

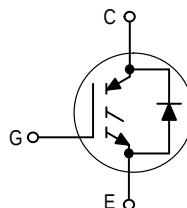
Product Preview Data Sheet

Insulated Gate Bipolar Transistor with Anti-Parallel Diode

N-Channel Enhancement Mode Silicon Gate

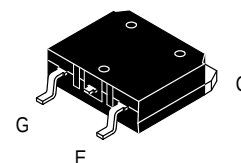
This Insulated Gate Bipolar Transistor (IGBT) is co-packaged with a soft recovery ultra-fast rectifier and uses an advanced termination scheme to provide an enhanced and reliable high voltage blocking capability. Short circuit rated IGBTs are specifically suited for applications requiring a guaranteed 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 μ J/A typical at 125°C
- High Short Circuit Capability – 10 μ 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}	± 20	Vdc
Collector Current — Continuous @ $T_C = 25^\circ\text{C}$ — Continuous @ $T_C = 90^\circ\text{C}$ — Repetitive Pulsed Current (1)	I_{C25} I_{C90} I_{CM}	20 12 40	Adc Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	123 0.98	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
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	μs
Thermal Resistance — Junction to Case – IGBT — Junction to Case – Diode — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JC}$ $R_{\theta JA}$	1.02 1.41 45	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T_L	260	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-to-Emitter Breakdown Voltage ($V_{GE} = 0\text{ Vdc}$, $I_C = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$B_{V_{CES}}$	1200 —	— 870	— —	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Collector Current ($V_{CE} = 1200\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$) ($V_{CE} = 1200\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{CES}	— —	— —	100 2500	μAdc
Gate-Body Leakage Current ($V_{GE} = \pm 20\text{ Vdc}$, $V_{CE} = 0\text{ Vdc}$)	I_{GES}	—	—	250	nAdc

ON CHARACTERISTICS (1)

Collector-to-Emitter On-State Voltage ($V_{GE} = 15\text{ Vdc}$, $I_C = 5\text{ Adc}$) ($V_{GE} = 15\text{ Vdc}$, $I_C = 10\text{ Adc}$, $T_J = 125^\circ\text{C}$) ($V_{GE} = 15\text{ Vdc}$, $I_C = 10\text{ Adc}$)	$V_{CE(on)}$	— — —	2.51 2.36 3.21	3.37 — 4.42	Vdc
Gate Threshold Voltage ($V_{CE} = V_{GE}$, $I_C = 1\text{ mAdc}$) Threshold Temperature Coefficient (Negative)	$V_{GE(th)}$	4.0 —	6.0 10	8.0 —	Vdc mV/ $^\circ\text{C}$
Forward Transconductance ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ Adc}$)	g_{fe}	—	12	—	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{CE} = 25\text{ Vdc}$, $V_{GE} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{ies}	—	930	—	pF
Output Capacitance		C_{oes}	—	126	—	
Transfer Capacitance		C_{res}	—	16	—	

SWITCHING CHARACTERISTICS (1)

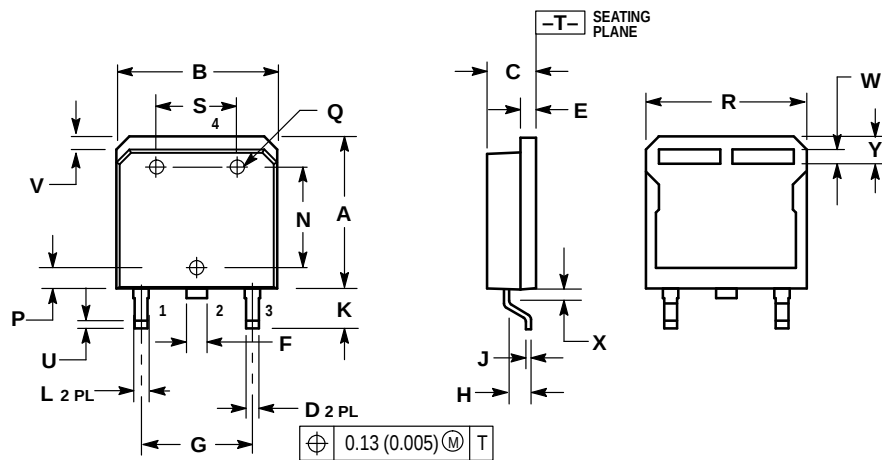
Turn-On Delay Time	$(V_{CC} = 720\text{ Vdc}$, $I_C = 10\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$, $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$, $T_J = 25^\circ\text{C}$) Energy losses include "tail"	$t_{d(on)}$	—	80	—	ns
Rise Time		t_r	—	114	—	
Turn-Off Delay Time		$t_{d(off)}$	—	66	—	
Fall Time		t_f	—	232	—	
Turn-Off Switching Loss		E_{off}	—	0.57	1.33	mJ
Turn-On Switching Loss		E_{on}	—	1.12	1.88	
Total Switching Loss		E_{ts}	—	1.69	3.21	
Turn-On Delay Time	$(V_{CC} = 720\text{ Vdc}$, $I_C = 10\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$, $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$, $T_J = 125^\circ\text{C}$) Energy losses include "tail"	$t_{d(on)}$	—	74	—	ns
Rise Time		t_r	—	110	—	
Turn-Off Delay Time		$t_{d(off)}$	—	80	—	
Fall Time		t_f	—	616	—	
Turn-Off Switching Loss		E_{off}	—	1.60	—	mJ
Turn-On Switching Loss		E_{on}	—	2.30	—	
Total Switching Loss		E_{ts}	—	3.90	—	
Gate Charge	$(V_{CC} = 720\text{ Vdc}$, $I_C = 10\text{ Adc}$, $V_{GE} = 15\text{ Vdc}$)	Q_T	—	31	—	nC
		Q_1	—	13	—	
		Q_2	—	14	—	

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

Characteristic		Symbol	Min	Typ	Max	Unit
DIODE CHARACTERISTICS						
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	—	μC
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	—	μC

(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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How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

MFAX: RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609
INTERNET: <http://Design-NET.com>

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

