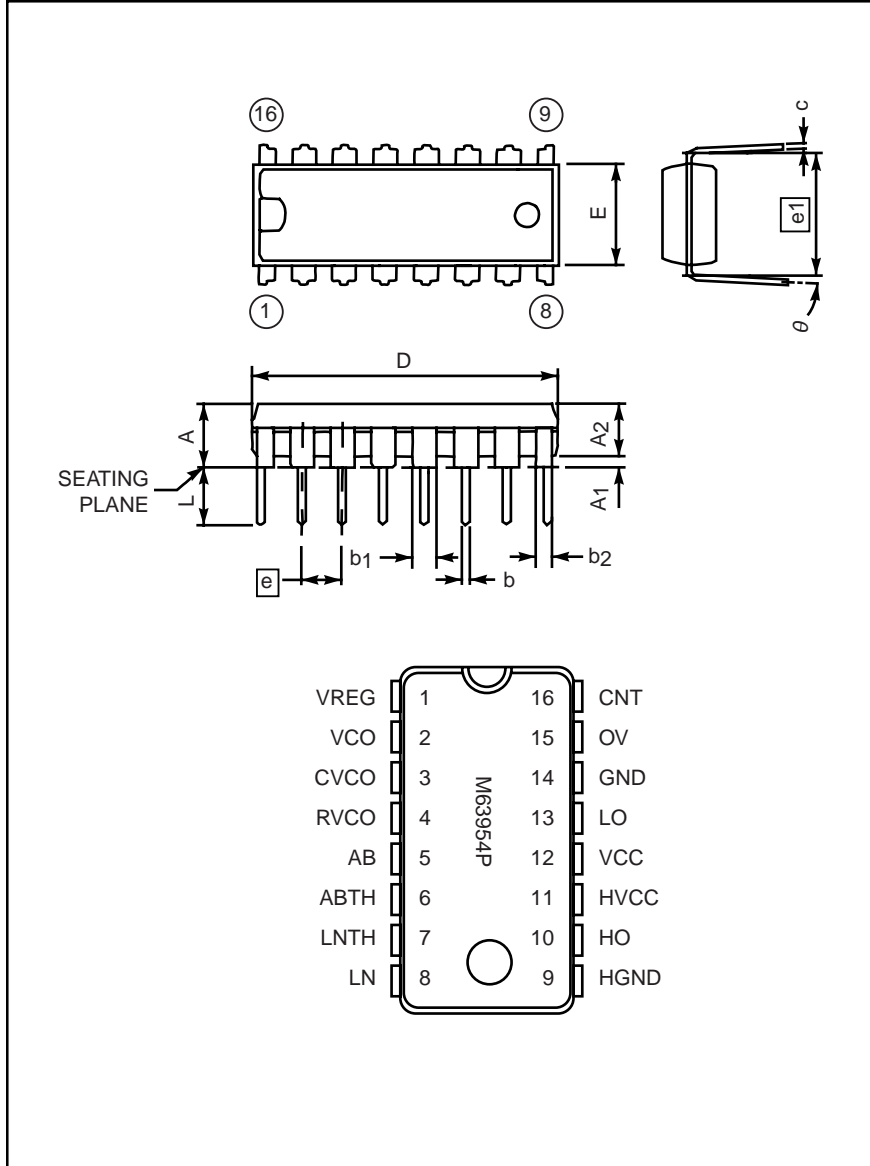


### HVIC Half-Bridge Driver



#### Description:

M63954P is a high voltage integrated circuit designed for electronic ballast, Power MOSFET and IGBT module driver for half-bridge applications.

#### Features:

- 600V Floating Supply Voltage
- ±500mA Output Current
- Half-Bridge Driver
- Built-In Oscillator
- DIP-16 Package
- Built-In Regulator

#### Application:

The M63954P is designed for use in electronic ballasts for fluorescent lamps.

Outline Drawing and Pin Diagram

Dimensions	Inches	Millimeters
A	0.18 Max.	4.5 Max.
A <sub>1</sub>	0.02 Min.	0.51 Min.
A <sub>2</sub>	0.13	3.3
b	0.02±0.004	0.5±0.1
b <sub>1</sub>	0.06+0.01/-0.004	1.5+0.3/-0.1
b <sub>2</sub>	0.04+0.01/-0.004	1.0+0.3/-0.1
c	0.01	0.27+0.07/-0.05

Dimensions	Inches	Millimeters
D	0.75±0.01	19.0±0.2
E	0.25±0.01	6.3±0.15
e	0.10	2.54
e <sub>1</sub>	0.31	7.62
L	0.12 Min.	3.0 Min.
θ	0° – 15°	0° – 15°



Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

**M63954P**  
**HVIC Half-Bridge Driver**

**Absolute Maximum Ratings,  $T_a = 25^\circ\text{C}$  unless otherwise specified**

Ratings	Symbol	Test Conditions	M63954P	Units
High Side Floating Supply Offset Voltage	$H_{GND}$		600	Volts
High Side Floating Supply Voltage	$H_{VCC}$	$H_{GND} = GND$	-0.5 ~ 20	Volts
Low Side Fixed Supply Voltage	$V_{CC}$		-0.5 ~ 20	Volts
OV Input Voltage	$V_{OV}$		-0.5 ~ $V_{CC}+0.5$	Volts
AB Input Voltage	$V_{AB}$		-0.5 ~ $V_{CC}+1.0$	Volts
AB Input Current	$I_{AB}$		2	mA
ABTH Input Voltage	$V_{ABTH}$		-0.5 ~ $V_{CC}+0.5$	Volts
LN Input Voltage	$V_{LN}$		-0.5 ~ $V_{CC}+1.0$	Volts
LN Input Current	$I_{LN}$		2	mA
LNTH Input Voltage	$V_{LNTH}$		-0.5 ~ $V_{CC}+0.5$	Volts
$V_{CO}$ Input Voltage	$V_{VCO}$		-0.5 ~ $V_{CC}+0.5$	Volts
High Side Output Current	$I_{HO}$		$\pm 500$	mA
Low Side Output Current	$I_{LO}$		$\pm 500$	mA
Package Power Dissipation	$P_t$	$T_a = 25^\circ\text{C}$ , On Board	1.67	W
Linear Derating Factor	$K\theta$	$T_a > 25^\circ\text{C}$ , On Board	13.3	mW/ $^\circ\text{C}$
Junction Temperature	$T_j$		150	$^\circ\text{C}$
Operation Temperature	$T_{opr}$		-20 ~ 80	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-40 ~ 125	$^\circ\text{C}$

**Output Frequency,  $R_{VCO1} = 15\text{k}\Omega$ ,  $R_{VCO2} = 39\text{k}\Omega$ ,  $C_{VCO} = 100\text{pF}$**

Oscillation Frequency	$V_{CO}$ Input Voltage	Min.	Typ.	Max.	Units
50kHz	$0.33V_{REG}$	—	50	—	kHz
60kHz	$0.42V_{REG}$	—	60	—	kHz



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M63954P  
HVIC Half-Bridge Driver

**Electrical Characteristics,  $H_{GND} = GND$ ,  $H_{VCC} = V_{CC} = 15V$ ,  $T_a = 25^\circ C$ , unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>General</b>						
High Side Floating Supply Voltage	$H_{VCC}$	$H_{VCC} - H_{GND}$	13	15	17	Volts
Low Side Fixed Supply Voltage	$V_{CC}$		13	15	17	Volts
Internal Supply Voltage	$V_{REG}$	$V_{CC} = 15V$ , No Load	6.9	7.2	7.5	Volts
Standby Current	$I_{CC1}$	$V_{CC} = 15V$ , $C_{NT} = 5V$ , $OV = 5V$	—	0.75	1	mA
ON Suspension Oscillate Current	$I_{CC2}$	$V_{CC} = 15V$ , $CNT = 0V$	—	2	4	mA
ON Oscillation Current (50kHz)	$I_{CC3}$	$V_{CC} = 15V$ , $R_{VCO1} = 15k\Omega$ , $V_{VCO} = 0.33 V_{REG}$	2	5	8	mA
ON Oscillation Current (115kHz)	$I_{CC4}$	$R_{VCO2} = 39k\Omega$ $C_{VCO} = 100pF$ , $V_{VCO} = 0.42 V_{REG}$	2	8	12	mA
<b>UV Voltage</b>						
$V_{CC}$ UV Reset Voltage	$V_{UVr}$		9.0	10.0	11.0	Volts
$V_{CC}$ UV Trip Voltage	$V_{UVt}$		5.5	6.5	7.5	Volts
UV Response Delay Time	$t_{UV}$		14	—	100	$\mu s$
<b>OV Voltage</b>						
OV Protection $V_{th}$	$V_{OV}$		3.4	3.6	3.8	Volts
OV Response Delay Time	$t_{OV}$		30	—	150	$\mu s$
OV Input Leak Current	$I_{OV}$	$V_{OV} = 0V$	-0.5	-0.08	—	$\mu A$
<b><math>V_{CO}</math> Voltage</b>						
$V_{CO}$ Frequency Set Up Limit	$f_{VCO}$		—	—	250	kHz
Output Frequency Set Up Limit	$f_O$	LO, HO	—	—	125	kHz
$V_{CO}$ Input Voltage Limit	$V_{VCO}$		1.5	—	$V_{REG} - 1.5$	Volts
$V_{CO}$ Input Leak Current	$I_{VCO}$	$V_{VCO} = 0V$	-2	-0.66	—	$\mu A$
$C_{VCO}$ Input Voltage	$V_{CVCO}$	$V_{REG} = 7.2V$	5.5	5.55	5.6	Volts
$C_{VCO}$ Input Leak Current	$I_{CVCO}$	$V_{CVCO} = 0V$ , $V_{VCO} > V_{CVCO}$	-2	-0.66	—	$\mu A$
$R_{VCO}$ Leak Current	$I_{RVCO}$	$V_{CVCO} = 0V$ , $V_{REG} = 7.2V$ , $V_{RVCO} = 10V$	—	—	0.5	$\mu A$
$R_{VCO}$ Saturation Voltage	$V_{SRVCO}$	$V_{CVCO} = 6V$ , $V_{REG} = 7.2V$ , $I_{RVCO} = 10mA$	—	—	500	mV

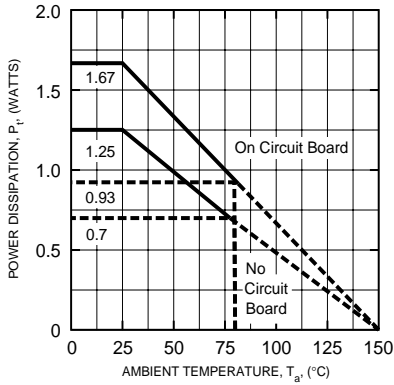
**M63954P**  
**HVIC Half-Bridge Driver**

**Electrical Characteristics,  $H_{GND} = GND$ ,  $H_{VCC} = V_{CC} = 15V$ ,  $T_a = 25^\circ C$ , unless otherwise specified**

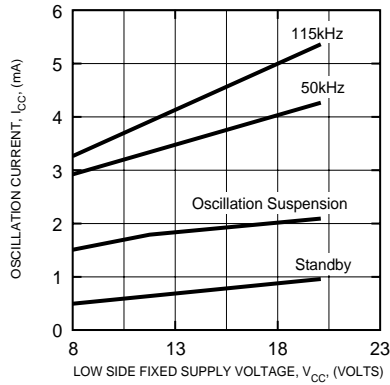
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Connection Detect</b>						
LN Input Voltage Limit	$V_{LN}$		1	—	$V_{CC}-1.5$	Volts
LNTH Input Voltage Limit	$V_{LNTH}$		1	—	$V_{CC}-1.5$	Volts
LN Offset Voltage	$V_{LNIO}$		-50	—	50	mV
LN Input Leak Current	$I_{LN}$	$V_{LN} < V_{LNTH}$	-1.0	-0.22	—	$\mu A$
LNTH Input Leak Current	$I_{LNTH}$	$V_{LN} > V_{LNTH}$ , $V_{CC} < V_{UVr}$	-1.0	-0.22	—	$\mu A$
LNTH Input Hysteresis Current	$I_{LNTHh}$	$V_{LN} > V_{LNTH}$ , $V_{LNTH} = 5V$	20	40	80	$\mu A$
LN Response Delay Time	$t_{LN}$		14	—	100	$\mu s$
<b>Abnormal Detect</b>						
AB Input Voltage Limit	$V_{AB}$		0	—	$V_{REG}-1.5$	Volts
ABTH Input Voltage Limit	$V_{ABTH}$		0	—	$V_{REG}-1.5$	Volts
AB Offset Voltage	$V_{ABIO}$		-50	—	50	mV
AB Input Leak Current	$I_{AB}$	$V_{AB} < V_{ABTH}$	-0.5	-0.08	—	$\mu A$
ABTH Input Leak Current	$I_{ABTH}$	$V_{AB} > V_{ABTH}$	-0.5	-0.08	—	$\mu A$
AB Response Delay Time	$t_{AB}$		30	—	150	$\mu s$
<b>External CNT</b>						
CNT Input Threshold Voltage	$V_{CNT}$		3.4	3.6	3.8	Volts
CNT Input Hysteresis Voltage	$V_{CNTH}$		0.8	1.0	1.2	Volts
CNT Input Leak Current	$I_{CNT}$	$V_{CNT} = 0V$	-0.5	-0.08	—	$\mu A$
CNT Response Delay Time	$t_{CNT}$		30	—	150	$\mu s$
<b>Driver</b>						
Floating Supply Leak Current	$I_{RFC}$	$V_{HGND} = 600V$	—	—	2.0	$\mu A$
Dead Time	$t_{DEAD}$	$C = 1000pF$	1.0	—	1.9	$\mu s$
HO Output Voltage	$V_{HOH1}$	$I_{HO} = 0mA$	14.0	14.4	—	Volts
	$V_{HOH2}$	$I_{HO} = -20mA$	10	13	—	Volts
	$V_{HOH3}$	$I_{HO} = -200mA$	1.0	5.5	—	Volts
	$V_{HOL1}$	$I_{HO} = 0mA$	—	5	100	mV
	$V_{HOL2}$	$I_{HO} = 20mA$	—	0.5	1.0	Volts
	$V_{HOL3}$	$I_{HO} = 200mA$	—	6	12	Volts
LO Output Voltage	$V_{LOH1}$	$I_{LO} = 0mA$	14.0	14.4	—	Volts
	$V_{LOH2}$	$I_{LO} = -20mA$	10	13	—	Volts
	$V_{LOH3}$	$I_{LO} = -200mA$	1.0	5.5	—	Volts
	$V_{LOL1}$	$I_{LO} = 0mA$	—	5	100	mV
	$V_{LOL2}$	$I_{LO} = 20mA$	—	0.5	1.0	Volts
	$V_{LOL3}$	$I_{LO} = 200mA$	—	6	12	Volts
Output Rise Time	$t_r$	Amplitude 10% $\rightarrow$ 90%, $C = 1000pF$	—	50	120	ns
Output Fall Time	$t_f$	Amplitude 90% $\rightarrow$ 10%, $C = 1000pF$	—	50	120	ns

**M63954P**  
**HVIC Half-Bridge Driver**

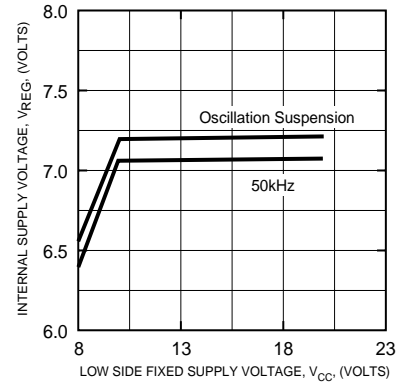
**THERMAL DERATING FACTOR CHARACTERISTICS (TYPICAL)**



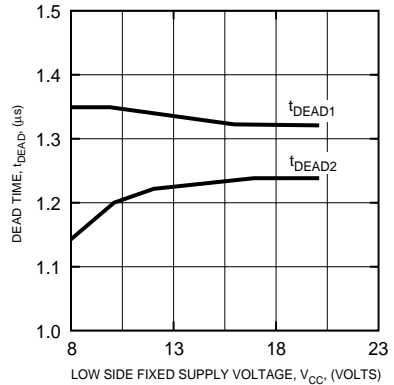
**$I_{CC}$  VS.  $V_{CC}$  CHARACTERISTIC**



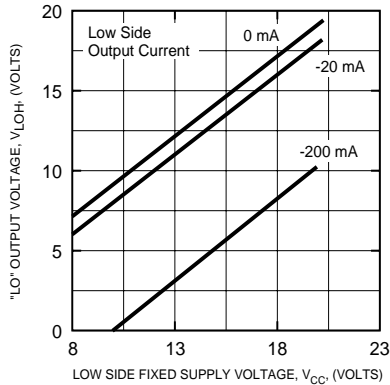
**$V_{REG}$  VS.  $V_{CC}$  CHARACTERISTIC**



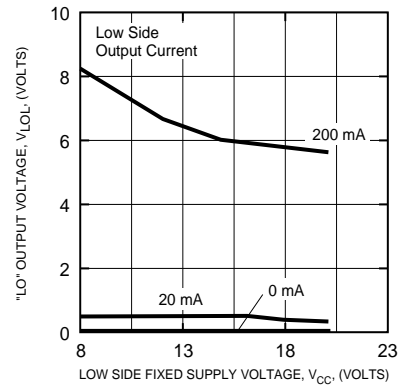
**$t_{DEAD}$  VS.  $V_{CC}$  CHARACTERISTIC**



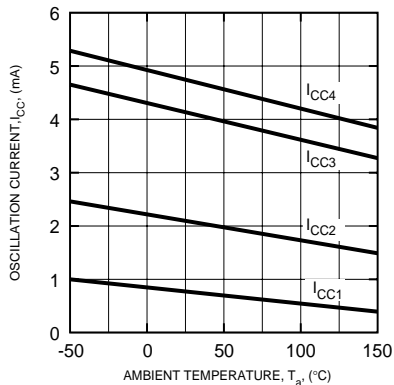
**$V_{LOH}$  VS.  $V_{CC}$  CHARACTERISTIC**



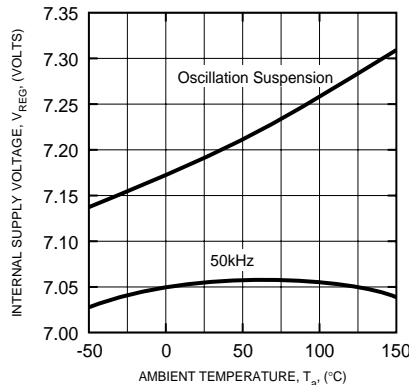
**$V_{LOL}$  VS.  $V_{CC}$  CHARACTERISTIC**



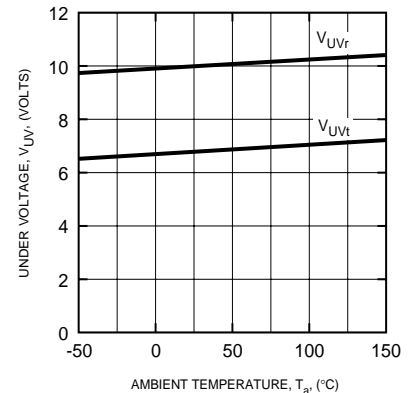
**$I_{CC}$  VS.  $T_a$  CHARACTERISTIC**



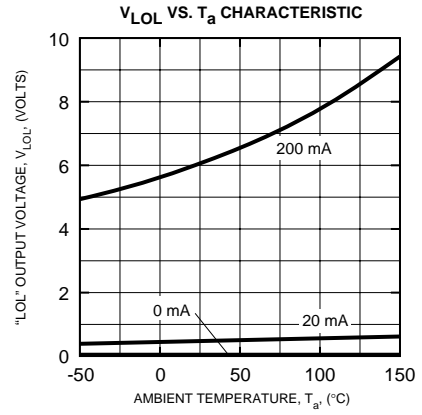
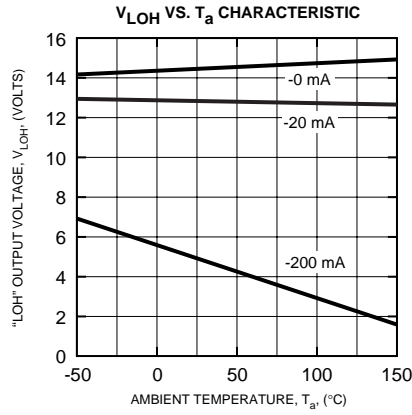
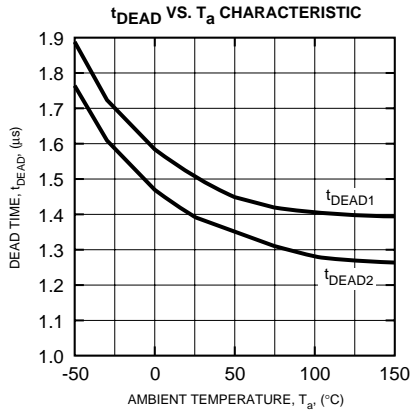
**$V_{REG}$  VS.  $T_a$  CHARACTERISTIC**



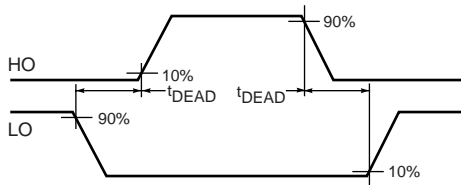
**$V_{UV}$  VS.  $T_a$  CHARACTERISTIC**



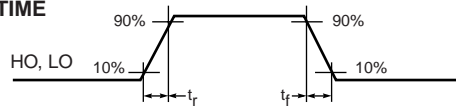
**M63954P**  
**HVIC Half-Bridge Driver**



**DEAD TIME**



**OUTPUT RISE TIME  
 FALL TIME**



**BLOCK DIAGRAM**

