

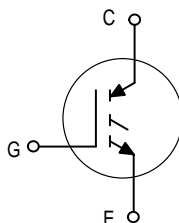
# Product Preview Data Sheet

## Insulated Gate Bipolar Transistor

### N-Channel Enhancement Mode Silicon Gate

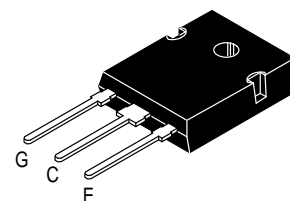
This Insulated Gate Bipolar Transistor (IGBT) uses an advanced termination scheme to provide an enhanced and reliable high voltage blocking capability. Fast switching characteristics result in efficient operations at high frequencies.

- Industry Standard High Power TO-247 Package with Isolated Mounting Hole
- High Speed  $E_{off}$ : 44  $\mu$ s/A typical at 125°C
- Low On-Voltage:  $V_{CE(on)}$  = 1.45V typical at 20A, 25°C
- Robust High Voltage Termination



**MGW40N60U**

**IGBT IN TO-247**  
**40 A @ 90°C**  
**65 A @ 25°C**  
**600 VOLTS**  
**LOW ON-VOLTAGE**



**CASE 340F-03, Style 4**  
**TO-247AE**

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

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	600	Vdc
Collector-Gate Voltage ( $R_{GE} = 1.0\text{ M}\Omega$ )	$V_{CGR}$	600	Vdc
Gate-Emitter Voltage — Continuous	$V_{GE}$	$\pm 20$	Vdc
Collector Current — Continuous @ $T_C = 25^\circ\text{C}$	$I_{C25}$	65	Adc
— Continuous @ $T_C = 90^\circ\text{C}$	$I_{C90}$	40	
— Repetitive Pulsed Current (1)	$I_{CM}$	130	Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	202	Watts
Derate above $25^\circ\text{C}$		1.61	W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to 150	°C
Thermal Resistance — Junction to Case — IGBT	$R_{\theta JC}$	0.62	°C/W
— Junction to Ambient	$R_{\theta JA}$	45	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	$T_L$	260	°C
Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.13 N•m)		

(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.

## MGW40N60U

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-to-Emitter Breakdown Voltage ( $V_{GE} = 0\text{ Vdc}$ , $I_C = 250\text{ }\mu\text{Adc}$ ) Temperature Coefficient (Positive)	$B_{V_{CES}}$	600 —	— 870	— —	Vdc mV/ $^\circ\text{C}$
Emitter-to-Collector Breakdown Voltage ( $V_{GE} = 0\text{ Vdc}$ , $I_{EC} = 100\text{ mAdc}$ )	$B_{V_{ECS}}$	15	—	—	Vdc
Zero Gate Voltage Collector Current ( $V_{CE} = 600\text{ Vdc}$ , $V_{GE} = 0\text{ Vdc}$ ) ( $V_{CE} = 600\text{ Vdc}$ , $V_{GE} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$I_{CES}$	— —	— —	100 2500	$\mu\text{Adc}$
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 ( $V_{GE} = 15\text{ Vdc}$ , $I_C = 20\text{ Adc}$ ) ( $V_{GE} = 15\text{ Vdc}$ , $I_C = 20\text{ Adc}$ , $T_J = 125^\circ\text{C}$ ) ( $V_{GE} = 15\text{ Vdc}$ , $I_C = 40\text{ Adc}$ )	$V_{CE(on)}$	— — —	1.45 1.35 1.80	1.71 — 2.21	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 ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 40\text{ Adc}$ )	$g_{fe}$	—	tbd	—	Mhos

### DYNAMIC CHARACTERISTICS

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

### SWITCHING CHARACTERISTICS (1)

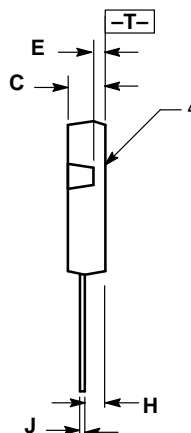
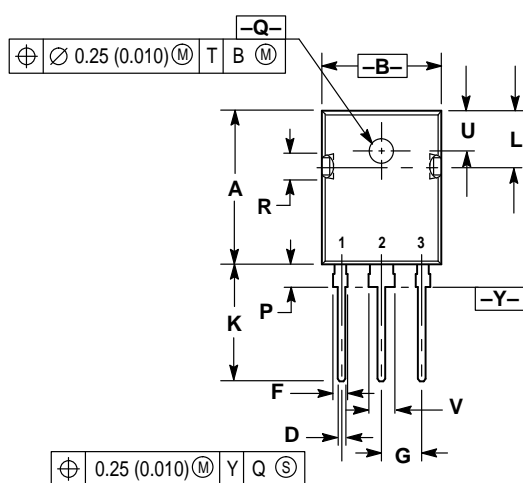
Turn-On Delay Time	$(V_{CC} = 360\text{ Vdc}$ , $I_C = 40\text{ Adc}$ , $V_{GE} = 15\text{ Vdc}$ , $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$ , $T_J = 25^\circ\text{C}$ ) Energy losses include "tail"	$t_{d(on)}$	—	tbd	—	ns
Rise Time		$t_r$	—	tbd	—	
Turn-Off Delay Time		$t_{d(off)}$	—	tbd	—	
Fall Time		$t_f$	—	tbd	—	
Turn-Off Switching Loss		$E_{off}$	—	1.14	1.89	mJ
Turn-On Delay Time	$(V_{CC} = 360\text{ Vdc}$ , $I_C = 40\text{ Adc}$ , $V_{GE} = 15\text{ Vdc}$ , $L = 300\text{ }\mu\text{H}$ $R_G = 20\text{ }\Omega$ , $T_J = 125^\circ\text{C}$ ) Energy losses include "tail"	$t_{d(on)}$	—	tbd	—	ns
Rise Time		$t_r$	—	tbd	—	
Turn-Off Delay Time		$t_{d(off)}$	—	tbd	—	
Fall Time		$t_f$	—	tbd	—	
Turn-Off Switching Loss		$E_{off}$	—	1.75	—	mJ
Gate Charge	$(V_{CC} = 360\text{ Vdc}$ , $I_C = 40\text{ Adc}$ , $V_{GE} = 15\text{ Vdc}$ )	$Q_T$	—	tbd	—	nC
		$Q_1$	—	tbd	—	
		$Q_2$	—	tbd	—	

### INTERNAL PACKAGE INDUCTANCE

Internal Emitter Inductance (Measured from the emitter lead 0.25" from package to emitter bond pad)	$L_E$	—	13	—	nH
--	-------	---	----	---	----

(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: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.40	20.90	0.803	0.823
B	15.44	15.95	0.608	0.628
C	4.70	5.21	0.185	0.205
D	1.09	1.30	0.043	0.051
E	1.50	1.63	0.059	0.064
F	1.80	2.18	0.071	0.086
G	5.45 BSC		0.215 BSC	
H	2.56	2.87	0.101	0.113
J	0.48	0.68	0.019	0.027
K	15.57	16.08	0.613	0.633
L	7.26	7.50	0.286	0.295
P	3.10	3.38	0.122	0.133
Q	3.50	3.70	0.138	0.145
R	3.30	3.80	0.130	0.150
U	5.30 BSC		0.209 BSC	
V	3.05	3.40	0.120	0.134

STYLE 4:  
 PIN 1: GATE  
 2. COLLECTOR  
 3. EMITTER  
 4. COLLECTOR

**CASE 340F-03  
 TO-247AE  
 ISSUE E**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**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

