

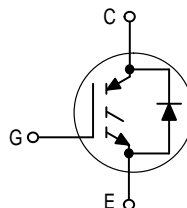
# Product Preview Data Sheet

## Insulated Gate Bipolar Transistor with Anti-Parallel Diode

### N-Channel Enhancement Mode Silicon Gate

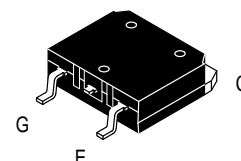
This Insulated Gate Bipolar Transistor (IGBT) is co-packaged with a soft recovery ultra-fast rectifier and uses an advanced termination scheme to provide an enhanced and reliable high voltage blocking capability. Short circuit rated IGBTs are specifically suited for applications requiring a guaranteed short circuit withstand time. Fast switching characteristics result in efficient operations at high frequencies. Co-packaged IGBTs save space, reduce assembly time and cost.

- High Power Surface Mount D3PAK Package
- High Speed  $E_{off}$ : 160  $\mu$ J/A typical at 125°C
- High Short Circuit Capability – 10  $\mu$ s minimum
- Soft Recovery Free Wheeling Diode is included in the package
- Robust High Voltage Termination



**MGV12N120D**

IGBT & DIODE IN D3PAK  
12 A @ 90°C  
20 A @ 25°C  
1200 VOLTS  
SHORT CIRCUIT RATED



CASE 433-01, Style 1  
TO-268AA

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	1200	Vdc
Collector-Gate Voltage ( $R_{GE} = 1.0 \text{ M}\Omega$ )	$V_{CGR}$	1200	Vdc
Gate-Emitter Voltage — Continuous	$V_{GE}$	$\pm 20$	Vdc
Collector Current — Continuous @ $T_C = 25^\circ\text{C}$	$I_{C25}$	20	Adc
— Continuous @ $T_C = 90^\circ\text{C}$	$I_{C90}$	12	
— Repetitive Pulsed Current (1)	$I_{CM}$	40	Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	$P_D$	123 0.98	Watts W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to 150	°C
Short Circuit Withstand Time ( $V_{CC} = 720 \text{ Vdc}$ , $V_{GE} = 15 \text{ Vdc}$ , $T_J = 125^\circ\text{C}$ , $R_G = 20 \Omega$ )	$t_{sc}$	10	$\mu$ s
Thermal Resistance — Junction to Case – IGBT	$R_{\theta JC}$	1.02	°C/W
— Junction to Case – Diode	$R_{\theta JC}$	1.41	
— Junction to Ambient	$R_{\theta JA}$	45	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	$T_L$	260	°C

(1) Pulse width is limited by maximum junction temperature.

This document contains information on a new product. Specifications and information are subject to change without notice.

# MGV12N120D

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-to-Emitter Breakdown Voltage (V <sub>GE</sub> = 0 Vdc, I <sub>C</sub> = 250 µAdc) Temperature Coefficient (Positive)	B <sub>V</sub> CES	1200 —	— 870	— —	Vdc mV/°C
Zero Gate Voltage Collector Current (V <sub>CE</sub> = 1200 Vdc, V <sub>GE</sub> = 0 Vdc) (V <sub>CE</sub> = 1200 Vdc, V <sub>GE</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>C</sub> ES	— —	— —	100 2500	µAdc
Gate-Body Leakage Current (V <sub>GE</sub> = ± 20 Vdc, V <sub>CE</sub> = 0 Vdc)	I <sub>G</sub> ES	—	—	250	nAdc

## ON CHARACTERISTICS (1)

Collector-to-Emitter On-State Voltage (V <sub>GE</sub> = 15 Vdc, I <sub>C</sub> = 5 Adc) (V <sub>GE</sub> = 15 Vdc, I <sub>C</sub> = 10 Adc, T <sub>J</sub> = 125°C) (V <sub>GE</sub> = 15 Vdc, I <sub>C</sub> = 10 Adc)	V <sub>CE(on)</sub>	— — —	2.51 2.36 3.21	3.37 — 4.42	Vdc
Gate Threshold Voltage (V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 1 mAdc) Threshold Temperature Coefficient (Negative)	V <sub>GE(th)</sub>	4.0 —	6.0 10	8.0 —	Vdc mV/°C
Forward Transconductance (V <sub>CE</sub> = 10 Vdc, I <sub>C</sub> = 10 Adc)	g <sub>fe</sub>	—	12	—	Mhos

## DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>CE</sub> = 25 Vdc, V <sub>GE</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>ies</sub>	—	930	—	pF
Output Capacitance		C <sub>oes</sub>	—	126	—	
Transfer Capacitance		C <sub>res</sub>	—	16	—	

## SWITCHING CHARACTERISTICS (1)

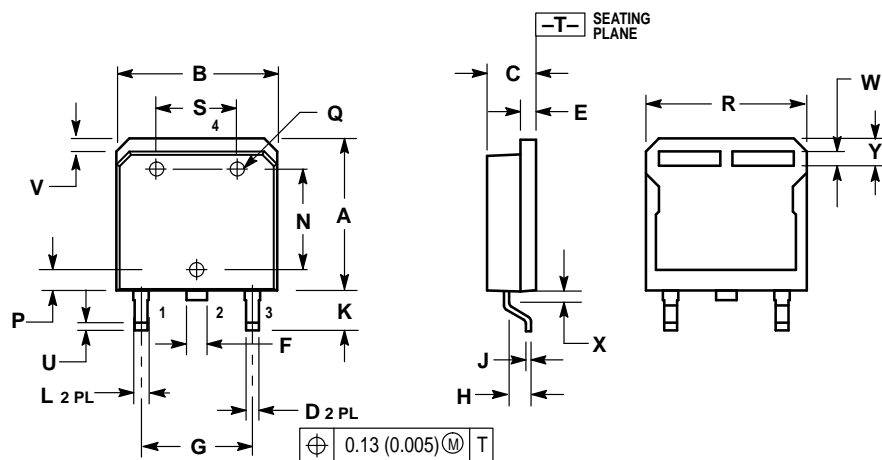
Turn-On Delay Time	(V <sub>CC</sub> = 720 Vdc, I <sub>C</sub> = 10 Adc, V <sub>GE</sub> = 15 Vdc, L = 300 µH R <sub>G</sub> = 20 Ω, T <sub>J</sub> = 25°C) Energy losses include "tail"	t <sub>d(on)</sub>	—	80	—	ns
Rise Time		t <sub>r</sub>	—	114	—	
Turn-Off Delay Time		t <sub>d(off)</sub>	—	66	—	
Fall Time		t <sub>f</sub>	—	232	—	
Turn-Off Switching Loss		E <sub>off</sub>	—	0.57	1.33	mJ
Turn-On Switching Loss		E <sub>on</sub>	—	1.12	1.88	
Total Switching Loss		E <sub>ts</sub>	—	1.69	3.21	
Turn-On Delay Time	(V <sub>CC</sub> = 720 Vdc, I <sub>C</sub> = 10 Adc, V <sub>GE</sub> = 15 Vdc, L = 300 µH R <sub>G</sub> = 20 Ω, T <sub>J</sub> = 125°C) Energy losses include "tail"	t <sub>d(on)</sub>	—	74	—	ns
Rise Time		t <sub>r</sub>	—	110	—	
Turn-Off Delay Time		t <sub>d(off)</sub>	—	80	—	
Fall Time		t <sub>f</sub>	—	616	—	
Turn-Off Switching Loss		E <sub>off</sub>	—	1.60	—	mJ
Turn-On Switching Loss		E <sub>on</sub>	—	2.30	—	
Total Switching Loss		E <sub>ts</sub>	—	3.90	—	
Gate Charge	(V <sub>CC</sub> = 720 Vdc, I <sub>C</sub> = 10 Adc, V <sub>GE</sub> = 15 Vdc)	Q <sub>T</sub>	—	31	—	nC
		Q <sub>1</sub>	—	13	—	
		Q <sub>2</sub>	—	14	—	

**ELECTRICAL CHARACTERISTICS — continued** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
<b>DIODE CHARACTERISTICS</b>						
Diode Forward Voltage Drop ( $I_{EC} = 5\text{ Adc}$ ) ( $I_{EC} = 5\text{ Adc}, T_J = 125^\circ\text{C}$ ) ( $I_{EC} = 10\text{ Adc}$ )		$V_{FEC}$	— — —	2.75 2.50 3.50	3.22 — 4.18	Vdc
Reverse Recovery Time	(1) ( $I_F = 10\text{ Adc}, V_R = 720\text{ Vdc},$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ )	$t_{rr}$	—	54	—	ns
		$t_a$	—	30	—	
		$t_b$	—	24	—	
Reverse Recovery Stored Charge		$Q_{RR}$	—	61	—	$\mu\text{C}$
Reverse Recovery Time	(1) ( $I_F = 10\text{ Adc}, V_R = 720\text{ Vdc},$ $dI_F/dt = 200\text{ A}/\mu\text{s}, T_J = 125^\circ\text{C}$ )	$t_{rr}$	—	150	—	ns
		$t_a$	—	102	—	
		$t_b$	—	48	—	
Reverse Recovery Stored Charge		$Q_{RR}$	—	653	—	$\mu\text{C}$

(1) Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

## PACKAGE DIMENSIONS



## NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.588	0.592	14.94	15.04
B	0.623	0.627	15.82	15.93
C	0.196	0.200	4.98	5.08
D	0.048	0.052	1.22	1.32
E	0.058	0.062	1.47	1.57
F	0.078	0.082	1.98	2.08
G	0.430	BSC	1.092	BSC
H	0.105	0.110	2.67	2.79
J	0.018	0.022	0.46	0.56
K	0.150	0.160	3.81	4.06
L	0.058	0.062	1.47	1.57
N	0.353	0.357	8.97	9.07
P	0.078	0.082	1.98	2.08
Q	0.053	0.057	1.35	1.45
R	0.623	0.627	15.82	15.93
S	0.313	0.317	7.95	8.05
U	0.028	0.032	0.71	0.81
V	0.050	—	1.27	—
W	0.054	0.058	1.37	1.47
X	0.050	0.060	1.27	1.52
Y	0.104	0.108	2.64	2.74

## STYLE 1:

- PIN 1. BASE
- COLLECTOR
- EMITTER
- COLLECTOR

CASE 433-01  
ISSUE B

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