

Field Stop Trench IGBT

650 V, 75 A

AFGHL75T65SQD

Using the novel field stop 4th generation high speed IGBT technology. AFGHL75T65SQD which is AEC Q101 qualified offers the optimum performance for both hard and soft switching topology in automotive application.

Features

- AEC-Q101 Qualified
- Maximum Junction Temperature: $T_J = 175^{\circ}\text{C}$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)} = 1.6\text{ V (Typ.) @ } I_C = 75\text{ A}$
- 100% of the Parts are Tested for I_{LM} (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

MAXIMUM RATINGS

Rating	Symbol	Value
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THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{\theta JC}$	0.4	$^{\circ}\text{C}/\text{W}$
Thermal resistance junction-to-case, for Diode	$R_{\theta JC}$	0.65	$^{\circ}\text{C}/\text{W}$
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-emitter breakdown voltage, gate-emitter short-circuited	$V_{GE} = 0\text{ V},$ $I_C = 1\text{ mA}$	BV_{CES}	650	-	-	V
Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V},$ $I_C = 1\text{ mA}$	$\frac{\Delta BV_{CES}}{\Delta T_J}$	-	0.6	-	$\text{V}/^{\circ}\text{C}$
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V},$ $V_{CE} = 650\text{ V}$	I_{CES}	-	-	250	μA
Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V},$ $V_{CE} = 0\text{ V}$	I_{GES}	-	-	± 400	nA

ON CHARACTERISTICS

Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 75\text{ mA}$	$V_{GE(th)}$	3.4	4.9	6.4	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 175^{\circ}\text{C}$	$V_{CE(sat)}$	-	1.6	2.1	V
			-	1.95	-	

DYNAMIC CHARACTERISTICS

Input capacitance	$V_{CE} = 30\text{ V},$ $V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$	C_{ies}	-	4617	-	pF
Output capacitance		C_{oes}	-	152	-	
Reverse transfer capacitance		C_{res}	-	13	-	
Gate charge total	$V_{CE} = 400\text{ V},$ $I_C = 75\text{ A},$ $V_{GE} = 15\text{ V}$	Q_g	-	136	-	nC
Gate-to-emitter charge		Q_{ge}	-	25	-	
Gate-to-collector charge		Q_{gc}	-	32	-	

SWITCHING CHARACTERISTICS, INDUCTIVE LOAD

Turn-on delay time	$T_C = 25^{\circ}\text{C},$ $V_{CC} = 400\text{ V},$ $I_C = 37.5\text{ A},$ $R_G = 4.7\ \Omega,$ $V_{GE} = 15\text{ V},$ Inductive Load	$t_{d(on)}$	-	23	-	ns	
Rise time		t_r	-	17	-		
Turn-off delay time		$t_{d(off)}$	-	112	-		
Fall time			t_f	-	8	-	
Turn-on switching loss			E_{on}	-	0.61	-	mJ
Turn-off switching loss			E_{off}	-	0.21	-	
Total switching loss			E_{ts}	-	0.82	-	
Turn-on delay time	$T_C = 25^{\circ}\text{C},$ $V_{CC} = 400\text{ V},$ $I_C = 75\text{ A},$ $R_G = 4.7\ \Omega,$ $V_{GE} = 15\text{ V},$ Inductive Load	$t_{d(on)}$	-	25	-	ns	
Rise time		t_r	-	46	-		
Turn-off delay time		$t_{d(off)}$	-	106	-		
Fall time			t_f	-	67	-	
Turn-on switching loss			E_{on}	-	1.86	-	mJ
Turn-off switching loss			E_{off}	-	1.13	-	
Total switching loss			E_{ts}	-	2.99	-	

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ELECTRICAL CHARACTERISTICS (T

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TYPICAL CHARACTERISTICS (CONTINUED)

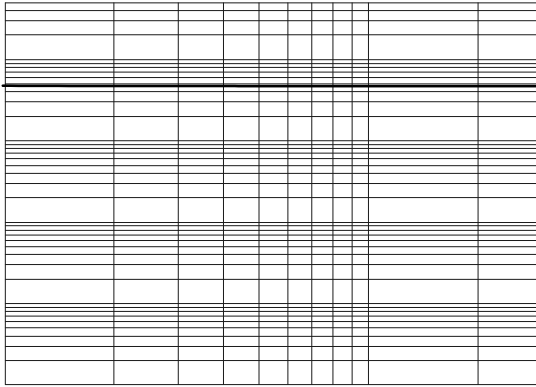


Figure 7. Capacitance Characteristics

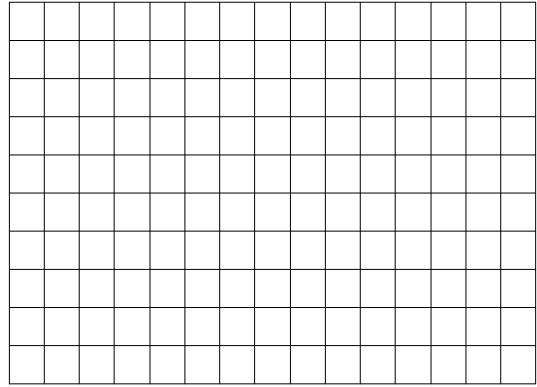


Figure 8. Gate Charge Characteristics

Figure 9. Turn-On Characteristics
vs. Gate Resistance

Figure 10. Turn-Off Characteristics
vs. Gate Resistance

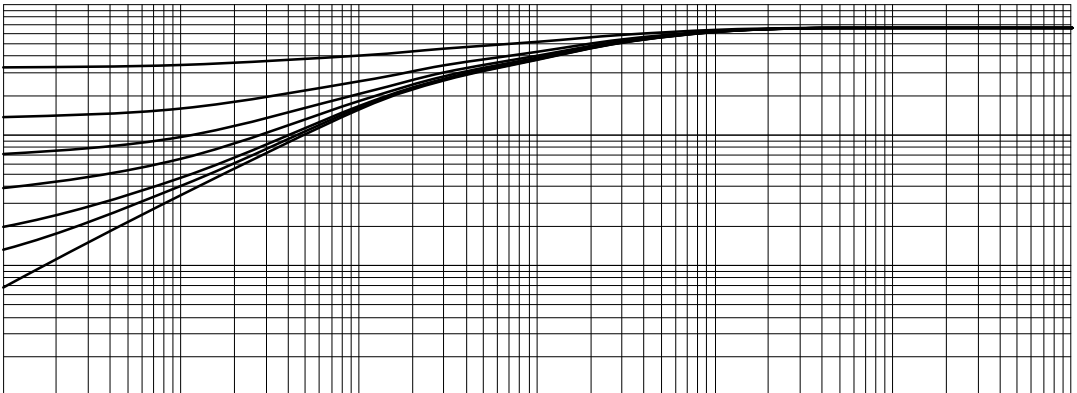
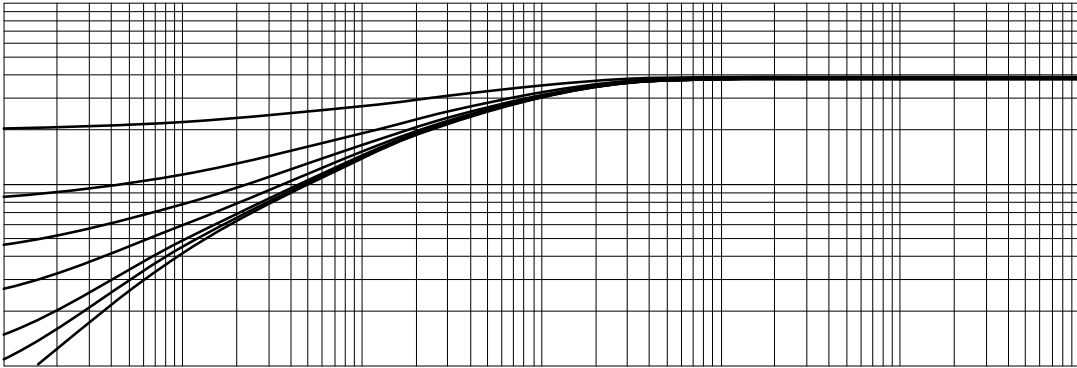
Figure 11. Turn-On Characteristics
vs. Collector Current

Figure 12. Turn-Off Characteristics
vs. Collector Current

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TYPICAL CHARACTERISTICS (CONTINUED)

Figure 19. Stored Charge



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