

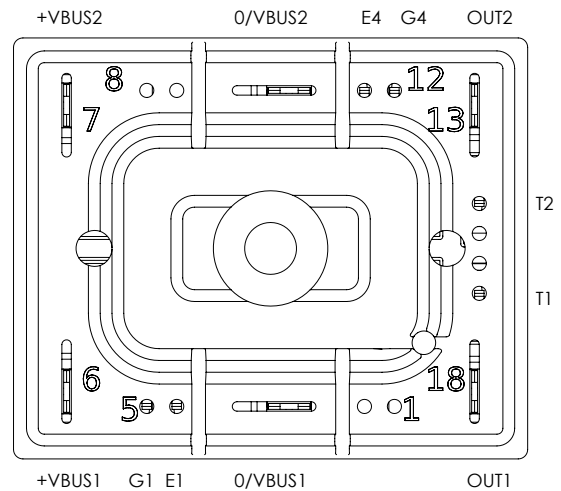
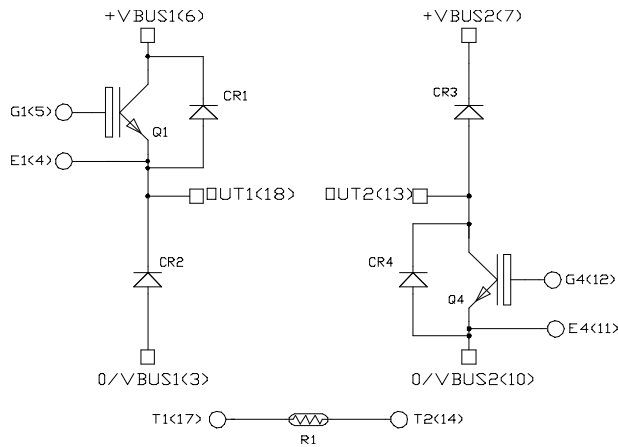
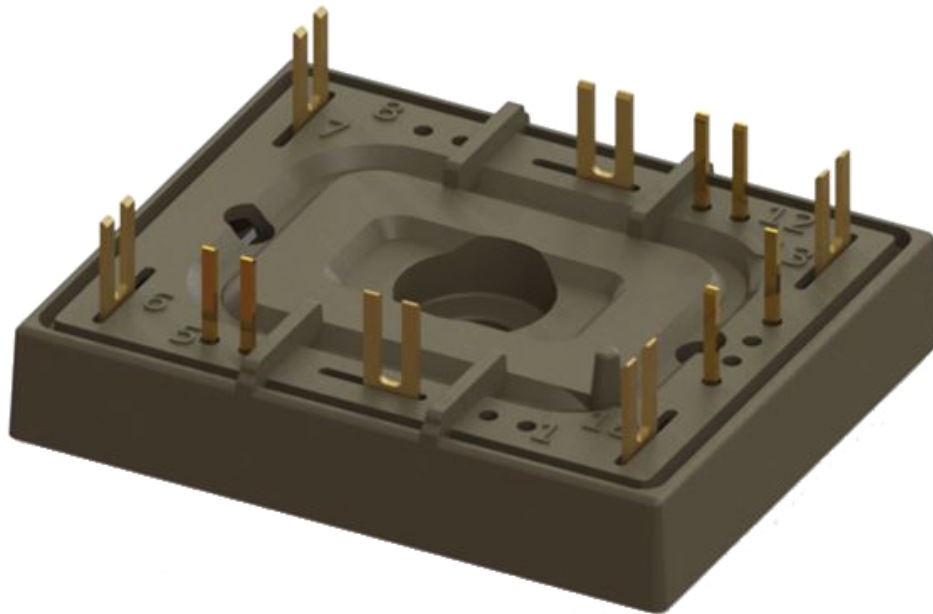


MSCGLQ50DH120CTBL2NG

Asymmetrical Bridge High-Speed IGBT4 Power Module

Product Overview

The MSCGLQ50DH120CTBL2NG device is a 1200 V, 50 A asymmetrical bridge 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

The following are the key features of MSCGLQ50DH120CTBL2NG 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
- Very low stray inductance
- Ultra low weight and profile
- Kelvin source for easy drive
- Si3N4 substrate with thick copper for improved thermal performance
- Internal thermistor for temperature monitoring
- Extended temperature range

Benefits

The following are the benefits of MSCGLQ50DH120CTBL2NG 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

The following are the applications of MSCGLQ50DH120CTBL2NG device:

- High reliability power systems
- High Efficiency AC/DC and DC/AC converters
- Motor control

1. Electrical Specifications

This section provides the electrical specifications of MSCGLQ50DH120CTBL2NG device.

1.1 IGBT4 Characteristics (Per IGBT)

The following table lists the absolute maximum ratings of MSCGLQ50DH120CTBL2NG 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	± 20	V	
P_D	Power dissipation	$T_H = 25^\circ\text{C}$	375	W

The following table lists the electrical characteristics of MSCGLQ50DH120CTBL2NG 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	μA	
$V_{CE(sat)}$	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	

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Electrical Specifications

The following table lists the dynamic characteristics of MSCGLQ50DH120CTBL2NG 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	—	Ω
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 Chopper SiC Diode Ratings and Characteristics (Per SiC Diode)

The following table lists the chopper SiC diode ratings and characteristics of MSCGLQ50DH120CTBL2NG device.

Table 1-4. Chopper 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	$V_R = 1200\text{ V}$	$T_J = 25^\circ\text{C}$	—	10	200	μA
			$T_J = 175^\circ\text{C}$	—	150	—	
I_F	DC forward current		$T_H = 100^\circ\text{C}$	—	30	—	A
V_F	Diode forward voltage	$I_F = 30\text{ A}$	$T_J = 25^\circ\text{C}$	—	1.5	1.8	V
			$T_J = 175^\circ\text{C}$	—	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 IGBT Parallel SiC Diode Ratings and Characteristics (Per SiC Diode)

The following table lists the IGBT parallel SiC diode ratings and characteristics of MSCGLQ50DH120CTBL2NG device.

Table 1-5. IGBT Parallel 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	$V_R = 1200\text{ V}$	$T_J = 25^\circ\text{C}$	—	10	200	μA
			$T_J = 175^\circ\text{C}$	—	50	—	
I_F	DC forward current		$T_H = 110^\circ\text{C}$	—	10	—	A
V_F	Diode forward voltage	$I_F = 10\text{ A}$	$T_J = 25^\circ\text{C}$	—	1.5	1.8	V
			$T_J = 175^\circ\text{C}$	—	2.1	—	
Q_C	Total capacitive charge	$V_R = 600\text{ V}$	—	48	—	nC	
C	Total capacitance	$f = 1\text{ MHz}$ $V_R = 400\text{ V}$	—	55	—	pF	
		$f = 1\text{ MHz}$ $V_R = 800\text{ V}$	—	43	—		
R_{thJH}	Junction-to-heatsink thermal resistance		$\lambda_{\text{paste}} = 3.4\text{ W/mK}$	—	1.63	—	$^\circ\text{C/W}$

1.4 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of MSCGLQ50DH120CTBL2NG device.

Table 1-6. Thermal and Package Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit		
V _{ISOL}	RMS isolation voltage, any terminal to case t = 1 min, 50 Hz/60 Hz	2500	—	—	V		
T _J	Operating junction temperature range	-55	—	175	°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		

The following table lists the temperature sensor NTC of MSCGLQ50DH120CTBL2NG device.

Table 1-7. Temperature Sensor NTC

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance at 25 °C	—	50	—	kΩ
ΔR ₂₅ /R ₂₅	—	—	5	—	%
B _{25/85}	T ₂₅ = 298.15 K	—	3952	—	K
ΔB/B	—	T _C = 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_T: Thermistor value at T

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

1.5 Typical IGBT4 Performance Curve (Per IGBT)

This section shows the typical IGBT 4 performance curves of MSCGLQ50DH120CTBL2NG device.

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

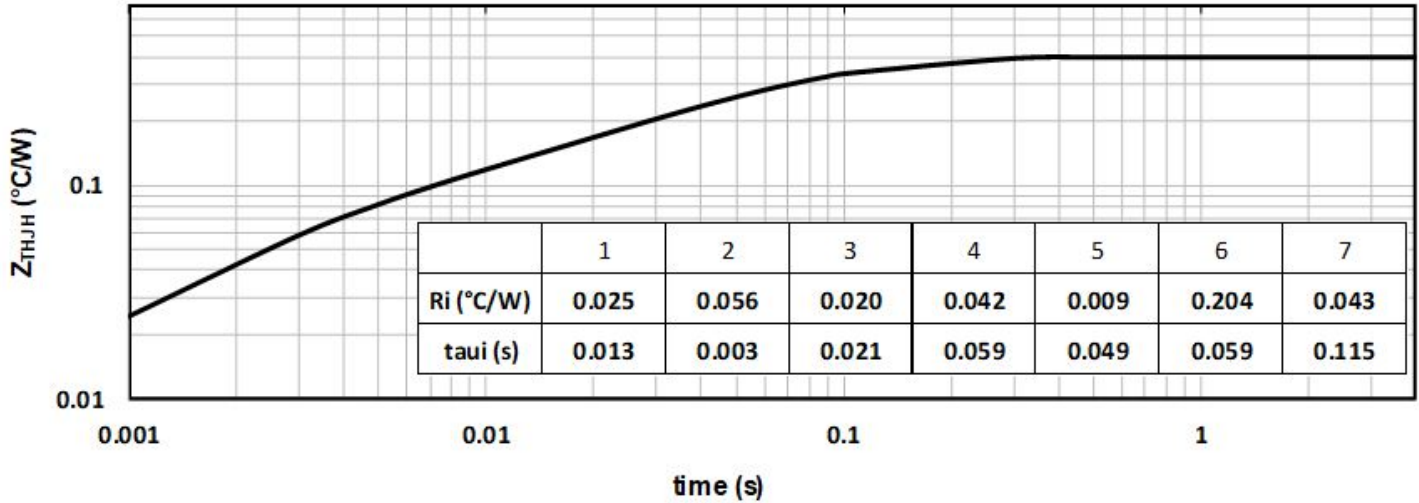


Figure 1-2. Output Characteristics ($V_{GE} = 15\text{ V}$)

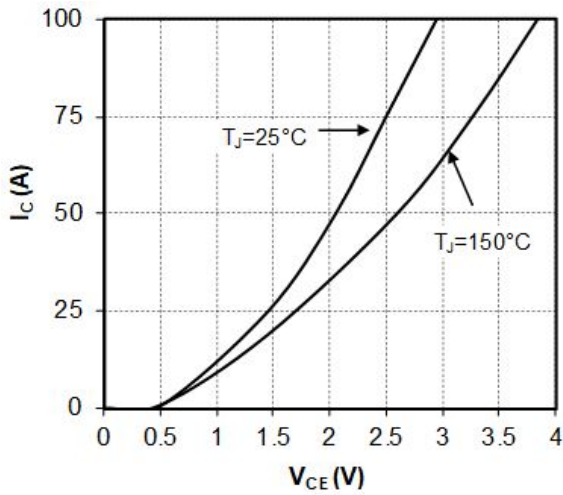
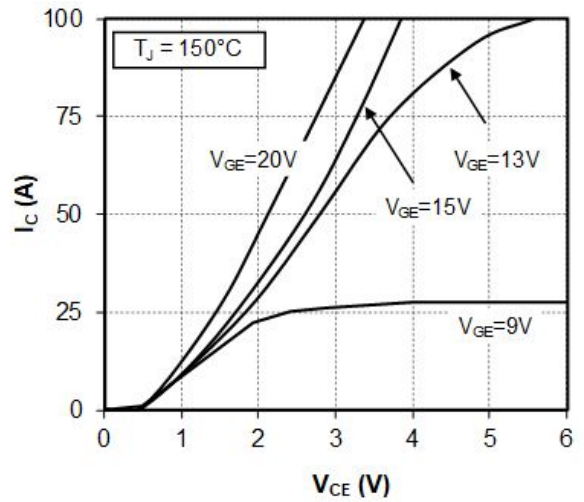


Figure 1-3. Output Characteristics



MSCGLQ50DH120CTBL2NG

Electrical Specifications

Figure 1-4. Transfer Characteristics

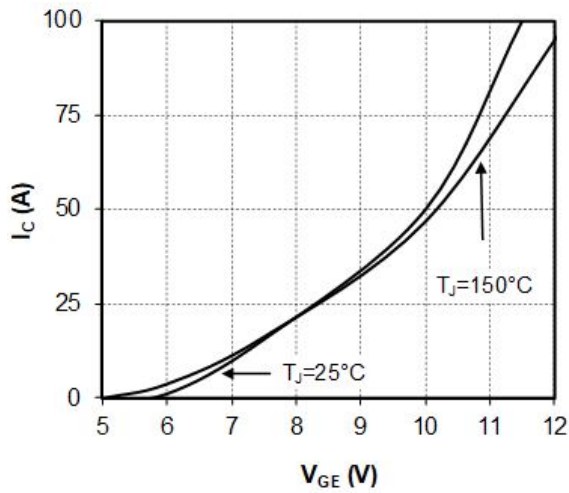


Figure 1-5. Energy losses vs. Collector Current

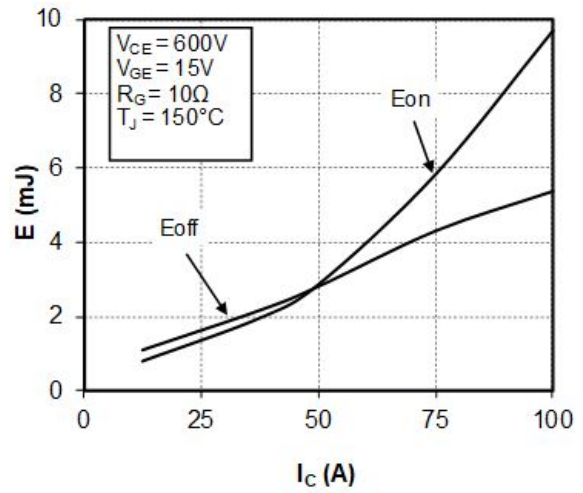


Figure 1-6. Switching Energy Losses vs. Gate Resistance

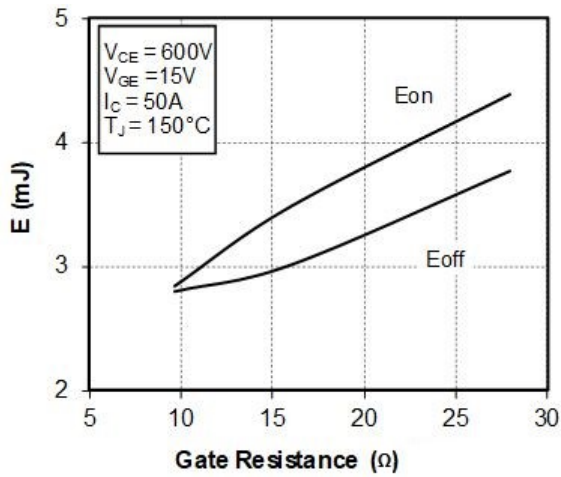
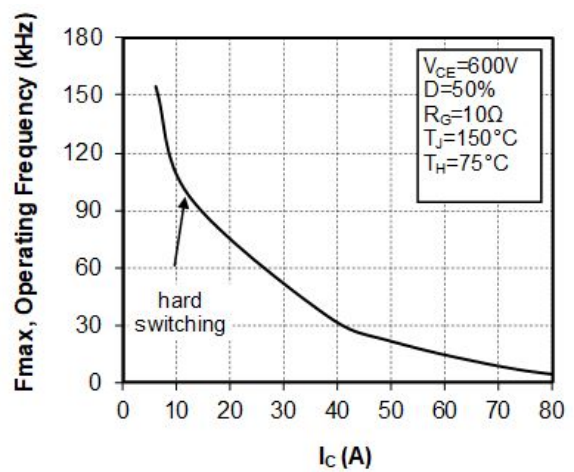


Figure 1-7. Operating Frequency vs. Collector Current



1.6 Typical Chopper SiC Diode Performance Curve (Per SiC Diode)

This section shows the typical chopper SiC diode performance curves of MSCGLQ50DH120CTBL2NG device.

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

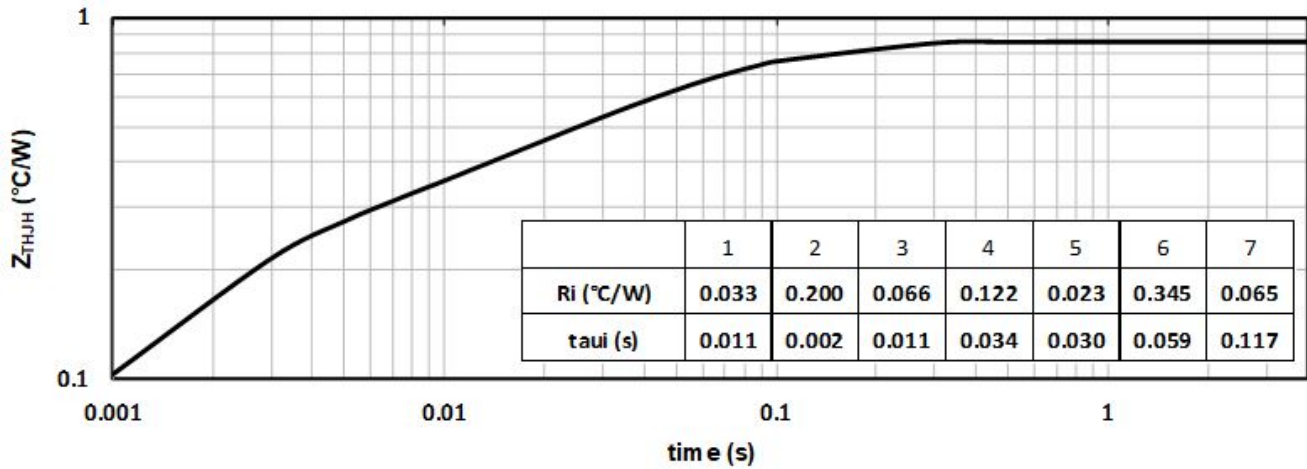


Figure 1-9. Forward Characteristics

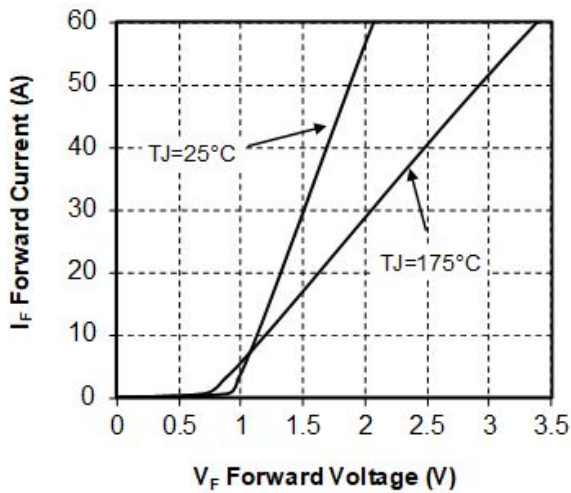
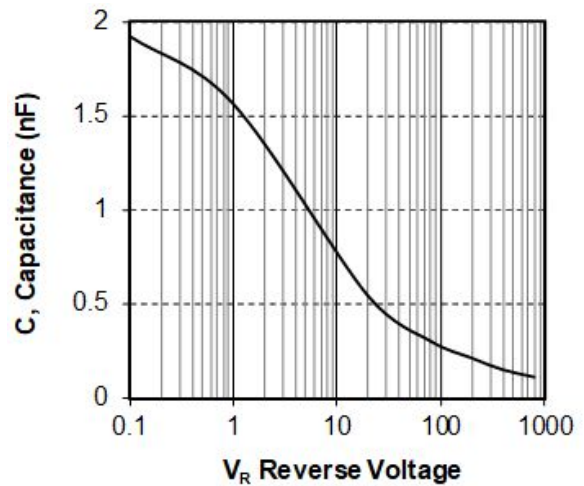


Figure 1-10. Capacitance vs. Reverse Voltage



1.7 Typical IGBT Parallel SiC Diode Performance Curve (Per SiC Diode)

This section shows the typical IGBT parallel SiC diode performance curves of MSCGLQ50DH120CTBL2NG device.

Figure 1-11. Junction-to-Heatsink Thermal Impedance

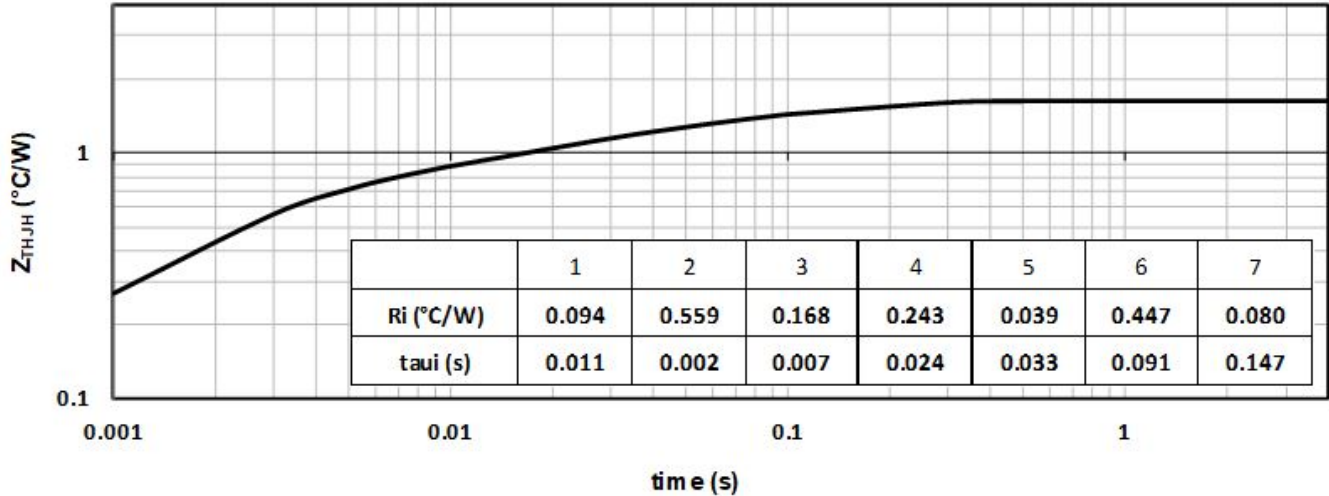


Figure 1-12. Forward Characteristics

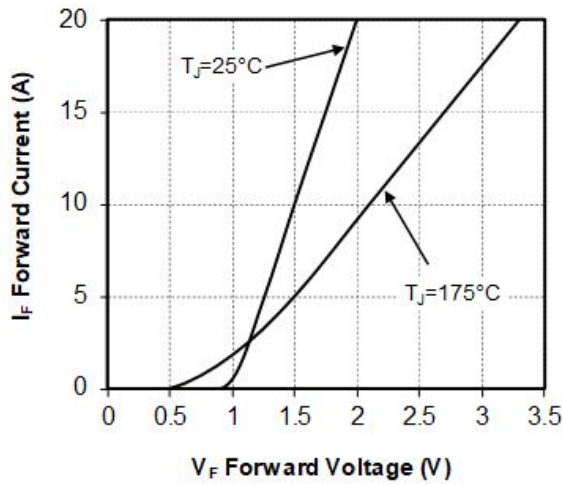
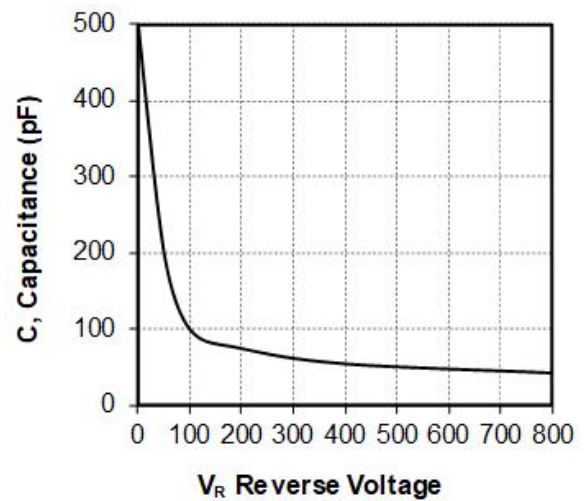


Figure 1-13. Capacitance vs. Reverse Voltage



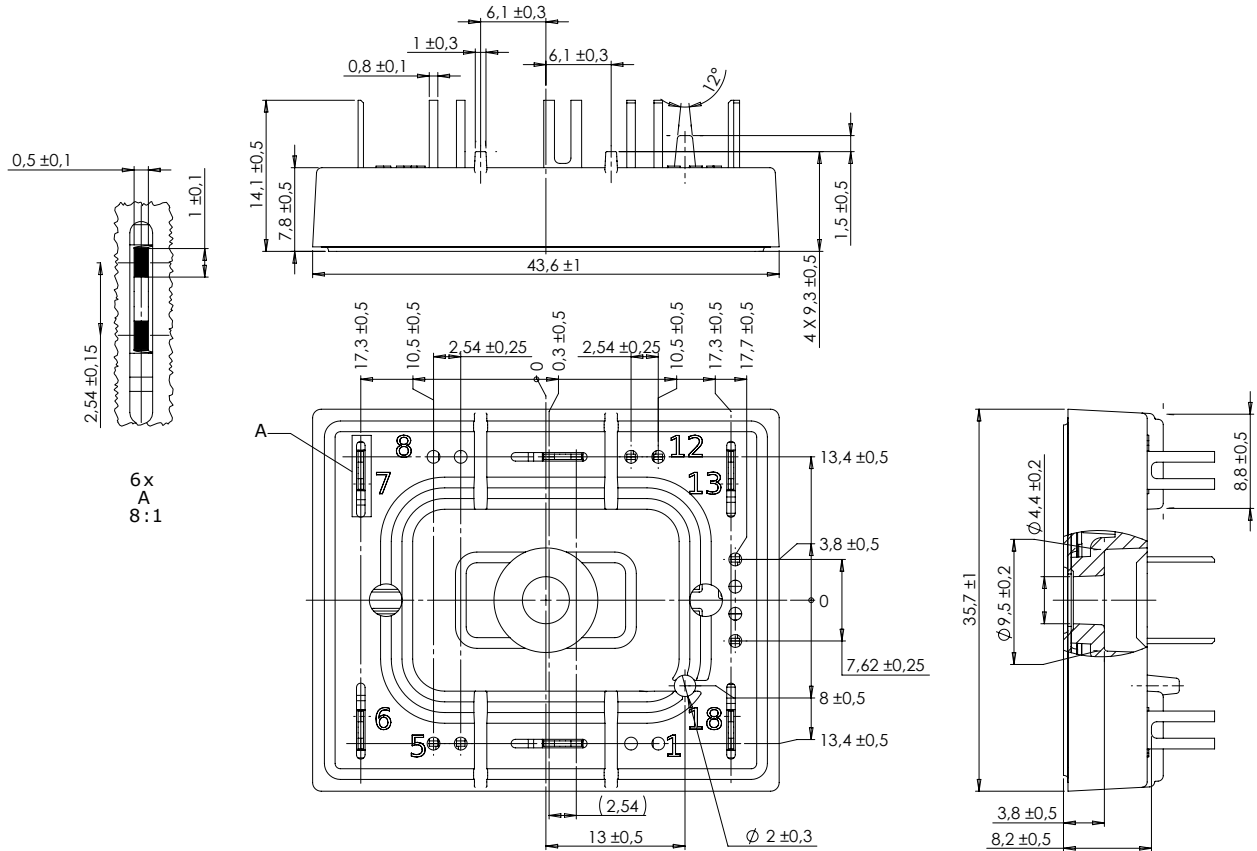
2. Package Specifications

The following section shows the package specification of MSCGLQ50DH120CTBL2NG device.

2.1 Package Outline

The following figure shows the package outline drawing of MSCGLQ50DH120CTBL2NG device. The dimensions in the following figure are in millimeters.

Figure 2-1. Package Outline Drawing



3. Revision History

Revision	Date	Description
A	07/2021	Initial Revision

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