Field Stop Trench IGBT

50 A, 650 V

AFGHL50T65SQ

Using the novel field stop 4th generation high speed IGBT technology. AFGHL50T65SQ which is AEC Q101 qualified offers the optimum performance for both hard and soft switching topology in automotive application. It is a stand-alone IGBT.

Features

- AEC-Q101 Qualified
- Maximum Junction Temperature: $T_J = 175^{\circ}C$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)} = 1.6 \text{ V} (Typ.) @ I_C = 50 \text{ A}$
- 100% of the Parts are Tested for ILM (Note 2)
- Fast Switching
- Tight Parameter Distribution
- RoHS Compliant

Typical Applications

- Automotive HEV-EV Onboard Chargers
- Automotive HEV-EV DC-DC Converters
- Totem Pole Bridgeless PFC
- PTC

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-to-Emitter Voltage	V _{CES}	650	V
Gate-to-Emitter Voltage Transient Gate-to-Emitter Voltage	V _{GES}	±20 ±30	V
Collector Current (Note 1)	Ι _C	80 50	A
Pulsed Collector Current (Note 2)	I _{LM}	200	А
Pulsed Collector Current (Note 3)	I _{CM}	200	А
$\begin{array}{llllllllllllllllllllllllllllllllllll$	P _D	268 134	W
Operating Junction / Storage Temperature Range	T _J , T _{STG}	–55 to +175	°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	ΤL	300	°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. Value limit by bond wire

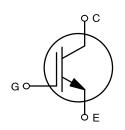
- 2. V_{CC} = 400 V, V_{GE} = 15 V, I_C = 200 A, R_G = 15 Ω , Inductive Load
- 3. Repetitive Rating: pulse width limited by max. Junction temperature



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50 A, 650 V V_{CESat} = 1.6 V





MARKING DIAGRAM



 &Z
 = Assembly Plant Code

 &3
 = 3-Digit Date Code

 &K
 = 2-Digit Lot Traceability Code

 AFGHL50T65SQ
 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
AFGHL50T65SQ	TO-247-3L	30 Units / Rail

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{ heta JC}$	0.56	°C/W
Thermal resistance junction-to-ambient	$R_{ hetaJA}$	40	°C/W

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

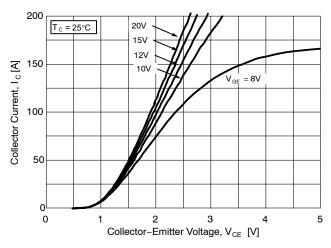
Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS	•					
Collector-emitter breakdown voltage, gate-emitter short-circuited	V _{GE} = 0 V, I _C = 1 mA	BV _{CES}	650	-	-	V
Temperature Coefficient of Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	ΔBV_{CES} ΔT_{J}	_	0.6	-	V/°C
Collector-emitter cut-off current, gate-emitter short-circuited	V _{GE} = 0 V, V _{CE} = 650 V	I _{CES}	-	-	250	μΑ
Gate leakage current, collector- emitter short-circuited	V _{GE} = 20 V, V _{CE} = 0 V	I _{GES}	_	-	±400	nA
ON CHARACTERISTICS						
Gate-emitter threshold voltage	$V_{GE} = V_{CE}$, $I_C = 50$ mA	V _{GE(th)}	3.4	4.9	6.4	V
Collector-emitter saturation voltage	V_{GE} = 15 V, I _C = 50 A V _{GE} = 15 V, I _C = 50 A, T _J = 175°C	V _{CE(sat)}	-	1.6 1.95	2.1	V
DYNAMIC CHARACTERISTICS						
Input capacitance	V _{CE} = 30 V,	Cies	-	3209	_	pF
Output capacitance	$V_{GE} = 0 V,$ f = 1 MHz	C _{oes}	-	42	-	
Reverse transfer capacitance	-	C _{res}	-	12	_	
Gate charge total	V _{CE} = 400 V,	Qg	-	99	-	nC
Gate-to-emitter charge	I _C = 50 A, V _{GE} = 15 V	Q _{ge}	-	17	-	
Gate-to-collector charge		Q _{gc}	-	23	-	
SWITCHING CHARACTERISTICS, INC	UCTIVE LOAD					
Turn-on delay time	$T_{\rm C} = 25^{\circ}{\rm C},$	t _{d(on)}	-	19	-	ns
Rise time	V _{CC} = 400 V, I _C = 25 A,	t _r	-	11	-	1
Turn-off delay time	R _G = 4.7 Ω, V _{GE} = 15 V,	t _{d(off)}	-	87	-	
Fall time	Inductive Load,	t _f	-	5	-	1
Turn-on switching loss	FWD: AFGHL50T65SQD	E _{on}	-	0.35	-	mJ
Turn-off switching loss		E _{off}	-	0.12	-	7
Total switching loss		E _{ts}	-	0.47	-	
Turn-on delay time	T _C = 25°C,	t _{d(on)}	-	20	-	ns
Rise time	$V_{CC} = 400 \text{ V}, \\ I_{C} = 50 \text{ A}, \\ R_{G} = 4.7 \Omega, \\ V_{GE} = 15 \text{ V}, \\ Inductive Load, \\ FWD: AFGHL50T65SQD$	t _r	-	28	-	
Turn-off delay time		t _{d(off)}	-	81	-	1
Fall time		t _f	-	36	_	1
Turn-on switching loss		E _{on}	_	0.95	_	mJ
Turn-off switching loss		E _{off}	_	0.46	_	1
Total switching loss	1	E _{ts}	-	1.41	-	1

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

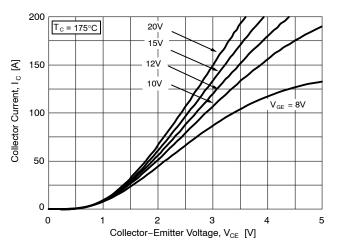
Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Turn-on delay time	$T_{J} = 175^{\circ}C,$	t _{d(on)}	-	18	-	ns
Rise time	$V_{CC} = 400 \text{ V},$ $I_C = 25 \text{ A},$	t _r	-	14	-	
Turn-off delay time	R _G = 4.7 Ω, V _{GE} = 15 V,	t _{d(off)}	-	99	-	
Fall time	Inductive Load, FWD: AFGHL50T65SQD	t _f	-	7	-	
Turn-on switching loss	TWD. AFGHESOTOSSQD	Eon	-	0.66	-	mJ
Turn-off switching loss		E _{off}	-	0.3	-	
Total switching loss		E _{ts}	-	0.96	-	
Turn-on delay time	$T_{\rm J} = 175^{\circ}{\rm C},$	t _{d(on)}	-	20	-	ns
Rise time	V _{CC} = 400 V, I _C = 50 A,	t _r	-	29	-	
Turn-off delay time	R _G = 4.7 Ω, V _{GE} = 15 V,	t _{d(off)}	-	88	-	
Fall time	Inductive Load, FWD: AFGHL50T65SQD	t _f	-	46	-	
Turn-on switching loss	TWD. AFGHESOTOSSQD	Eon	-	1.42	-	mJ
Turn-off switching loss		E _{off}	-	0.65	-	1
Total switching loss		E _{ts}	-	2.07	-	1

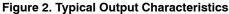
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

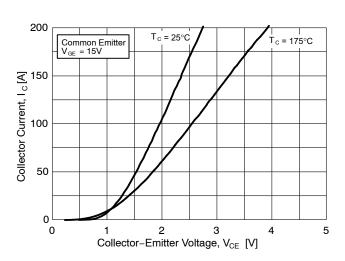
TYPICAL CHARACTERISTICS













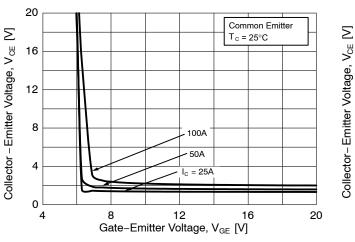


Figure 5. Saturation Voltage vs. V_{GE}

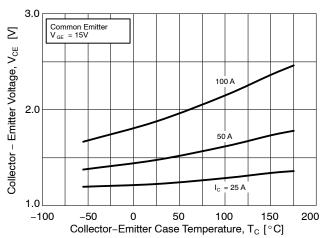


Figure 4. Saturation Voltage vs. Case Temperature

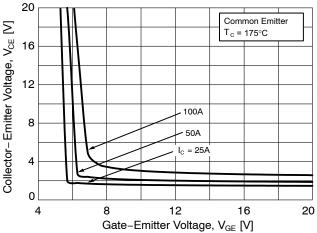
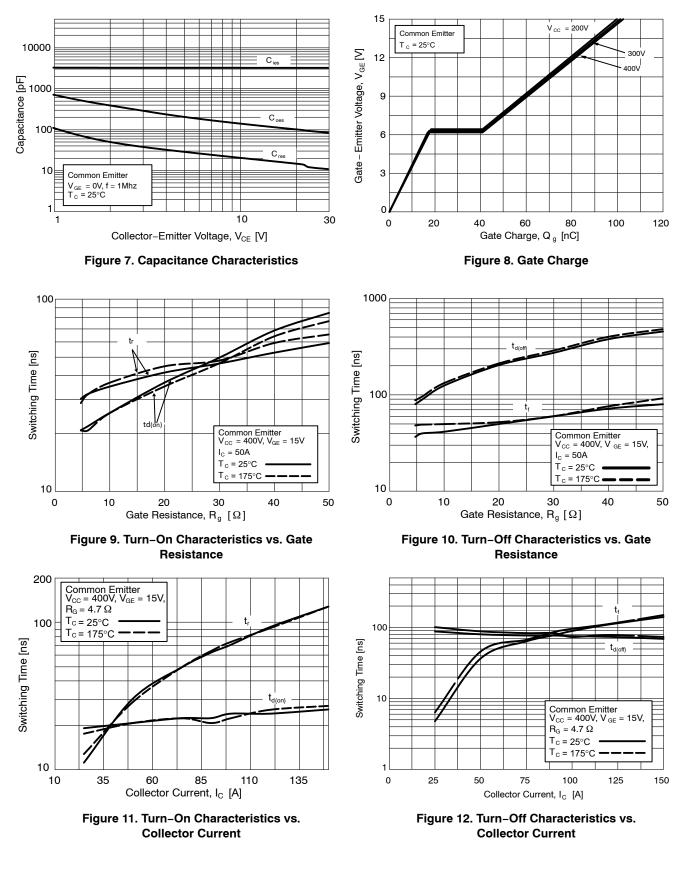
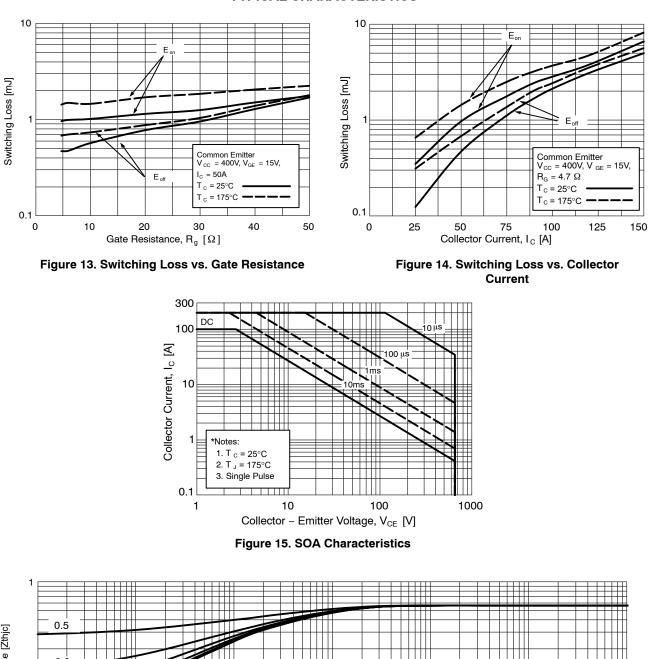


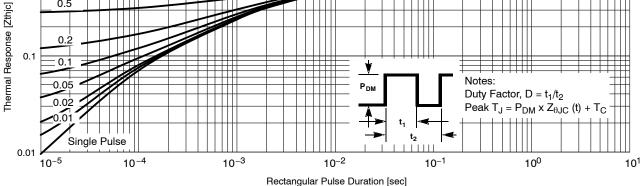
Figure 6. Saturation Voltage vs. V_{GE}

TYPICAL CHARACTERISTICS



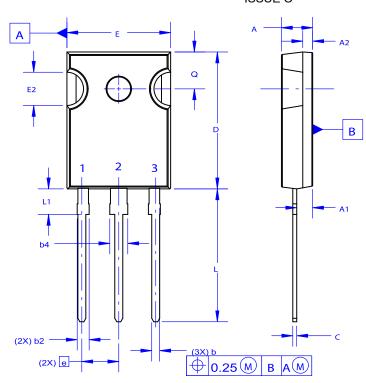
TYPICAL CHARACTERISTICS





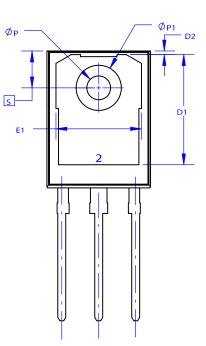


TO-247-3LD CASE 340CX ISSUE O



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD
- FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.



	MILLIMETERS			
DIM	MIN	NOM	MAX	
Α	4.58	4.70	4.82	
A 1	2.20	2.40	2.60	
A2	1.40	1.50	1.60	
D	20.32	20.57	20.82	
Е	15.37	15.62	15.87	
E2	4.96	5.08	5.20	
е	~	5.56	~	
L	19.75	20.00	20.25	
L1	3.69	3.81	3.93	
ØР	3.51	3.58	3.65	
Q	5.34	5.46	5.58	
S	5.34	5.46	5.58	
b	1.17	1.26	1.35	
b2	1.53	1.65	1.77	
b4	2.42	2.54	2.66	
С	0.51	0.61	0.71	
D1	13.08	~	~	
D2	0.51	0.93	1.35	
E1	12.81	~	~	
Ø P 1	6.60	6.80	7.00	

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