P5MBG040

60V N+P Dual Channel MOSFETs

| BV$_{DSS}$	R$_{DS(ON)}$	I$_D$
60 V	40 mΩ	6.06 A
-60 V	70 mΩ	-4.58 A

General Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Features

· Fast switching
· Green Device Available
· Suit for 4.5V Gate Drive Applications

PPAK5X6 Dual Pin Configuration
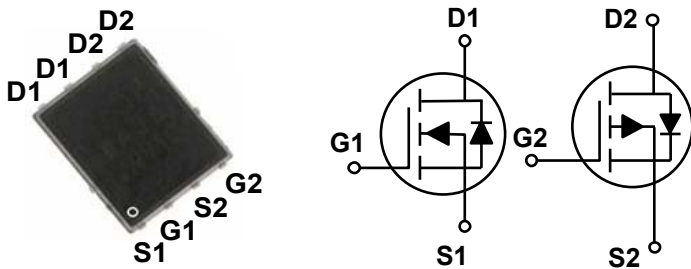
Applications

· Battery Protection
· Load switch
· Uninterruptible Power Supply

Absolute Maximum Ratings T$_C$=25°C unless otherwise noted

Symbol	Parameter	Rating		Units
V$_{DS}$	Drain-Source Voltage	60	-60	V
V$_{GS}$	Gate-Source Voltage	±20	±20	V
I$_D$	Drain Current - Continuous (T$_A$=25°C)	6.06	-4.58	A
I$_{DM}$	Drain Current - Pulsed (NOTE 1)	24	-18	A
EAS	Single Pulse Avalanche Energy (NOTE 2、6)	25.5	35.3	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	22.6	-26.6	A
P$_D$	Power Dissipation (T$_A$=25°C)	1.47		W
T$_J$	Operating Junction Temperature Range	-55 to 150		^{o}C
T$_{STG}$	Storage Temperature Range	-55 to 150		^{o}C
Marking Code		BG040		

Thermal Characteristics

Symbol	Parameter	Rating	Unit
R$_{θJA}$	Thermal Resistance Junction to Ambient	85	^{o}C/W

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N Channel Electrical Characteristics (T_J=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	60	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=48V , V_{GS}=0V	---	---	1	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=4A	---	---	40	mΩ
		V_{GS}=4.5V , I_D=2A	---	---	45	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS}, I_D=250uA	1.2	---	2.5	V
gfs	Forward Transconductance	V_{DS}=5V , I_D=4A	---	21	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge	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=3.3Ω , 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	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , F=1MHz	---	1378	---	pF
C_{oss}	Output Capacitance		---	86	---	
C_{rss}	Reverse Transfer Capacitance		---	64	---	
R_g	Gate Resistance	V_{GS}=0V , V_{DS}=0V , F=1MHz	---	3.2	---	Ω

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	4.8	A
I_{SM}	Pulsed Source Current		---	---	9.6	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=1A	---	---	1.2	V

NOTES：

1. Repetitive Rating：Pulsed width limited by maximum junction temperature.

2. V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=22.6A.

3. The data tested by pulsed, pulse width ≦ 300us, duty cycle ≦ 2%.

4. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.
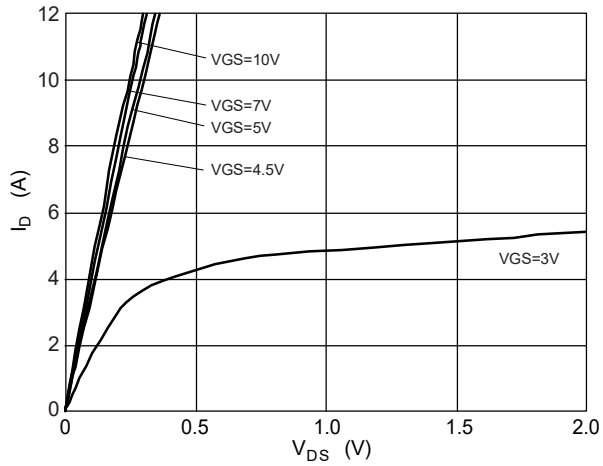
Characteristics Curves

FIG. 1-Output Characteristics
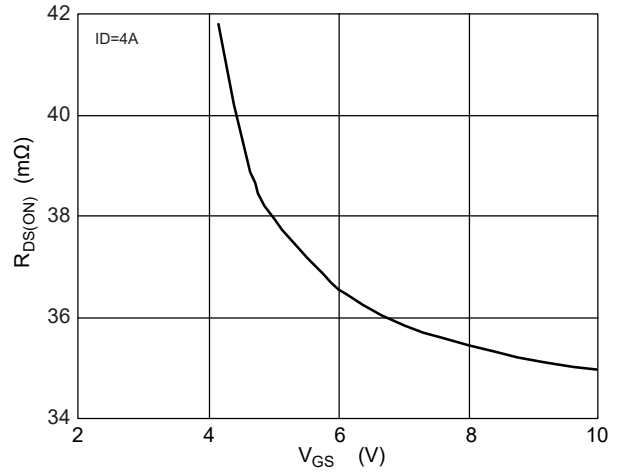
FIG. 2-$R_{DS(ON)}$ vs V_{GS}
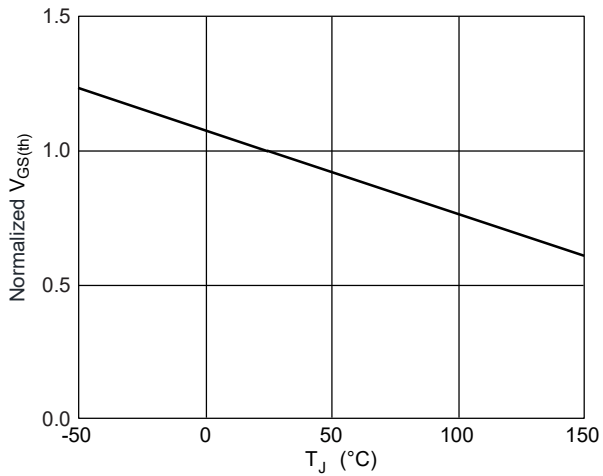
FIG. 3-Normalized V_{th} vs T_J

FIG. 4-Normalized $R_{DS(ON)}$ vs T_J

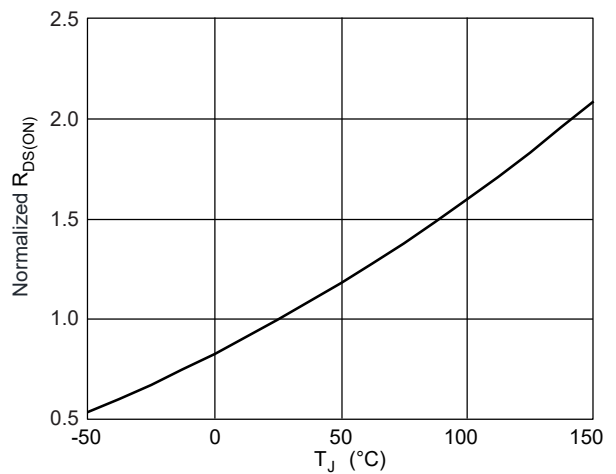FIG. 5-I_S vs V_{SD}
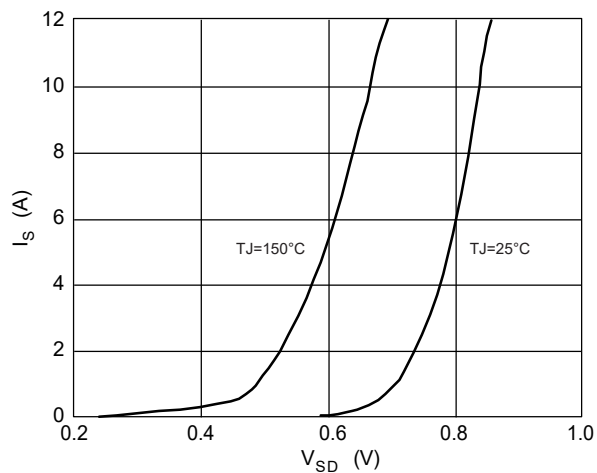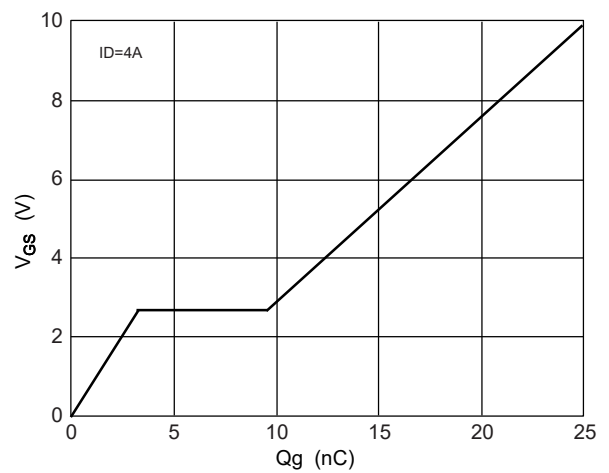
FIG. 6-Gate Charge Characteristics

P Channel Electrical Characteristics (T$_J$=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$= 0V , I$_D$= -250uA	-60	---	---	V
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$= -48V , V$_{GS}$= 0V	---	---	-1	uA
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$= ±20V , V$_{DS}$= 0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$= -10V , I$_D$= -3A	---	---	70	mΩ
		V$_{GS}$= -4.5V , I$_D$= -2A	---	---	105	
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$= -250uA	-1.2	---	-2.5	V
gfs	Forward Transconductance	V$_{DS}$= -5V , I$_D$= -3A	---	15	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge	V$_{DS}$= -48V , V$_{GS}$= -4.5V , I$_D$= -3A	---	9.86	---	nC
Q$_{gs}$	Gate-Source Charge		---	3.1	---	
Q$_{gd}$	Gate-Drain Charge		---	2.95	---	
T$_{d(on)}$	Turn-On Delay Time	V$_{DD}$= -15V , V$_{GS}$= -10V , R$_G$= 3.3Ω , 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	---	
C$_{iss}$	Input Capacitance	V$_{DS}$= -15V , V$_{GS}$= 0V , F= 1MHz	---	1447	---	pF
C$_{oss}$	Output Capacitance		---	97.3	---	
C$_{rss}$	Reverse Transfer Capacitance		---	70	---	
R$_g$	Gate Resistance	V$_{GS}$=0V , V$_{DS}$=0V , F=1MHz	---	13.5	---	Ω

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current	V$_G$=V$_D$=0V , Force Current	---	---	-3.7	A
I$_{SM}$	Pulsed Source Current		---	---	-7.5	A
V$_{SD}$	Diode Forward Voltage	V$_{GS}$=0V , I$_S$= -1A	---	---	-1.2	V

NOTES：

5. Repetitive Rating：Pulsed width limited by maximum junction temperature.

6. V$_{DD}$=-25V, V$_{GS}$=-10V, L=0.1mH, I$_{AS}$=-26.6A.

7. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.

8. The data is theoretically the same as I$_D$ and I$_{DM}$, in real applications, should be limited by total power dissipation.

60V N+P Dual Channel MOSFETs

Characteristics Curves
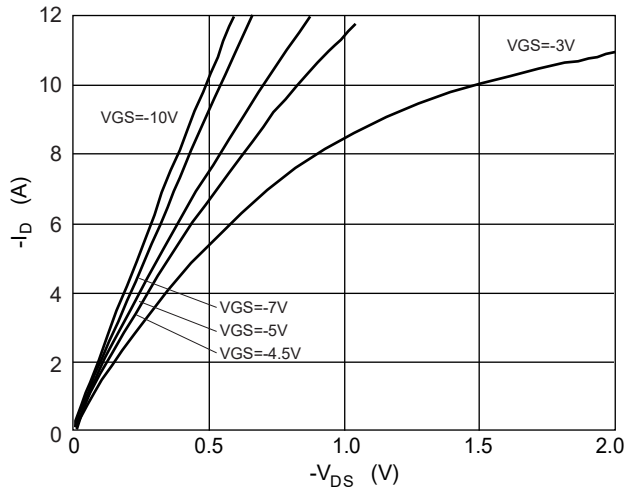
FIG. 7-Output Characteristics
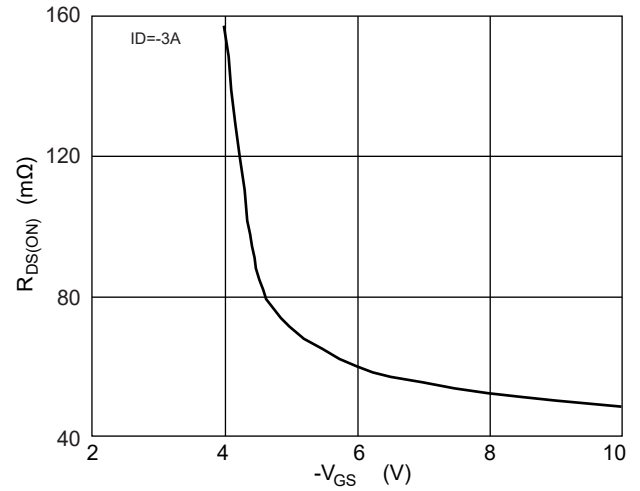

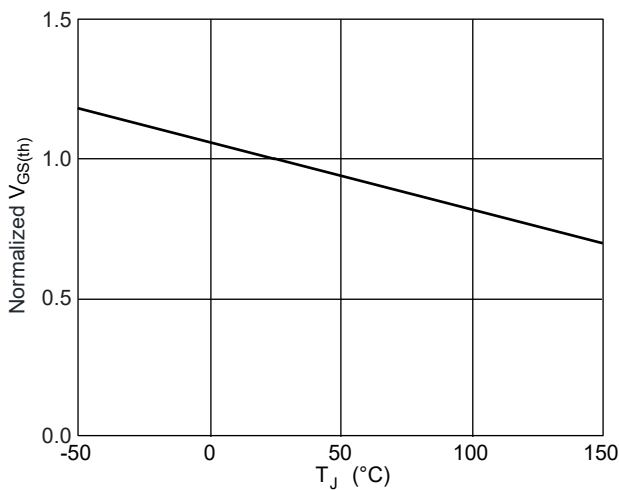FIG. 8-$R_{DS(ON)}$ vs V_{GS}

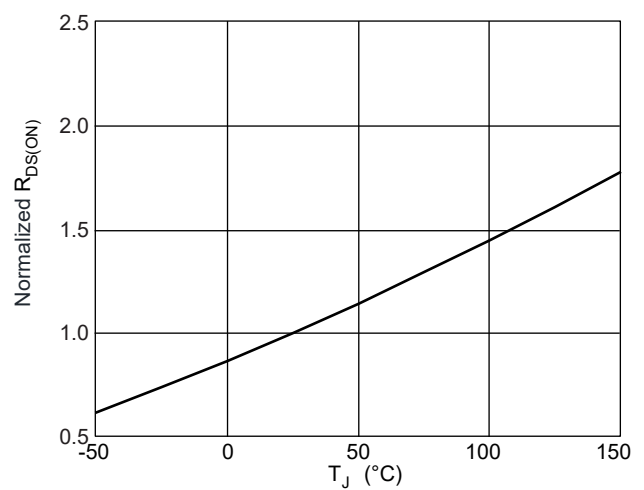FIG. 9-Normalized V_{th} vs T_J

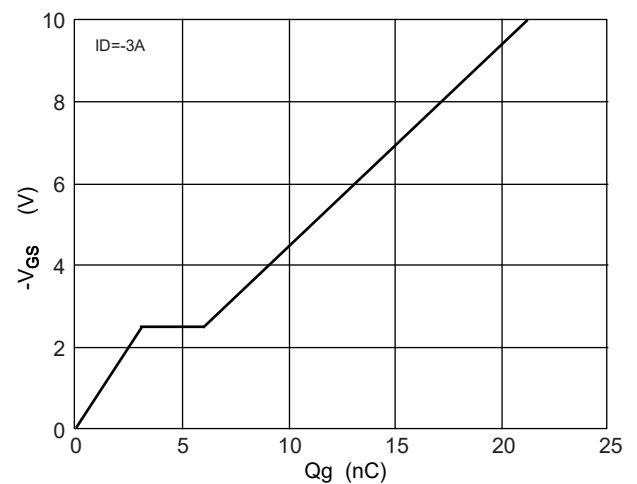FIG. 10-Normalized $R_{DS(ON)}$ vs T_J

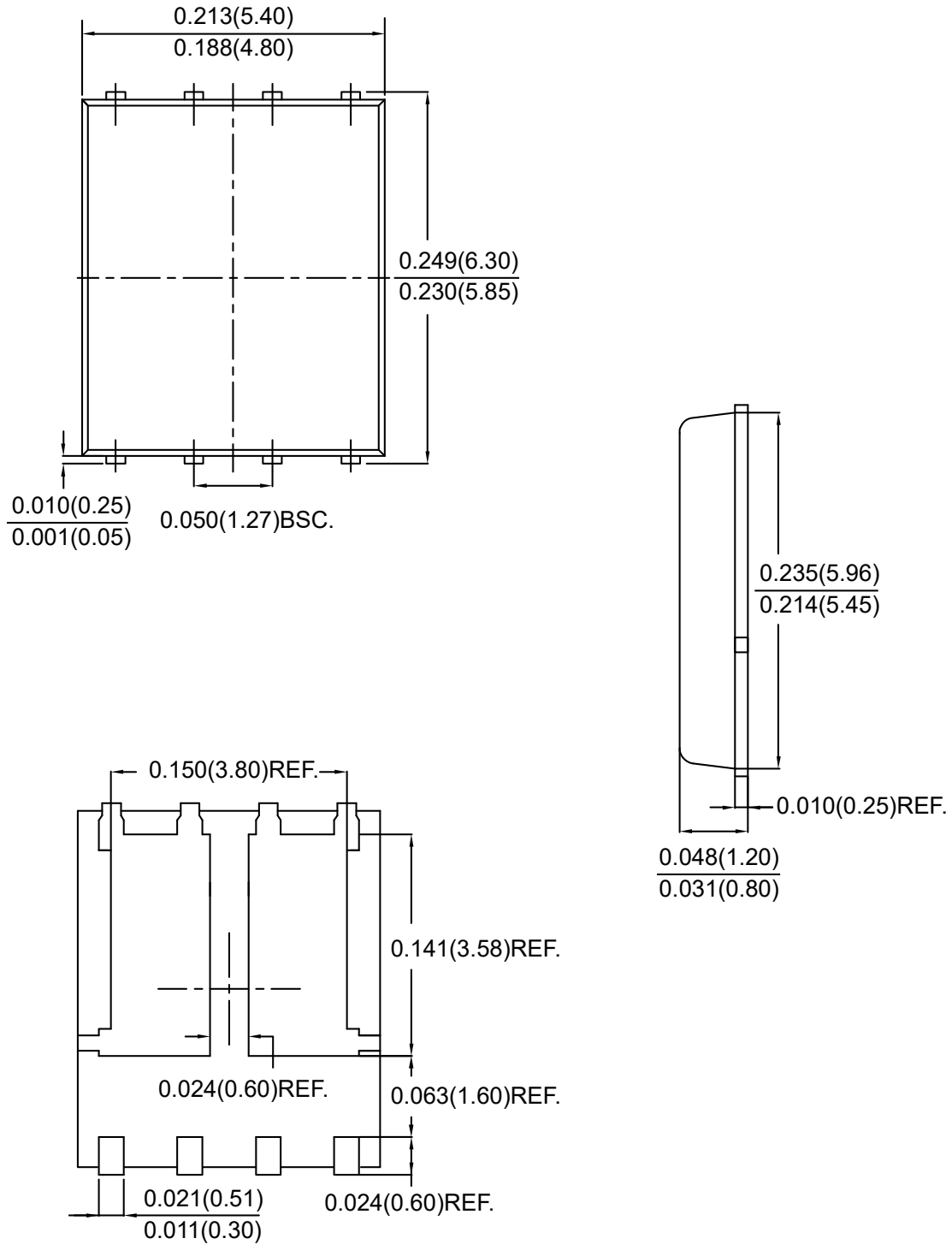
FIG. 11-I_S vs V_{SD}
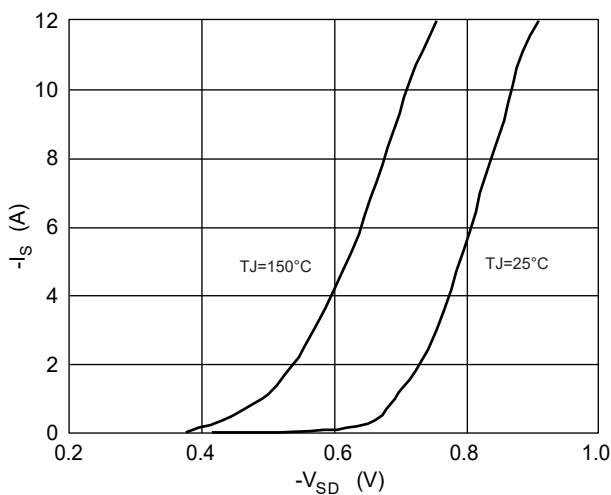
FIG. 12-Gate Charge Characteristics

P5MBG040

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Package Outline Dimensions

0.213(5.40)
0.188(4.80)

0.249(6.30)
0.230(5.85)

0.010(0.25)
0.001(0.05)

0.050(1.27)BSC.

0.235(5.96)
0.214(5.45)

0.010(0.25)REF.

0.048(1.20)
0.031(0.80)

0.150(3.80)REF.

0.141(3.58)REF.

0.024(0.60)REF.

0.063(1.60)REF.

0.021(0.51)
0.011(0.30)

0.024(0.60)REF.

PPAK5X6 Dual
Dimensions in inches and (millimeters)

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