



## MOC3020 / MOC3021 / MOC3022 / MOC3023

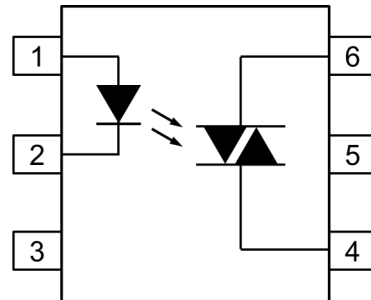


### DESCRIPTION

The MOC3020, MOC3021, MOC3022 and MOC3023 are optically coupled isolators consisting of a Gallium Arsenide infrared emitting diode coupled with a light activated silicon bilateral switch performing the functions of a triac.

These photocouplers provide random phase control of high current triacs or thyristors. They feature greatly enhanced static dv/dt capability to ensure stable switching performance of inductive loads.

These devices are mounted in a standard 6 pin dual-in-line package.



- 1 Anode
- 2 Cathode
- 3 NC
- 4 Main Terminal
- 5 Substrate  
(Do not Connect)
- 6 Main Terminal

### FEATURES

- High Repetitive Peak Off-state Voltage  
 $V_{DRM}$  : minimum 400V
- High Critical Rate of Rise of Off-state Voltage  
 $dv/dt$  : minimum 1000V/ $\mu$ s )
- High Isolation Voltage between Input and Output  
Viso : 5000Vrms
- Lead Free and RoHS Compliant
- UL Approval Certificate E91231  
Package Code "KK"
- VDE Approval Certificate 40028086

### APPLICATIONS

- AC Motor Drives / Starters
- Static AC Power Switch
- Lighting Controls
- Solid State Relays
- Solenoid / Valve Controls
- Temperature Controls

### ORDER INFORMATION

- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount  
Tape & Reel

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

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

#### Input

Forward Current	50mA
Reverse Voltage	6V
Power dissipation	100mW
Junction Temperature	125°C

#### Output

Off State Output Terminal Voltage	400V
Peak Repetitive Surge Current (Pulse width = 1ms, 120pps)	1A
Power Dissipation	300mW
Junction Temperature	125°C

#### Total Package

Isolation Voltage	5000V <sub>RMS</sub>
Total Power Dissipation	330mW
Operating Temperature	-40 to 110°C
Storage Temperature	-55 to 150 °C
Lead Soldering Temperature (10s)	260°C

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**Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	$V_{AC}$			120	$V_{AC}$
Forward Current					mA
MOC3020	$I_F$	30	40	50	
MOC3021		22.5	25	30	
MOC3022		15	20	30	
MOC3023		7.5	10	30	
Operating Temperature	$T_A$	-25		85	$^{\circ}C$

**NOTE :**

Recommended operating conditions are given as a design guideline to obtain expected performance of the device.

Each item is an independent guideline.

Please also refer to specified characteristics in this document.



**MOC3020 / MOC3021 / MOC3022 / MOC3023**

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

**INPUT**

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	$V_F$	$I_F = 20\text{mA}$		1.15	1.4	V
Reverse Current	$I_R$	$V_R = 6\text{V}$		0.05	10	$\mu\text{A}$

**OUTPUT**

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Peak Off-state Current Either Direction	$I_{\text{DRM}}$	$V_{\text{DRM}} = 400\text{V}$ $I_F = 0\text{mA}$ Note 1		10	100	nA
On-State Voltage Either Direction	$V_{\text{TM}}$	$I_{\text{TM}} = 100\text{mA (Peak)}$			3.0	V
Critical Rate of Rise of Off-State Voltage	dv/dt	$I_F = 0\text{mA}$ $V_{\text{IN}} = 240\text{V}_{\text{RMS}}$	1000			V/ $\mu\text{s}$

**COUPLED**

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Input Trigger Current Either Direction	$I_{\text{FT}}$	Main Terminal Voltage = 3V Note 2 MOC3020 MOC3021 MOC3022 MOC3023			30 15 10 5	mA
Holding Current Either Direction	$I_{\text{H}}$			200		$\mu\text{A}$

**ISOLATION**

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Insulation Voltage	$V_{\text{ISO}}$	AC 1 minute, RH 40 to 60%	5000			$V_{\text{RMS}}$

Measured with input leads shorted together and output leads shorted together.

Note 1 : Test Voltage must be applied within static dv/dt rating.

Note 2 : Guaranteed to trigger at an  $I_F$  value less than or equal to max  $I_{\text{FT}}$ ,  
Recommended  $I_F$  lies between Rated  $I_{\text{FT}}$  to Absolute Max  $I_F$ .

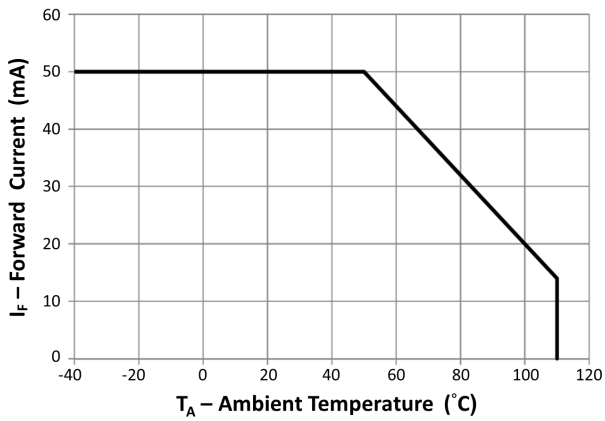


Fig 1 Forward Current vs Ambient Temperature

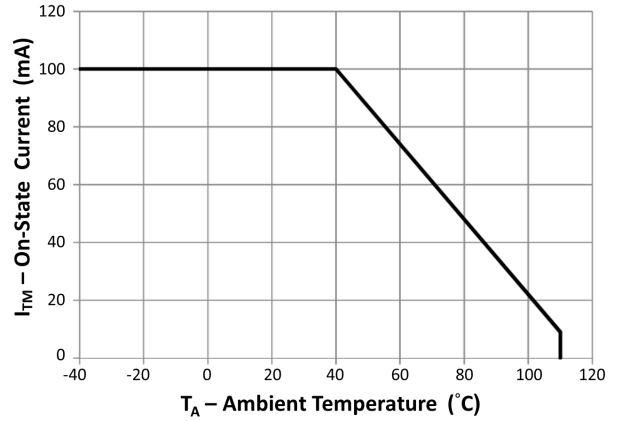


Fig 2 On-State Current vs Ambient Temperature

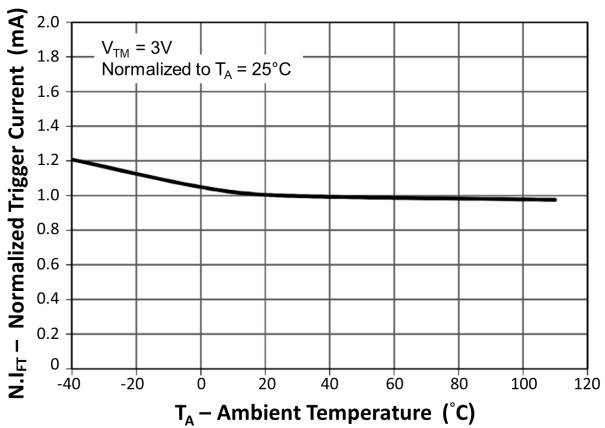


Fig 3 Normalized Trigger Current vs Ambient Temperature

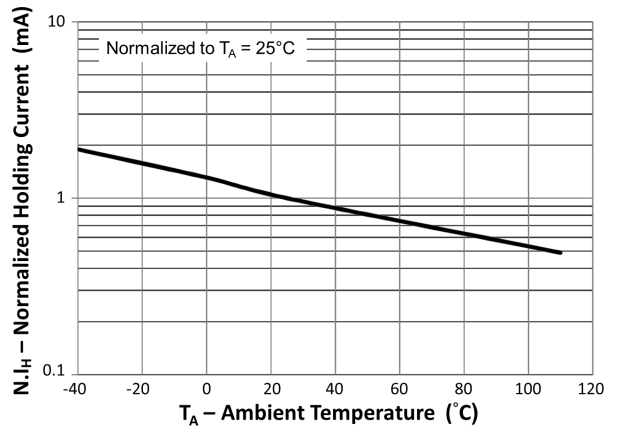


Fig 4 Normalized Holding Current vs Ambient Temperature

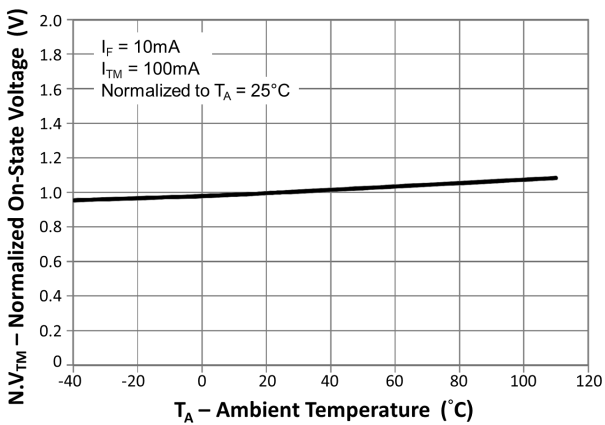


Fig 5 Normalized On-State Voltage vs Ambient Temperature

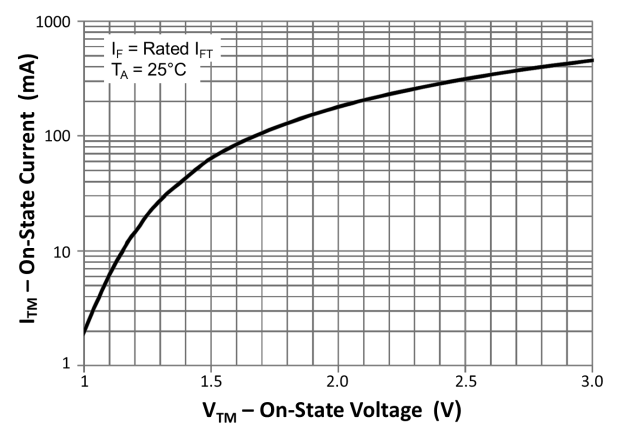
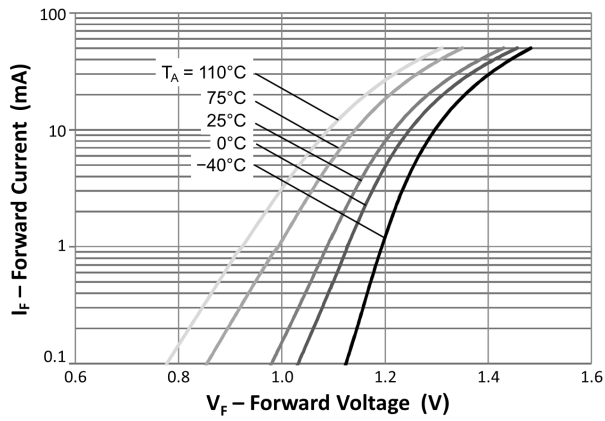
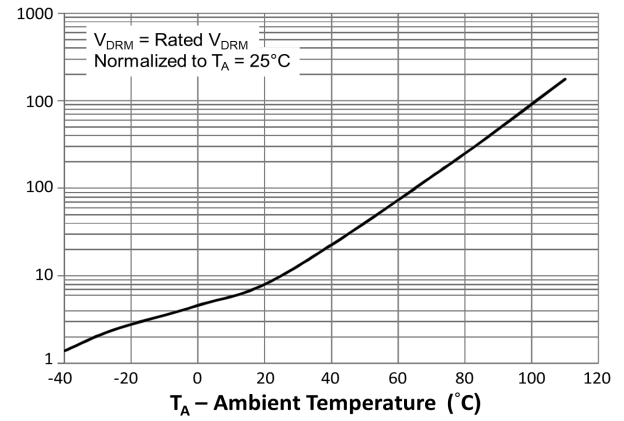


Fig 6 On-State Current vs On-State Voltage



**Fig 7 Forward Current vs Forward Voltage**



**Fig 8 Normalized Peak Off-State Current vs Ambient Temperature**



**MOC3020 / MOC3021 / MOC3022 / MOC3023**

**ORDER INFORMATION**

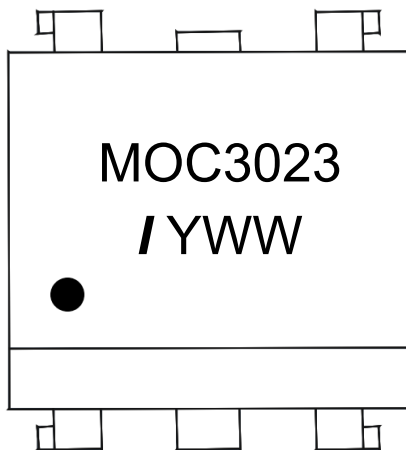
<b>MOC3020 / MOC3021 / MOC3022 / MOC3023 (UL Approval)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	MOC3020, MOC3021 MOC3022, MOC3023	Standard DIP6	65 pcs per tube
G	MOC3020G, MOC3021G MOC3022G, MOC3023G	10mm Lead Spacing	65 pcs per tube
SM	MOC3020SM, MOC3021SM MOC3022SM, MOC3023SM	Surface Mount	65 pcs per tube
SMT&R	MOC3020SMT&R MOC3021SMT&R MOC3022SMT&R MOC3023SMT&R	Surface Mount Tape & Reel	1000 pcs per reel

<b>MOC3020 / MOC3021 / MOC3022 / MOC3023 (UL and VDE Approvals)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	MOC3020X, MOC3021X MOC3022X, MOC3023X	Standard DIP6	65 pcs per tube
G	MOC3020XG, MOC3021XG MOC3022XG, MOC3023XG	10mm Lead Spacing	65 pcs per tube
SM	MOC3020XSM, MOC3021XSM MOC3022XSM, MOC3023XSM	Surface Mount	65 pcs per tube
SMT&R	MOC3020XSMT&R MOC3021XSMT&R MOC3022XSMT&R MOC3023XSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

**ORDER INFORMATION**

**DEVICE MARKING**

**Example : MOC3023**



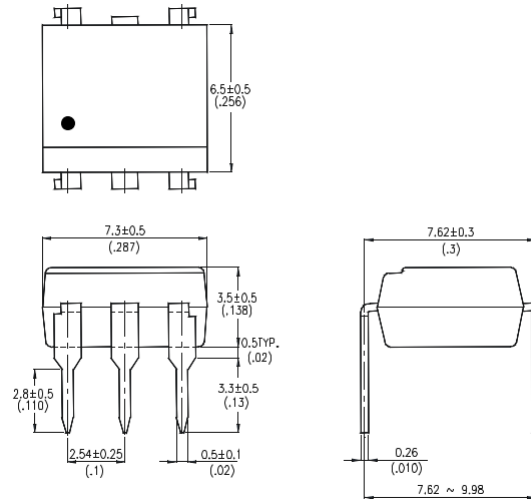
MOC3023 denotes Device Part Number  
/ denotes Isocom  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code



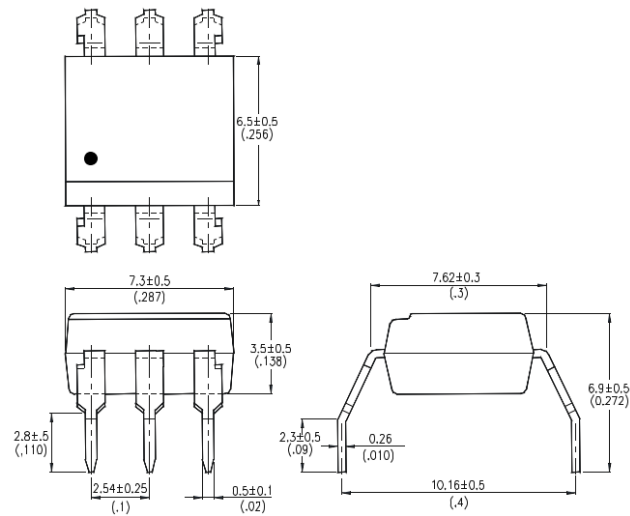
**MOC3020 / MOC3021 / MOC3022 / MOC3023**

**PACKAGE DIMENSIONS in mm (inch)**

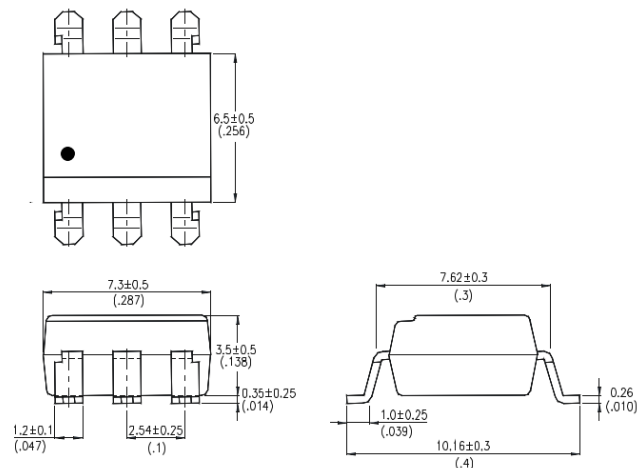
**DIP**



**G Form**



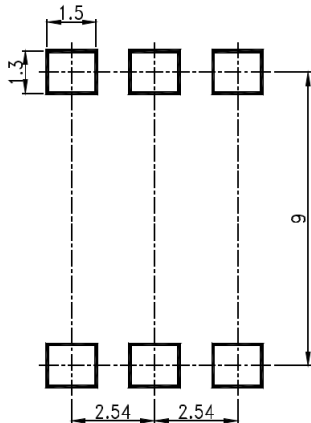
**SMD**



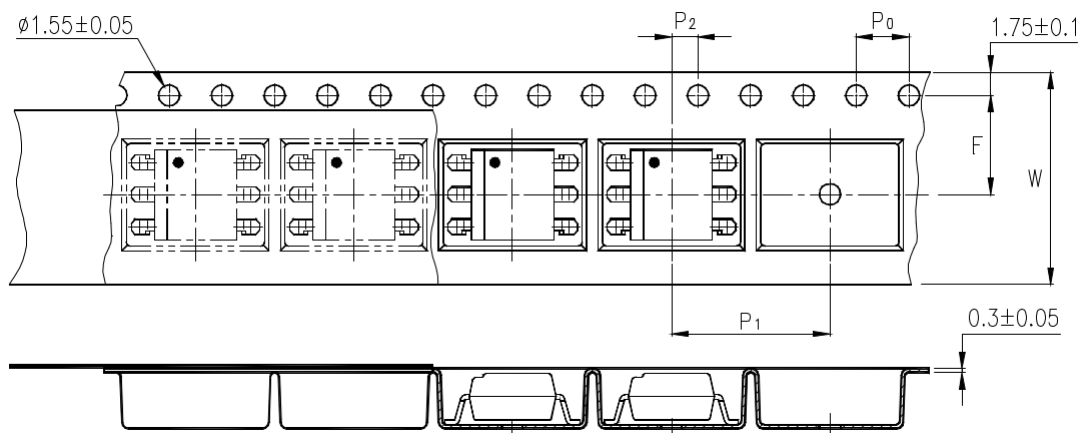




**RECOMMENDED PAD LAYOUT FOR SMD (mm)**



**TAPE AND REEL PACKAGING**

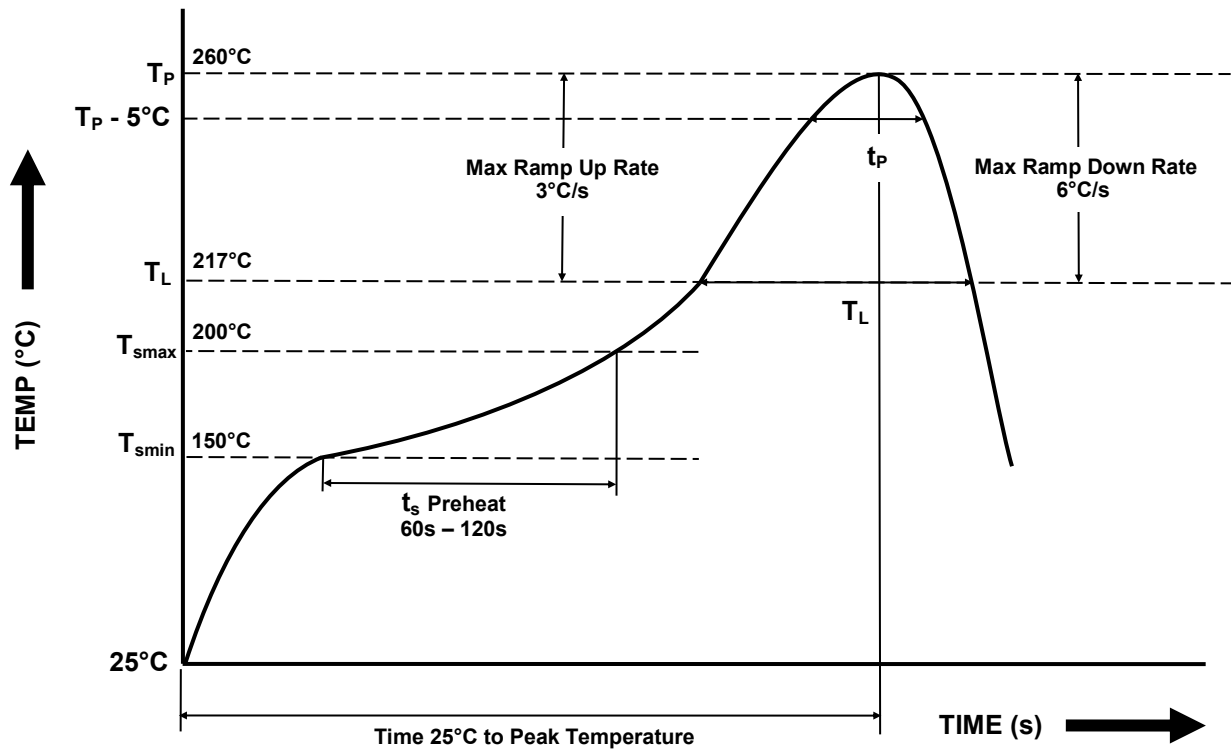


Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P <sub>0</sub>	4 ± 0.1 (0.15)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.295)
	P <sub>2</sub>	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P <sub>1</sub>	12 ± 0.1 (0.472)



**IR REFLOW SOLDERING TEMPERATURE PROFILE**

Note : One Time Reflow Soldering is Recommended.  
Do Not Immerse Device Body in Solder Paste.



Profile Details	Conditions
<b>Preheat</b> - Min Temperature ( $T_{SMIN}$ ) - Max Temperature ( $T_{SMAX}$ ) - Time $T_{SMIN}$ to $T_{SMAX}$ ( $t_s$ )	150°C 200°C 60s - 120s
<b>Soldering Zone</b> - Peak Temperature ( $T_P$ ) - Time at Peak Temperature - Liquidous Temperature ( $T_L$ ) - Time within 5°C of Actual Peak Temperature ( $T_P - 5^\circ C$ ) - Time maintained above $T_L$ ( $t_L$ ) - Ramp Up Rate ( $T_L$ to $T_P$ ) - Ramp Down Rate ( $T_P$ to $T_L$ )	260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate ( $T_{smax}$ to $T_P$ )	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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