

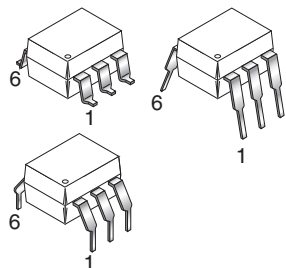
TIL111

TIL111-M

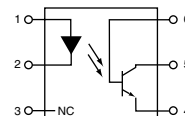
TIL117-M

MOC8100-M

WHITE PACKAGE (-M SUFFIX)

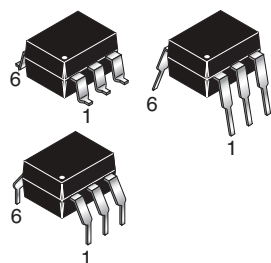


SCHEMATIC



PIN 1. ANODE
2. CATHODE
3. NO CONNECTION
4. EMITTER
5. COLLECTOR
6. BASE

BLACK PACKAGE (NO -M SUFFIX)



DESCRIPTION

The MOC8100, TIL111 and TIL117 optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

FEATURES

- The TIL111 is also available in both black and white packages by specifying -M suffix, e.g. TIL111-M for the white package and no suffix for the black package.
- UL recognized (File # E90700)
- VDE recognized (File # 94766); (File #102497 for white package)
 - Add option V for white package (e.g., TIL111V-M)
 - Add option 300 for black package (e.g., TIL111.300)

APPLICATIONS

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

TIL111

TIL111-M

TIL117-M

MOC8100-M

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Device	Symbol	Value	Units
TOTAL DEVICE				
Storage Temperature	All	T _{STG}	-55 to +150	°C
Operating Temperature	All	T _{OPR}	-55 to +100	°C
Lead Solder Temperature	All	T _{SOL}	260 for 10 sec	°C
Total Device Power Dissipation @ T _A = 25°C Derate above 25°C	All	P _D	250	mW
			3.3 (non-M) 2.94 (-M)	mW/°C
EMITTER				
DC/Average Forward Input Current	All	I _F	100 (non-M), 60 (-M)	mA
Reverse Input Voltage	TIL111/TIL111-M	V _R	3	V
	MOC8100-M/TIL117-M		6	
Forward Current - Peak (300μs, 2% Duty Cycle)	All	I _{F(pk)}	3	A
LED Power Dissipation @ T _A = 25 °C Derate above 25°C	All	P _D	150 (non-M), 120 (-M)	mW
			2.0 (non-M), 1.41 (-M)	mW/°C
DETECTOR				
Collector-Emitter Voltage	All	V _{CEO}	30	V
Collector-Base Voltage	All	V _{CBO}	70	V
Emitter-Collector Voltage	TIL111-M/TIL117-M	V _{ECO}	7	V
Emitter-Base Voltage	All	V _{EBO}	7	
Detector Power Dissipation @ T _A = 25 °C Derate above 25°C	All	P _D	150	mW
			2.0 (non-M), 1.76 (-M)	mW/°C

TIL111

TIL111-M

TIL117-M

MOC8100-M

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Device	Symbol	Min	Typ*	Max	Unit
EMITTER							
Input Forward Voltage	$(I_F = 16 \text{ mA})$	$(T_A = 25^\circ\text{C})$	TIL111/TIL111-M		1.2	1.4	V
	$(I_F = 10 \text{ mA; for MOC8100-M})$	$(T_A = 0-70^\circ\text{C})$	MOC8100-M/ TIL117-M		1.2	1.4	
	$(I_F = 16 \text{ mA; for TIL117-M})$	$(T_A = -55^\circ\text{C})$			1.32		
		$(T_A = +100^\circ\text{C})$			1.10		
Reverse Leakage Current		$(V_R = 3.0 \text{ V})$	TIL111/TIL111-M/ TIL117-M		0.001	10	μA
		$(V_R = 6.0 \text{ V})$	MOC8100-M		0.001	10	μA
DETECTOR							
Collector-Emitter Breakdown Voltage	$(I_C = 1.0 \text{ mA}, I_F = 0)$	All	BV_{CEO}	30	100		V
Collector-Base Breakdown Voltage	$(I_C = 10 \mu\text{A}, I_F = 0)$	All	BV_{CBO}	70	120		V
Emitter-Base Breakdown Voltage	$(I_E = 10 \mu\text{A}, I_F = 0)$	All	BV_{EBO}	7	10		V
Emitter-Collector Breakdown Voltage	$(I_F = 100 \mu\text{A}, I_F = 0)$	TIL111-M TIL117-M	BV_{ECO}	7	10		V
Collector-Emitter Dark Current	$(V_{CE} = 10 \text{ V}, I_F = 0)$	TIL111/TIL111-M/ TIL117-M	I_{CEO}		1	50	nA
	$(V_{CE} = 5 \text{ V}, T_A = 25^\circ\text{C})$	MOC8100-M	I_{CEO}		0.5	25	nA
	$(V_{CE} = 30 \text{ V}, I_F = 0, T_A = 70^\circ\text{C})$	TIL117-M/ MOC8100-M	I_{CEO}		0.2	50	μA
Collector-Base Dark Current	$(V_{CB} = 10 \text{ V})$	TIL111/TIL111-M/ TIL117-M	I_{CBO}			20	nA
	$(V_{CB} = 5 \text{ V})$	MOC8100-M	I_{CBO}			10	nA
Capacitance	$(V_{CE} = 0 \text{ V}, f = 1 \text{ MHz})$	All	C_{CE}		8		pF

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	(Non '-M', Black Package) ($f = 60 \text{ Hz}, t = 1 \text{ min}$)	V_{ISO}	5300			Vac(rms)
	('M', White Package) ($f = 60 \text{ Hz}, t = 1 \text{ sec}$)		7500			Vac(pk)
Isolation Resistance	$(V_{I-O} = 500 \text{ VDC})$	R_{ISO}	10^{11}			Ω
Isolation Capacitance	$(V_{I-O} = 0, f = 1 \text{ MHz})$	C_{ISO}			2	pF

Note

* Typical values at $T_A = 25^\circ\text{C}$ unless otherwise noted

TIL111

TIL111-M

TIL117-M

MOC8100-M

TRANSFER CHARACTERISTICS (T _A = 25°C Unless otherwise specified.)							
DC Characteristic	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
Current Transfer Ratio, Collector to Emitter	(I _F = 10 mA, V _{CE} = 10 V)	CTR _{CE}	TIL117-M	50			%
	(I _F = 1 mA, V _{CE} = 5 V)		MOC8100-M	50			%
	(I _F = 1 mA, V _{CE} = 5 V, T _A = 0 to +70°C)			30			
On-State Collector Current (Phototransistor Operation)	(I _F = 16 mA, V _{CE} = 0.4 V)	I _{C(ON)}	TIL111	2			mA
On-State Collector Current (Photodiode Operation)	(I _F = 16 mA, V _{CB} = 0.4V)		TIL111-M	7			μA
Collector-Emitter Saturation Voltage	(I _C = 500 μA, I _F = 10 mA)	V _{CE (SAT)}	TIL117-M			0.4	V
	(I _C = 2 mA, I _F = 16 mA)		TIL111 TIL111-M			0.4	
	(I _C = 100 μA, I _F = 1 mA)		MOC8100-M			0.5	
AC Characteristic							
Turn-On Time	(I _C = 2 mA, V _{CC} = 10 V, R _L = 100Ω) (Fig. 20)	T _{ON}	MOC8100-M			20	μs
			TIL117-M			10	
Turn-Off Time		T _{OFF}	MOC8100-M			20	μs
			TIL117-M			10	
Rise Time		t _r	MOC8100-M		2		μs
Fall Time		t _f	TIL117-M		2		
Rise Time (Phototransistor Operation)	(I _{C(ON)} = 2 mA, V _{CC} = 10 V, R _L = 100Ω) (Fig. 20)	t _r	TIL111 TIL111-M			10	μs
Fall Time (Phototransistor Operation)		t _f					

* Typical values at $T_A = 25^\circ\text{C}$

TIL111

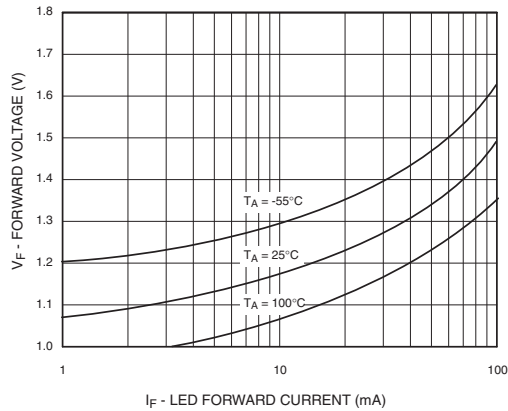
TIL111-M

TIL117-M

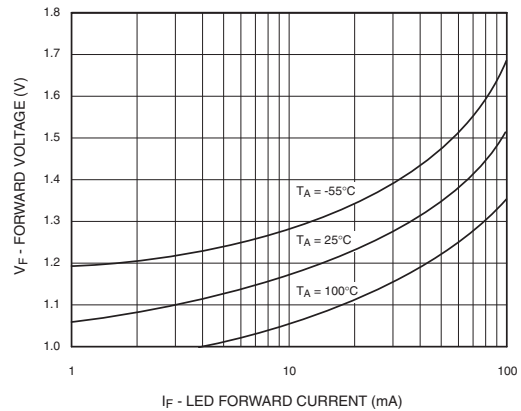
MOC8100-M

TYPICAL PERFORMANCE CURVES

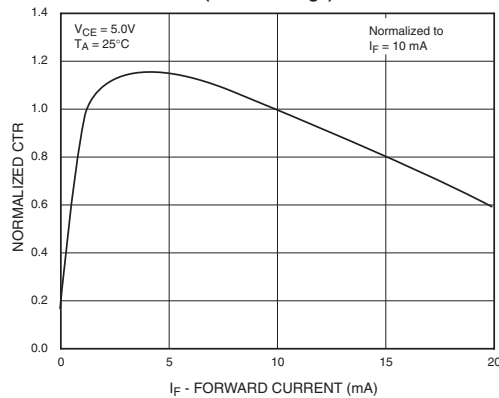
**Fig. 1 LED Forward Voltage vs. Forward Current
(Black Package)**



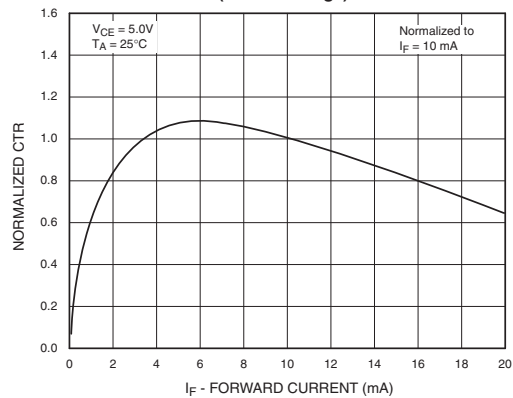
**Fig. 2 LED Forward Voltage vs. Forward Current
(White Package)**



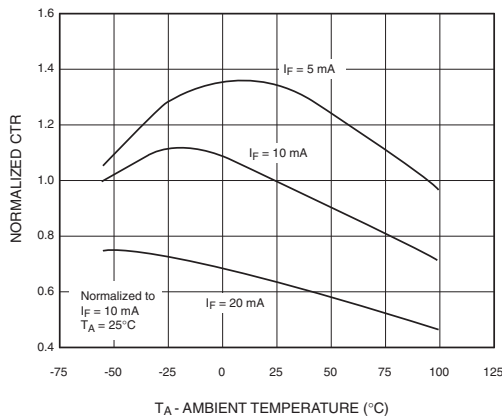
**Fig.3 Normalized CTR vs. Forward Current
(Black Package)**



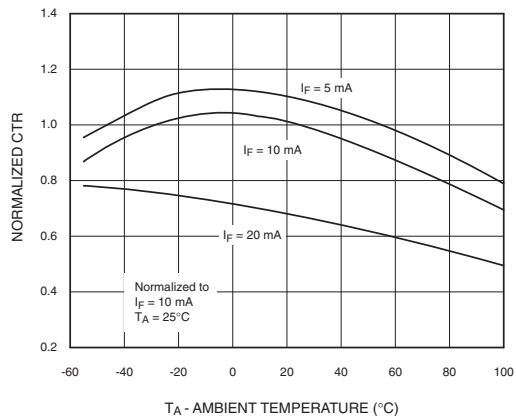
**Fig.4 Normalized CTR vs. Forward Current
(White Package)**



**Fig. 5 Normalized CTR vs. Ambient Temperature
(Black Package)**



**Fig. 6 Normalized CTR vs. Ambient Temperature
(White Package)**



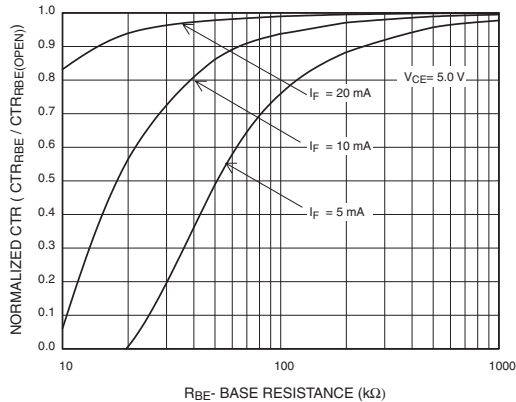
TIL111

TIL111-M

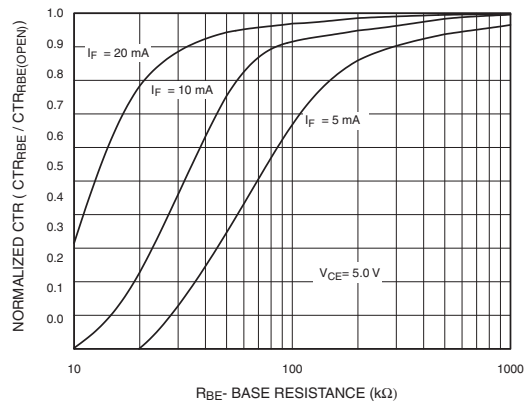
TIL117-M

MOC8100-M

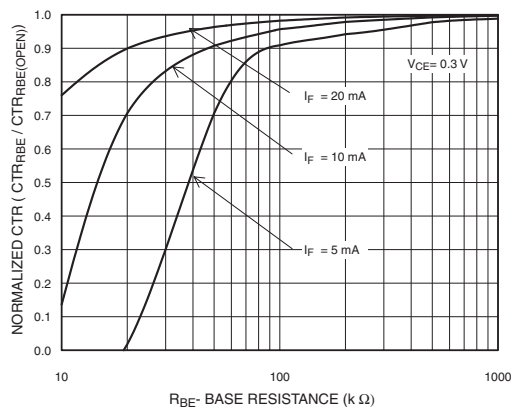
**Fig. 7 CTR vs. R_{BE} (Unsaturated)
(Black Package)**



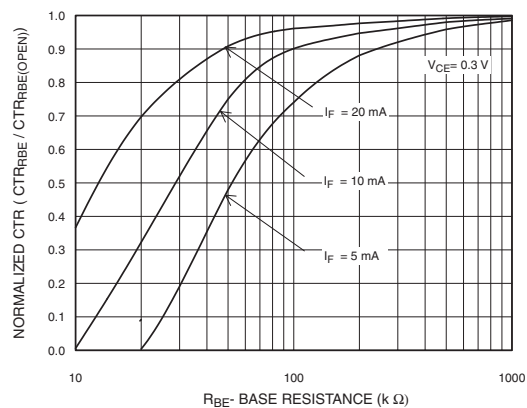
**Fig. 8 CTR vs. R_{BE} (Unsaturated)
(White Package)**



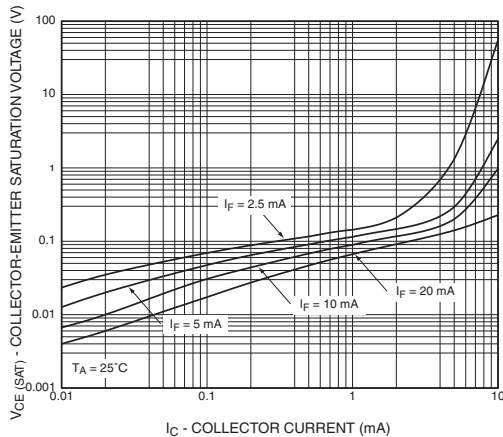
**Fig. 9 CTR vs. R_{BE} (Saturated)
(Black Package)**



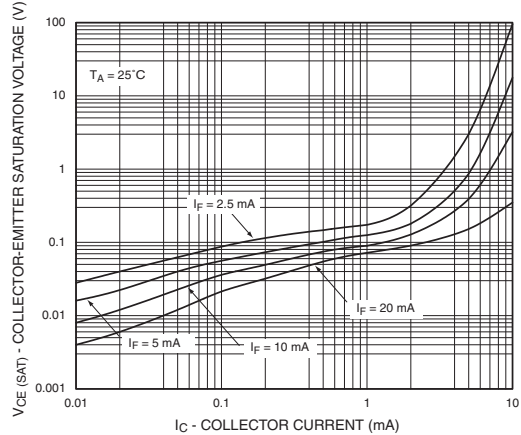
**Fig. 10 CTR vs. R_{BE} (Saturated)
(White Package)**



**Fig. 11 Collector-Emitter Saturation Voltage vs. Collector Current
(Black Package)**



**Fig. 12 Collector-Emitter Saturation Voltage vs. Collector Current
(White Package)**



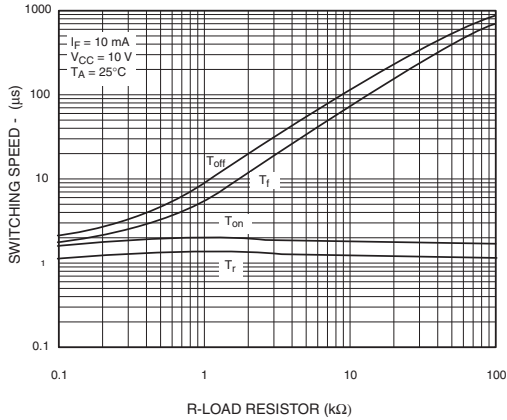
TIL111

TIL111-M

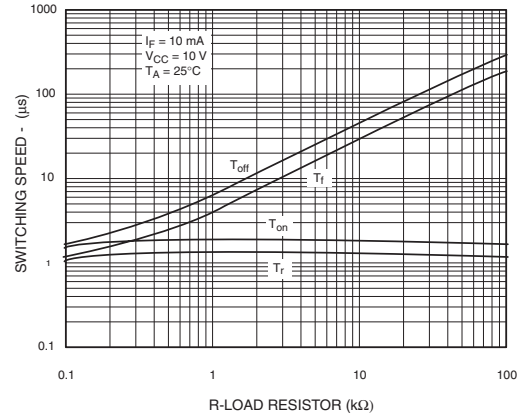
TIL117-M

MOC8100-M

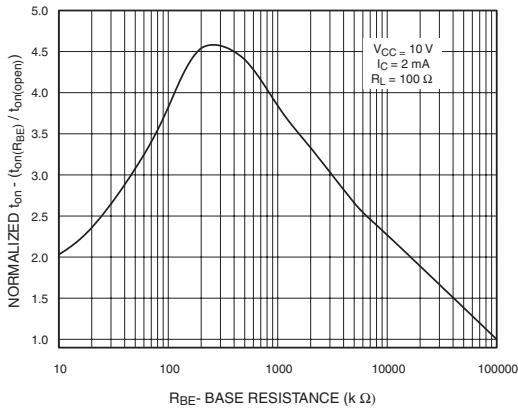
**Fig. 13 Switching Speed vs. Load Resistor
(Black Package)**



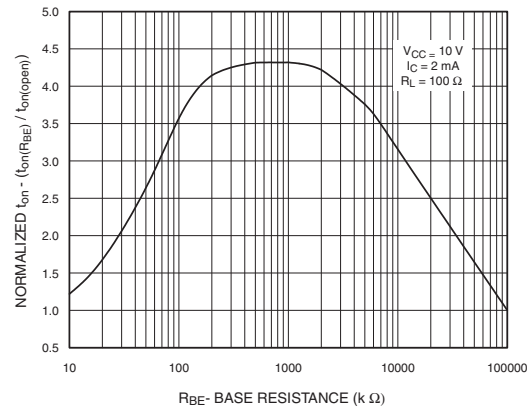
**Fig. 14 Switching Speed vs. Load Resistor
(White Package)**



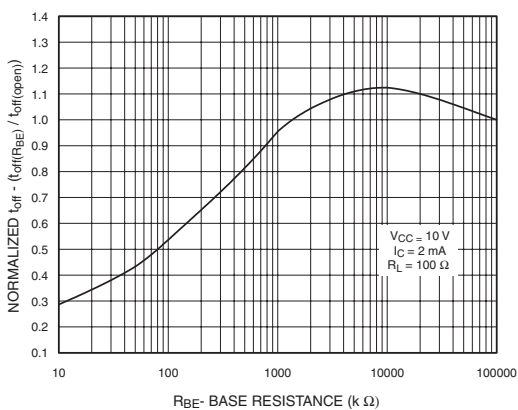
**Fig. 15 Normalized t_{on} vs. R_{BE}
(Black Package)**



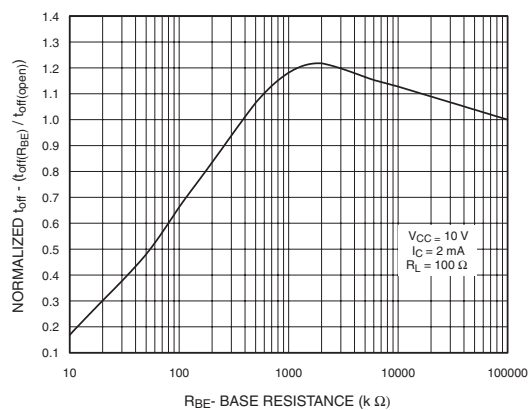
**Fig. 16 Normalized t_{on} vs. R_{BE}
(White Package)**



**Fig. 17 Normalized t_{off} vs. R_{BE}
(Black Package)**



**Fig. 18 Normalized t_{off} vs. R_{BE}
(White Package)**



TIL111

TIL111-M

TIL117-M

MOC8100-M

Fig. 19 Dark Current vs. Ambient Temperature

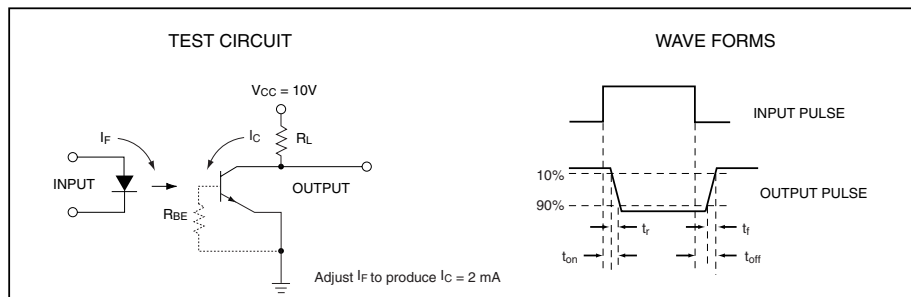
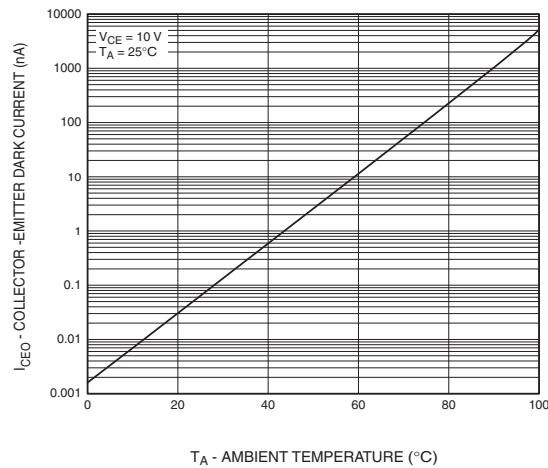


Figure 20. Switching Time Test Circuit and Waveforms

TIL111

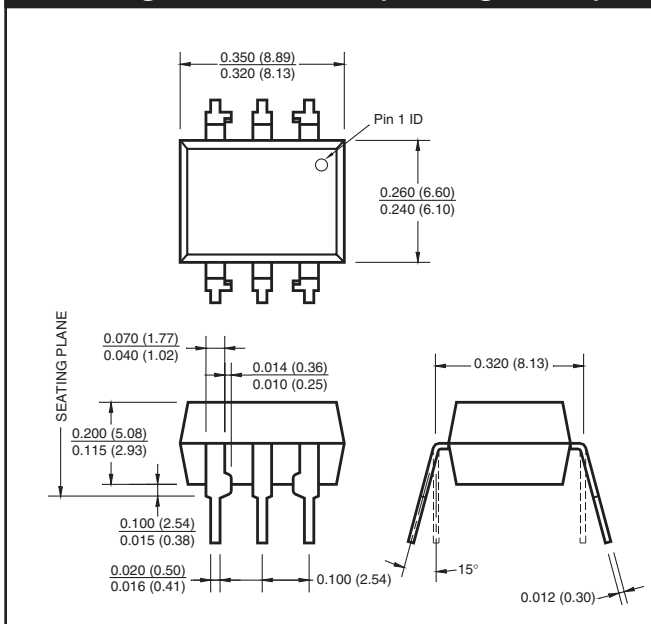
TIL111-M

TIL117-M

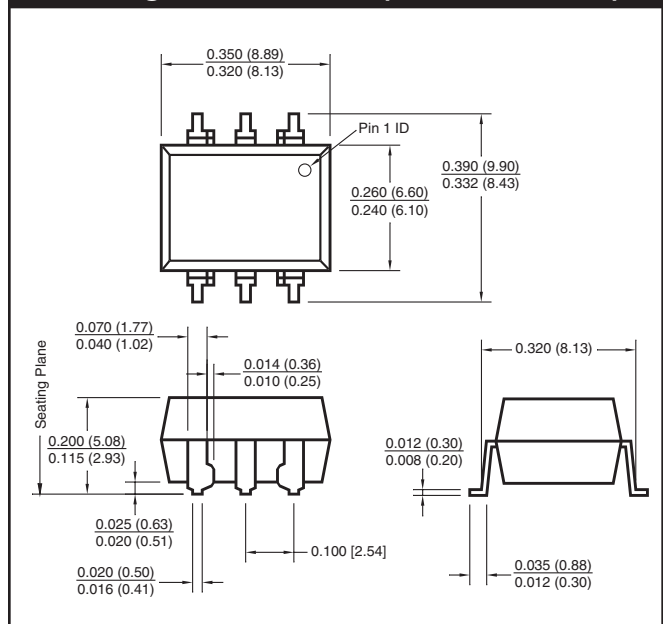
MOC8100-M

White Package (-M Suffix)

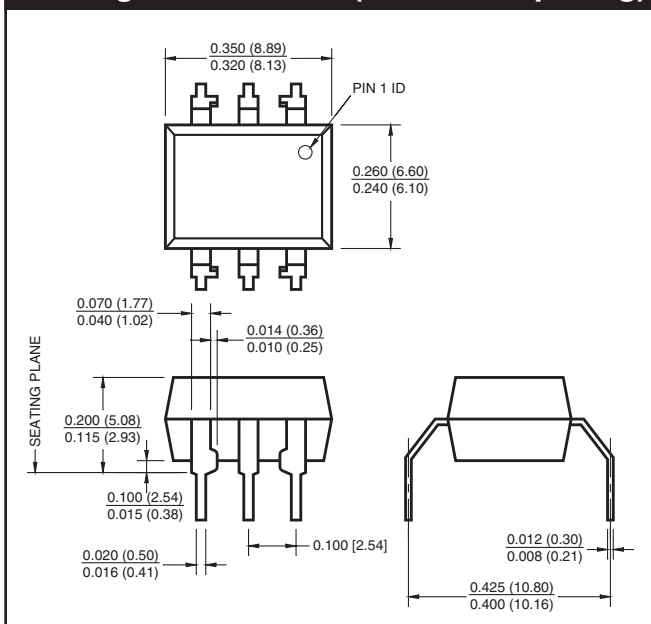
Package Dimensions (Through Hole)



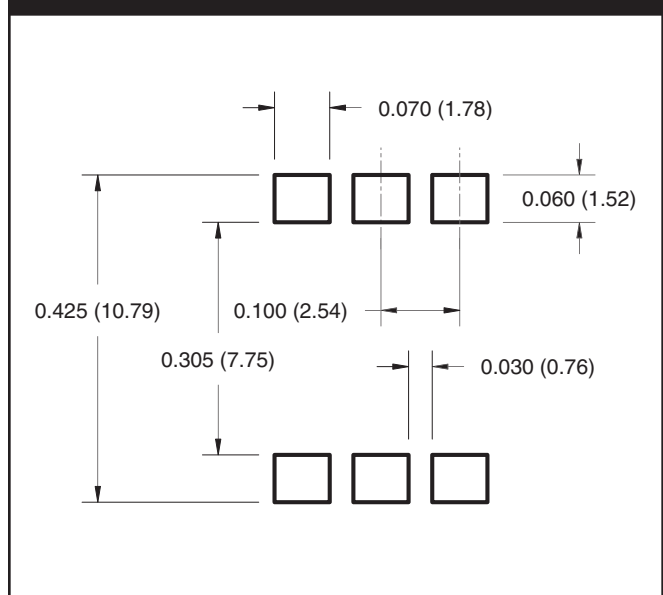
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



**Recommended Pad Layout for
Surface Mount Leadform**



NOTE

All dimensions are in inches (millimeters)

TIL111

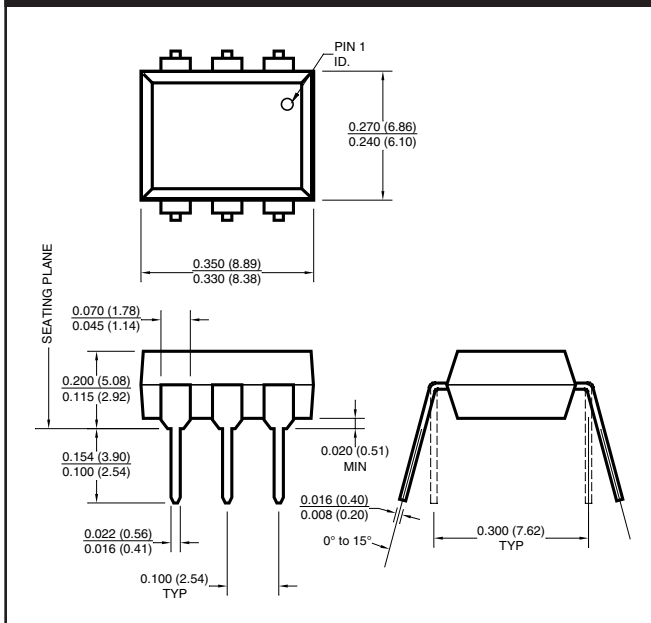
TIL111-M

TIL117-M

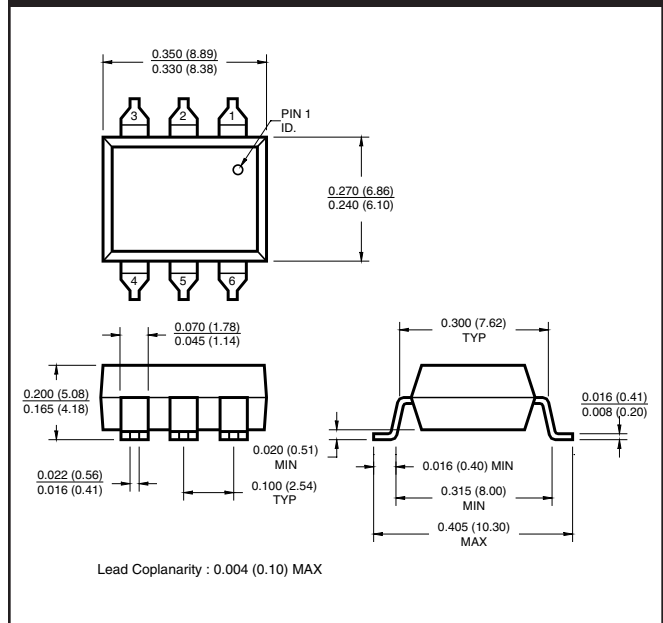
MOC8100-M

Black Package (No -M Suffix)

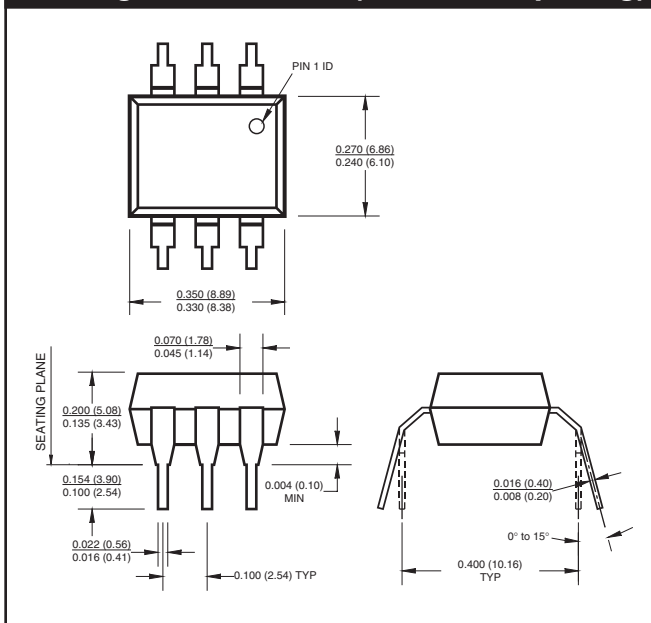
Package Dimensions (Through Hole)



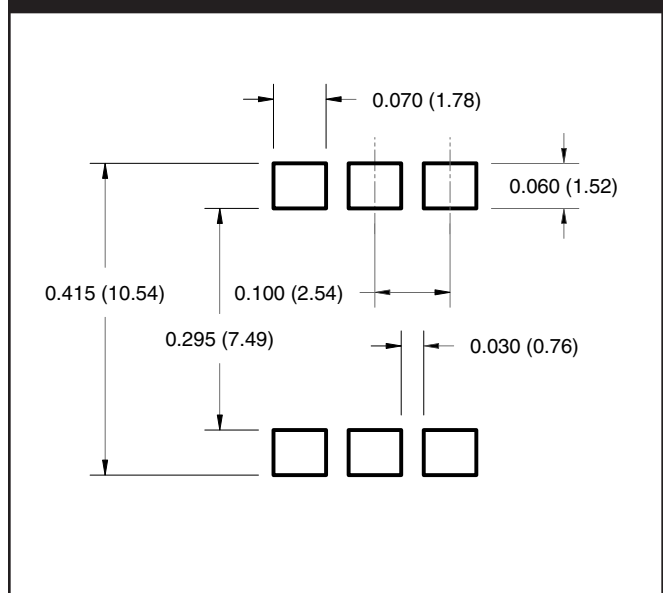
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

TIL111

TIL111-M

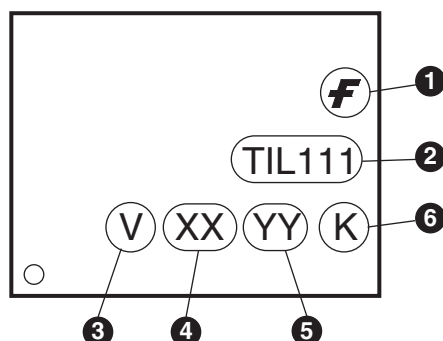
TIL117-M

MOC8100-M

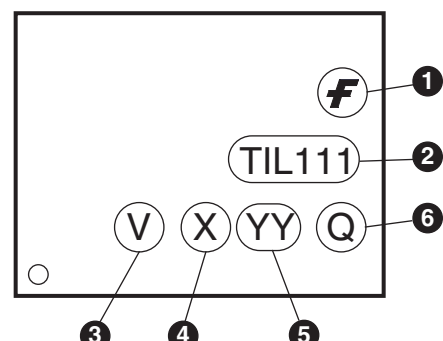
ORDERING INFORMATION

Order Entry Identifier		
Black Package (No Suffix)	White Package (-M Suffix)	Option
.S	S	Surface Mount Lead Bend
.SD	SR2	Surface Mount; Tape and reel
.W	T	0.4" Lead Spacing
.300	V	VDE 0884
.300W	TV	VDE 0884, 0.4" Lead Spacing
.3S	SV	VDE 0884, Surface Mount
.3SD	SR2V	VDE 0884, Surface Mount, Tape & Reel

MARKING INFORMATION



Black Package, No Suffix



White Package, -M Suffix

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 or two digit year code - Two digits for black package parts, e.g., '03' - One digit for white package parts, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

*Note – Parts built in the white package (M suffix) that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in the portrait format.

Technical drawing of a 5-axis lathe tool holder. The drawing shows a side view of the tool holder with various dimensions and features. The dimensions are in millimeters (mm).

Key dimensions and features:

- Overall length: 12.0 ± 0.1
- Distance from left face to first hole: 4.0 ± 0.1
- Distance between holes: 4.0 ± 0.1
- Distance from last hole to right face: 4.0 ± 0.1
- Overall width: 16.0 ± 0.3
- Distance from top face to hole center: 7.5 ± 0.1
- Distance from bottom face to hole center: 9.55 ± 0.20
- Distance from left face to hole center: 10.30 ± 0.20
- Distance from left face to tool holder body: 4.85 ± 0.20
- Distance from tool holder body to hole center: 0.30 ± 0.05
- Distance from tool holder body to hole center: 0.1 MAX
- Hole diameter: $\varnothing 1.55 \pm 0.05$
- Tool holder body diameter: $\varnothing 1.6 \pm 0.1$

The drawing also includes a "User Direction of Feed" arrow pointing to the right.

Technical drawing of a 5-axis lathe tool holder. The drawing shows a side view of the tool holder with various dimensions and features. The dimensions are as follows:

- Overall length: 12.0 ± 0.1
- Distance from front face to first hole: 4.5 ± 0.20
- Distance between holes: 2.0 ± 0.05
- Distance from last hole to end: 4.0 ± 0.1
- Top flange thickness: 0.30 ± 0.05
- Bottom flange thickness: 0.1 MAX
- Distance from front face to center of first hole: 10.1 ± 0.20
- Distance from front face to center of second hole: 11.5 ± 1.0
- Distance from front face to center of third hole: 9.1 ± 0.20
- Distance from front face to center of fourth hole: 24.0 ± 0.3
- Distance from front face to center of fifth hole: 17.5 ± 0.10
- Distance from front face to center of sixth hole: 11.5 ± 1.0
- Distance from front face to center of seventh hole: 9.1 ± 0.20
- Distance from front face to center of eighth hole: 24.0 ± 0.3
- Distance from front face to center of ninth hole: 17.5 ± 0.10
- Distance from front face to center of tenth hole: 11.5 ± 1.0
- Distance from front face to center of eleventh hole: 9.1 ± 0.20
- Distance from front face to center of twelfth hole: 24.0 ± 0.3
- Distance from front face to center of thirteenth hole: 17.5 ± 0.10
- Distance from front face to center of fourteenth hole: 11.5 ± 1.0
- Distance from front face to center of fifteenth hole: 9.1 ± 0.20
- Distance from front face to center of sixteenth hole: 24.0 ± 0.3
- Distance from front face to center of seventeenth hole: 17.5 ± 0.10
- Distance from front face to center of eighteenth hole: 11.5 ± 1.0
- Distance from front face to center of nineteenth hole: 9.1 ± 0.20
- Distance from front face to center of twentieth hole: 24.0 ± 0.3
- Distance from front face to center of twenty-first hole: 17.5 ± 0.10
- Distance from front face to center of twenty-second hole: 11.5 ± 1.0
- Distance from front face to center of twenty-third hole: 9.1 ± 0.20
- Distance from front face to center of twenty-fourth hole: 24.0 ± 0.3
- Distance from front face to center of twenty-fifth hole: 17.5 ± 0.10
- Distance from front face to center of twenty-sixth hole: 11.5 ± 1.0
- Distance from front face to center of twenty-seventh hole: 9.1 ± 0.20
- Distance from front face to center of twenty-eighth hole: 24.0 ± 0.3
- Distance from front face to center of twenty-ninth hole: 17.5 ± 0.10
- Distance from front face to center of thirtieth hole: 11.5 ± 1.0
- Distance from front face to center of thirty-first hole: 9.1 ± 0.20
- Distance from front face to center of thirty-second hole: 24.0 ± 0.3
- Distance from front face to center of thirty-third hole: 17.5 ± 0.10
- Distance from front face to center of thirty-fourth hole: 11.5 ± 1.0
- Distance from front face to center of thirty-fifth hole: 9.1 ± 0.20
- Distance from front face to center of thirty-sixth hole: 24.0 ± 0.3
- Distance from front face to center of thirty-seventh hole: 17.5 ± 0.10
- Distance from front face to center of thirty-eighth hole: 11.5 ± 1.0
- Distance from front face to center of thirty-ninth hole: 9.1 ± 0.20
- Distance from front face to center of fortieth hole: 24.0 ± 0.3
- Distance from front face to center of forty-first hole: 17.5 ± 0.10
- Distance from front face to center of forty-second hole: 11.5 ± 1.0
- Distance from front face to center of forty-third hole: 9.1 ± 0.20
- Distance from front face to center of forty-fourth hole: 24.0 ± 0.3
- Distance from front face to center of forty-fifth hole: 17.5 ± 0.10
- Distance from front face to center of forty-sixth hole: 11.5 ± 1.0
- Distance from front face to center of forty-seventh hole: 9.1 ± 0.20
- Distance from front face to center of forty-eighth hole: 24.0 ± 0.3
- Distance from front face to center of forty-ninth hole: 17.5 ± 0.10
- Distance from front face to center of fiftieth hole: 11.5 ± 1.0
- Distance from front face to center of fifty-first hole: 9.1 ± 0.20
- Distance from front face to center of fifty-second hole: 24.0 ± 0.3
- Distance from front face to center of fifty-third hole: 17.5 ± 0.10
- Distance from front face to center of fifty-fourth hole: 11.5 ± 1.0
- Distance from front face to center of fifty-fifth hole: 9.1 ± 0.20
- Distance from front face to center of fifty-sixth hole: 24.0 ± 0.3
- Distance from front face to center of fifty-seventh hole: 17.5 ± 0.10
- Distance from front face to center of fifty-eighth hole: 11.5 ± 1.0
- Distance from front face to center of fifty-ninth hole: 9.1 ± 0.20
- Distance from front face to center of sixtieth hole: 24.0 ± 0.3
- Distance from front face to center of sixty-first hole: 17.5 ± 0.10
- Distance from front face to center of sixty-second hole: 11.5 ± 1.0
- Distance from front face to center of sixty-third hole: 9.1 ± 0.20
- Distance from front face to center of sixty-fourth hole: 24.0 ± 0.3
- Distance from front face to center of sixty-fifth hole: 17.5 ± 0.10
- Distance from front face to center of sixty-sixth hole: 11.5 ± 1.0
- Distance from front face to center of sixty-seventh hole: 9.1 ± 0.20
- Distance from front face to center of sixty-eighth hole: 24.0 ± 0.3
- Distance from front face to center of sixty-ninth hole: 17.5 ± 0.10
- Distance from front face to center of seventieth hole: 11.5 ± 1.0
- Distance from front face to center of seventy-first hole: 9.1 ± 0.20
- Distance from front face to center of seventy-second hole: 24.0 ± 0.3
- Distance from front face to center of seventy-third hole: 17.5 ± 0.10
- Distance from front face to center of seventy-fourth hole: 11.5 ± 1.0
- Distance from front face to center of seventy-fifth hole: 9.1 ± 0.20
- Distance from front face to center of seventy-sixth hole: 24.0 ± 0.3
- Distance from front face to center of seventy-seventh hole: 17.5 ± 0.10
- Distance from front face to center of seventy-eighth hole: 11.5 ± 1.0
- Distance from front face to center of seventy-ninth hole: 9.1 ± 0.20
- Distance from front face to center of eightieth hole: 24.0 ± 0.3
- Distance from front face to center of eighty-first hole: 17.5 ± 0.10
- Distance from front face to center of eighty-second hole: 11.5 ± 1.0
- Distance from front face to center of eighty-third hole: 9.1 ± 0.20
- Distance from front face to center of eighty-fourth hole: 24.0 ± 0.3
- Distance from front face to center of eighty-fifth hole: 17.5 ± 0.10
- Distance from front face to center of eighty-sixth hole: 11.5 ± 1.0
- Distance from front face to center of eighty-seventh hole: 9.1 ± 0.20
- Distance from front face to center of eighty-eighth hole: 24.0 ± 0.3
- Distance from front face to center of eighty-ninth hole: 17.5 ± 0.10
- Distance from front face to center of ninetieth hole: 11.5 ± 1.0
- Distance from front face to center of ninety-first hole: 9.1 ± 0.20
- Distance from front face to center of ninety-second hole: 24.0 ± 0.3
- Distance from front face to center of ninety-third hole: 17.5 ± 0.10
- Distance from front face to center of ninety-fourth hole: 11.5 ± 1.0
- Distance from front face to center of ninety-fifth hole: 9.1 ± 0.20
- Distance from front face to center of ninety-sixth hole: 24.0 ± 0.3
- Distance from front face to center of ninety-seventh hole: 17.5 ± 0.10
- Distance from front face to center of ninety-eighth hole: 11.5 ± 1.0
- Distance from front face to center of ninety-ninth hole: 9.1 ± 0.20
- Distance from front face to center of one hundredth hole: 24.0 ± 0.3

The drawing also includes a "User Direction of Feed" arrow pointing to the right.

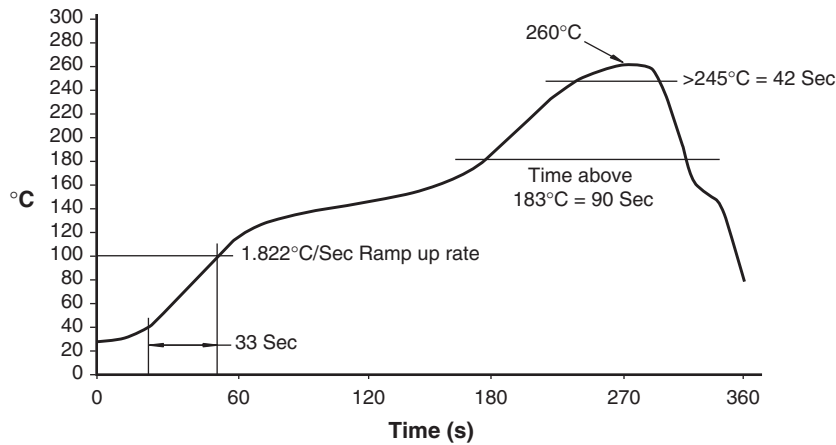
TIL111

TIL111-M

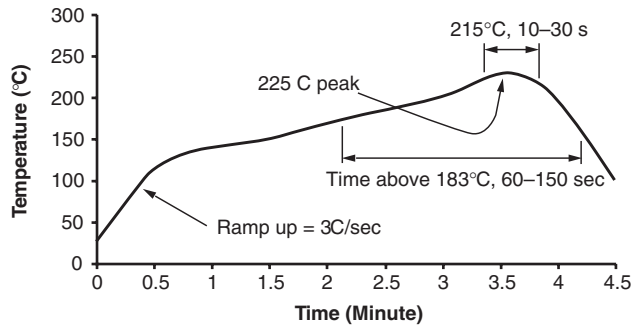
TIL117-M

MOC8100-M

Reflow Profile (White Package, -M Suffix)



Reflow Profile (Black Package, No Suffix)



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60-150 seconds
- One time soldering reflow is recommended

TIL111

TIL111-M

TIL117-M

MOC8100-M

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.