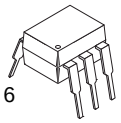
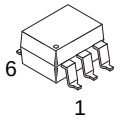
6-Pin DIP Zero-Cross Triac Driver Optocoupler (600 Volt Peak)

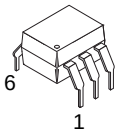
MOC3061M, MOC3062M, MOC3063M, MOC3162M, MOC3163M



PDIP6 8.51x6.35, 2.54P
CASE 646BX



PDIP6 8.51x6.35, 2.54P
CASE 646BY



PDIP6 8.51x6.35, 2.54P
CASE 646BZ

Description

The MOC306XM and MOC316XM devices consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a triac in the interface of logic systems to equipment powered from 115/240 VAC lines, such as solid−state relays, industrial controls, motors, solenoids and consumer appliances, etc.

Features

- Simplifies Logic Control of 115/240 VAC Power
- Zero Voltage Crossing to Minimize Conducted and Radiated Line Noise
- 600 V Peak Blocking Voltage
- Superior Static dv/dt
  - 600 V/μs (MOC306xM)
  - 1000 V/μs (MOC316xM)
- Safety and Regulatory Approvals
  - UL1577, 4,170 VAC_{RMS} for 1 Minute
  - DIN EN/IEC60747−5−5
- These are Pb−Free Devices

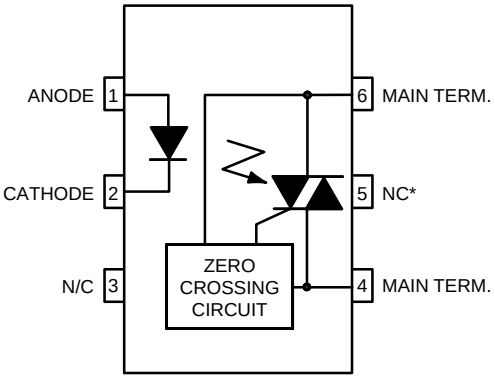
Applications

- Solenoid/Valve Controls
- Static Power Switches
- Temperature Controls
- AC Motor Starters
- Lighting Controls
- AC Motor Drives
- E.M. Contactors
- Solid State Relays

MARKING DIAGRAM

MOC3061	= Device Number
V	= DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X	= One−Digit Year Code, e.g., ‘5’
YY	= Two−Digit Work Week, Ranging from ‘01’ to ‘53’
Q	= Assembly Package Code

SCHEMATIC



*DO NOT CONNECT (TRIAC SUBSTRATE)

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

SAFETY AND INSULATION RATINGS (As per DIN EN/IEC 60747−5−5, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.)

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	<150 V_{RMS}	I–IV
	<300 V_{RMS}	I–IV
Climatic Classification		40/85/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V_{PR}	Input−to−Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1360	V_{peak}
	Input−to−Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1594	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	850	V_{peak}
V_{IOTM}	Highest Allowable Over−Voltage	6000	V_{peak}
	External Creepage	≥7	mm
	External Clearance	≥7	mm
	External Clearance (for Option TV, 0.4” Lead Spacing)	≥10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥0.5	mm
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V	$>10^9$	Ω

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Device	Value	Unit
TOTAL DEVICE				
T_{STG}	Storage Temperature	All	−40 to +125	°C
T_{OPR}	Operating Temperature	All	−40 to +85	°C
T_J	Junction Temperature Range	All	−40 to +100	°C
T_{SOL}	Lead Solder Temperature	All	260 for 10 seconds	°C
P_D	Total Device Power Dissipation at 25°C Ambient	All	250	mW
	Derate Above 25°C		2.94	mW/°C
EMITTER				
I_F	Continuous Forward Current	All	60	mA
V_R	Reverse Voltage	All	6	V
P_D	Total Power Dissipation at 25°C Ambient	All	120	mW
	Derate Above 25°C		1.41	mW/°C
DETECTOR				
V_{DRM}	Off−State Output Terminal Voltage	All	600	V
I_{TSM}	Peak Non−Repetitive Surge Current (Single Cycle 60 Hz Sine Wave)	All	1	A_{peak}
I_{TM}	Peak Repetitive On−State Current	All	100	mA_{peak}
P_D	Total Power Dissipation at 25°C Ambient	All	150	mW
	Derate Above 25°C		1.76	mW/°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Test Conditions	Device	Min	Typ	Max	Unit
INDIVIDUAL COMPONENT CHARACTERISTICS							
EMITTER							
V_F	Input Forward Voltage	I_F = 30 mA	All	–	1.3	1.5	V
I_R	Reverse Leakage Current	V_R = 6 V	All	–	0.005	100	μA
DETECTOR							
I_{DRM1}	Peak Blocking Current, Either Direction	V_{DRM} = 600 V, I_F = 0 (Note 1)	MOC306XM	–	10	500	nA
			MOC316XM	–	10	100	
dv/dt	Critical Rate of Rise of Off−State Voltage	I_F = 0 (Note 2)	MOC306XM	600	1500	–	V/μs
			MOC316XM	1000	–	–	
TRANSFER CHARACTERISTICS							
I_{FT}	LED Trigger Current (Rated I_{FT})	Main Terminal Voltage = 3 V (Note 3)	MOC3061M	–	–	15	mA
			MOC3062M MOC3162M	–	–	10	
			MOC3063M MOC3163M	–	–	5	
V_{TM}	Peak On−State Voltage, Either Direction	I_{TM} = 100 mA peak, I_F = rated I_{FT}	All	–	1.8	3.0	V
I_H	Holding Current, Either Direction		All	–	500	–	μA
ZERO CROSSING CHARACTERISTICS							
V_{INH}	Inhibit Voltage (MT1−MT2 Voltage Above Which Device will not Trigger)	I_F = rated I_{FT}	MOC3061M MOC3062M MOC3063M	–	12	20	V
			MOC3162M MOC3163M	–	12	15	
I_{DRM2}	Leakage in Inhibited State	I_F = rated I_{FT}, V_{DRM} = 600 V, off−state	All	–	–	2	mA
ISOLATION CHARACTERISTICS							
V_{ISO}	Isolation Voltage (Note 4)	f = 60 Hz, t = 1 Minute		4170	–	–	VAC_{RMS}
R_{ISO}	Isolation Resistance	$V_{I−O}$ = 500 V_{DC}		–	10^{11}	–	Ω
C_{ISO}	Isolation Capacitance	V = 0 V, f = 1 MHz		–	0.2	–	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Test voltage must be applied within dv/dt rating.
2. This is static dv/dt. Commutating dv/dt is a function of the load−driving thyristor(s) only.
3. All devices are guaranteed to trigger at an I_F value less than or equal to max I_{FT}. Therefore, recommended operating I_F lies between max I_{FT} (15 mA for MOC3061M, 10 mA for MOC3062M and MOC3162M, 5 mA for MOC3063M and MOC3163M) and absolute maximum I_F (60 mA).
4. Isolation voltage, V_{ISO}, is an internal device dielectric breakdown rating. For this test, pins 1 and 2 are common, and pins 4, 5 and 6 are common.

TYPICAL PERFORMANCE CURVES

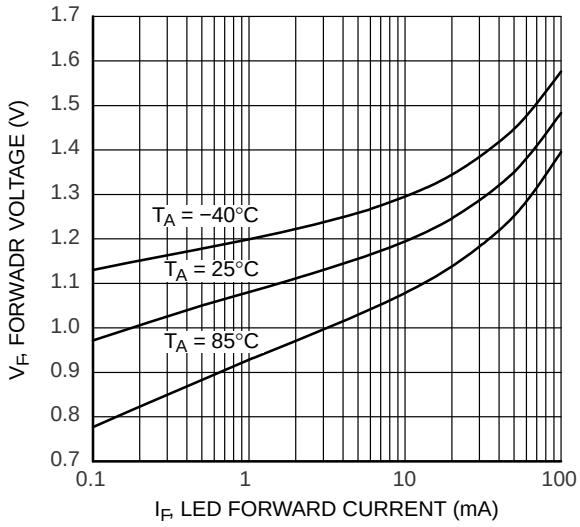


Figure 1. LED Forward Voltage vs. Forward Current

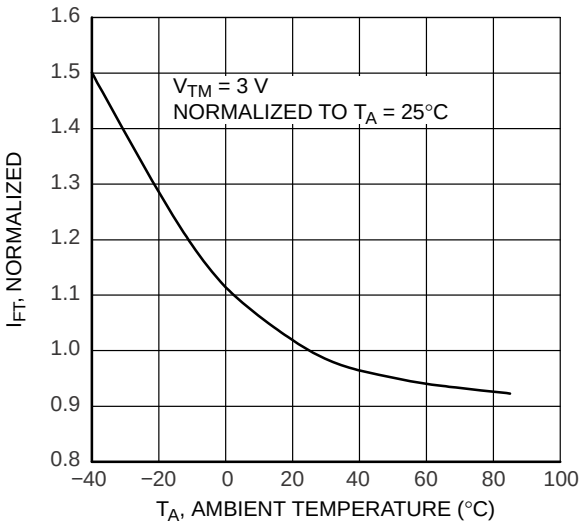


Figure 2. Trigger Current Vs. Temperature

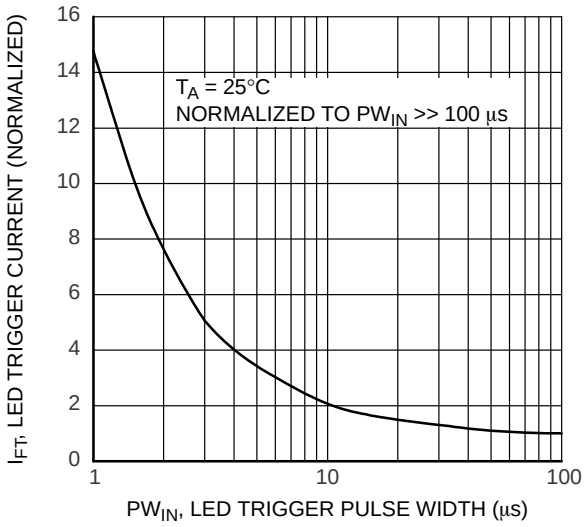


Figure 3. LED Current Required to Trigger vs. LED Pulse Width

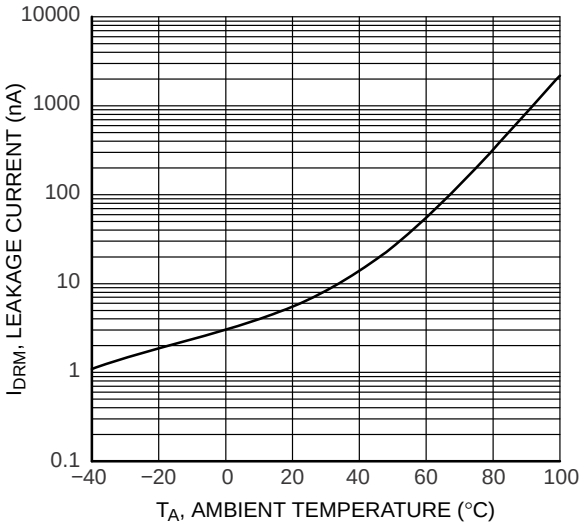


Figure 4. Leakage Current, I_{DRM} vs. Temperature

TYPICAL PERFORMANCE CURVES (Continued)

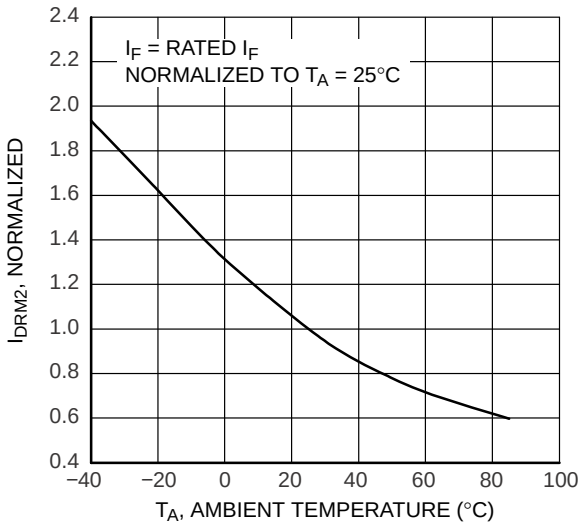


Figure 5. I_{DRM2}, Leakage in Inhibit State vs. Temperature

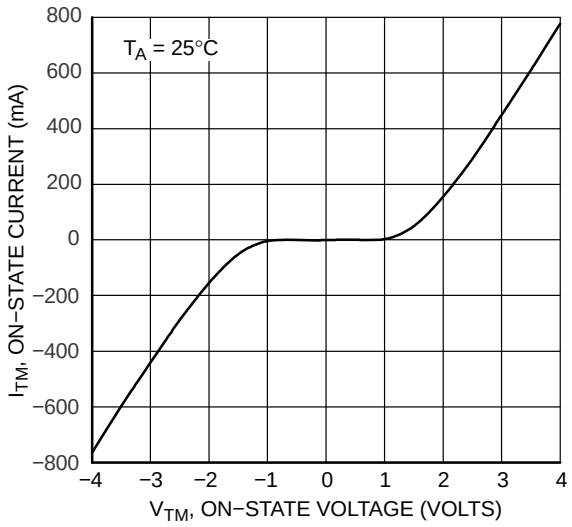


Figure 6. On−State Characteristics

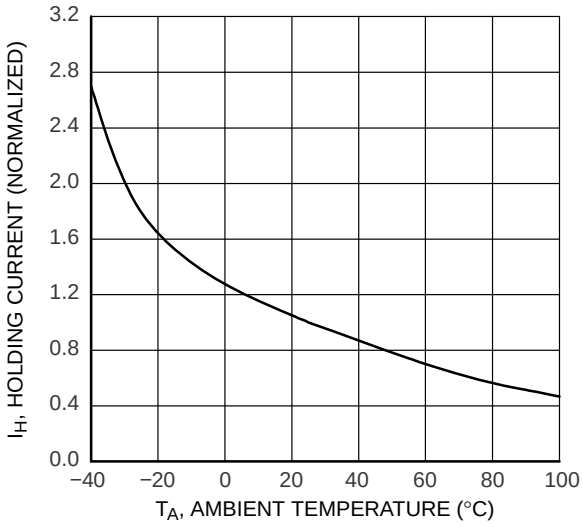


Figure 7. I_H, Holding Current vs. Temperature

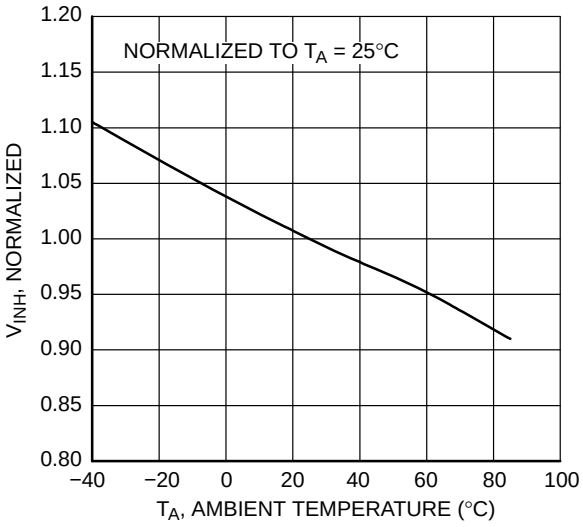


Figure 8. Inhibit Voltage vs. Temperature

APPLICATION INFORMATION

Basic Applications

Typical circuit for use when hot line switching is required. In this circuit the “hot” side of the line is switched and the load connected to the cold or neutral side. The load may be connected to either the neutral or hot line.

Rin is calculated so that I_F is equal to the rated I_{FT} of the part, 15 mA for the MOC3061M, 10 mA for the MOC3062M, or 5 mA for the MOC3063M.

The 39 Ω resistor and 0.01 μF capacitor are for snubbing of the triac and is often, but not always, necessary depending upon the particular triac and load used.

Suggested method of firing two, back−to−back SCR’s with a **onsemi** triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 330 Ω.

NOTE: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.

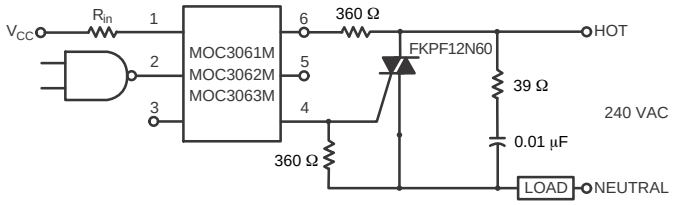


Figure 9. Hot−Line Switching Application Circuit

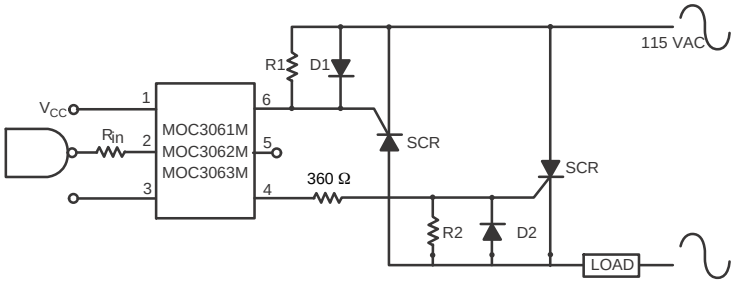
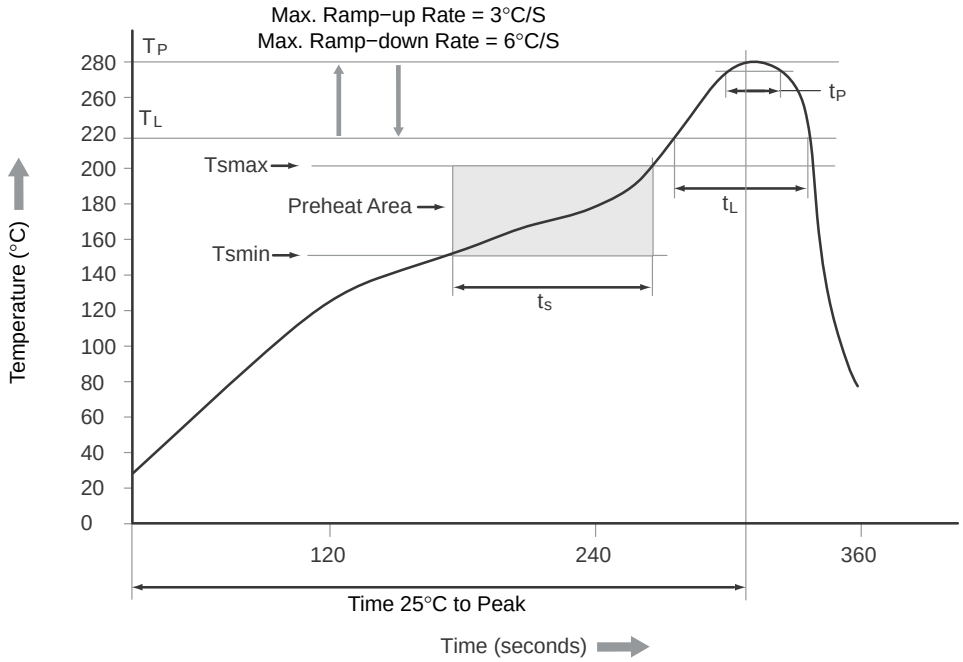


Figure 10. Inverse−Parallel SCR Driver Circuit



Temperature Minimum (Tsmin)	150°C
Temperature Maximum (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60 seconds to 120 seconds
Ramp−up Rate (T_L to T_P)	3°C/second maximum
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 seconds to 150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp−down Rate (T_P to T_L)	6°C/second maximum
Time 25°C to Peak Temperature	8 minutes maximum

Figure 11. Reflow Profile

ORDERING INFORMATION (Note 5)

Part Number	Package	Shipping†
MOC3061M	DIP 6−Pin (Pb−Free)	50 Units / Tube
MOC3061SM	SMT 6−Pin (Lead Bend) (Pb−Free)	50 Units / Tube
MOC3061SR2M	SMT 6−Pin (Lead Bend) (Pb−Free)	1000 / Tape & Reel
MOC3061VM	DIP 6−Pin, DIN EN/IEC60747−5−5 Option (Pb−Free)	50 Units / Tube
MOC3061SVM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option (Pb−Free)	50 Units / Tube
MOC3061SR2VM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option (Pb−Free)	1000 / Tape & Reel
MOC3061TVM	DIP 6−Pin, 0.4” Lead Spacing, DIN EN/IEC60747−5−5 Option (Pb−Free)	50 Units / Tube

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

5. The product orderable part number system listed in this table also applies to the MOC3062M, MOC3063M, MOC3162M, and MOC3163M product families.

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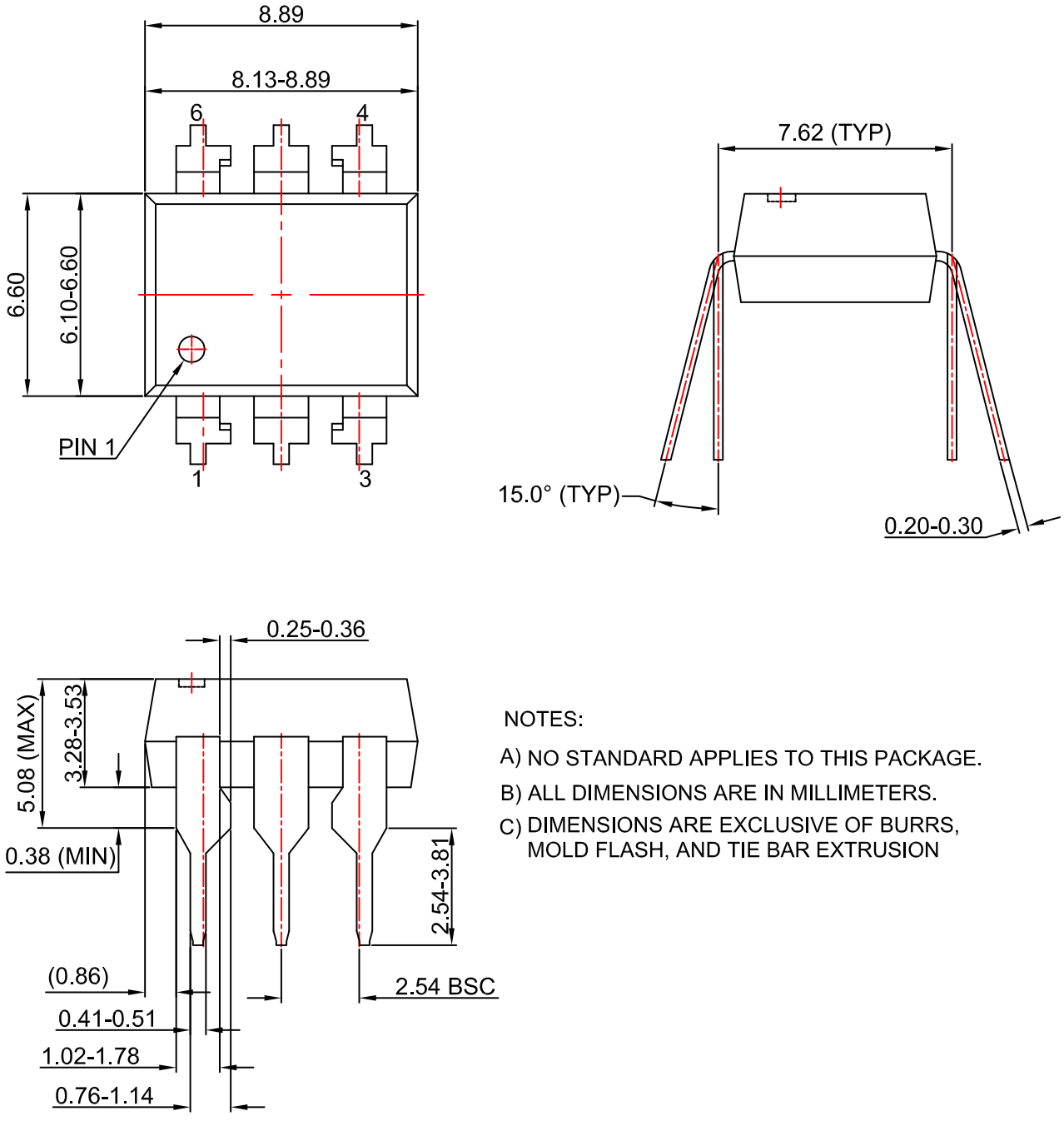
CASE 646BX
ISSUE O

DATE 31 JUL 2016



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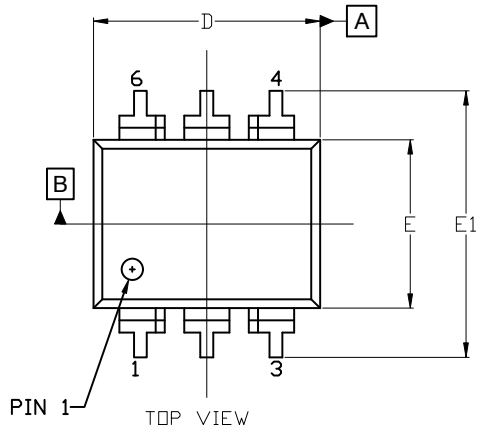
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

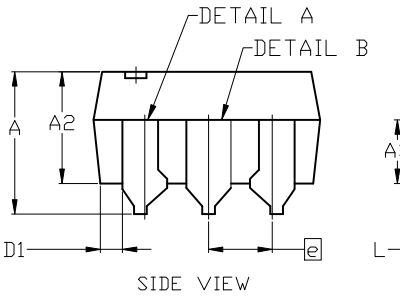
PDIP6 8.51x6.35, 2.54P
CASE 646BY
ISSUE A

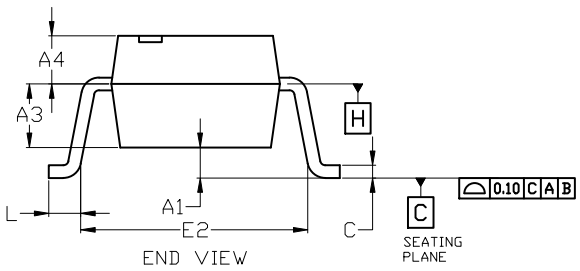
DATE 15 JUL 2019

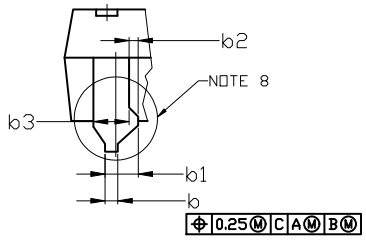


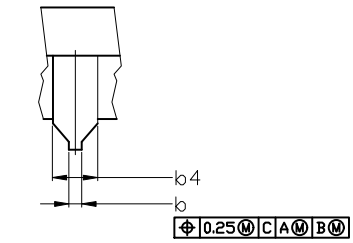
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS A, A1, AND L ARE MEASURED WITH THE PACKAGE SEATED.
4. DIMENSIONS D, D1, AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 2.54mm.
5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF CORNER LEADS ARE LOCATED BY LOCATING THE CENTER OF FEATURE b2 AND b3.

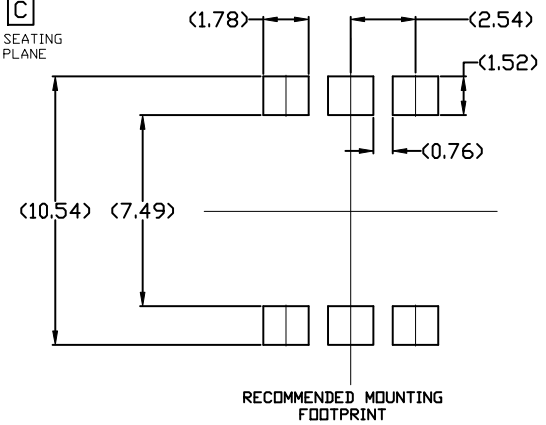
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	4.80
A1	0.38	---	---
A2	3.28	3.40	3.53
A3		2.49 REF	
A4		1.89 REF	
b	0.41	0.46	0.51
b1	0.76	0.92	1.14
b2	0.25	0.28	0.36
b3	1.02	1.40	1.78
b4		1.778 REF	
c	0.20	0.25	0.30
D	8.13	8.51	8.89
D1		0.86 REF	
E	6.10	6.35	6.60
E1	8.43	9.17	9.90
E2		8.13 REF	
e		2.54 BSC	
L	0.16	0.52	0.88











* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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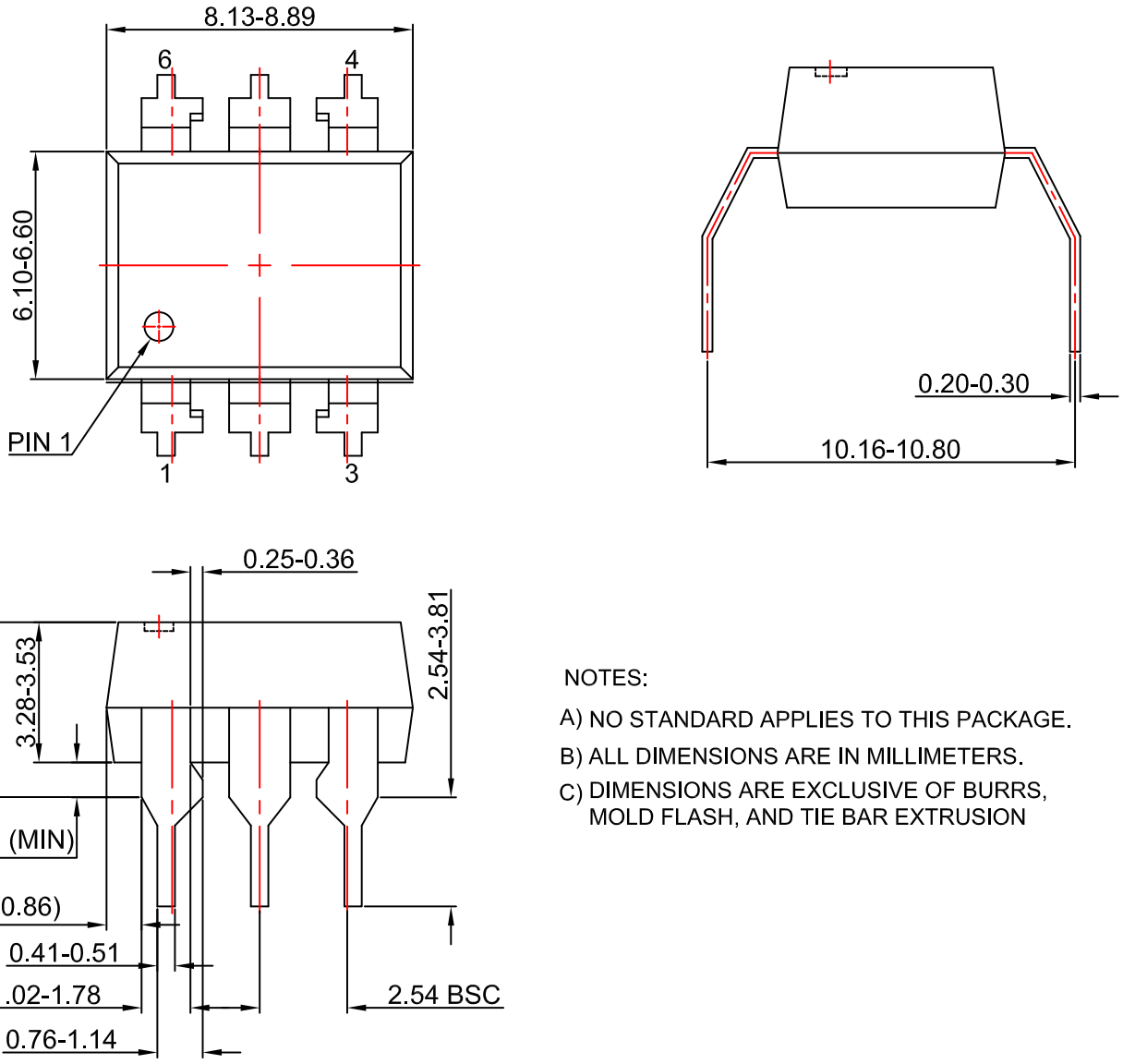
CASE 646BZ
ISSUE O

DATE 31 JUL 2016



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