QUALITY TECHNOLOGIES

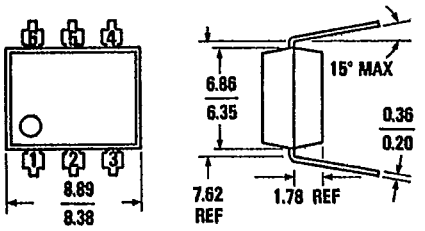
VDE APPROVED NON-ZERO-CROSSING TRIACS

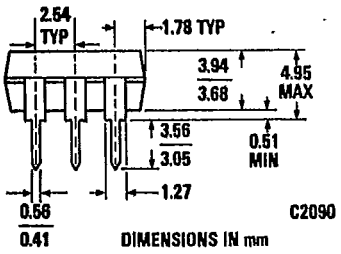
1

T-41-87

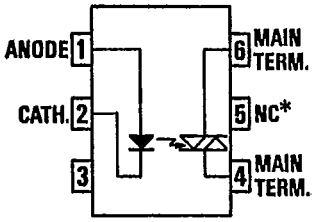
MCP3020/0Z* MCP3021/1Z MCP3022/2Z

PACKAGE DIMENSIONS





DIMENSIONS IN mm



Equivalent Circuit

DESCRIPTION

The MCP3020, MCP3021 and MCP3022 are optically isolated triac driver devices. These devices contain a GaAs infrared emitting diode and a light activated silicon bilateral switch, which functions like a triac. This is designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 240 VAC operations.

FEATURES

- Minimum commutating dv/dt is specified at 0.1 V/μsec
- Excellent I_{FT} stability—IR emitting diode has low degradation
- Pin for pin replacement for the MOC3020, MOC3021 and MOC3022
- High isolation voltage—minimum 7500 VAC peak
- Underwriters Laboratory (UL) recognized—File #E50151

APPLICATIONS

- European applications for 240 VAC
- Triac driver
- Industrial controls
- Traffic lights
- Vending machines
- Motor control
- Solid state relay

*Not Recommended For New Designs

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE

Storage temperature	−55°C to 150°C
Operating temperature	−40°C to 100°C
Lead temperature (soldering, 10 sec)	260°C
Total package power dissipation @ 25°C (LED plus detector)	330 mW
Derate linearly from 25°C	4.0 mW/°C
Surge isolation voltage	7500 VAC Peak

INPUT DIODE

Forward DC current	60 mA
Reverse voltage	3 V
Peak forward current (1 μs pulse, 300 pps)	3.0 A
Power dissipation 25°C ambient	100 mW
Derate linearly from 25°C	1.33 mW/°C

OUTPUT DRIVER

Off-state output terminal voltage		400 Volts
On-state RMS current	T_A=25°C	100 mA
(Full cycle, 50 to 60 Hz)	T_A=70°C	50 mA
Peak nonrepetitive surge current (PW=10 ms, DC=10%)		1.2 A
Total power dissipation @ T_A=25°C		300 mW
Derate above 25°C		4.0 mW/°C

QUALITY TECHNOLOGIES

VDE APPROVED NON-ZERO-CROSSING TRIACS

T-41-87

ELECTRO-OPTICAL CHARACTERISTICS (25°C Temperature Unless Otherwise Specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
Forward voltage	V_F		1.3	1.50	V	I_F=30 mA
Forward voltage temperature coefficient	$\frac{\Delta V_F}{\Delta T_A}$		−1.8		mV/°C	
Reverse breakdown voltage	BV_R	3.0	25		V	I_R=10 μA
Junction capacitance	C_J		50 65		pF pF	V_F=0 V, f=1 MHz V_F=1 V, f=1 MHz
Reverse leakage current	I_R		.35	10	μA	V_R=3.0 V
OUTPUT DETECTOR						
Peak blocking current, either direction	I_{DRM}	—	10	100	nA	V_{DRM}=400 V, Note 1
Peak on-state voltage, either direction	V_{TM}	—	2.0	3.0	Volts	I_{TM}=100 mA Peak

Note 1. Test voltage must be applied within dv/dt rating.

TRANSFER CHARACTERISTICS

DC CHARACTERISTICS		SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
LED trigger current (current required to latch output)	MCP3020	I_{FT}	—	15	30	mA	Main terminal voltage=3.0 V
	MCP3021	I_{FT}	—	8	15	mA	
	MCP3022	I_{FT}	—	5	10	mA	
Holding current		I_H	—	200	—	μA	Either direction

TRANSFER CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
dv/dt RATING						
Critical rate of rise of off-state voltage	dv/dt	—	15	—	V/μs	Static dv/dt, T_A=85°C (see Fig. 4)
Critical rate of rise of commutating voltage	dv/dt	0.1	0.2	—	V/μs	Commutating dv/dt I_{LOAD}=15 mA (see Fig. 5)

ISOLATION CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Isolation voltage	V_{iso}	5300			V_{AC}RMS	Relative humidity<50%, I_{I-O}<10 μA, 5 seconds
	V_{iso}	7500			V_{AC}PEAK	Relative humidity<50%, I_{I-O}<10 μA, 5 seconds
Isolation resistance	R_{iso}	10^{11}			ohms	V_{I-O}=500 VDC
Isolation capacitance	C_{iso}		0.5		pF	f=1 MHz

QUALITY TECHNOLOGIES

VDE APPROVED NON-ZERO-CROSSING TRIACS

T-41-87

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

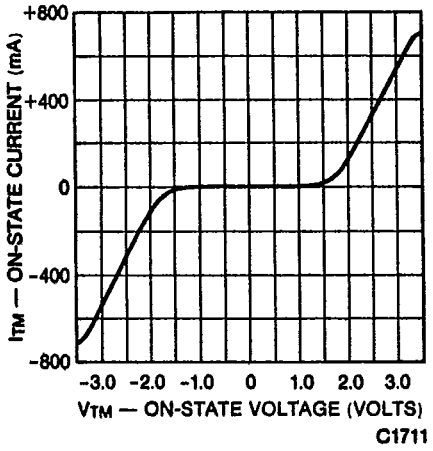


Fig. 1. On-State Characteristics

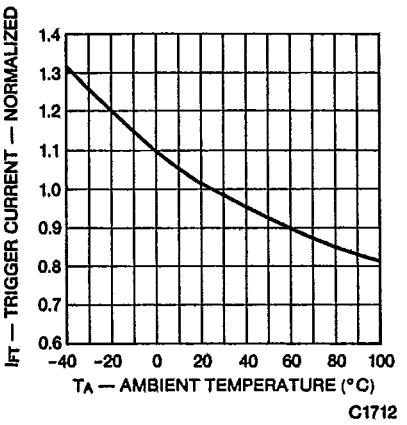
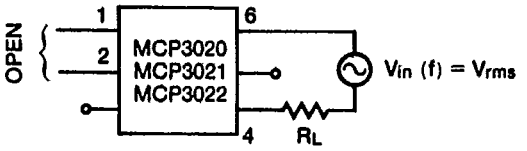


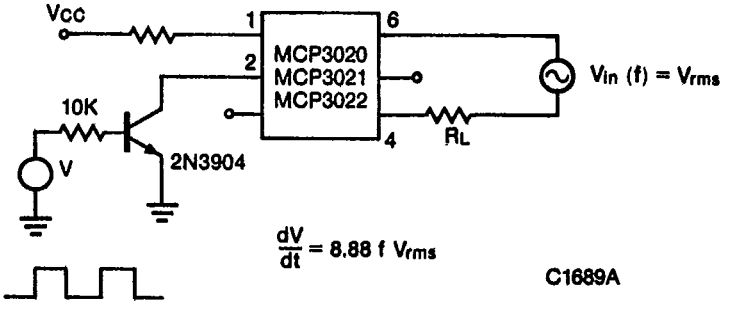
Fig. 2. Trigger Current vs. Temperature

TEST CIRCUITS FOR dV/dt MEASUREMENTS



$$\frac{dV}{dt} = wV_{pack} = 2\pi f \times 1.414\ V_{rms}$$
$$= 8.88\ f\ V_{rms}$$

Fig. 3. Static dV/dt

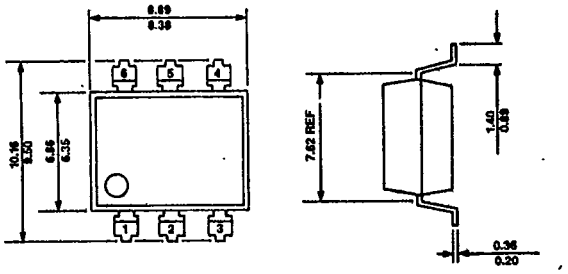


$$\frac{dV}{dt} = 8.88\ f\ V_{rms}$$

C1689A

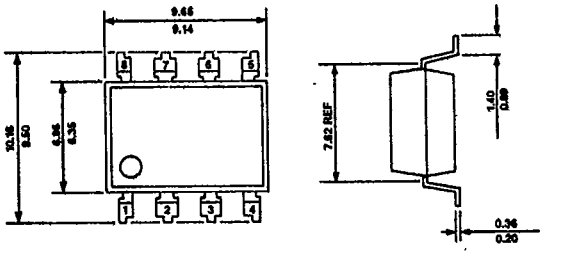
Fig. 4. Commutating dV/dt

SURFACE MOUNT OPTIONS



DIMENSIONS IN mm

Option 200 / 6-Pin



DIMENSIONS IN mm

Option 200 / 8-Pin

FEATURES

OPTION 100 & 200

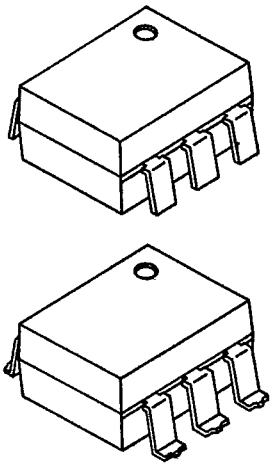
- Surface Mount Options available for all Quality Technologies 6 pin and 8 pin dual in-line optocouplers.
- Industry Standard lead co-planarity — within 0.1 mm/.004 inch.
- Compatible with vapor phase reflow soldering — withstands standard 215°C/30 second process.
- Electrical specifications unchanged - see applicable device data sheets.
- Uncompromised isolation performance.
- UL approved - File E50151.

OPTION 100

- Trimmed (butt joint) leads for minimal foot print.
- 0.51 mm/0.02 inch minimum package standoff for board cleaning.

OPTION 200

- Formed leads for JEDEC MS-013 surface mount specification compatibility.



QUALITY TECHNOLOGIES

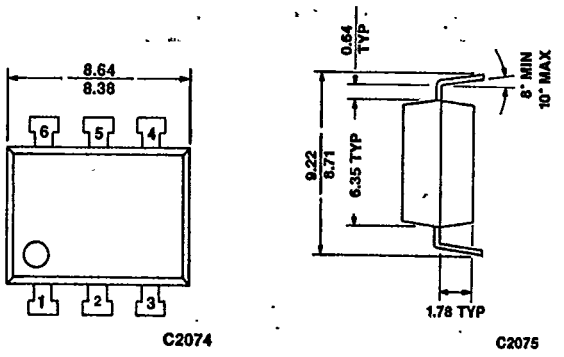
SURFACE MOUNT OPTIONS

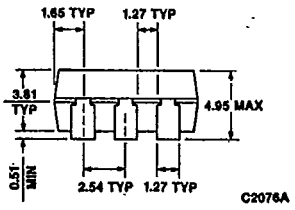
T-90-20

SMD OPTION 100

T-90-32

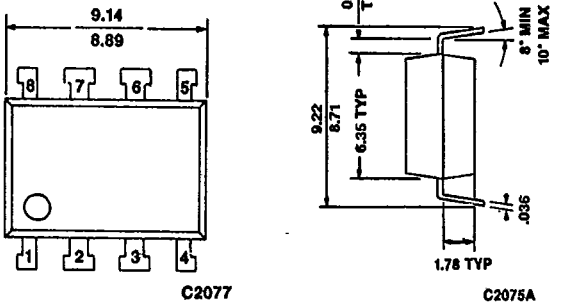
PACKAGE DIMENSIONS

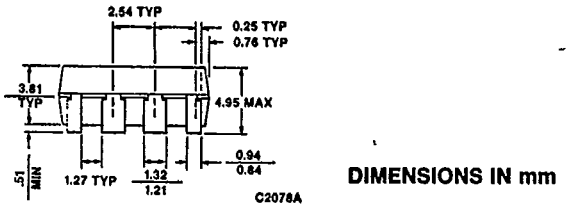




DIMENSIONS IN mm

6-Pin Optocoupler





DIMENSIONS IN mm

8-Pin Optocoupler

FEATURES

- Surface mountable
- Lead co-planarity with 0.1 mm or .004 inches
- Compatible with vapor phase reflow soldering
- All 6-pin and 8-pin optocouplers
- All electrical specifications remain unchanged
- Come in standard anti-static shipping tubes

ORDER INFORMATION

Option 100/200 is available for all 6-pin and 8-pin optocouplers in plastic package with certain minimum quantity restrictions.

To order these SMD version of an optocoupler just add -100 to the part number, for example:

74**OL**6000-100	Optologic
MCT62-100	Dual Transistor Output
HCPL-2631-100	Dual Logic Output
MCT2-100	Single Transistor Output

DESCRIPTION

Option 100 is a standard DIP plastic package optocoupler with the leads cut off at the standoff. This provides a low cost SMD-version of a large variety of optocouplers. Option 100, in many cases, can be tested and handled by the same equipment as a standard DIP package, which eliminates costly duplication of testers and handlers.

The distance from the bottom of the Option 100 to the PCB is a minimum of 0.51 mm or .020 inches, in order to accommodate PCB cleaning after soldering. The height of the Option 100 over the PCB is maximum 4.95 mm or .195 inches.

SPECIFICATIONS

The electrical specifications for optocouplers with Option 100 remain unchanged. See applicable datasheet. In addition, the device will withstand standard vapor phase reflow soldering at 215°C for 30 seconds.

QUALITY TECHNOLOGIES

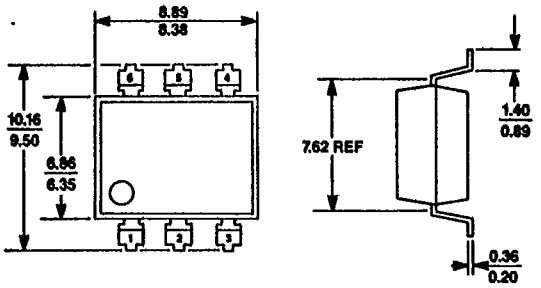
T-90-20

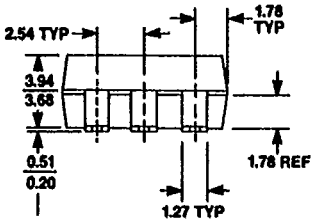
6-PIN SURFACE MOUNT

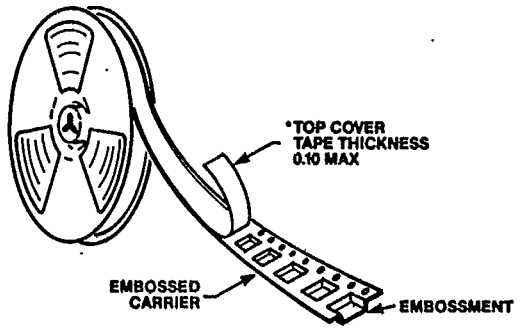
T-90-30

TAPE AND REEL

PACKAGE DIMENSIONS (OPTION 200)







FEATURES

- Taping of Surface-Mount optocouplers for compatibility with automatic placement equipment
- Packaging in full compliance with EIA Standard 481-A—Option 200
- Efficient packaging, static-inhibiting materials, industry compatible tape
- Bar coding label for optimum inventory control
- Option 100 parts do not meet EIA Standard 481-A specifications.

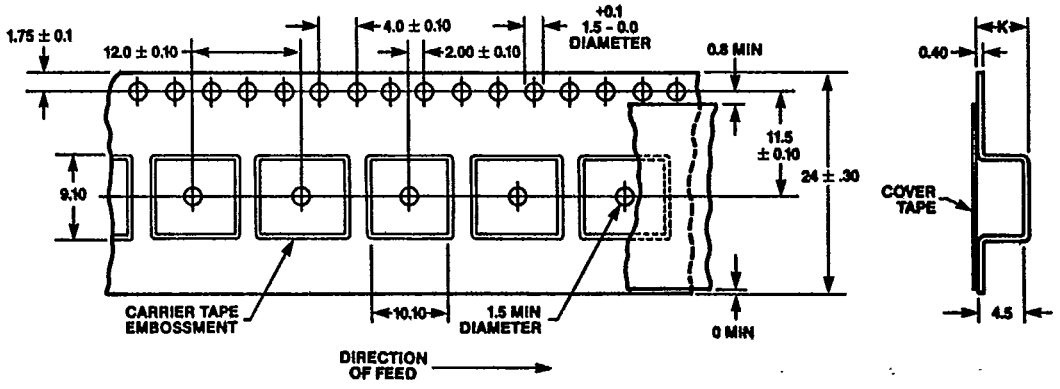
ORDERING INFORMATION

To order 6-pin package on Tape and Reel, include appropriate standard device part number, option, and suffix code to specify Tape and Reel. Standard quantity per reel is 1000 parts.

For example:

MCT2.200 D

- **D** — Specifies Tape and Reel
- **200** — Option for lead trim and bend
- **MCT2** — Standard part number for 6-pin optocoupler



ALL DIMENSIONS IN mm.
ALL DIMENSIONS AND TOLERANCES PER E.I.A. STANDARD 481-A

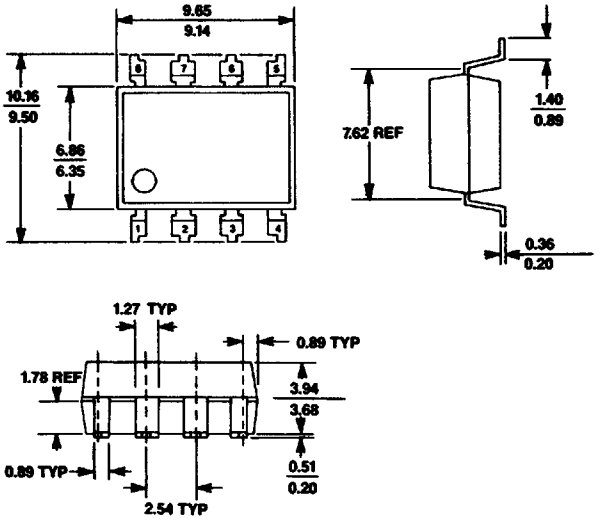
T-90-20

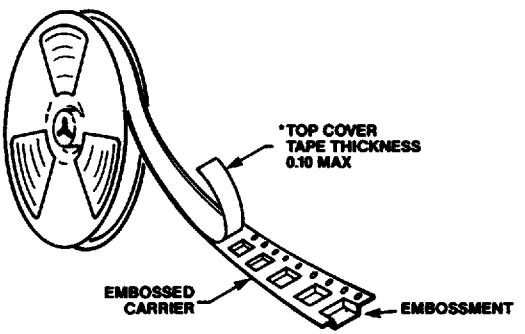
QUALITY TECHNOLOGIES

8-PIN SURFACE MOUNT

TAPE AND REEL

PACKAGE DIMENSIONS (OPTION 200)





FEATURES

- Taping of Surface-Mount optocouplers for compatibility with automatic placement equipment
- Packaging in full compliance with EIA Standard 481-A—Option 100 and 200
- Efficient packaging, static-inhibiting materials, industry compatible tape
- Bar coding label for optimum inventory control

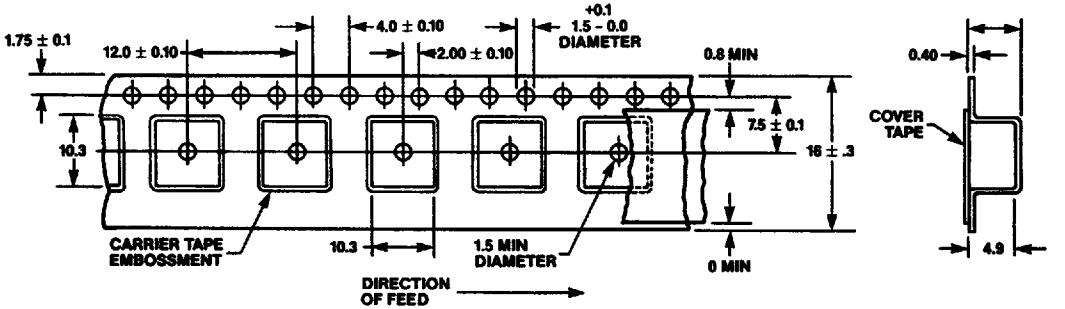
ORDERING INFORMATION

To order 8-pin package on Tape and Reel, include appropriate standard device part number, option, and suffix code to specify Tape and Reel. Standard quantity per reel is 1000 parts.

For example:

MCT9001.200 D

- **D** — Specifies Tape and Reel
- **200** — Option for lead trim and bend
- **MCT9001** — Standard part number for 8-pin optocoupler



ALL DIMENSIONS ARE IN mm.
ALL DIMENSIONS AND TOLERANCES PER E.I.A. STANDARD 481-A.

TAPE AND REEL