

# IGBT for Automotive Application

1200 V, 40 A

## AFGHL40T120RHD

### Description

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop II Trench construction. Provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss, which is AEC Q101 qualified offer the optimum performance for both hard and soft switching topology in automotive application.

### Features

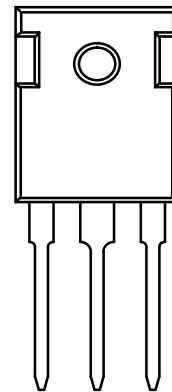
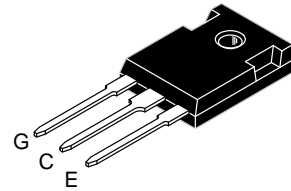
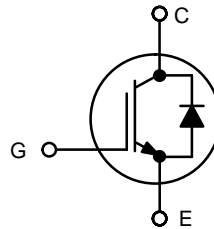
- Extremely Efficient Trench with Field Stop Technology
- Maximum Junction Temperature:  $T_J = 175^{\circ}\text{C}$
- Short Circuit Withstand Time 9  $\mu\text{s}$
- 100% of the Parts Tested for  $I_{LM}$  (Note 2)
- Fast Switching
- Tighten Parameter Distribution
- AEC-Q101 Qualified and PPAP Capable
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

### Typical Applications

- Automotive HEV-EV E-Compressor
- Automotive HEV-EV PTC Heater
- Automotive HEV-EV Onboard Chargers
- Automotive HEV-EV DC-DC Converters



www.onsemi.com



ORD#97NG INFORM AFGHL40T120RHD Unit 10/ Rail

# AFGHL40T120RHD

## MAXIMUM RATINGS

Description	Symbol	Value	Units
Collector to Emitter Voltage	$V_{CES}$	1200	V
Gate to Emitter Voltage	$V_{GES}$	$\pm 20$	V
Transient Gate to Emitter Voltage		$\pm 30$	

# AFGHL40T120RHD

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

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
-----------	-----------------	--------	------	------	------	------

### DYNAMIC CHARACTERISTICS

Input Capacitance	V <sub>CE</sub> = 20 V, V <sub>GE</sub> = 0 V, f = 100 kHz	C <sub>ies</sub>	–	6172	–	pF
Output Capacitance		C <sub>oes</sub>	–	246	–	
Reverse Transfer Capacitance		C <sub>res</sub>	–	111	–	

### SWITCHING CHARACTERISTICS, INDUCTIVE LOAD

Turn-on Delay Time	T <sub>J</sub> = 25°C V <sub>CC</sub> = 600 V, I <sub>C</sub> = 20 A R <sub>g</sub> = 5 Ω V <sub>GE</sub> = 15 V Inductive Load	t <sub>d(on)</sub>	–	35	–	ns
Rise Time		t <sub>r</sub>	–	14	–	
Turn-off Delay Time						

# AFGHL40T120RHD

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

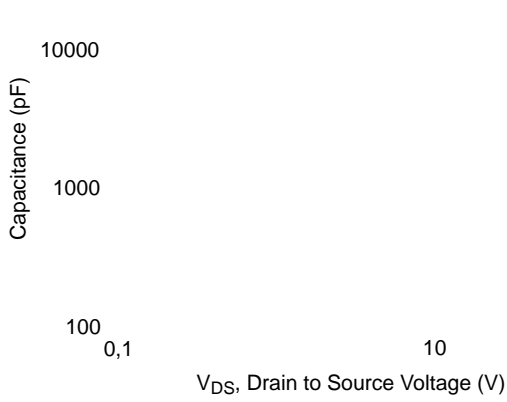
Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
<b>DIODE CHARACTERISTICS</b>						
Reverse Recovery Energy	$T_J = 25^\circ\text{C}$ $V_R = 600\text{ V}$ , $I_F = 40\text{ A}$ , $di_F/dt = 1000\text{ A}/\mu\text{s}$	$E_{rec}$	–	1.14	–	mJ
Diode Reverse Recovery Time		$T_{rr}$	–	195	–	ns
Diode Reverse Recovery Charge		$Q_{rr}$	–	3761	–	nC
Reverse Recovery Energy	$T_J = 175^\circ\text{C}$ $V_R = 600\text{ V}$ , $I_F = 20\text{ A}$ , $di_F/dt = 1000\text{ A}/\mu\text{s}$	$E_{rec}$	–	1.92	–	mJ
Diode Reverse Recovery Time		$T_{rr}$	–	212	–	ns
Diode Reverse Recovery Charge		$Q_{rr}$	–	5242	–	nC
Reverse Recovery Energy	$T_J = 175^\circ\text{C}$ $V_R = 600\text{ V}$ , $I_F = 40\text{ A}$ , $di_F/dt = 1000\text{ A}/\mu\text{s}$	$E_{rec}$	–	2.768	–	mJ
Diode Reverse Recovery Time		$T_{rr}$	–	286	–	ns
Diode Reverse Recovery Charge		$Q_{rr}$	–	7321	–	nC

**AFGHL40T120RHD**

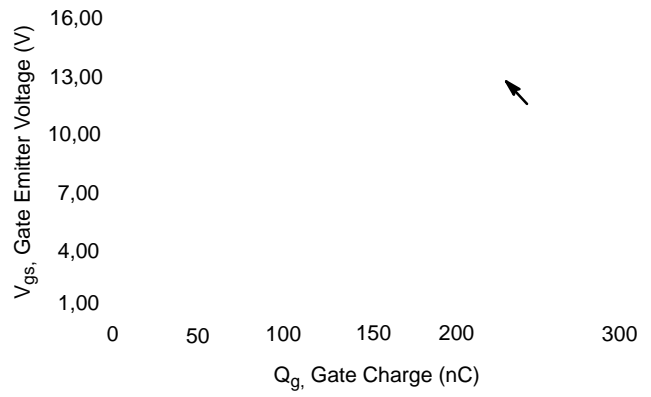


# AFGHL40T120RHD

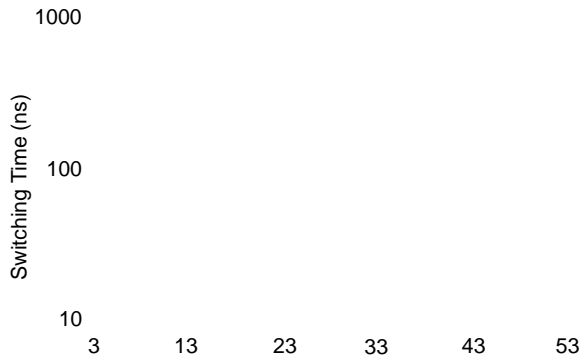
## TYPICAL CHARACTERISTICS (continued)



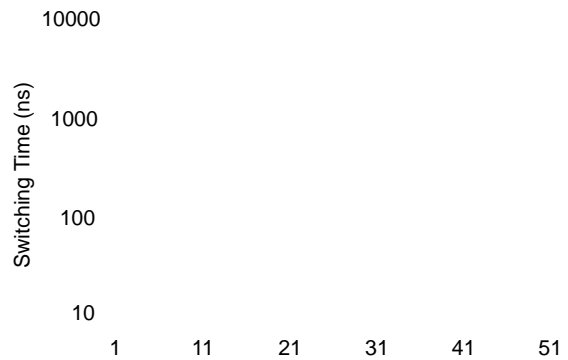
**Figure 7. Capacitance Characteristics**



**Figure 8. Gate Charge Characteristics**



**Figure 9. Turn-on Characteristics vs. Gate Resistance**



**Figure 10. Turn-off Characteristics vs. Gate Resistance**

**Figure 11. Turn-on Characteristics vs. Collector Current**

**Figure 12. Turn-off Characteristics vs. Collector Current**

**AFGHL40T120RHD**

# AFGHL40T120RHD

## TYPICAL CHARACTERISTICS (continued)

Figure 19. Transient Thermal Impedance of IGBT

Figure 20. Transient Thermal Impedance of Diode



# AFGHL40T120RHD

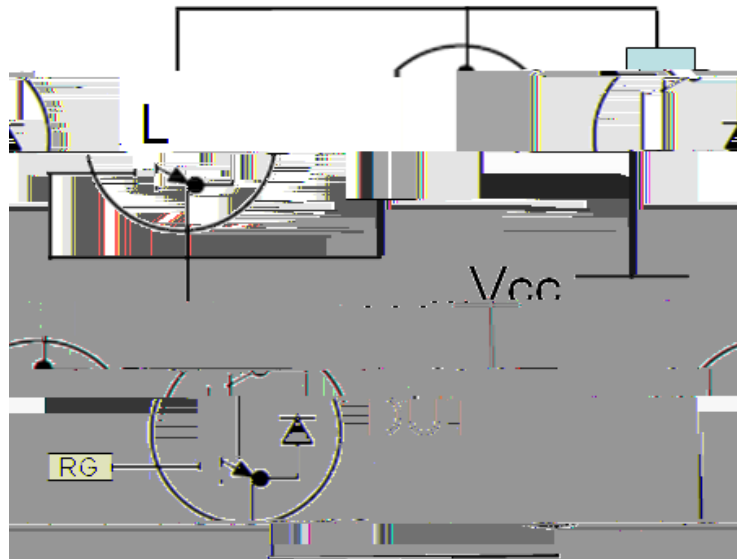


Figure 21. Test Circuit for Switching Characteristics

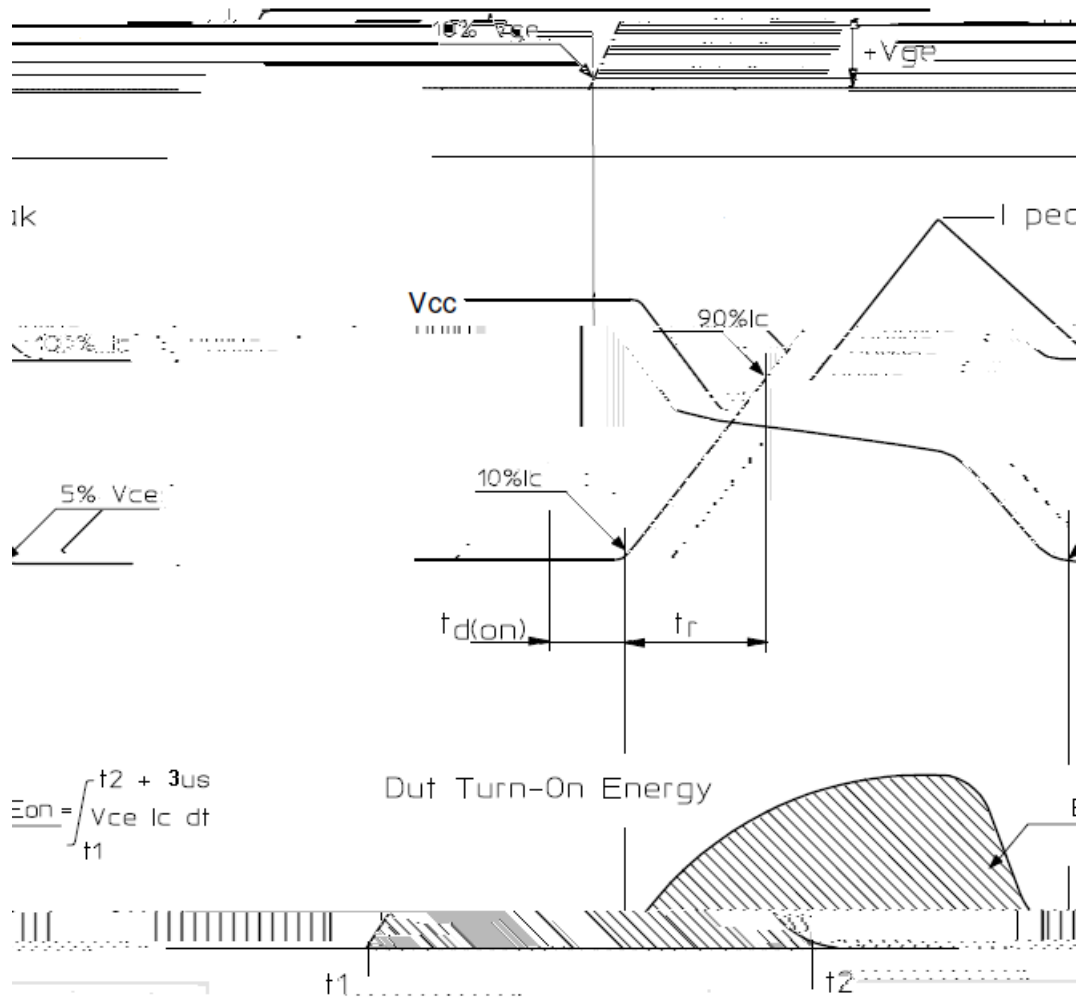


Figure 22. Definition of Turn On Waveform

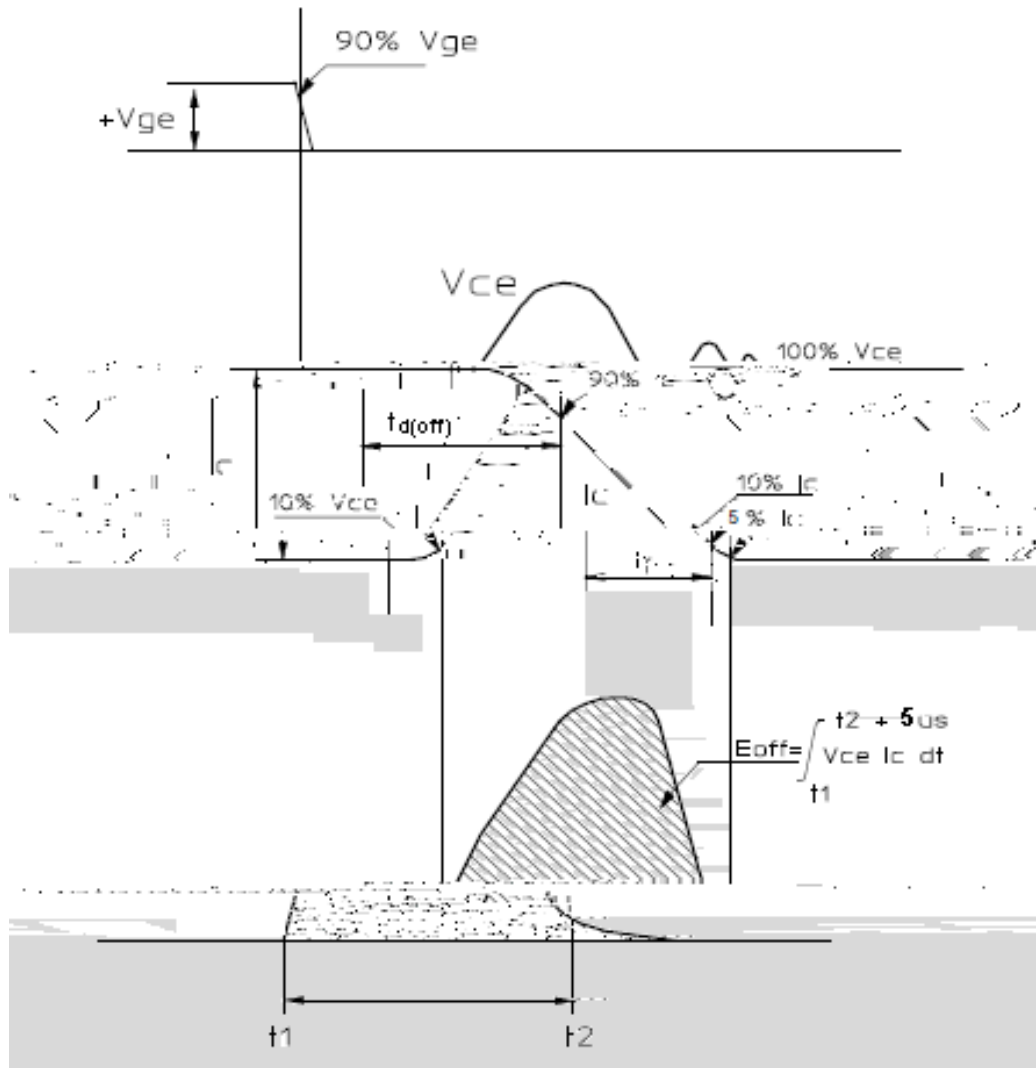


Figure 23. Definition of Turn Off Waveform



**onsemi**, **onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi**

---

---