



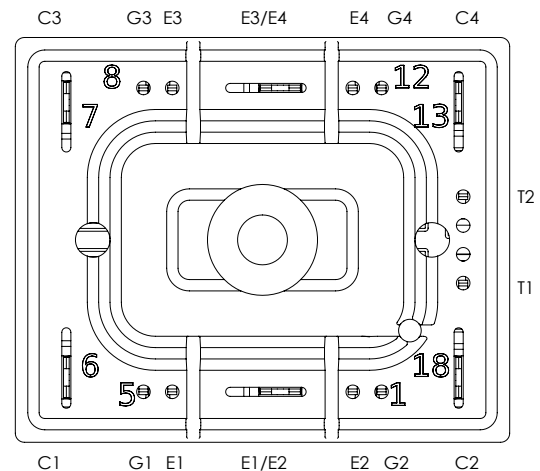
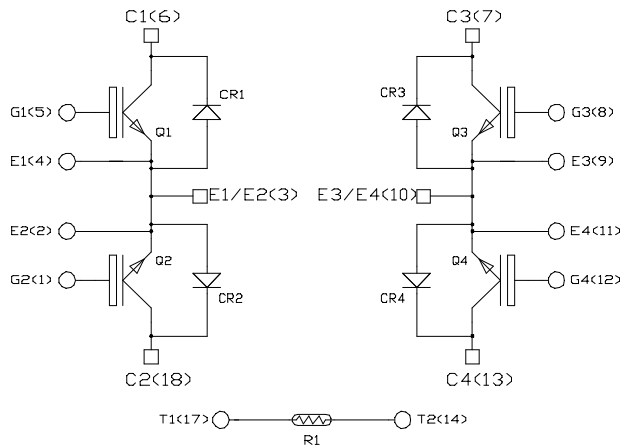
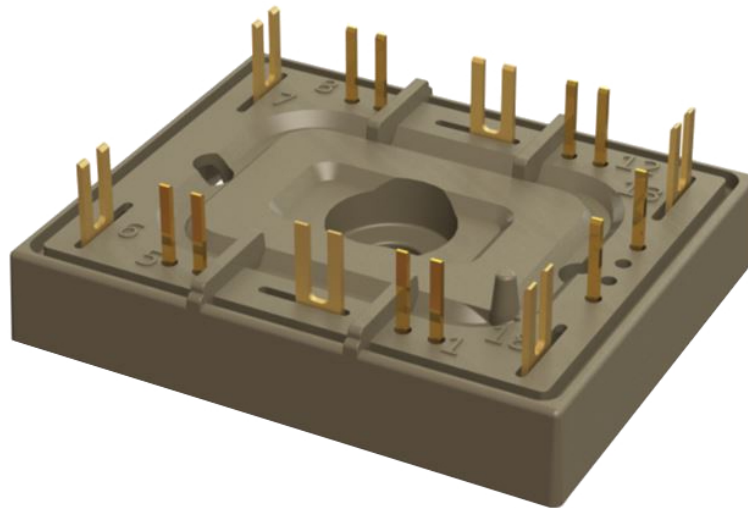
**MICROCHIP**

# MSCGLQ50DDU120CTBL2NG

## Double Dual Common Emitter High-Speed IGBT4 Power Module

### Product Overview

The MSCGLQ50DDU120CTBL2NG device is a 1200 V, 50 A double dual common emitter high-speed IGBT4 power module.



All ratings at  $T_j = 25^{\circ}\text{C}$ , unless otherwise specified.

**Caution:** These devices are sensitive to electrostatic discharge. Proper handling procedures must be followed.

## Features

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The following are the key features of MSCGLQ50DDU120CTBL2NG device:

- High speed IGBT4
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- SiC Schottky Diode
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature independent switching behavior
  - Positive temperature coefficient on VF
- Ultra low weight and profile
- Kelvin emitter for easy drive
- Si<sub>3</sub>N<sub>4</sub> substrate with thick copper for improved thermal performance
- Internal thermistor for temperature monitoring
- Extended temperature range

## Benefits

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The following are the benefits of MSCGLQ50DDU120CTBL2NG device:

- High efficiency converter
- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction-to-heatsink thermal resistance
- Low profile
- RoHS Compliant
- Solderable terminals both for power and signal for easy PCB mounting
- Very integrated power conversion system

## Application

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The following are the applications of MSCGLQ50DDU120CTBL2NG device:

- High reliability power systems
- AC switches

### 1. Electrical Specifications

This section provides the electrical specifications of MSCGLQ50DDU120CTBL2NG device.

#### 1.1 IGBT4 Characteristics (Per IGBT)

The following table lists the absolute maximum ratings of MSCGLQ50DDU120CTBL2NG device.

**Table 1-1. Absolute Maximum Ratings**

Symbol	Parameter		Maximum Ratings	Unit
$V_{CES}$	Collector-Emitter voltage		1200	V
$I_C$	Continuous collector current	$T_H = 25^{\circ}\text{C}$	110	A
		$T_H = 100^{\circ}\text{C}$	50	
$I_{CM}$	Pulsed collector current	$T_H = 25^{\circ}\text{C}$	180	
$V_{GE}$	Gate-Emitter voltage		$\pm 20$	V
$P_D$	Power dissipation	$T_H = 25^{\circ}\text{C}$	375	W

The following table lists the electrical characteristics of MSCGLQ50DDU120CTBL2NG device.

**Table 1-2. Electrical Characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{CES}$	Zero gate voltage collector current	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$		—	—	25	$\mu\text{A}$
$V_{CE(sat)}$	Collector emitter saturation voltage	$V_{GE} = 15\text{ V}$ $I_C = 50\text{ A}$	$T_J = 25^{\circ}\text{C}$	1.7	2.05	2.4	V
			$T_J = 150^{\circ}\text{C}$	—	2.6	—	
$V_{GE(th)}$	Gate threshold voltage	$V_{GE} = V_{CE}$ $I_C = 1.7\text{ mA}$		5.3	5.8	6.3	V
$I_{GES}$	Gate-Emitter leakage current	$V_{GE} = 20\text{ V}$ $V_{CE} = 0\text{ V}$		—	—	150	nA

The following table lists the dynamic characteristics of MSCGLQ50DDU120CTBL2NG device.

**Table 1-3. Dynamic Characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$C_{ies}$	Input capacitance	$V_{GE} = 0\text{ V}$		—	2770	—	pF
$C_{oes}$	Output capacitance	$V_{CE} = 25\text{ V}$		—	185	—	
$C_{res}$	Reverse transfer capacitance	$f = 1\text{ MHz}$		—	160	—	
$Q_g$	Total gate charge	$V_{GE} = 15\text{ V}$ $V_{CE} = 960\text{ V}$ $I_C = 50\text{ A}$		—	230	—	nC
$T_{d(on)}$	Turn-on delay time	$V_{GE} = \pm 15\text{ V}$	$T_J = 150^\circ\text{C}$	—	30	—	ns
$T_r$	Rise time	$V_{Bus} = 600\text{ V}$		—	49	—	
$T_{d(off)}$	Turn-off delay time	$I_C = 50\text{ A}$		—	366	—	
$T_f$	Fall time	$R_G = 10\ \Omega$		—	48	—	
$E_{on}$	Turn-on switching energy	$V_{GE} = \pm 15\text{ V}$ $V_{Bus} = 600\text{ V}$	$T_J = 150^\circ\text{C}$	—	2.8	—	mJ
$E_{off}$	Turn-off switching energy	$I_C = 50\text{ A}$ $R_G = 10\ \Omega$	$T_J = 150^\circ\text{C}$	—	2.8	—	
$R_G$	Integrated gate resistor			—	4	—	$\Omega$
$I_{SC}$	Short circuit data	$V_{GE} \leq 15\text{ V}$ $V_{Bus} = 900\text{ V}$ $t_p \leq 10\ \mu\text{s}$	$T_J = 150^\circ\text{C}$	—	190	—	A
$R_{thJH}$	Junction-to-heatsink thermal resistance	$\lambda_{paste} = 3.4\text{ W/mK}$		—	0.4	—	$^\circ\text{C/W}$

### 1.2 SiC Diode Ratings and Characteristics (Per SiC Diode)

The following table lists the SiC diode ratings and characteristics of MSCGLQ50DDU120CTBL2NG device.

**Table 1-4. SiC Diode Ratings and Characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$V_{RRM}$	Peak repetitive reverse voltage			—	—	1200	V
$I_{RM}$	Reverse leakage current	$V_R = 1200\text{ V}$	$T_J = 25\text{ }^{\circ}\text{C}$	—	10	200	$\mu\text{A}$
			$T_J = 175\text{ }^{\circ}\text{C}$	—	150	—	
$I_F$	DC forward current	—	$T_H = 100\text{ }^{\circ}\text{C}$	—	30	—	A
$V_F$	Diode forward voltage	$I_F = 30\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	—	1.5	1.8	V
			$T_J = 175\text{ }^{\circ}\text{C}$	—	2.1	—	
$Q_C$	Total capacitive charge	$V_R = 600\text{ V}$		—	130	—	nC
C	Total capacitance	$f = 1\text{ MHz}$ $V_R = 400\text{ V}$		—	141	—	pF
		$f = 1\text{ MHz}$ $V_R = 800\text{ V}$		—	105	—	
$R_{thJH}$	Junction-to-heatsink thermal resistance	$\lambda_{\text{paste}} = 3.4\text{ W/mK}$		—	0.854	—	$^{\circ}\text{C/W}$

### 1.3 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of the MSCGLQ50DDU120CTBL2NG device.

**Table 1-5. Thermal and Package Characteristics**

Symbol	Characteristic			Min	Typ	Max	Unit
$V_{ISOL}$	RMS isolation voltage, any terminal to case $t = 1\text{ min}$ , 50 Hz/60 Hz			2500	—	—	V
$T_J$	Operating junction temperature range			−55	—	175	$^{\circ}\text{C}$
$T_{JOP}$	Recommended junction temperature under switching conditions			−55	—	$T_{Jmax} - 25$	
$T_{STG}$	Storage case temperature			−55	—	125	
$T_C$	Operating case temperature			−55	—	125	
Torque	Mounting torque	To heatsink	M4	1.5	—	2	N.m
Wt	Package weight			—	21.5	—	g

# MSCGLQ50DDU120CTBL2NG

## Electrical Specifications

The following table lists the temperature sensor NTC of the MSCGLQ50DDU120CTBL2NG device.

**Table 1-6. Temperature Sensor NTC**

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance at 25 °C	—	50	—	kΩ
ΔR <sub>25</sub> /R <sub>25</sub>		—	5	—	%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K	—	3952	—	K
ΔB/B	— T <sub>C</sub> = 100 °C	—	4	—	%

$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

**Note:** See [APT0406—Using NTC Temperature Sensor Integrated into Power Module](#) for more information.

### 1.4 Typical IGBT 4 Performance Curve (Per IGBT)

This section shows the typical IGBT 4 performance curves of MSCGLQ50DDU120CTBL2NG device.

Figure 1-1. Junction-to-Heatsink Thermal Impedance

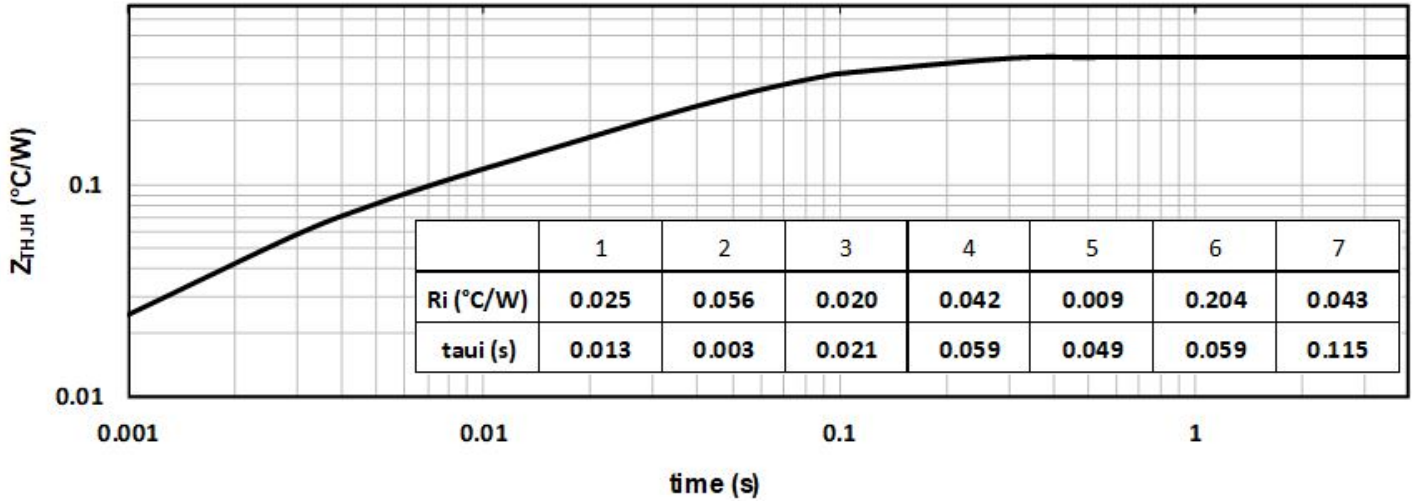


Figure 1-2. Output Characteristics ( $V_{GE} = 15\text{ V}$ )

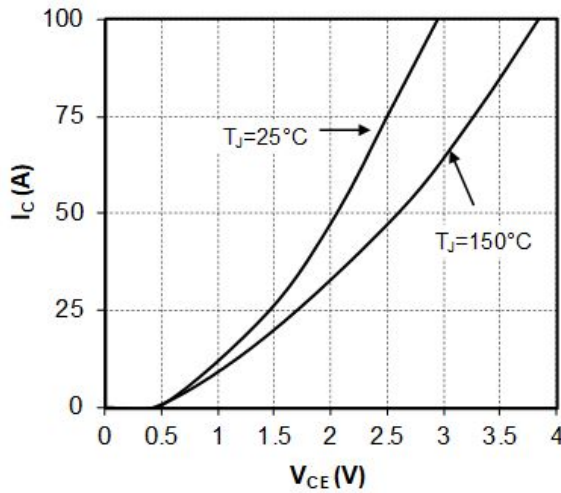


Figure 1-3. Output Characteristics

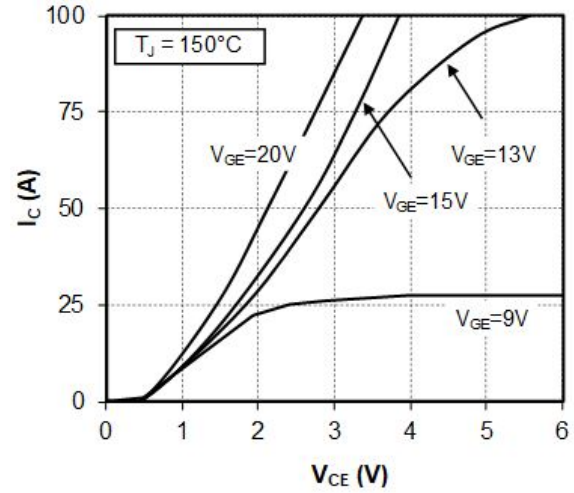


Figure 1-4. Transfer Characteristics

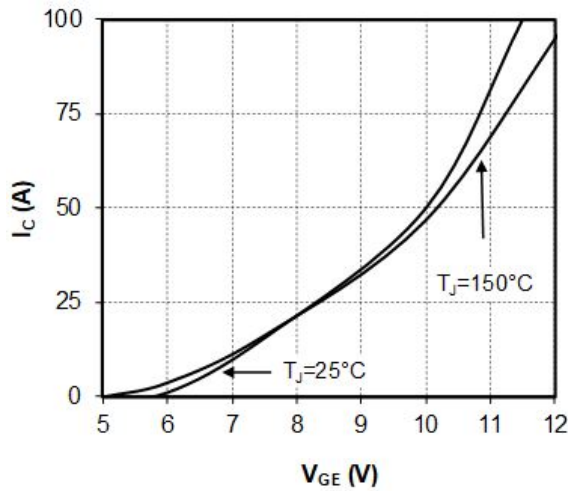


Figure 1-5. Energy Losses vs. Collector Current

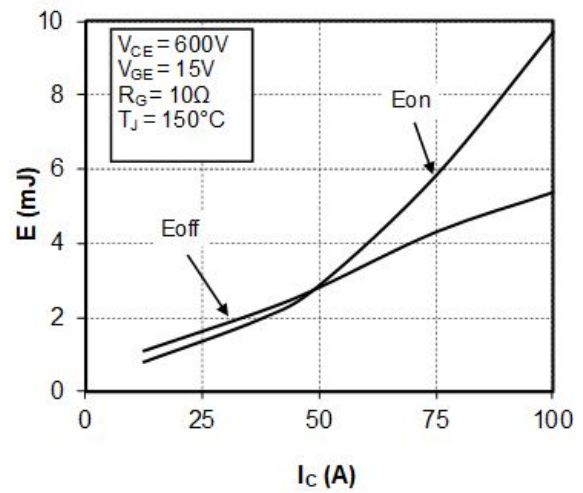


Figure 1-6. Switching Energy Losses vs. Gate Resistance

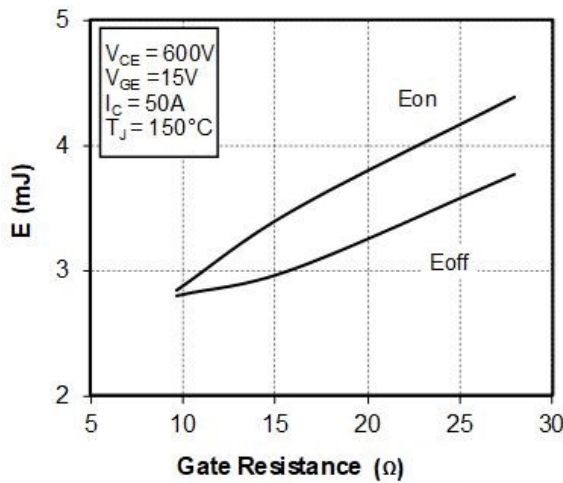
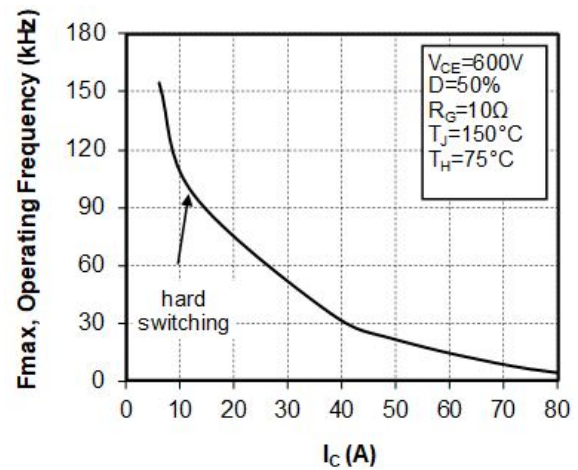


Figure 1-7. Operating Frequency vs. Collector Current





### 1.5 Typical SiC Diode Performance Curves (Per SiC Diode)

This section shows the typical SiC diode performance curves of MSCGLQ50DDU120CTBL2NG device.

Figure 1-8. Junction-to-Heatsink Thermal Impedance

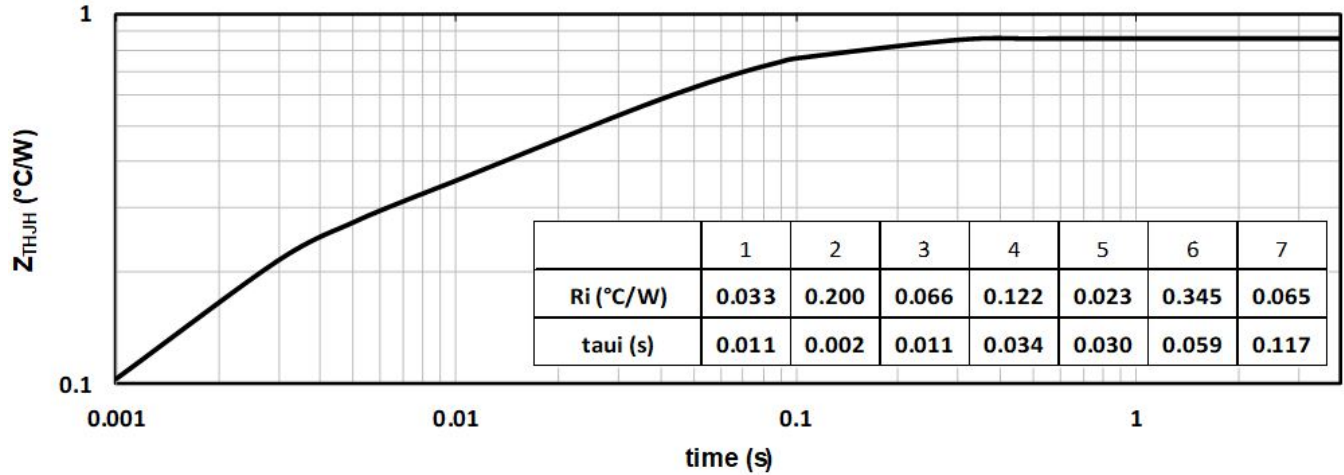


Figure 1-9. Forward Characteristics

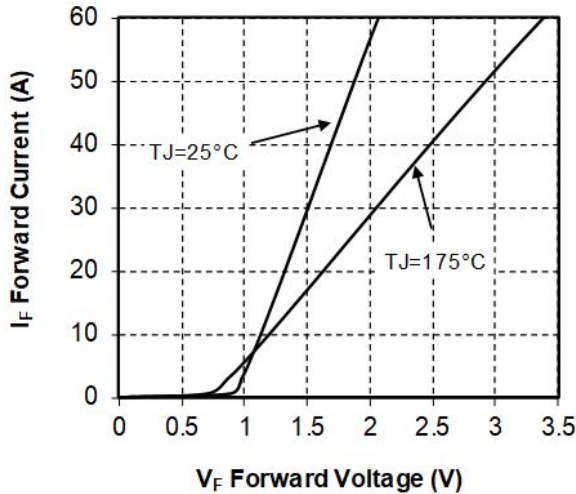
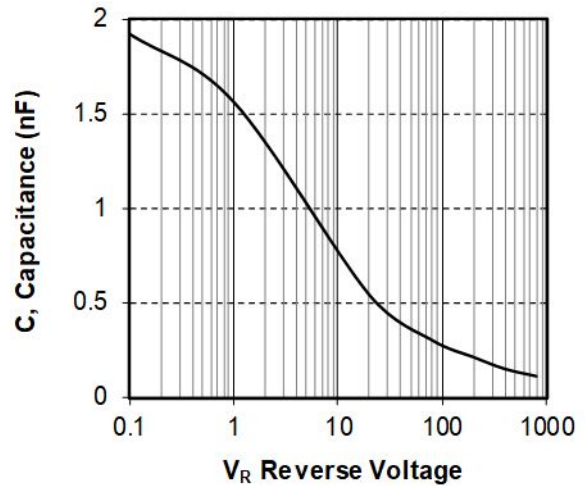


Figure 1-10. Capacitance vs. Reverse Voltage



The following section shows the package specification of MSCGLQ50DDU120CTBL2NG device.

The following figure shows the package outline drawing of MSCGLQ50DDU120CTBL2NG device. The dimensions in the following figure are in millimeters.

[illegible]

### 3. Revision History

Revision	Date	Description
A	07/2021	Initial Revision

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