

# MOC8111M, MOC8112M, MOC8113M 6-Pin DIP Optocoupler for Power Supply Applications (No Base Connection)

## Features

- High isolation voltage  
7500 VAC Peak—1 second
- High  $BV_{CEO}$  minimum 70 Volts
- Current transfer ratio in selected groups:  
MOC8111M: 20% min.  
MOC8112M: 50% min.  
MOC8113M: 100% min.
- Maximum switching time in saturation specified
- Underwriters Laboratory (UL) recognized  
(File #E90700, Vol. 2)
- IEC60747-5-2 approved (ordering option V)

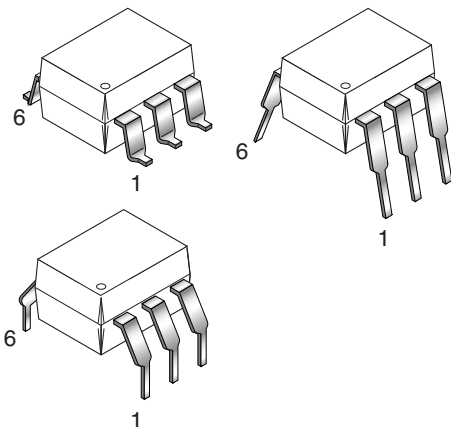
## Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

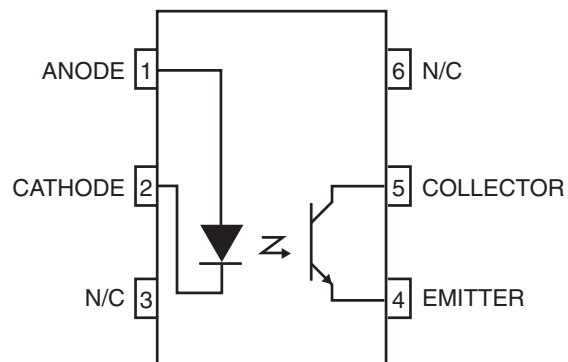
## Description

The MOC811XM series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor. The base of the transistor is not bonded to an external pin for improved noise immunity.

## Packages



## Schematic



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Unit
<b>TOTAL DEVICE</b>			
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$	260	mW
	Derate above $25^\circ\text{C}$	3.5	$\text{mW}/^\circ\text{C}$
$T_{\text{OPR}}$	Ambient Operating Temperature Range	-40 to +100	$^\circ\text{C}$
$T_{\text{STG}}$	Storage Temperature Range	-40 to +150	$^\circ\text{C}$
$T_{\text{SOL}}$	Lead Soldering Temperature (Wave Solder) (1/16" from case, 10 sec. duration)	260	$^\circ\text{C}$
<b>INPUT LED</b>			
$I_F$	Forward Current – Continuous	90	mA
$I_F(\text{pk})$	Forward Current – Peak (PW = $1\mu\text{s}$ , 300pps)	3	A
$V_R$	Reverse Voltage	6	V
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$	135	mW
	Derate above $25^\circ\text{C}$	1.8	$\text{mW}/^\circ\text{C}$
<b>OUTPUT TRANSISTOR</b>			
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$	200	mW
	Derate above $25^\circ\text{C}$	2.67	$\text{mW}/^\circ\text{C}$

## Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified.)

### Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>EMITTER</b>						
V <sub>F</sub>	Input Forward Voltage	I <sub>F</sub> = 60mA		1.35	1.65	V
		I <sub>F</sub> = 10mA		1.15	1.50	
V <sub>R</sub>	Reverse Voltage	I <sub>R</sub> = 10μA	6.0	15		V
C <sub>J</sub>	Capacitance	V <sub>F</sub> = 0V, f = 1.0MHz		50		pF
		V <sub>F</sub> = 1V, f = 1.0MHz		65		
I <sub>R</sub>	Reverse Leakage Current	V <sub>R</sub> = 3.0V		.35	10	μA
<b>DETECTOR</b>						
BV <sub>CEO</sub>	Breakdown Voltage, Collector to Emitter	I <sub>C</sub> = 1.0mA, I <sub>F</sub> = 0	70			V
BV <sub>ECO</sub>	Breakdown Voltage, Emitter to Collector	I <sub>E</sub> = 100μA, I <sub>F</sub> = 0	7			V
I <sub>CEO</sub>	Leakage Current, Collector to Emitter	V <sub>CE</sub> = 10V, I <sub>F</sub> = 0		5	50	V
C <sub>CE</sub>	Capacitance, Collector to Emitter	V <sub>CE</sub> = 0 V, f = 1MHz		8		pF

### Isolation Characteristics

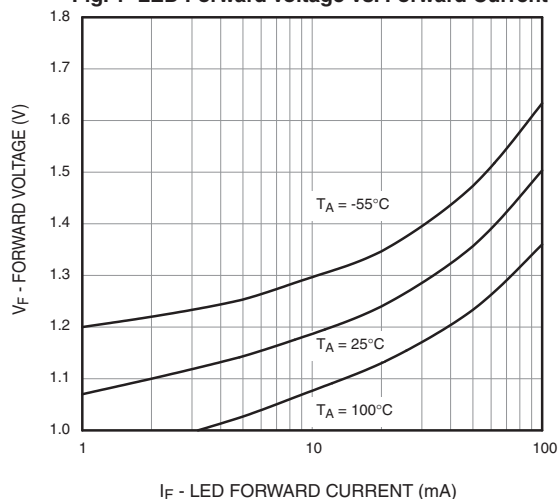
Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
V <sub>ISO</sub>	Input-Output Isolation Voltage	f = 60Hz, t = 1 sec.	7500			V <sub>AC(PK)</sub>
C <sub>ISO</sub>	Isolation Capacitance	V <sub>I-O</sub> = 0, f = 1MHz		0.5		pF

### Transfer Characteristic

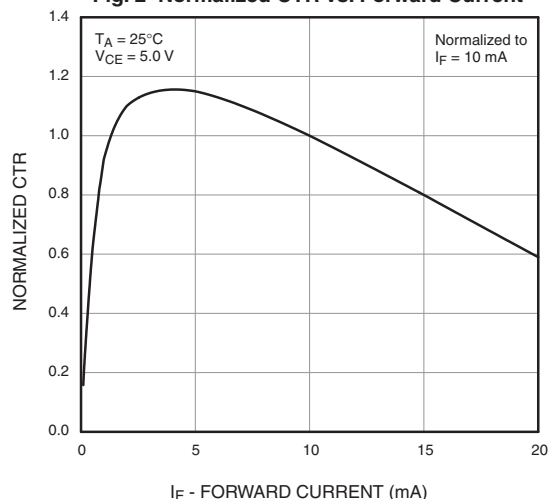
Symbol	Characteristics	Test Conditions	Device	Min.	Typ.	Max.	Units
<b>DC CHARACTERISTICS</b>							
CTR	Output/Input Current Transfer Ratio	I <sub>F</sub> = 10mA, V <sub>CE</sub> = 5V	MOC8111M	20			%
			MOC8112M	50			
			MOC8113M	100			
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	I <sub>F</sub> = 10mA, I <sub>C</sub> = 2.5mA	All		0.27	0.4	V
<b>AC CHARACTERISTICS</b>							
Non-Saturated Switching Times							
t <sub>on</sub>	Turn-On Time	R <sub>L</sub> = 100Ω, I <sub>C</sub> = 2mA, V <sub>CC</sub> = 10V, See Figure 7	All		6.0	10	μs
t <sub>off</sub>	Turn-Off Time		All		5.5	10	μs
Saturated Switching Times							
t <sub>on</sub>	Turn-On Time	I <sub>F</sub> = 20mA, V <sub>CE</sub> = 0.4V	MOC8111M		3.0	5.5	μs
		I <sub>F</sub> = 10mA, V <sub>CE</sub> = 0.4V	MOC812M/3M		4.2	8.0	
t <sub>r</sub>	Rise-Time	I <sub>F</sub> = 20mA, V <sub>CE</sub> = 0.4V	MOC8111M		2.0	4.0	μs
		I <sub>F</sub> = 10mA, V <sub>CE</sub> = 0.4V	MOC812M/3M		3.0	6.0	
t <sub>off</sub>	Turn-Off Time	I <sub>F</sub> = 20mA, V <sub>CE</sub> = 0.4V	MOC8111M		18	34	μs
		I <sub>F</sub> = 10mA, V <sub>CE</sub> = 0.4V	MOC812M/3M		23	39	
t <sub>f</sub>	Fall-Time	I <sub>F</sub> = 20mA, V <sub>CE</sub> = 0.4V	MOC8111M		11	20	μs
		I <sub>F</sub> = 10mA, V <sub>CE</sub> = 0.4V	MOC812M/3M		14	24	

## Typical Performance Characteristics

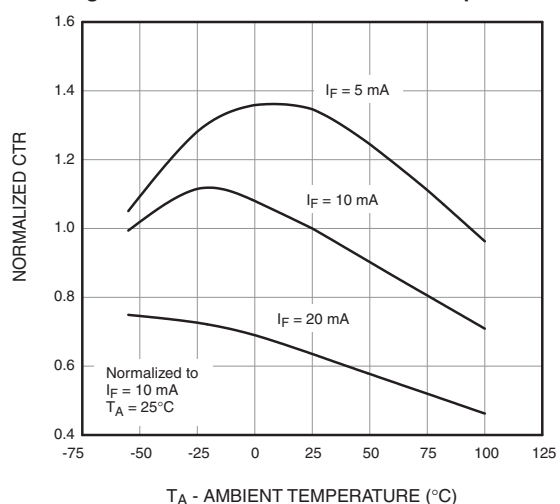
**Fig. 1 LED Forward Voltage vs. Forward Current**



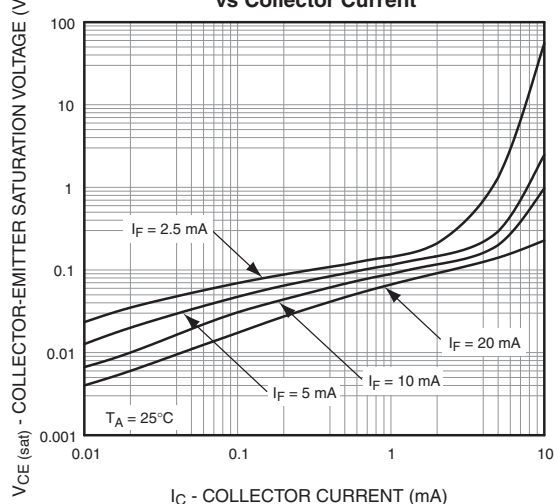
**Fig. 2 Normalized CTR vs. Forward Current**



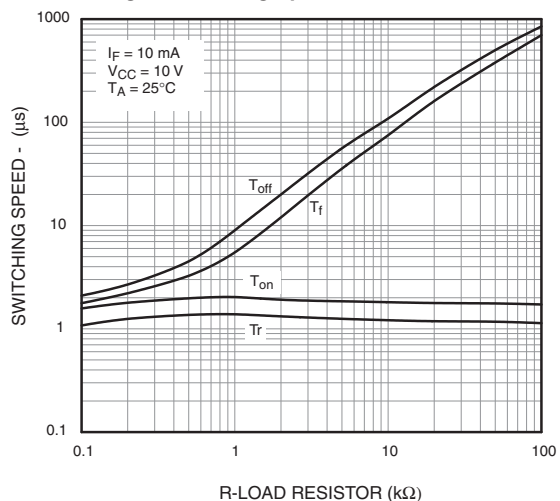
**Fig. 3 Normalized CTR vs. Ambient Temperature**



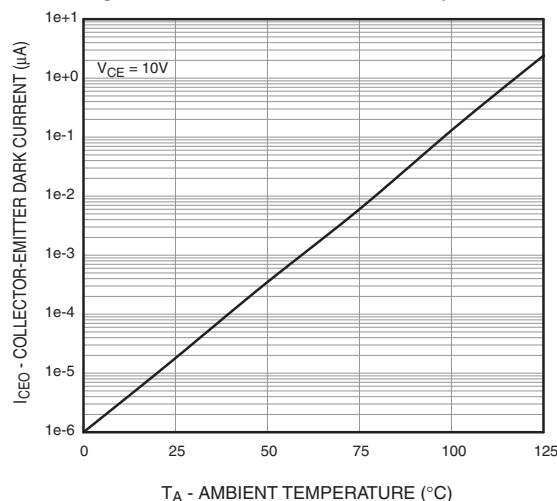
**Fig. 4 Collector Emitter Saturation Voltage vs Collector Current**



**Fig. 5 Switching Speed vs. Load Resistor**



**Fig. 6 Dark current vs. Ambient Temperature.**



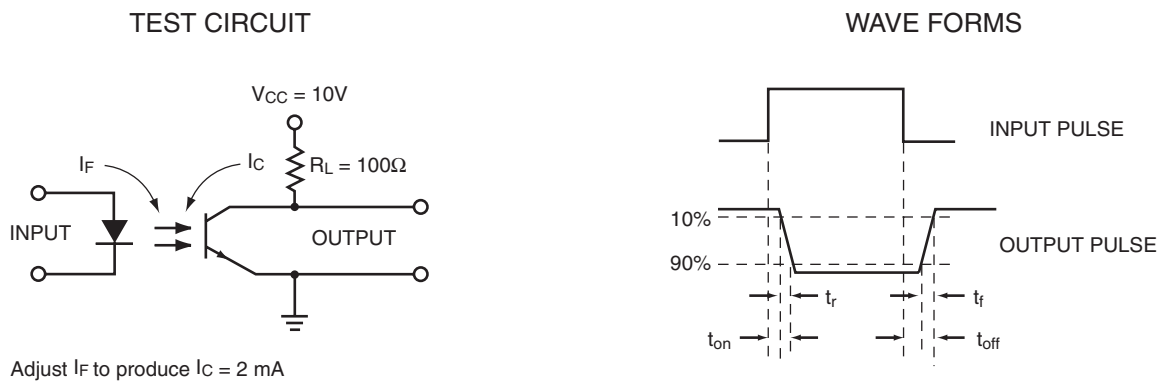
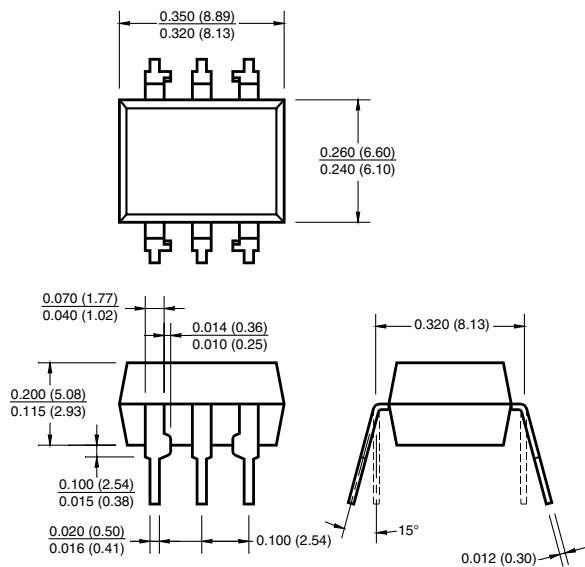


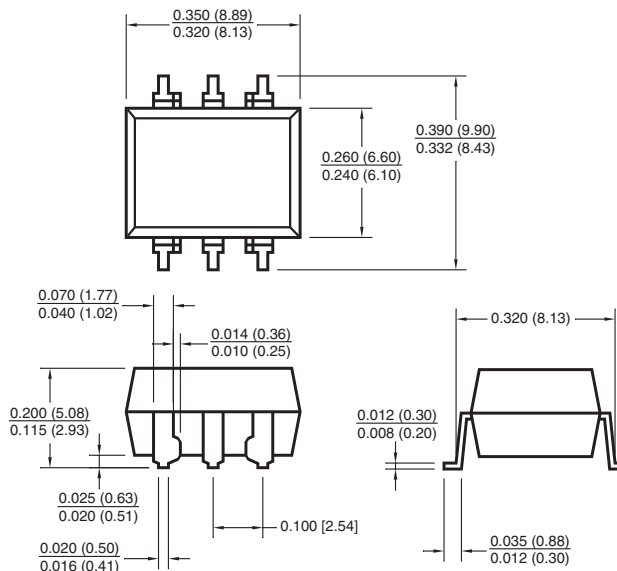
Figure 7. Switching Time Test Circuit and Waveforms

## Package Dimensions

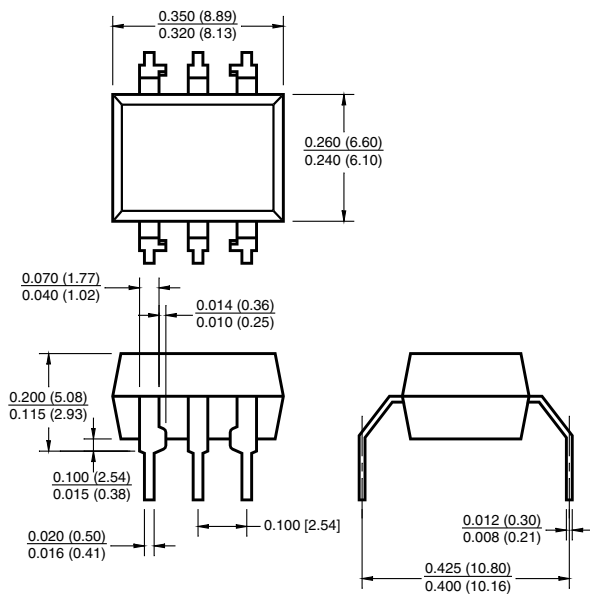
### Through Hole



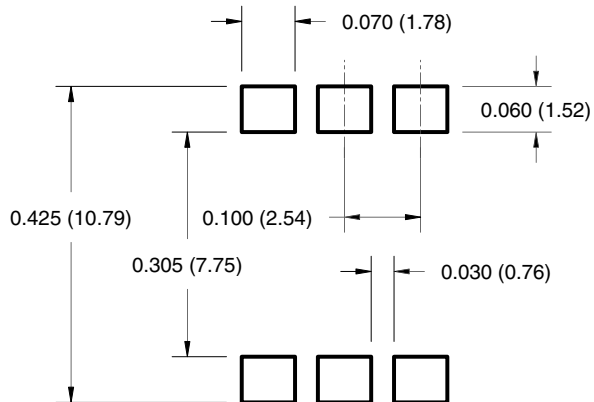
### Surface Mount



### 0.4" Lead Spacing



### Recommend Pad Layout for Surface Mount Leadform



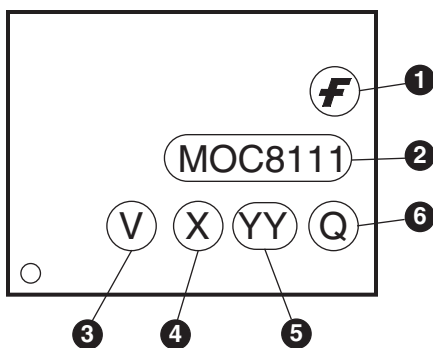
#### Note:

All dimensions are in inches (millimeters).

## Ordering Information

Option	Example Part Number	Description
No Suffix	MOC8111M	Through Hole
S	MOC8111SM	Surface Mount Lead Bend
SR2	MOC8111SR2M	Surface Mount; Tape and Reel
T	MOC8111TM	0.4" Lead Spacing
V	MOC8111VM	VDE 0884
TV	MOC8111TVM	IEC60747-5-2 (VDE), 0.4" Lead Spacing
SV	MOC8111SVM	IEC60747-5-2 (VDE), Surface Mount
SR2V	MOC8111SR2VM	IEC60747-5-2 (VDE), Surface Mount, Tape and Reel

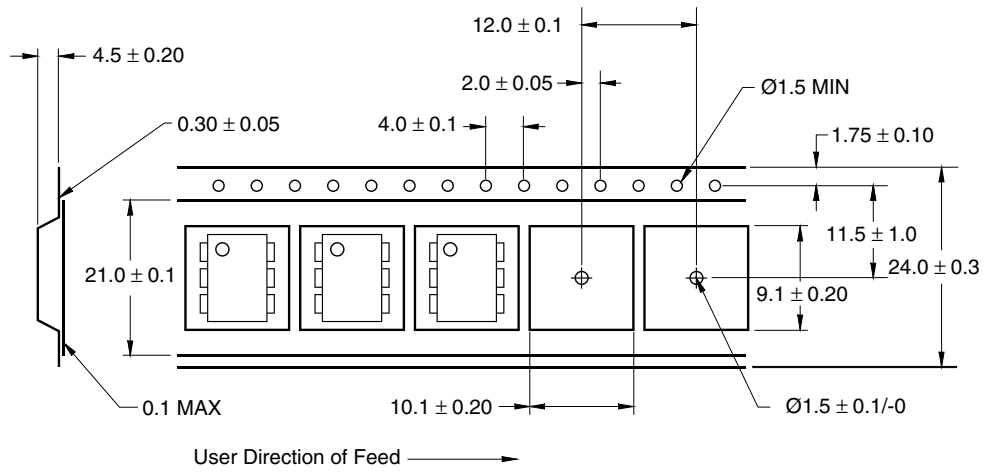
## Marking Information



### Definitions

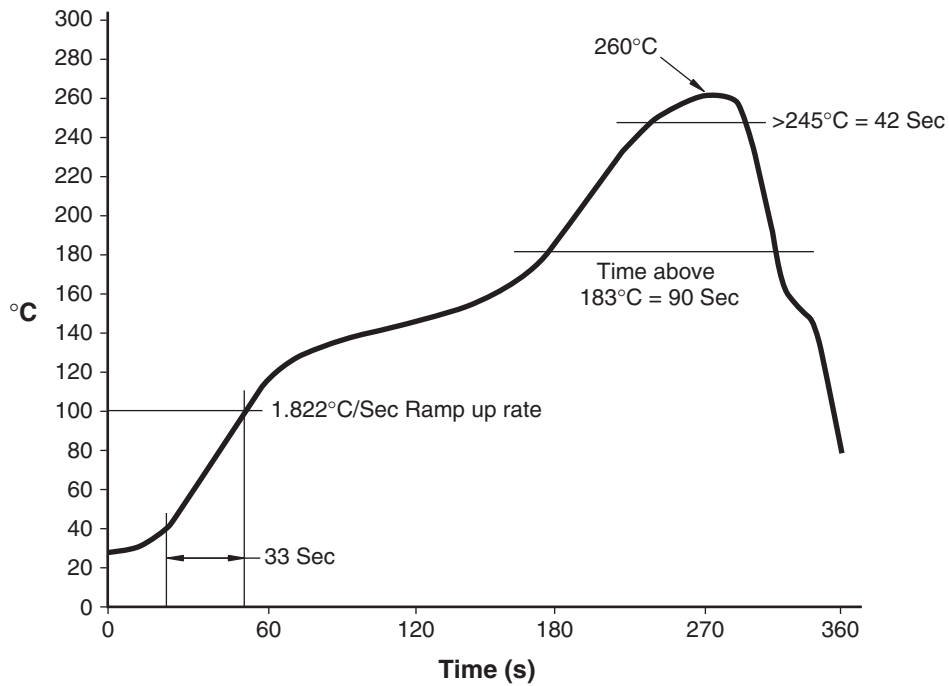
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '8'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

### Tape Dimensions



**Note:**  
All dimensions are in millimeters.

### Reflow Profile









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No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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