IGBT for Automotive Applications

650 V, 30 A

AFGB30T65RQDN

BV_{CES}	$V_{CE(sat)}$ TYP	I_C
650 V		30 A

Using novel field stop IGBT technology, **onsemi**'s new series of FS4 IGBTs offer the optimum performance for automotive applications. This technology is Short circuit rated and offers high figure of merit with low conduction and switching losses.

Features

- Maximum Junction Temperature: T_J = 175°C
- Positive Temperature Coefficient for Easy Parallel Operation
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)}$ = 1.58 V (Typ.) @ I_C = 30 A
- 100% of the Parts Tested for ILM (Note 2)
- High Input Impedance
- Fast Switching
- Tightened Parameter Distribution
- This Device is Pb−Free and RoHS Compliant
- AEC−Q101 Qualified

Typical Applications

- E−compressor for HEV/EV
- PTC Heater for HEV/EV

ORDERING INFORMATION

Device	Package	Shipping†
AFGB30T65RQDN	D2PAK (TO−263)	800 Units /

MAXIMUM RATINGS (T_C = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Collector to Emitter Voltage	V_{CES}	650	V
Gate to Emitter Voltage Transient Gate to Emitter Voltage T_{pulse} = 5 μs, D < 0.10	V_{GES}	±20 ±30	V
Collector Current (Note 1) @T_C = 25°C @T_C = 100°C	I_C	 68 30	A
Pulsed Collector Current (Note 2)	I_{LM}	120	A
Pulsed Collector Current (Note 3)	I_{CM}	120	A
Diode Forward Current (Note 1) @T_C = 25°C @T_C = 100°C	I_F	 68 30	A
Pulsed Diode Maximum Forward Current	I_{FM}	120	A
Non−Repetitive Forward Surge Current (Half−Sine Pulse, tp = 8.3 ms, T_C = 25°C) (Half−Sine Pulse, tp = 8.3 ms, T_C = 150°C)	$I_{F, SM}$	 140 100	A
Short Circuit Withstand Time V_{GE} = 15 V, V_{CC} = 400 V, T_C = 150°C	T_{SC}	 5	μs
Maximum Power Dissipation @T_C = 25°C @T_C = 100°C	P_D	 235.48 117.74	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	−55 to +175	°C
Maximum Lead Temp. for Soldering Purposes, 1/8″ from case for 5 seconds	T_L	265	°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 limited by bond wire.
2. V_{CC} = 400 V, V_{GE} = 15 V, I_C = 90 A, R_G = 100 Ω, Inductive Load, 100% Tested.
3. Repetitive rating: pulse width limited by max. Junction temperature.

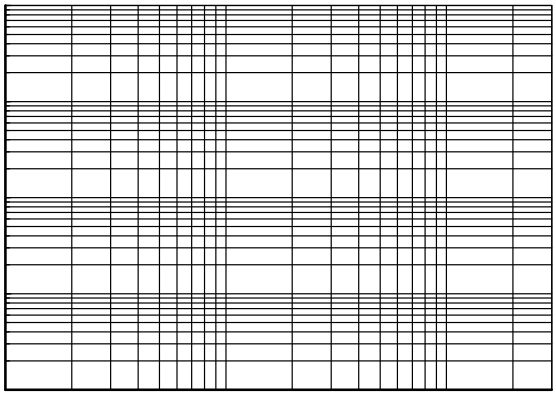
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance Junction−to−Case, for IGBT	$R_{θJC}$	−	0.49	0.64	°C/W
Thermal Resistance Junction−to−Case, for Diode	$R_{θJC}$	−	0.97	1.26	
Thermal Resistance Junction−to−Ambient	$R_{θJA}$	−	−	40	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector−to−Emitter Breakdown Voltage, Gate−Emitter Short−Circuited	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA	650	−	−	V
Temperature Coefficient of Breakdown Voltage	$\Delta BV_{CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 1 mA	−	0.61	−	V/°C
Collector−Emitter Cut−Off Current, Gate−Emitter Short−Circuited	I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0 V	−	−	30	μA
Gate Leakage Current, Collector−Emitter Short−Circuited	I_{GES}	V_{GE} = V_{GES}, V_{CE} = 0 V	−	−	±400	nA
ON CHARACTERISTICS						
Gate−Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 30 mA	4.30	5.30	6.30	V
Collector−Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 30 A, V_{GE} = 15 V, T_J = 25°C	−	1.58	1.82	V
		I_C = 30 A, V_{GE} = 15 V, T_J = 175°C	−	1.94	−	V
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	−	1580	−	pF
Output Capacitance	C_{oes}		−	54	−	
Reverse Transfer Capacitance	C_{res}		−	7	−	
Gate Resistance	R_g	FREQ = 1 MHz	−	15	−	Ω
Gate Charge Total	Q_g	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V	−	38	−	nC
Gate–Emitter Charge	Q_{ge}		−	13	−	
Gate–Collector Charge	Q_{gc}		−	11	−	
SWITCHING CHARACTERISTICS, INDUCTIVE LOAD						
Turn−On Delay Time	$t_{d(on)}$	T_J = 25°C, V_{CC} = 400 V, I_C = 15 A, R_g = 2.5 Ω, V_{GE} = 15 V, Inductive Load	–	20	–	ns
Rise Time	t_r		–	18	–	
Turn-Off Delay Time	$t_{d(off)}$		–	60	–	
Fall Time	t_f		–	92	–	
Turn-On Switching Loss	E_{on}		–	0.34	–	mJ
Turn−Off Switching Loss	E_{off}		–	0.32	–	
Total Switching Loss	E_{ts}		–	0.66	–	
Turn-On Delay Time	$t_{d(on)}$	T_J = 25°C, V_{CC} = 400 V, I_C = 30 A, R_g = 2.5 Ω, V_{GE} = 15 V, Inductive Load	–	18	–	ns
Rise Time	t_r		–	37	–	
Turn-Off Delay Time	$t_{d(off)}$		–	48	–	
Fall Time	t_f		–	75	–	
Turn-On Switching Loss	E_{on}		–	0.78	–	mJ
Turn−Off Switching Loss	E_{off}		–	0.56	–	
Total Switching Loss	E_{ts}		–	1.34	–	
Turn−On Delay Time	$t_{d(on)}$	T_J = 175°C, V_{CC} = 400 V, I_C = 15 A, R_g = 2.5 Ω, V_{GE} = 15 V, Inductive Load	–	20	–	ns
Rise Time	t_r		–	24	–	
Turn-Off Delay Time	$t_{d(off)}$					

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Continued)

SCALE 1:1

D^2PAK-3 (TO−263, 3−LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021