

# AFGH50T65SQDN

## Product Preview

# IGBT for Automotive Applications

650 V, 50 A, TO-247-3L

### Features

- Maximum Junction Temperature:  $T_J = 175^\circ\text{C}$
- High Speed Switching Series
- $V_{CE(sat)} = 1.6\text{ V (typ.) @ } I_C = 50\text{ A}$
- Low  $V_F$  Soft Recovery Co-packaged Diode
- Tight Parameters Distribution
- Low Thermal Resistance
- Qualified with AEC-Q101
- These Devices are Pb-Free and are RoHS Compliant

### Typical Applications

- Automotive On Board Charger
- Automotive DC/DC Converter for HEV

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

Parameter	Symbol	Value	Unit
Collector to Emitter Voltage	$V_{CES}$	650	V
Transient Gate-to-Emitter Voltage	$V_{GS}$	$\pm 20$	V
Collector Current ( $T_C = 25^\circ\text{C}$ )	$I_C$	100	A
Collector Current ( $T_C = 100^\circ\text{C}$ )		50	A
Pulsed Collector Current	$I_{CM}$	160	A
Diode Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_F$	80	A
Diode Forward Current ( $T_C = 100^\circ\text{C}$ )		40	A
Pulsed Diode Maximum Forward Current	$I_{FM}$	TBD	A
Maximum Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	268	W
Maximum Power Dissipation ( $T_C = 100^\circ\text{C}$ )		134	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using  $1\text{ in}^2$  pad size, 1 oz Cu pad.

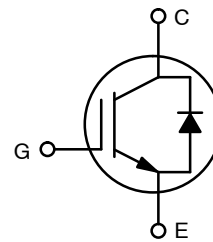
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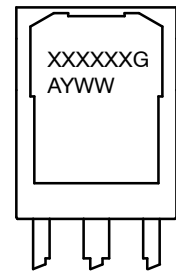
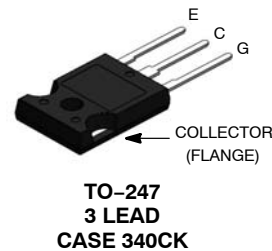
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$BV_{CES}$	$V_{CE(sat)}$ TYP	$I_C$ MAX
650 V	1.6 V	100 A



### MARKING DIAGRAM



XXXXXX = Specific Device Code  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 G = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping†
AFGH50T65SQDN	TO-247 3L	450 / Tube

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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**Table 1. THERMAL RESISTANCE RATINGS**

Parameter	Symbol	Max	Unit
Junction-to-Case IGBT – Steady State (Note 2)	$R_{\theta JC}$	0.56	°C/W
Junction-to-Case Diode – Steady State (Note 2)	$R_{\theta JC}$	1.25	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	40	

2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

**Table 2. ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Collector to Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE} = 0\text{ V}, I_D = 1\text{ mA}$	650			V
Temperature Coefficient of Breakdown Voltage	$\Delta V_{CES} / \Delta T_J$	$V_{GE} = 0\text{ V}, I_D = 1\text{ mA}$		0.6		mV/°C
Collector Cut-Off Current	$I_{CES}$	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$			250	μA
G-E Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$			±400	μA

**ON CHARACTERISTICS**

Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 40\text{ mA}$		4.5		V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 50\text{ A}, V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$		1.6		V
		$I_C = 50\text{ A}, V_{GE} = 15\text{ V}, T_C = 175^\circ\text{C}$		1.9		V

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$C_{ISS}$	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		3275		pF
Output Capacitance	$C_{OSS}$			84		
Reverse Transfer Capacitance	$C_{RSS}$			12		

**SWITCHING CHARACTERISTICS**

Turn-On Delay Time	$T_{d(on)}$	$V_{CC} = 400\text{ V}, I_C = 25\text{ A}, R_G = 4.7\ \Omega,$ $V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 25^\circ\text{C}$		19		ns
Rise Time	$T_r$			13		ns
Turn-Off Delay Time	$T_{d(off)}$			93		ns
Fall Time	$T_f$			6.4		ns
Turn-On Switching Loss	$E_{on}$			TBD		μJ
Turn-Off Switching Loss	$E_{off}$			88		μJ
Total Switching Loss	$E_{ts}$			TBD		μJ
Turn-On Delay Time	$T_{d(on)}$	$V_{CC} = 400\text{ V}, I_C = 25\text{ A}, R_G = 4.7\ \Omega,$ $V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 175^\circ\text{C}$		18		ns
Rise Time	$T_r$			15		ns
Turn-Off Delay Time	$T_{d(off)}$			102		ns
Fall Time	$T_f$			8		ns
Turn-On Switching Loss	$E_{on}$			TBD		μJ
Turn-Off Switching Loss	$E_{off}$			203		μJ
Total Switching Loss	$E_{ts}$			TBD		μJ

**DIODE CHARACTERISTICS**

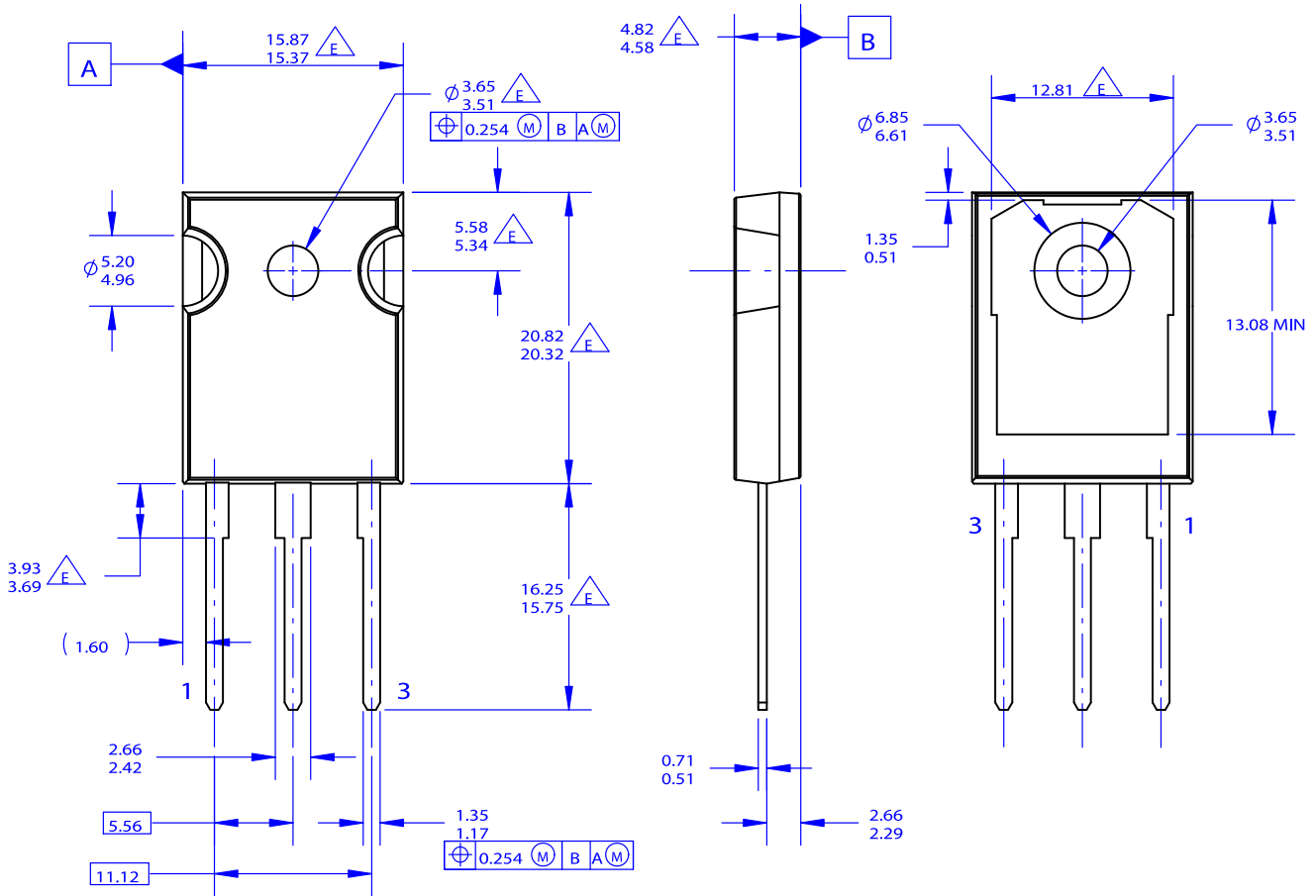
Diode Forward Voltage	$V_F$	$I_F = 20\text{ A}$		TBD		V
Reverse Recovery Energy	$E_{rec}$	$I_F = 20\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$		TBD		μJ
Diode Reverse Recovery Time	$T_{rr}$			TBD		Ns
Diode Reverse Recovery Charge	$Q_{rr}$			TBD		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# AFGH50T65SQDN

## PACKAGE DIMENSIONS

TO-247-3LD  
CASE 340CK  
ISSUE O



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5 - 1994

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