Designer's™ Data Sheet

Insulated Gate Bipolar Transistor

N-Channel Enhancement-Mode Silicon Gate

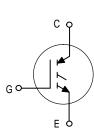
This Insulated Gate Bipolar Transistor (IGBT) uses an advanced termination scheme to provide an enhanced and reliable high voltage–blocking capability. Short circuit rated IGBT's are specifically suited for applications requiring a guaranteed short circuit withstand time such as Motor Control Drives. Fast switching characteristics result in efficient operation at high frequencies.

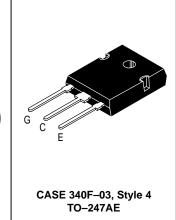
- Industry Standard High Power TO–247 Package with Isolated Mounting Hole
- High Speed E_{off}: 160 μJ/A typical at 125°C
- High Short Circuit Capability 10 μs minimum
- Robust High Voltage Termination

MGW12N120

Motorola Preferred Device

IGBT IN TO-247
12 A @ 90°C
20 A @ 25°C
1200 VOLTS
SHORT CIRCUIT RATED





MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	VCES	1200	Vdc
Collector–Gate Voltage (R _{GE} = 1.0 MΩ)	V _{CGR}	1200	Vdc
Gate-Emitter Voltage — Continuous	V _{GE}	±20	Vdc
Collector Current — Continuous @ T _C = 25°C — Continuous @ T _C = 90°C — Repetitive Pulsed Current (1)	IC25 IC90 ICM	20 12 40	Adc Apk
Total Power Dissipation @ T _C = 25°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 Vdc, V_{GE} = 15 Vdc, T_J = 125°C, R_G = 20 Ω)	t _{SC}	10	μs
Thermal Resistance — Junction to Case – IGBT — Junction to Ambient	R _θ JC R _θ JA	1.0 45	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	TL	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. Repetitive rating.

Designer's Data for "Worst Case" Conditions — The Designer's Data Sheet permits the design of most circuits entirely from the information presented. SOA Limit curves — representing boundaries on device characteristics — are given to facilitate "worst case" design.

Preferred devices are Motorola recommended choices for future use and best overall value.

REV 1



MGW12N120

Characteristic		Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS						
Collector-to-Emitter Breakdown V (V _{GE} = 0 Vdc, I _C = 25 μAdc) Temperature Coefficient (Positive	BVCES	1200 —	— 870	_	Vdc mV/°C	
Emitter-to-Collector Breakdown V	BVECS	25	_	_	Vdc	
Zero Gate Voltage Collector Currer (VCE = 1200 Vdc, VGE = 0 Vdc) (VCE = 1200 Vdc, VGE = 0 Vdc,	ICES			100 2500	μAdc	
Gate-Body Leakage Current (VGE	IGES	_	_	250	nAdc	
ON CHARACTERISTICS (1)		•		•	•	•
Collector-to-Emitter On-State Voltage (VGE = 15 Vdc, I _C = 5.0 Adc) (VGE = 15 Vdc, I _C = 5.0 Adc, T _J = 125°C) (VGE = 15 Vdc, I _C = 10 Adc)		VCE(on)	_ _ _	2.51 2.36 3.21	3.37 — 4.42	Vdc
Gate Threshold Voltage (V _{CE} = V _{GE} , I _C = 1.0 mAdc) Threshold Temperature Coefficie	ent (Negative)	VGE(th)	4.0 —	6.0 10	8.0 —	Vdc mV/°C
Forward Transconductance (VCE =	9fe	_	12	_	Mhos	
DYNAMIC CHARACTERISTICS						
Input Capacitance		C _{ies}	-	930	-	pF
Output Capacitance	$(V_{CE} = 25 \text{ Vdc}, V_{GE} = 0 \text{ Vdc}, f = 1.0 \text{ MHz})$	C _{oes}	_	126	_	
Transfer Capacitance	,	C _{res}	_	16	_	
SWITCHING CHARACTERISTICS (1)					
Turn-On Delay Time		^t d(on)	_	74	_	ns
Rise Time	$(V_{CC} = 720 \text{ Vdc}, I_{C} = 10 \text{ Adc},$	t _r	_	83	_	
Turn-Off Delay Time	V_{GE} = 15 Vdc, L = 300 μH R_{G} = 20 Ω , T_{J} = 25°C)	td(off)	_	76	_	
Fall Time	Energy losses include "tail"	t _f	_	231	_	
Turn-Off Switching Loss		E _{off}	_	0.55	1.33	mJ
Turn-On Delay Time		^t d(on)	_	66	_	ns
Rise Time	$(V_{CC} = 720 \text{ Vdc}, I_{C} = 10 \text{ Adc},$	t _r	_	87	_	
Turn-Off Delay Time	V_{GE} = 15 Vdc, L = 300 μH R _G = 20 Ω, T _J = 125°C)	td(off)	_	120	_	1
Fall Time	Energy losses include "tail"	t _f	_	575	_	1
Turn-Off Switching Loss]	E _{off}	_	1.49	_	mJ
Gate Charge	(V _{CC} = 720 Vdc, I _C = 10 Adc, V _{GE} = 15 Vdc)	QT	_	31	_	nC
		Q ₁	_	13	_	
		Q ₂	_	14	_	
INTERNAL PACKAGE INDUCTANO	DE					
Internal Emitter Inductance (Measured from the emitter lead 0.25" from package to emitter bond pad)		LE		13		nH

⁽¹⁾ Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

TYPICAL ELECTRICAL CHARACTERISTICS

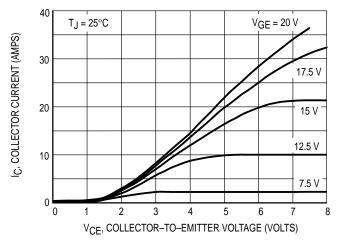
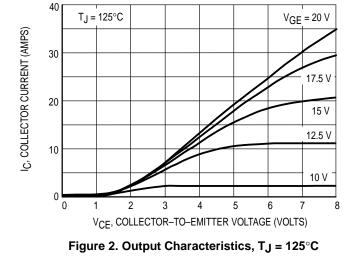


Figure 1. Output Characteristics, T_J = 25°C



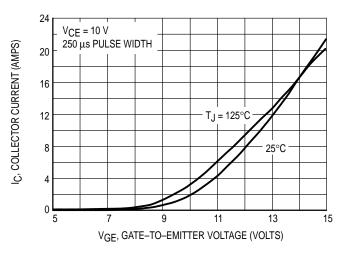


Figure 3. Transfer Characteristics

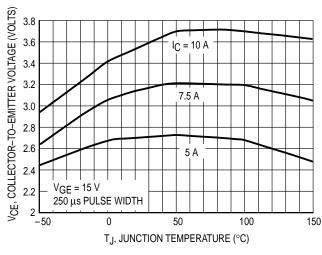


Figure 4. Collector-to-Emitter Saturation Voltage versus Junction Temperature

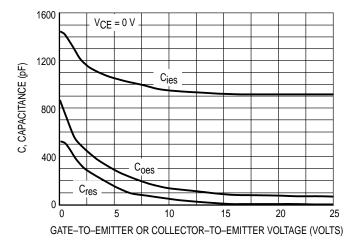


Figure 5. Capacitance Variation

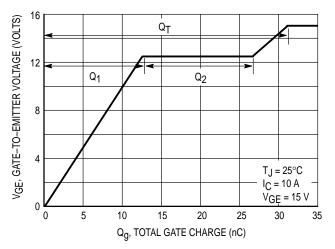


Figure 6. Gate-to-Emitter Voltage versus Total Charge

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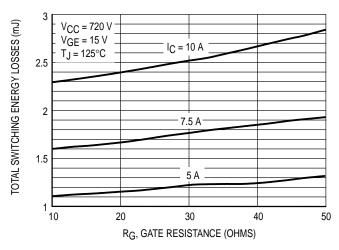


Figure 7. Total Switching Losses versus
Gate Resistance

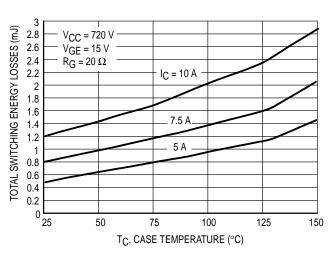


Figure 8. Total Switching Losses versus

Case Temperature

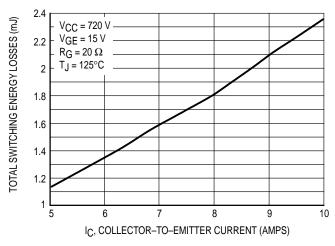


Figure 9. Total Switching Losses versus Collector-to-Emitter Current

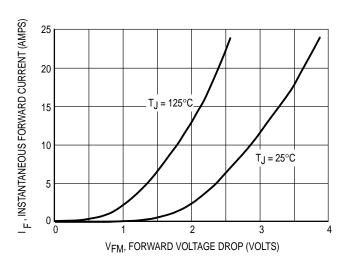


Figure 10. Maximum Forward Drop versus Instantaneous Forward Current

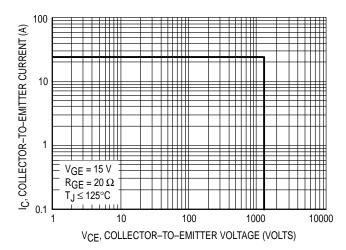


Figure 11. Reverse Biased Safe Operating Area

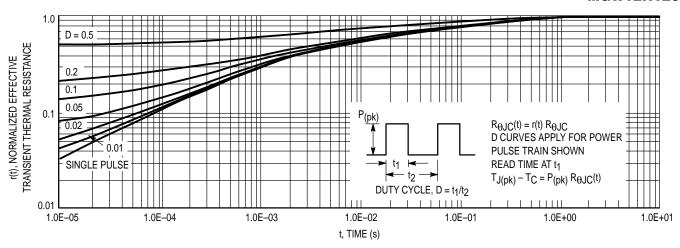
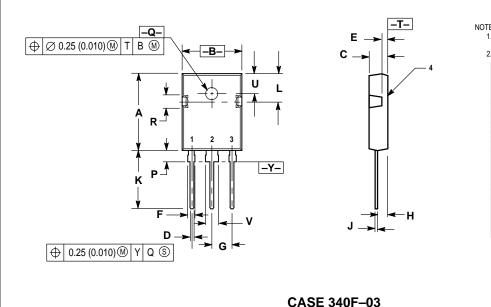


Figure 12. Thermal Response

PACKAGE DIMENSIONS

TO-247AE **ISSUE E**



NOTES:

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

	MILLIN	IETERS	INCHES		
DIM	MIN	MAX	MIN	MAX	
Α	20.40	20.90	0.803	0.823	
В	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	
Е	1.50	1.63	0.059	0.064	
F	1.80	2.18	0.071	0.086	
G	5.45 BSC		0.215 BSC		
Н	2.56	2.87	0.101	0.113	
7	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	
Ρ	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		
٧	3.05	3.40	0.120	0.134	

STYLE 4:

PIN 1. GATE

- 2. COLLECTOR 3. EMITTER
- 4. COLLECTOR

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