onsemi

IGBT - Power, Single, N-Channel, Field Stop VII (FS7), SCR, Power TO247-4L 1200 V, 1.45 V, 40 A

AFGH4L40T120RW

Description

Using the novel field stop 7th generation IGBT technology in TO247 4-lead package, this device offers the optimum performance with low on state voltage and minimal switching losses for both hard and soft switching topologies in automotive applications.

Features

- Extremely Efficient Trench with Field Stop Technology
- Maximum Junction Temperature $T_J = 175^{\circ}C$
- Short Circuit Rated and Low Saturation Voltage
- Fast Switching and Tightened Parameter Distribution
- AEC-Q101 Qualified, PPAP Available Upon Request
- These Device is Pb–Free, Halogen Free/BFR Free and is RoHS Compliant

Applications

- Automotive E-compressor
- Automotive EV PTC Heater
- OBC

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

Paramet	Symbol	Value	Unit	
Collector to Emitter Voltage	V _{CE}	1200	V	
Gate to Emitter Voltage	V _{GE}	±20		
Transient Gate to Emitter Vo	oltage		±30	
Collector Current $T_{C} = 25^{\circ}C$		Ι _C	80	А
	$T_{C} = 100^{\circ}C$		40	
Power Dissipation	$T_{\rm C} = 25^{\circ}{\rm C}$	PD	576	W
	$T_{C} = 100^{\circ}C$		288	
$\begin{array}{l} \mbox{Pulsed Collector Current} \\ \mbox{T}_{C} = 25^{\circ}C, \\ \mbox{t}_{p} = 10 \ \mu s \ (\mbox{Note 1}) \end{array}$		I _{CM}	120	A
Short Circuit Withstand Time V_{GE} = 15 V, Vcc = 800 V, T _C	T _{SC}	6	μs	
Operating Junction and Stor Range	T _J , T _{stg}	–55 to +175	°C	
Lead Temperature for Solde	TL	260		

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. Repetitive rating: Pulse width limited by max. junction temperature

BV _{CES}	VCE _(sat) TYP	I _C MAX
1200 V	1.45 V	40 A

PIN CONNECTIONS



TO-247-4LD CASE 340CJ

MARKING DIAGRAM



AFGH40120RW &Z

&З

&K

\$Y

= Specific Device Code

- = Assembly Plant Code
- = 3-Digit Date Code
- = 2-Digit Lot Traceability Code
- = **onsemi** Logo

ORDERING INFORMATION

Device	Package	Shipping
AFGH4L40T120RW	TO-247-4L (Pb-Free)	30 Units / Rail

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THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case for IGBT	$R_{\theta JC}$	0.26	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Тур	Max	Unit
OFF CHARACTERISTICS	•					
Collector to Emitter Breakdown Voltage	BV _{CES}	$V_{GE} = 0 V$, $I_C = 1 mA$	1200	-	-	V
Zero Gate Voltage Collector Current	I _{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}	-	-	40	μA
Gate-to-Emitter leakage Current	I _{GES}	$V_{GE} = \pm 20 \text{ V}, \text{ V}_{CE} = 0 \text{ V}$	-	-	±400	nA
ON CHARACTERISTICS					-	-
Gate to Emitter Threshold Voltage	V _{GE(th)}	V_{GE} = V_{CE} , I_C = 40 mA, T_J = 25°C	4.98	5.88	6.78	V
Collector to Emitter Saturation Voltage	V _{CE(sat)}	V_{GE} = 15 V, I _C = 40 A, T _J = 25°C	-	1.45	1.78	V
		V_{GE} = 15 V, I _C = 40 A, T _J = 175°C	-	1.75	-	
DYNAMIC CHARACTERISTICS					-	-
Input Capacitance	C _{IES}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	-	4721	-	pF
Output Capacitance	C _{OES}		-	144	-	pF
Reverse Transfer Capacitance	C _{RES}		-	24.2	-	pF
Total Gate Charge	Q _G	V_{CE} = 600 V, V_{GE} = 15 V, I_{C} = 40 A	-	171	-	nC
Gate to Emitter Charge	Q _{GE}		-	42.2	-	nC
Gate to Collector Charge	Q _{GC}		-	73.4	-	nC
SWITCHING CHARACTERISTICS, INDUC		lote: Si Diode Applied)			-	
Turn-On Delay Time	t _{d(on)}	$V_{CE} = 600 V V_{GE} = 0/15 V I_{C} = 20 A R_{G} = 6 \Omega T_{1} = 25^{\circ}C$	-	53.5	-	ns
Turn-Off Delay Time	t _{d(off)}		-	311	-	
Rise Time	t _r		-	27.8	_	
Fall Time	t _f		-	189	-	
Turn-On Switching Loss	Eon		-	1.26	-	mJ
Turn-Off Switching Loss	E _{off}		-	1.36	-	
Total Switching Loss	E _{ts}		-	2.61	-	
Turn-On Delay Time	t _{d(on)}	$V_{CE} = 600 V$	-	58.2	-	ns
Turn-Off Delay Time	t _{d(off)}	$V_{GE}^{OE} = 0/15 V$ $I_{C} = 40 A$ $R_{G} = 6 \Omega$ $T_{J} = 25^{\circ}C$	-	258	-	
Rise time	t _r		-	47.4	-	
Fall Time	t _f		-	122	-	
Turn-On Switching Loss	E _{on}		-	3.38	-	mJ
Turn-Off Switching Loss	E _{off}		-	1.7	-	1
Total Switching Loss	E _{ts}		_	5.08	-	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Symbol	Test Conditions	Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS, IN	IDUCTIVE LOAD (N	lote: Si Diode Applied)				
Turn-On Delay Time	t _{d(on)}	$V_{CE} = 600 V$	-	58.7	-	ns
Turn-Off Delay Time	t _{d(off)}	V _{GE} = 0/15 V I _C = 20 A	-	433	-	
Rise Time	t _r	R _G = 6 Ω T _J = 175°C	-	39.4	-	
Fall Time	t _f	U U	-	376	-	
Turn-On Switching Loss	E _{on}		-	2.01	-	mJ
Turn–Off Switching Loss	E _{off}		-	2.52	-	
Total Switching Loss	E _{ts}		-	4.53	-	
Turn-On Delay Time	t _{d(on)}	$V_{CE} = 600 V$	-	65.7	-	ns
Turn-Off Delay Time	t _{d(off)}	V _{GE} = 0/15 V I _C = 40 A	-	343	-	
Rise Time	t _r	R _G = 6 Ω Τ _J = 175°C	-	64.7	-	
Fall Time	t _f		-	233	-	
Turn–On Switching Loss	E _{on}		-	5.45	-	mJ
Turn–Off Switching Loss	E _{off}		-	3.04	-	
Total Switching Loss	E _{ts}		-	8.49	-	

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.

TYPICAL CHARACTERISTICS







Figure 3. Output Characteristics



Figure 5. Saturation Characteristics







Figure 4. Transfer Characteristics



gure 6. Saturation Voltage vs. Junctic Temperature

TYPICAL CHARACTERISTICS











Figure 9. Switching Time vs Gate Resistance



Figure 11. Switching Loss vs Gate Resistance



Figure 10. Switching Time vs Gate Resistance



Figure 12. Switching Loss vs Gate Resistance

TYPICAL CHARACTERISTICS







TO-247-4LD CASE 340CJ **ISSUE A**

DATE 16 SEP 2019

NOM

5.00

2.40

2.00

1.20

1.40

2.22

0.60

22.54

16.25

1.17

2.54 BSC

5.08 BSC

15.60

13.00

5.00

18.42

2.62

3.60

6.80

6.17

6.17

3.40

6.60

5.97

5.97

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Q

S

MAX

5.20

2.70

2.20

1.33

1.60

2.42

0.70

22.74

16.50

1.37

15.80

13.20

5.20

18.62

2.82

3.80

7.00 6.37

6.37



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