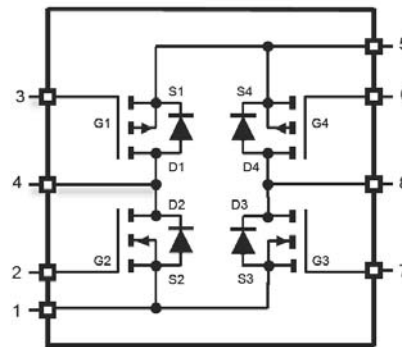
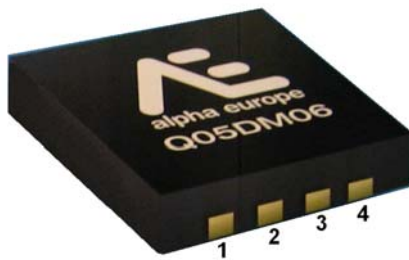


### 1 Description

Q05DM06 is the first product in alpha europe's new H-bridge driver-family. It is using one of the latest state-of-the-art trench technologies to achieve ultra low resistance  $R_{DS(on)}$  for the power MOSFETs. The complementary H-bridge is built of 2 PMOS/NMOS transistor pairs. Based on this trench-technology - the input gate capacity is very low, so high switching frequencies are possible for using in different applications. With this technical performance above and the high density of power integration in a SOT8 pad compatible DFN8 package - it makes the Q05DM06 as an ideal choice for a wide spread of high efficiency application in motor driving, lighting and power management.

### 2 Features

- Complementary N/P-MOS H-Bridge
- Wide power supply range 5V-60V
- 60V/5.1A/  $R_{DS(on)} = 34m\Omega$ (typ)  
-60V/-4.2A/  $R_{DS(on)} = 54m\Omega$ (typ)
- Low QG of 9.86/12.6nC for PMOS/NMOS  
Low CISS of 1447pF/1378pF for PMOS/NMOS
- Low voltage gate drive  $V_{GS} = \pm 20V$
- RoHS compliant and green product
- Temperature Range -55C...+150C
- DFN8L 5x6x0.75 mm



### 3 Absolute Maximum Ratings

Symbol	Parameter	AEQ05DM06AV-XXU0		Units
		DFN5*6		
		N-Ch	P-Ch	
$V_{DS}$	Drain-Source Voltage	60	-60	V
$I_D$	Drain Current - Continuous @ $V_{GS}=10V^1$ , $T_C=25^\circ C$ - Continuous @ $V_{GS}=10V^1$ , $T_C=70^\circ C$	5.1	-4.2	A
		4.2	-3.5	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	15	-12	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$P_D$	Power Dissipation <sup>4</sup> ( $T_C= 25^\circ C$ )	2.2	2.2	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$



# DEVICE SPECIFICATION

AEQ05DM06AV

N/P-MOS H-BRIDGE

## 4 Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	---	328.15	K/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	277.15	K/W

## 5 N-Channel Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	---	0.063	---	$V/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=48V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=48V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.24	---	$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=5A$	---	34	40	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=4A$	---	37	48	
gfs	Forward Transconductance	$V_{DS}=5V, I_D=4A$	---	21	---	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	1378	---	$\mu F$
$C_{oss}$	Output Capacitance		---	86	---	
$C_{rss}$	Reverse Transfer Capacitance		---	64	---	
<b>Switching Characteristics</b>						
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	3.2	6.4	$\Omega$
$Q_g$	Total Gate Charge (4.5V)	$V_{DS}=48V, V_{GS}=4.5V, I_D=4A$	---	12.6	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.2	---	
$Q_{gd}$	Gate-Drain Charge		---	6.3	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=30V, V_{GS}=10V, R_G=3.3\Omega, I_D=4A$	---	8	---	ns
$T_r$	Rise Time		---	14.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	24.4	---	
$T_f$	Fall Time		---	4.6	---	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V, \text{Force Current}$	---	---	5.1	A
$I_{SM}$	Pulsed Source Current <sup>2,4</sup>		---	---	12	A



# DEVICE SPECIFICATION

AEQ05DM06AV

## N/P-MOS H-BRIDGE

$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ C$	---	---	1.2	V
----------	------------------------------------	-------------------------------------	-----	-----	-----	---

**Note :**

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=22.6A$
- 4.The power dissipation is limited by 150<sup>o</sup>C junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

**P-Channel Electrical Characteristics**  $T_C = 25^\circ C$  unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	-60	---	---	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	BVDSS Temperature Coefficient	Reference to 25 <sup>o</sup> C , $I_D=-1mA$	---	-0.03	---	V/ <sup>o</sup> C
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	uA
		$V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.2	---	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.56	---	mV/ <sup>o</sup> C
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V, I_D=-4A$	---	54	70	m $\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	---	73	90	
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V, I_D=-3A$	---	15	---	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	---	1447	---	pF
$C_{oss}$	Output Capacitance		---	97.3	---	
$C_{riss}$	Reverse Transfer Capacitance		---	70	---	
<b>Switching Characteristics</b>						
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	13.5	27	$\Omega$
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-48V, V_{GS}=-4.5V, I_D=-3A$	---	9.86	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.08	---	
$Q_{gd}$	Gate-Drain Charge		---	2.95	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$	---	28.8	---	ns
$T_r$	Rise Time		---	19.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	60.8	---	
$T_f$	Fall Time		---	7.2	---	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G=V_D=0V, \text{Force Current}$	---	---	-4.2	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		---	---	-10.5	A



# DEVICE SPECIFICATION

AEQ05DM06AV

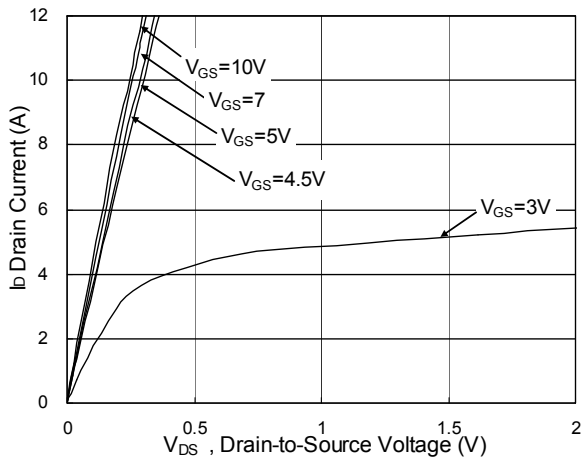
N/P-MOS H-BRIDGE

$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ C$	---	---	-1.2	V
----------	------------------------------------	-------------------------------------	-----	-----	------	---

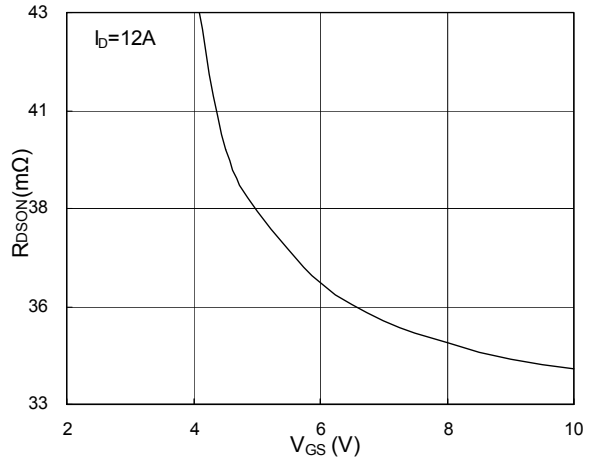
**Note :**

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-26.6A$
- 4.The power dissipation is limited by 150 $^\circ C$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

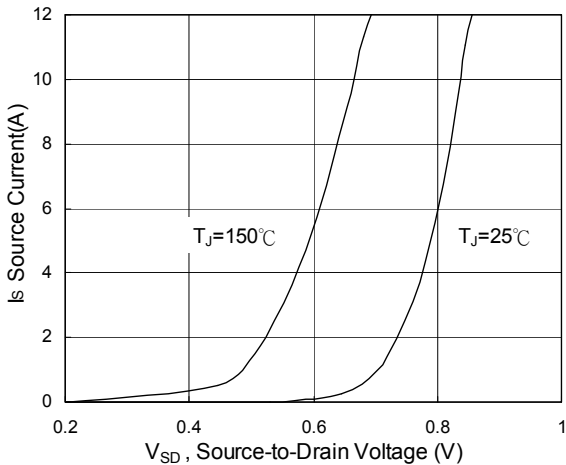
## 6. N-Channel Typical Characteristics



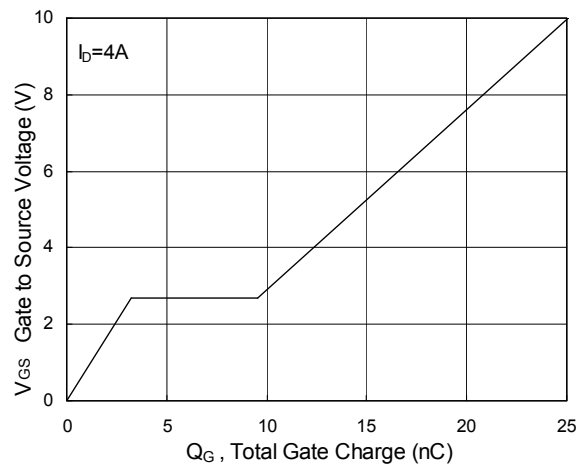
**Fig.1 Typical Output Characteristics**



**Fig.2 On-Resistance vs. Gate-Source Voltage**



**Fig.3 Forward Characteristics of reverse**



**Fig.4 Gate-Charge Characteristics**

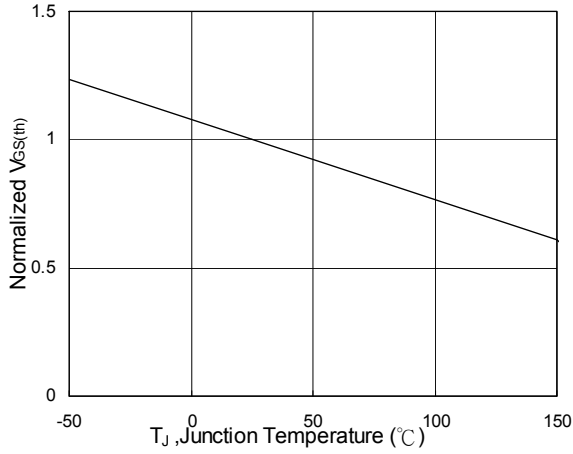


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

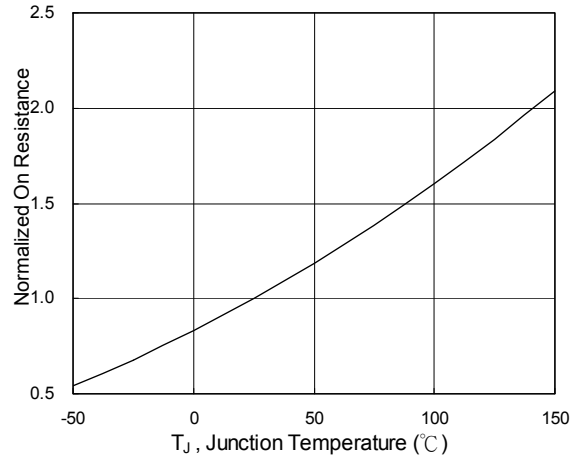


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

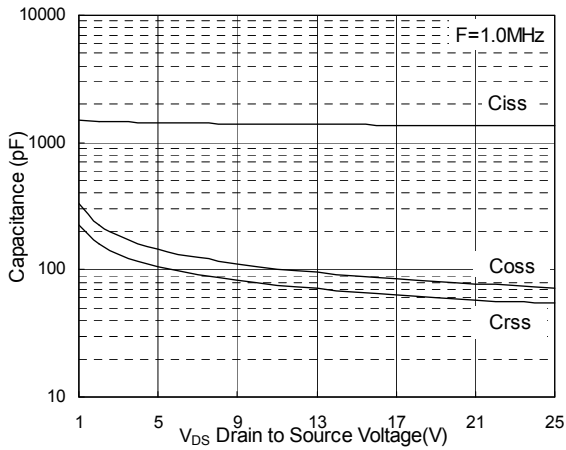


Fig.7 Capacitance

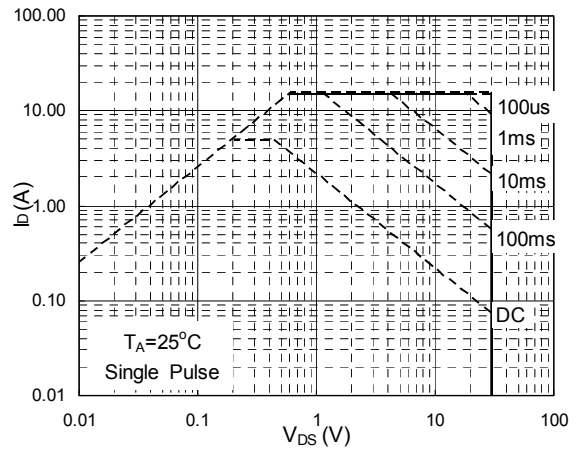


Fig.8 Safe Operating Area

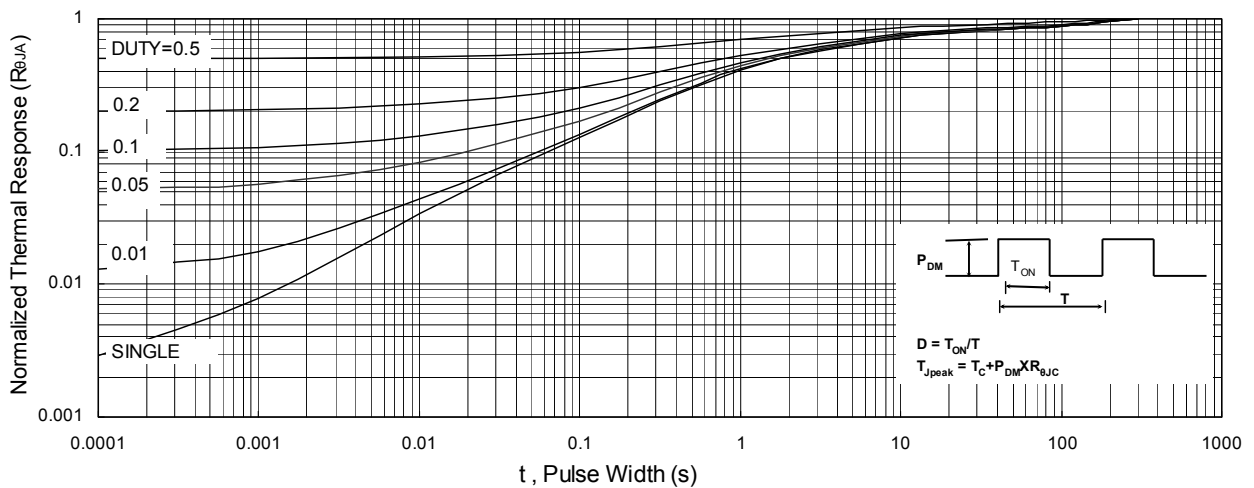


Fig.9 Normalized Maximum Transient Thermal Impedance

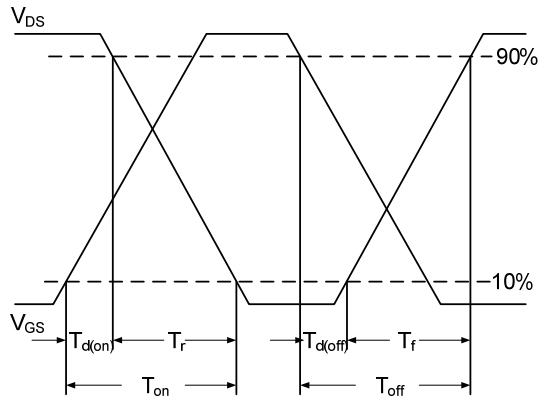


Fig.10 Switching Time Waveform

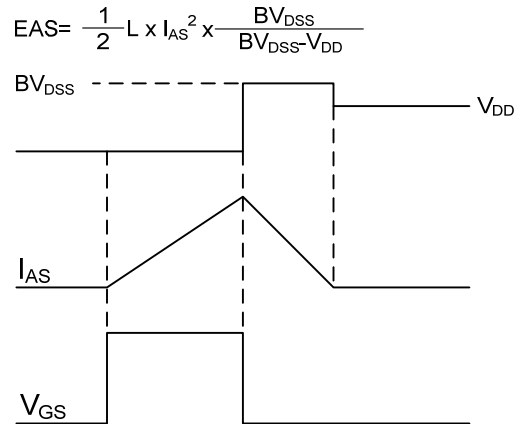


Fig.11 Unclamped Inductive Waveform

P-Channel Typical Characteristics

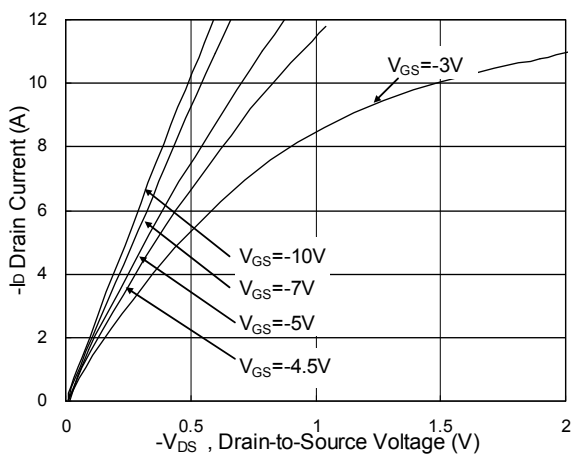


Fig.1 Typical Output Characteristics

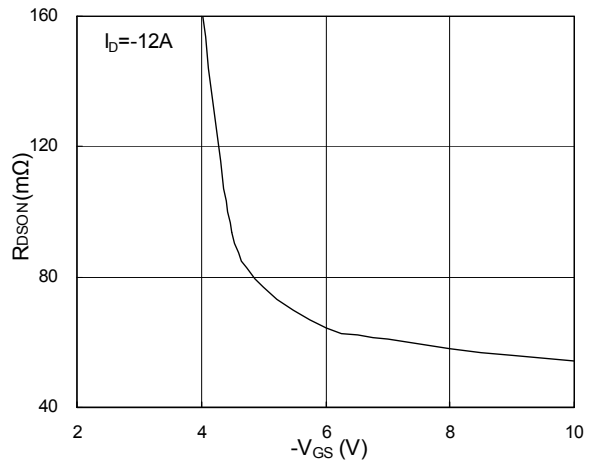


Fig.2 On-Resistance vs. Gate-Source Voltage

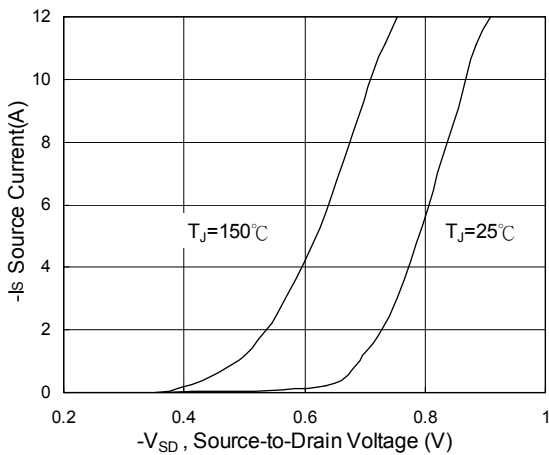


Fig.3 Forward Characteristics of reverse

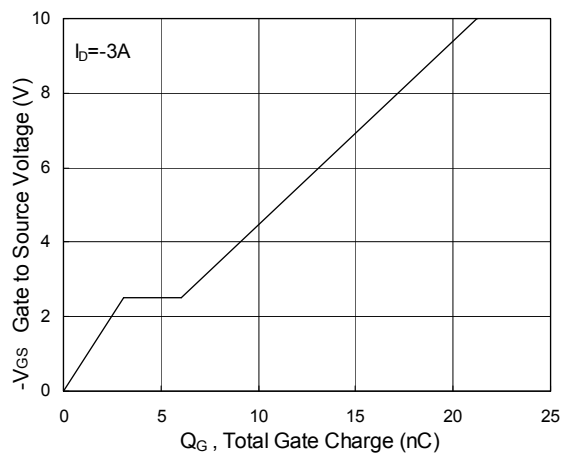


Fig.4 Gate-Charge Characteristics

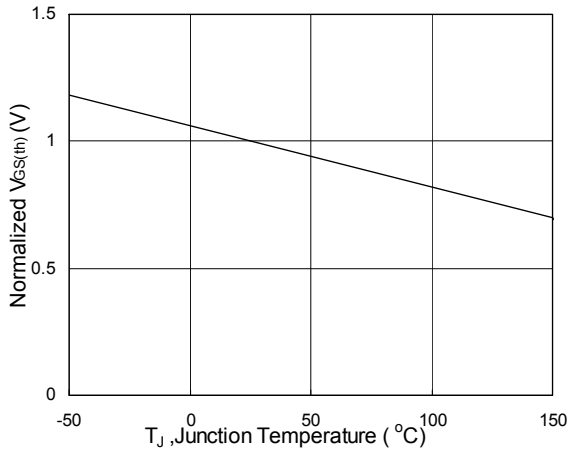


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

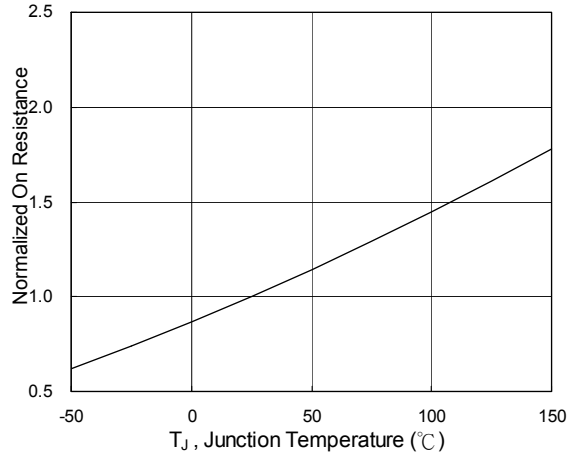


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

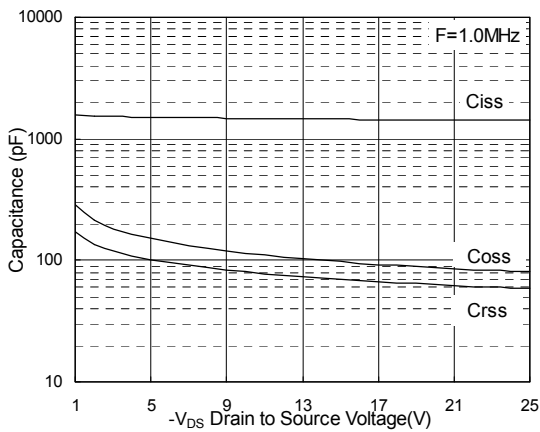


Fig.7 Capacitance

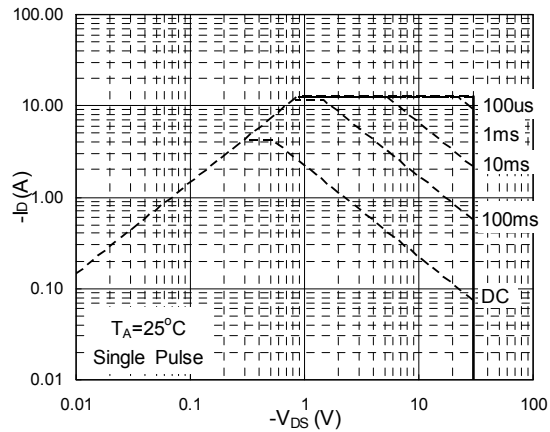


Fig.8 Safe Operating Area

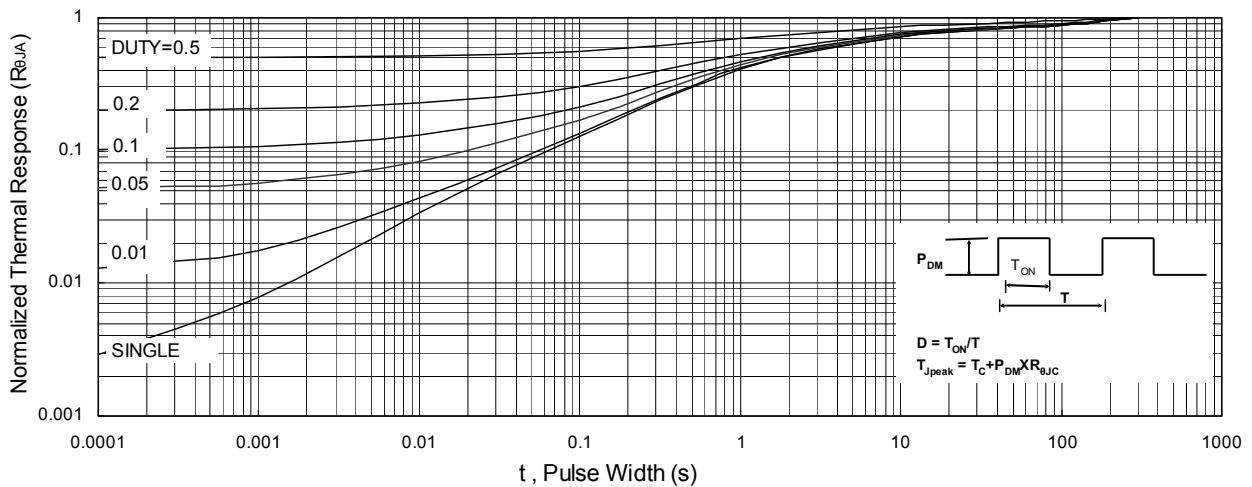


Fig.9 Normalized Maximum Transient Thermal Impedance

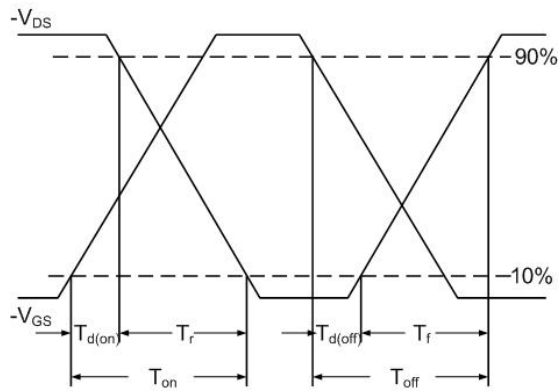


Fig.10 Switching Time Waveform

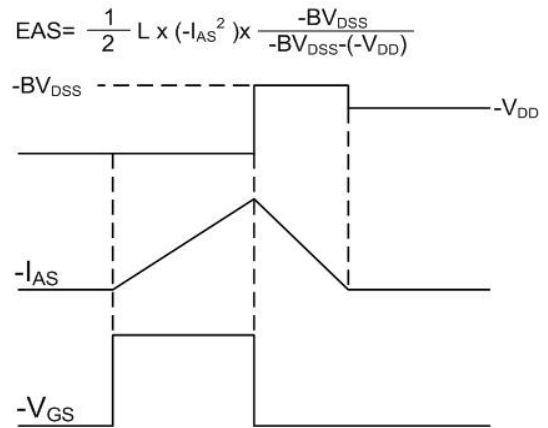
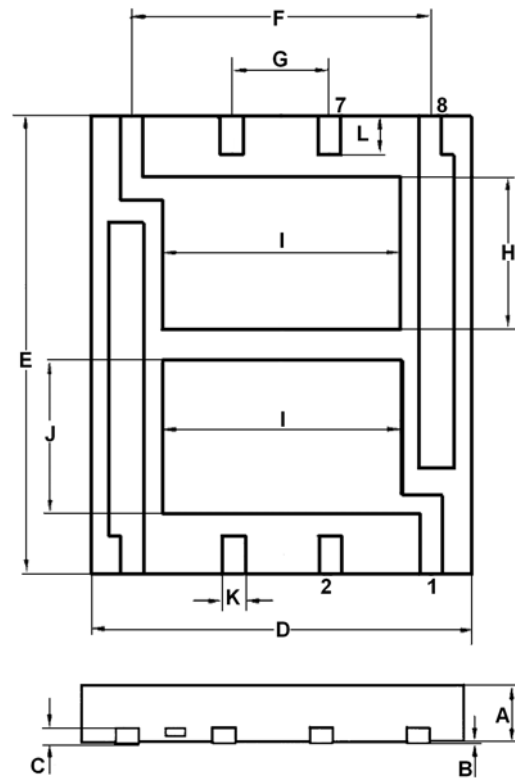


Fig.11 Unclamped Inductive Waveform

7. Package Dimensions

DFN5*6 DIMENSION			
DIM	MILLIMETERS		
	MIN	TYP	MAX.
A	0.70	0.75	0.80
B	--	0.02	0.05
C	0.18	0.20	0.25
E	5.90	6.00	6.10
F	3.81 BSC		
G	1.28 BSC		
H	1.90	2.0	2.10
I	3.02	3.12	3.22
J	1.90	2.0	2.10
K	0.30	0.325	0.35
L	0.49	0.50	0.55





## DEVICE SPECIFICATION

AEQ05DM06AV

N/P-MOS H-BRIDGE

### Note

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