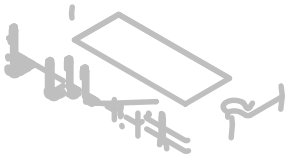
B C S a



May, 2021 − Rev. 0
Publication Order Number:
FAM65CR51AXZ1/D

ORDERING INFORMATION

Part Number	Package	Lead Forming	DBC Material	Pb−Free and RoHS Compliant	Operating Temperature (T_A)	Packing Method
FAM65CR51AXZ1	APM16−CDA	Y−Shape	ALN	Yes	−40°C ~ 125°C	Tube
FAM65CR51AXZ2	APM16−CDB	L−Shape	ALN	Yes	−40°C ~ 125°C	Tube

Pin Configuration and Description

Figure 1. Pin Configuration

Table 1. PIN DESCRIPTION

Pin Number	Pin Name	Pin Description
1, 2	AC1	Phase 1 Leg of the PFC Bridge
3	NC	Not Connected
4	NC	Not Connected
5, 6	B+	Positive Battery Terminal
7, 8	Q1 Source	Source Terminal of Q1
9	Q1 Gate	Gate Terminal of Q1
10	Q2 Gate	Gate Terminal of Q2
11, 12	Q2 Source	Source Terminal of Q2
13	NC	Not Connected
14	NC	Not Connected
15, 16	AC2	Phase 2 Leg of the PFC Bridge

INTERNAL EQUIVALENT CIRCUIT

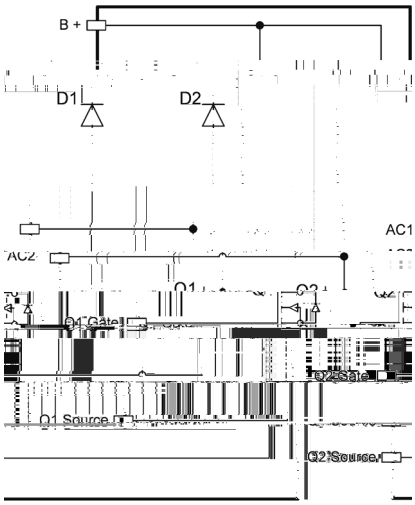


Figure 2. Internal Block Diagram

Table 2. ABSOLUTE MAXIMUM RATINGS OF MOSFET (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Max	Unit
V_{DS} (Q1~Q2)	Drain−to−		

Table 3. ELECTRICAL SPECIFICATIONS OF MOSFET (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain−to−					

Table 4. ABSOLUTE MAXIMUM RATINGS OF THE BOOST DIODE (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Rating	Unit
V_{RRM}	Peak Repetitive Reverse Voltage (Note 4)	650	V
E_{AS}	Avalanche Energy (17 A, 1 mH)	144	mJ
I_F	Continuous Rectified Forward Current, T_C < 148°C	30	A
$I_{F,MAX}$	Non−Repetitive Forward Surge Current, T_C = 25°C, 10 μs	1100	A
$I_{F,MAX}$	Non−Repetitive Forward Surge Current, T_C = 150°C, 10 μs	1000	A
I_{FSM}	Non−Repetitive Peak Surge Current (Sine Half Wave, Tp = 8.3 ms)	110	A
P_D	Power Dissipation (T_C = 25°C)	166	W
T_J	Maximum Junction Temperature	−55 to +175	°C
T_C	Maximum Case Temperature	−40 to +125	°C
T_{STG}	Storage Temperature	−40 to +125	°C

4. V_{RRM} and I_F value referenced to TO220−2L Auto Qualified Package Device FFSP3065B_F085

Table 5. ELECTRICAL SPECIFICATIONS OF THE BOOST DIODE (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{DC}	DC Blocking Voltage	I_R = 200 μA	T_C = 25°C	650	−	−	V
V_F	Instantaneous Forward Voltage	I_F = 30 A	T_C = 25°C	−	1.38	1.7	V
			T_C = 125°C	−	1.6	2.0	V
			T_C = 175°C	−	1.72	2.4	V
I_R	Instantaneous Reverse Current	V_R = 650 V	T_C = 25°C	−	0.5	40	μA
			T_C = 125°C	−	1.0	80	μA
			T_C = 175°C	−	2.0	160	μA
Q_C	Total Capacitive Charge	V_R = 400 V	T_C = 25°C	−	43	−	nC
C	Total Capacitance	V_R = 1 V	f = 100 kHz		1280		pF
		V_R = 200 V	f = 100 kHz		139		
		V_R = 400 V	f = 100 kHz		108		

Table 6. THERMAL RESISTANCE

Parameters		Min	Typ	Max	Unit
$R_{\theta JC}$ (per MOSFET chip)	Q1,Q2 Thermal Resistance Junction−to−Case (Note 5)	−	0.19	0.27	°C/W
$R_{\theta JS}$					

PARAMETER DEFINITIONS

BV_{DSS}	Q1, Q2 MOSFET Drain−to−Source Breakdown Voltage The maximum drain−to−source voltage the MOSFET can endure without the avalanche breakdown of the body− drain P−N junction in off state. The measurement conditions are to be found in Table 3. The typ. Temperature behavior is described in Figure 13
$V_{GS(th)}$	Q1, Q2 MOSFET Gate to Source Threshold Voltage The gate−to−source voltage measurement is triggered by a threshold ID current given in conditions at Table 4. The typ. Temperature behavior can be found in Figure 10
$R_{DS(ON)}$	Q1, Q2 MOSFET On Resistance $R_{DS(on)}$ is the total resistance between the source and the drain during the on state. The measurement conditions are to be found in Table 3. The typ behavior can be found in Figure 11 and Figure 12 as well as Figure 17
g_{FS}	Q1, Q2 MOSFET Forward Transconductance

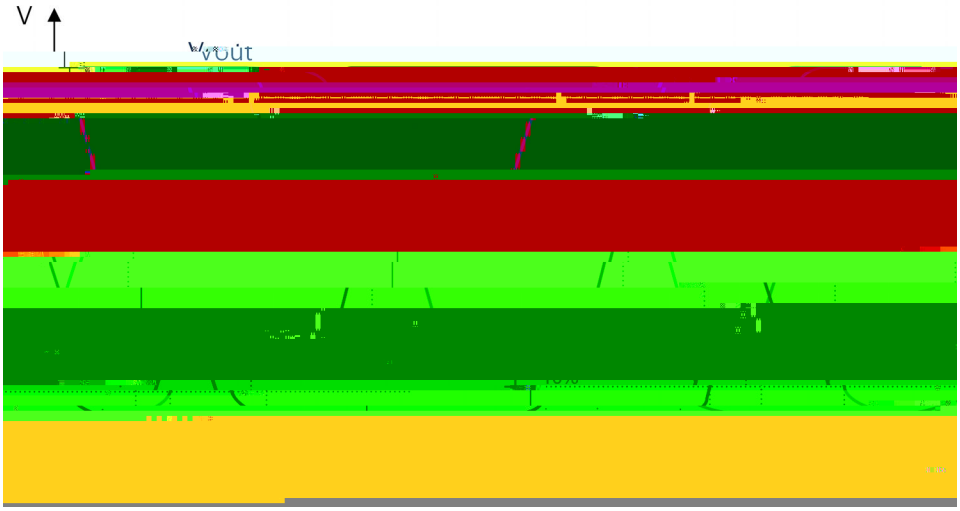


Figure 3. Timing Measurement Variable Definition

Table 8. PARAMETER OF SWITCHING CHARACTERISTICS

Turn−On Delay ($t_{d(on)}$)	This is the time needed to charge the input capacitance, Ciss, before the load current ID starts flowing. The measurement conditions are described in the Table 3. For signal definition please check Figure 3 above.
Rise Time (t_r)	The rise time is the time to discharge output capacitance, Coss. After that time the MOSFET conducts the given load current ID. The measurement conditions are described in the Table 3. For signal definition please check Figure 3 above.
Turn−On Time (t_{on})	

TYPICAL CHARACTERISTICS − MOSFETs

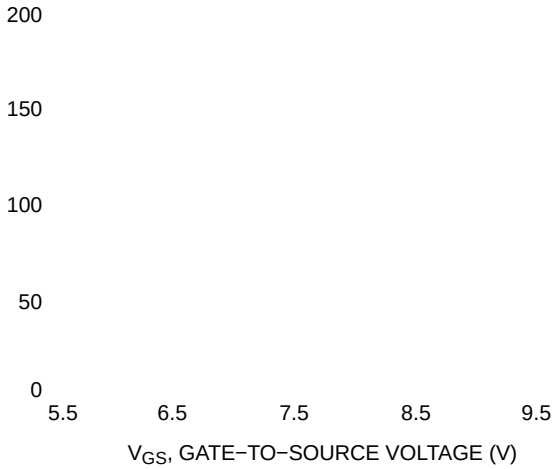


Figure 10. On−Resistance vs. Gate−to−Source Voltage

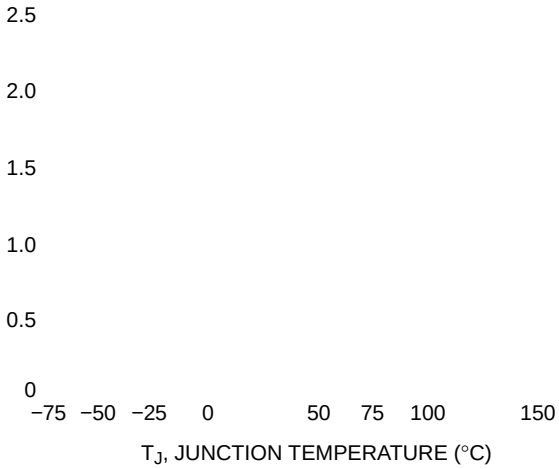


Figure 11. $R_{DS(norm)}$ vs. Junction Temperature

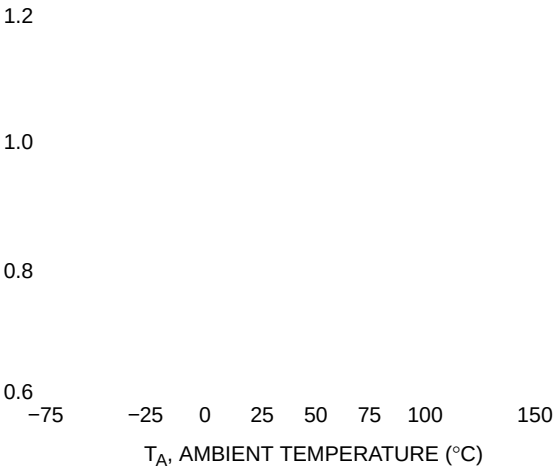


Figure 12. Normalized Gate Threshold Voltage vs. Temperature

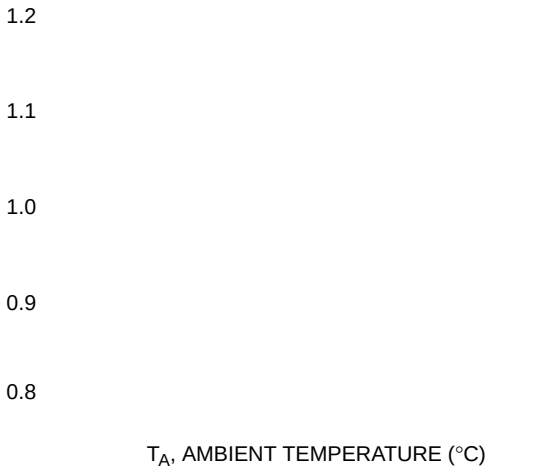
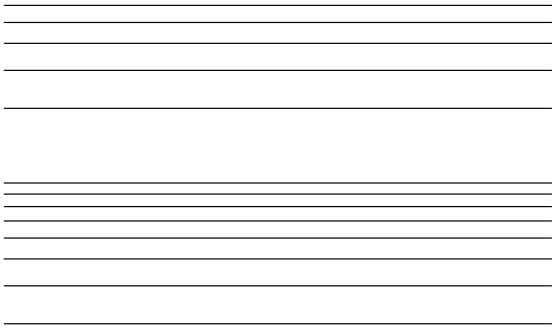
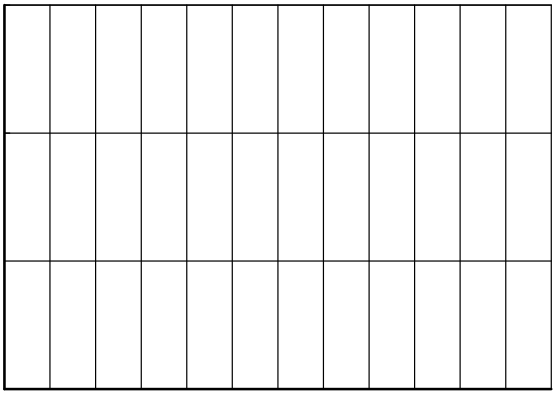


Figure 13. Normalized Breakdown Voltage vs. Temperature

TYPICAL CHARACTERISTICS − DIODES



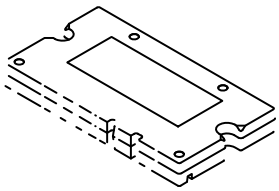


APMCD−A16 / 12LD, AUTOMOTIVE MODULE

1. DIMENSIONING

SION: MILLIMETERS

GENERIC
MARKING DIAGRAM*



APMCD−B16 / 12LD, AUTOMOTIVE MODULE
CASE MODGK
ISSUE D

DATE 04 NOV 2021

GENERIC
MARKING DIAGRAM*

XXXX = Specific Device Code
ZZZ = Lot ID
AT = Assembly & Test Location
Y = Year
W = Work Week
NNN = Serial Number

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.