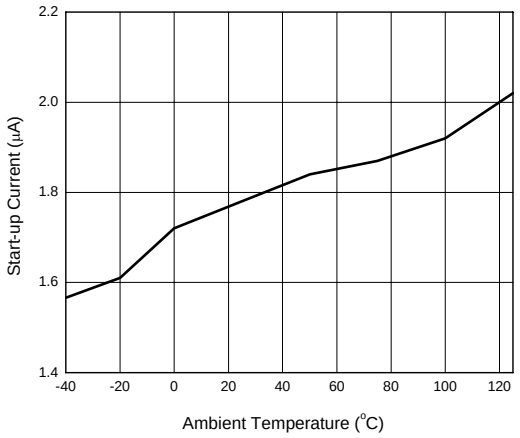

Figure 6. Start-up Current vs. Ambient Temperature

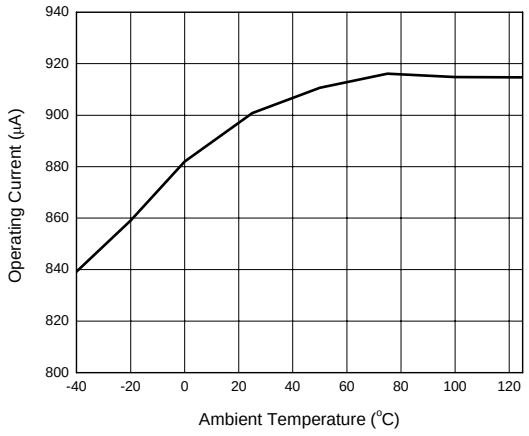

Figure 7. Operating Current vs. Ambient Temperature

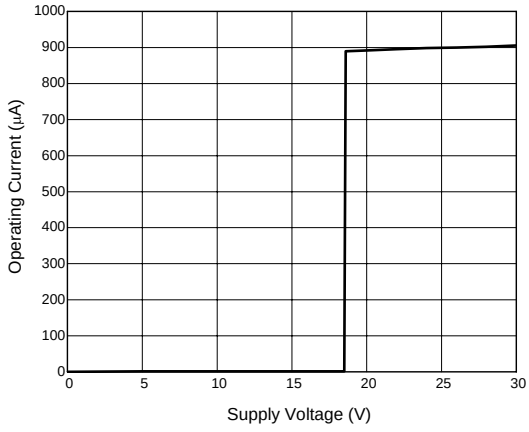

Figure 8. Operating Current vs. Supply Voltage

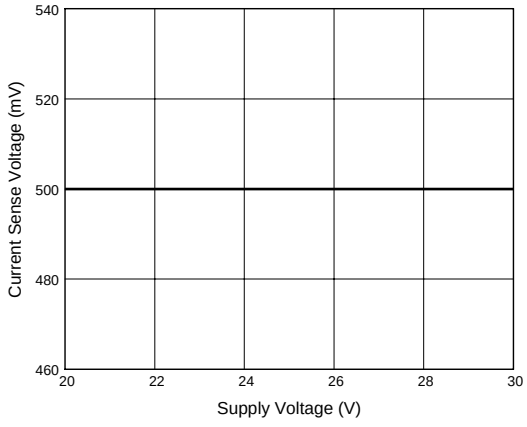

Figure 9. Current Sense Voltage vs. Supply Voltage

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Typical Performance Characteristics (Continued)

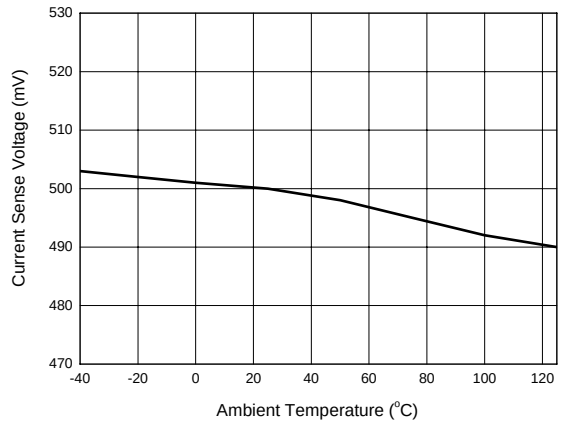

Figure 10. Current Sense Voltage vs. Ambient Temperature

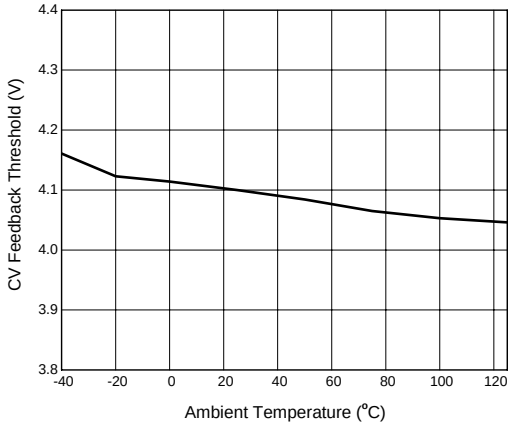

Figure 11. CV Feedback Threshold vs. Ambient Temperature

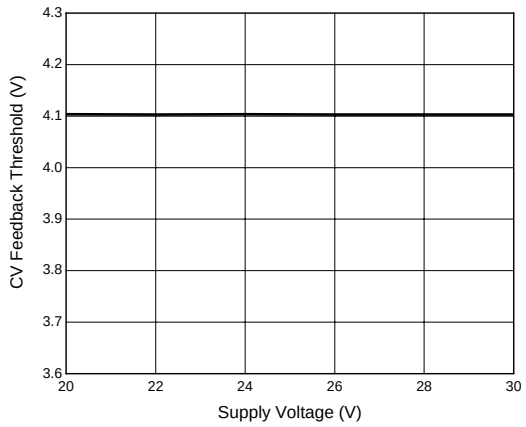

Figure 12. CV Feedback Threshold vs. Supply Voltage

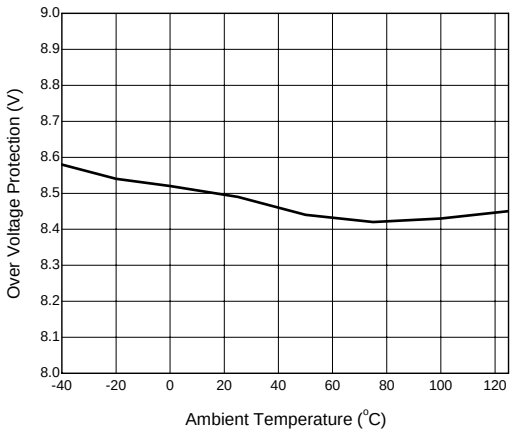

Figure 13. Over Voltage Protection vs. Ambient Temperature

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Typical Performance Characteristics (Continued)

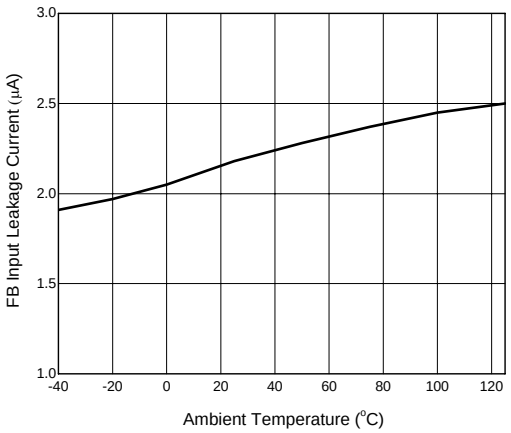

Figure 14. FB Input Leakage Current vs. Ambient Temperature

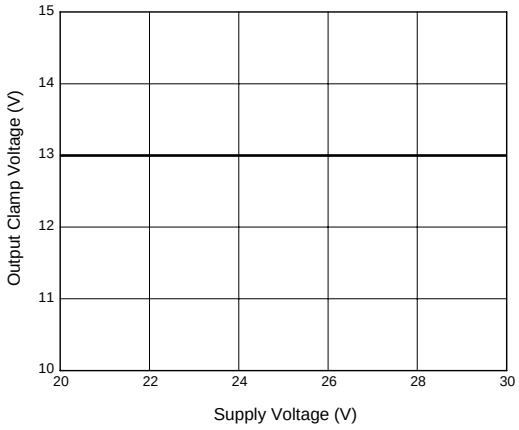

Figure 15. Output Clamp Voltage vs. Supply Voltage

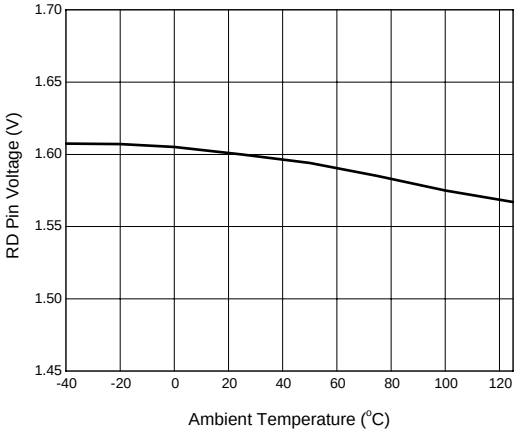

Figure 16. RD Pin Voltage vs. Ambient Temperature

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Typical Application

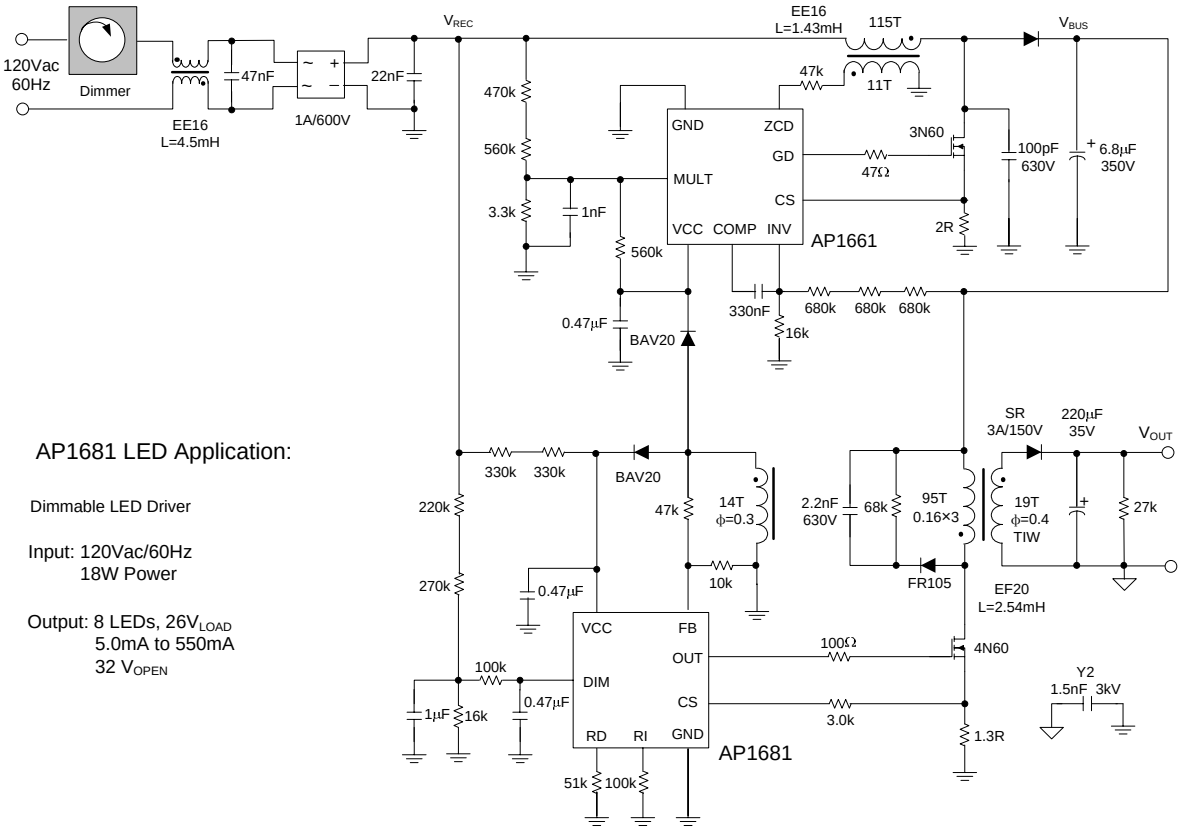

Figure 17. Typical Application of AP1681

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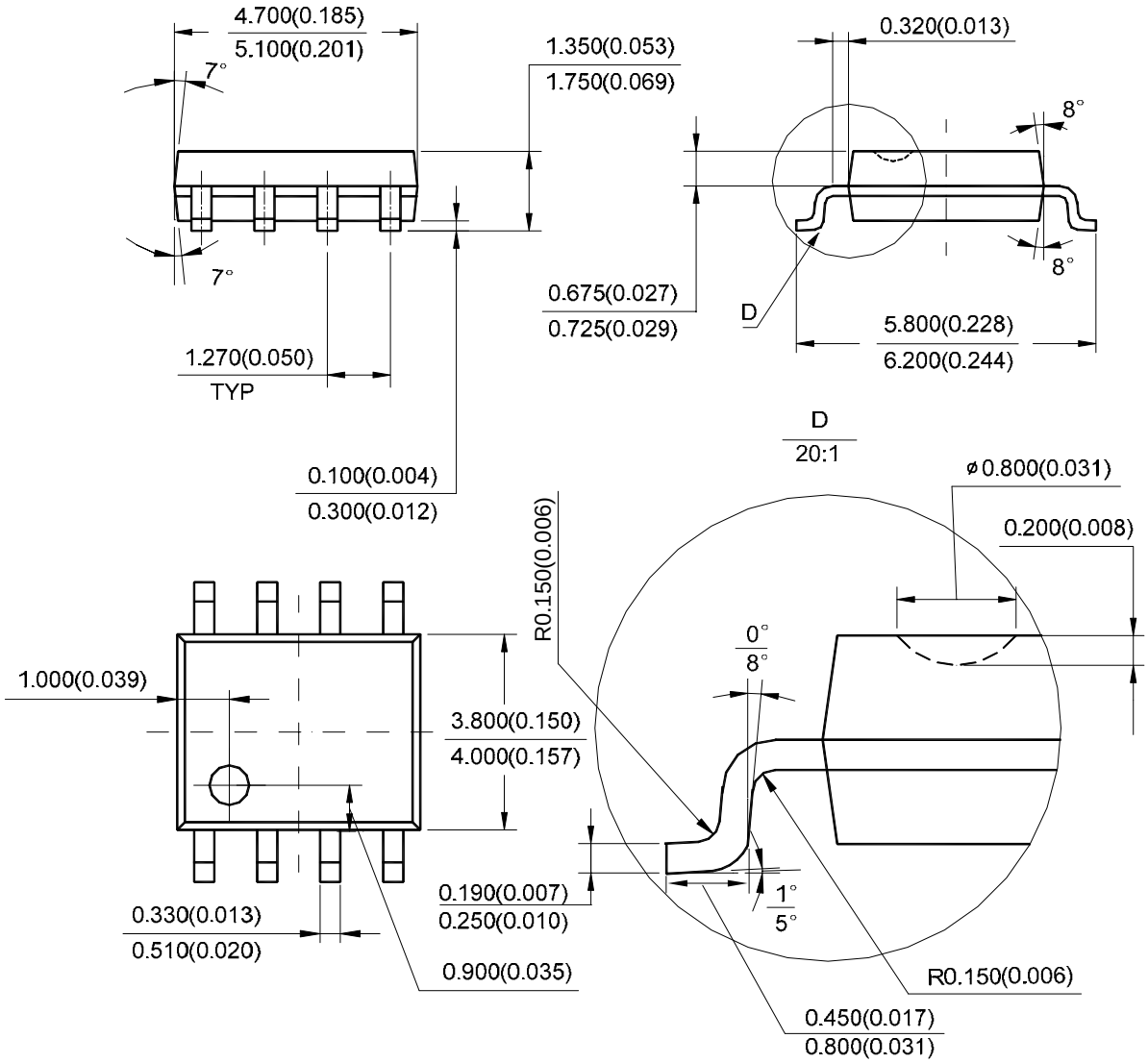
Mechanical Dimensions

SOIC-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

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