

HM6604BWKR

Complementary Enhancement Mode Field Effect Transistor

General Description

The HM6604BWKR uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, an inverter, and for a host of other applications. Both devices are ESD protected. *HM6604BWKR are electrically identical.*

-RoHS Compliant

-HM6604BWKR is Halogen Free

Features

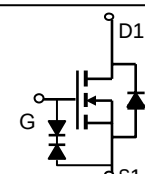
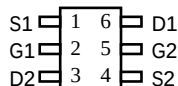
n-channel
 $V_{DS} (V) = 20V$
 $I_D = 0.9A (V_{GS}=4.5V)$

p-channel
 $-20V$
 $-0.8A (V_{GS}=-4.5V)$

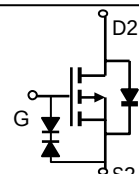
$R_{DS(ON)}$
< 270m Ω ($V_{GS}=4.5V$)
< 330m Ω ($V_{GS}=2.5V$)
< 450m Ω ($V_{GS}=1.8V$)

$R_{DS(ON)}$
< 480m Ω ($V_{GS}=-4.5V$)
< 950m Ω ($V_{GS}=-2.5V$)
< 2200m Ω ($V_{GS}=-1.8V$)

SC70-6
(SOT-363)
Top View



n-channel



p-channel

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 8	± 8	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	0.9	-0.8	A
	$T_A=70^\circ\text{C}$	0.7	-0.56	
Pulsed Drain Current ^B	I_{DM}	2.7	-2.4	
Power Dissipation	$T_A=25^\circ\text{C}$	0.3	0.3	W
	$T_A=70^\circ\text{C}$	0.19	0.19	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics: n-channel and p-channel

Parameter	Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	n-ch	360	415	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		n-ch	400	460	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	n-ch	300	350	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	p-ch	360	415	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		p-ch	400	460	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	p-ch	300	350	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =16V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±8V			25	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.45		1.2	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	0.9			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =4.5V, I _D =0.9A T _J =125°C		220	270	mΩ
		V _{GS} =2.5V, I _D =0.75A		260	330	mΩ
		V _{GS} =1.8V, I _D =0.7A		330	450	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =0.8A		2.6		S
V _{SD}	Diode Forward Voltage	I _S =0.5A, V _{GS} =0V		0.69	1	V
I _S	Maximum Body-Diode Continuous Current				0.4	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, f=1MHz		101	120	pF
C _{oss}	Output Capacitance			17		pF
C _{rss}	Reverse Transfer Capacitance			14		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		3	4	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =0.8A		1.57	1.9	nC
Q _{gs}	Gate Source Charge			0.13		nC
Q _{gd}	Gate Drain Charge			0.36		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =5V, V _{DS} =10V, R _L =12.5Ω, R _{GEN} =6Ω		3.2		ns
t _r	Turn-On Rise Time			4		ns
t _{D(off)}	Turn-Off DelayTime			15.5		ns
t _f	Turn-Off Fall Time			2.4		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =0.8A, dI/dt=100A/μs		6.7	8.1	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =0.8A, dI/dt=100A/μs		1.6		nC

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Rev 4 : Feb 2008

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

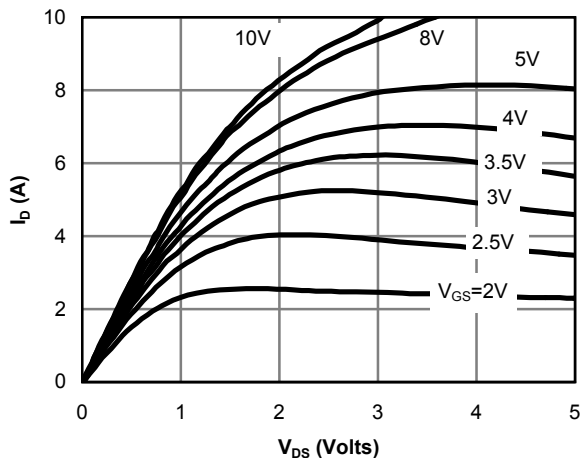


Fig 1: On-Region Characteristics

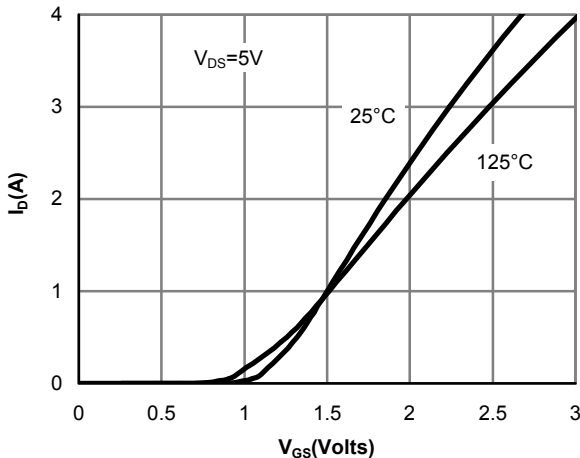


Figure 2: Transfer Characteristics

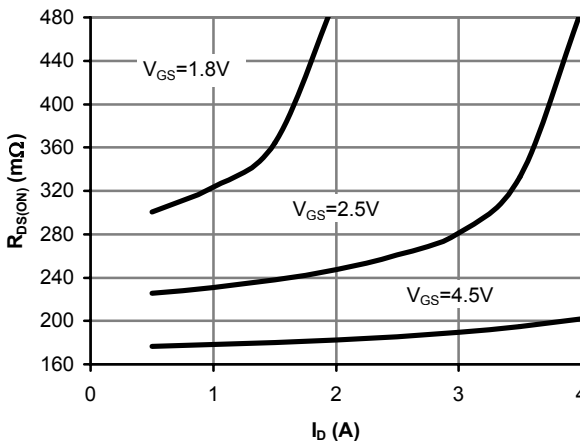


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

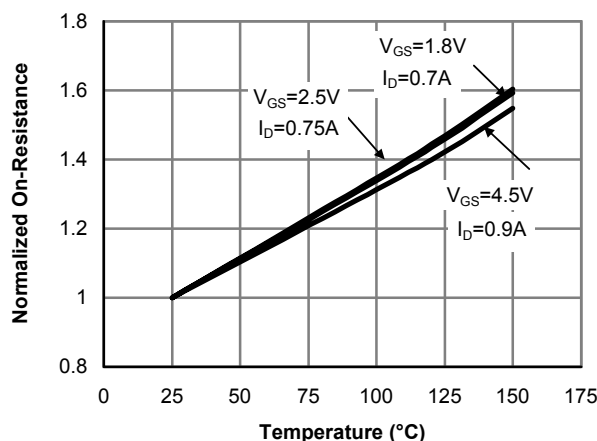


Figure 4: On-Resistance vs. Junction Temperature

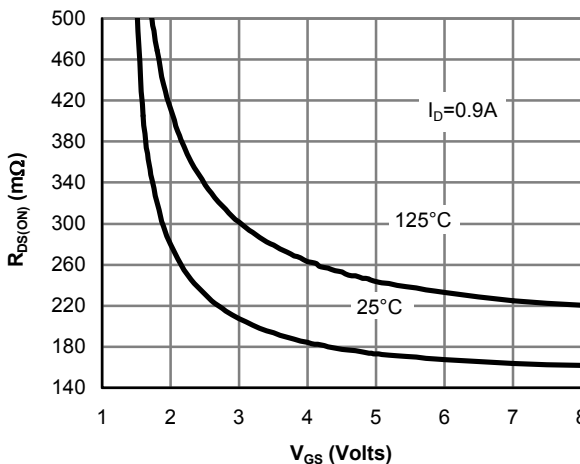


Figure 5: On-Resistance vs. Gate-Source Voltage

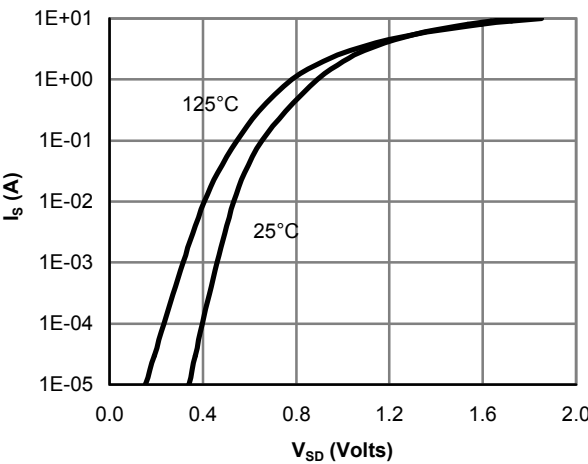
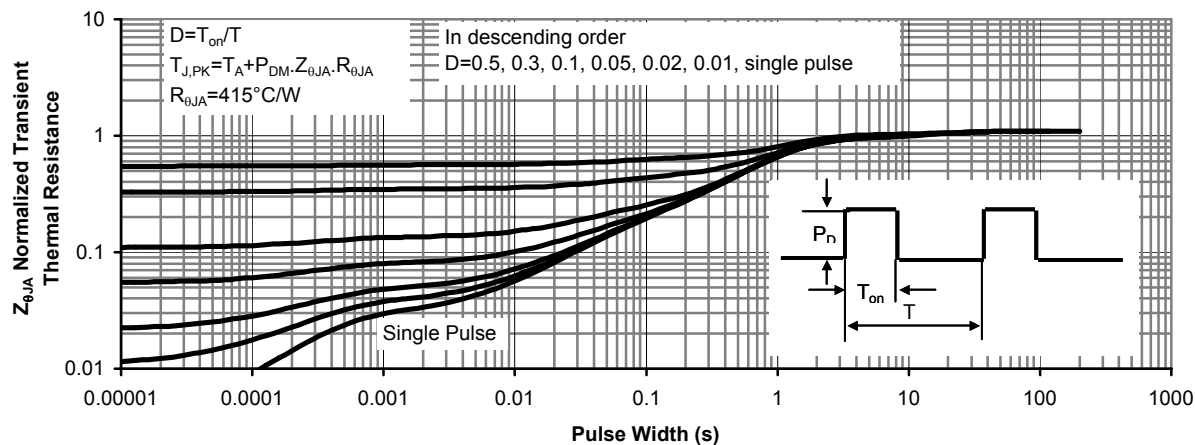
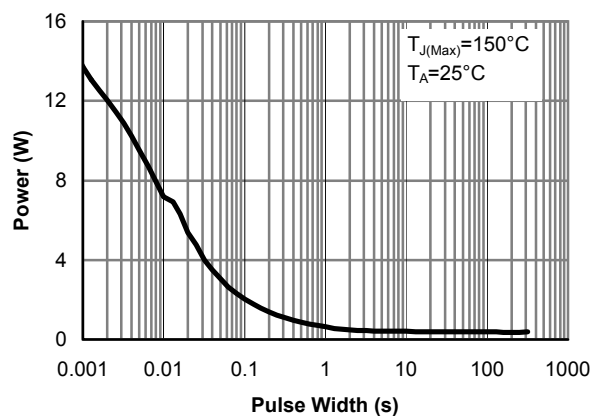
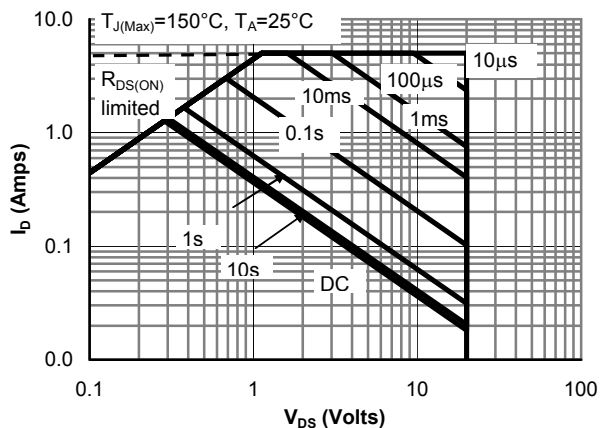
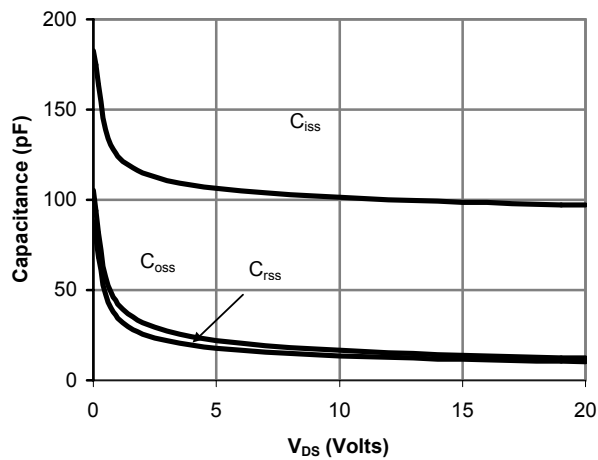
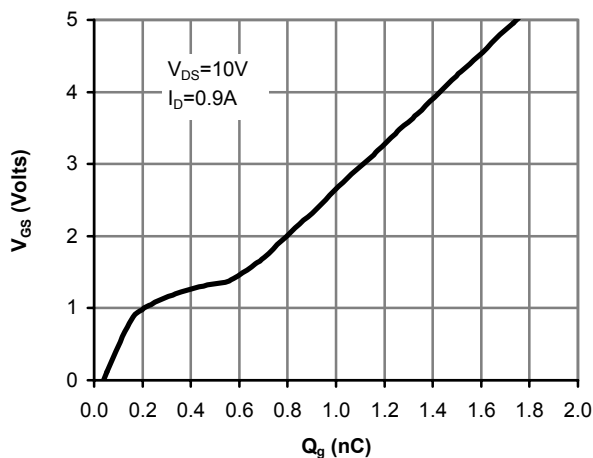


Figure 6: Body-Diode Characteristics

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.45		-1.2	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-0.8			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-0.8\text{A}$ $T_J=125^{\circ}\text{C}$		350 440	480 670	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-0.5\text{A}$		550	950	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-0.4\text{A}$		780	2200	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-0.8\text{A}$		1.7		S
V_{SD}	Diode Forward Voltage	$I_S=-0.5\text{A}$, $V_{GS}=0\text{V}$		-0.86	-1	V
I_S	Maximum Body-Diode Continuous Current				-0.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		114	140	pF
C_{oss}	Output Capacitance			17		pF
C_{rss}	Reverse Transfer Capacitance			14		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		12	17	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-0.8\text{A}$		1.44	1.8	nC
Q_{gs}	Gate Source Charge			0.14		nC
Q_{gd}	Gate Drain Charge			0.35		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=16.7\Omega$, $R_{GEN}=3\Omega$		6.5		ns
t_r	Turn-On Rise Time			6.5		ns
$t_{D(off)}$	Turn-Off DelayTime			18.2		ns
t_f	Turn-Off Fall Time			5.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-0.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		10	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-0.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $\leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Rev 4 : Feb 2008

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

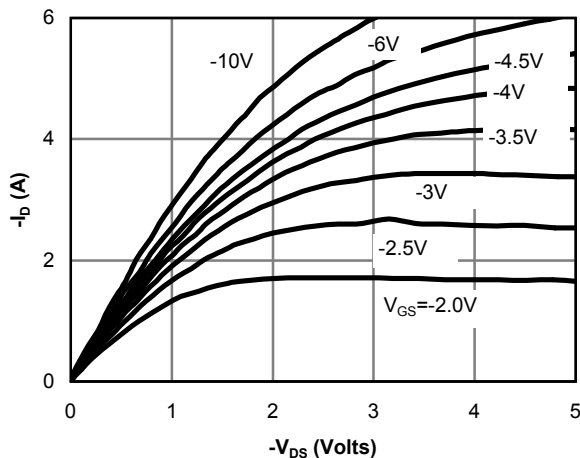


Fig 1: On-Region Characteristics

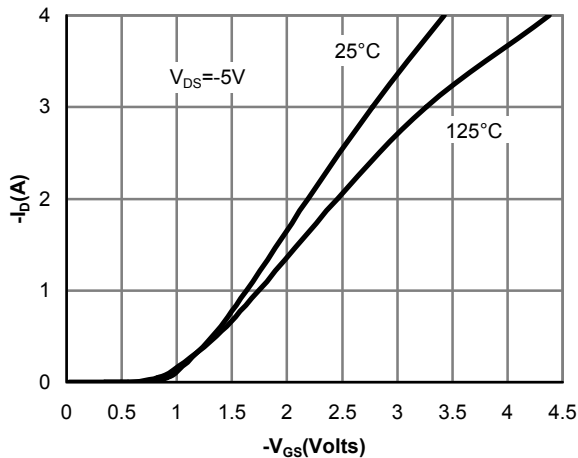


Figure 2: Transfer Characteristics

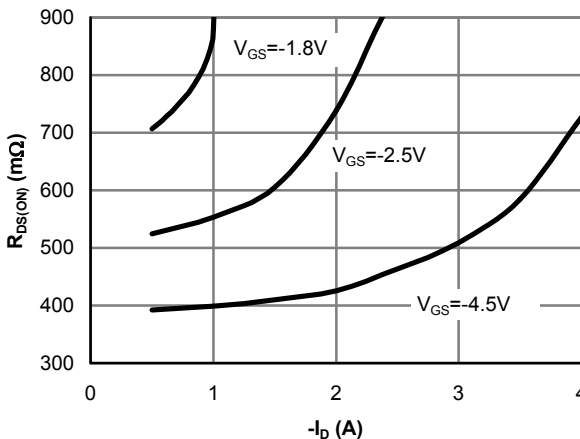


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

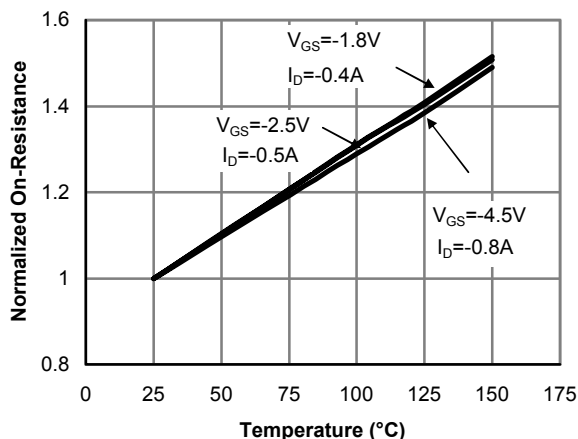


Figure 4: On-Resistance vs. Junction Temperature

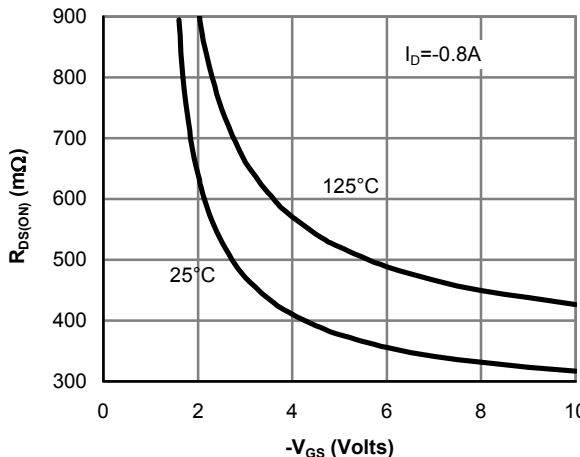


Figure 5: On-Resistance vs. Gate-Source Voltage

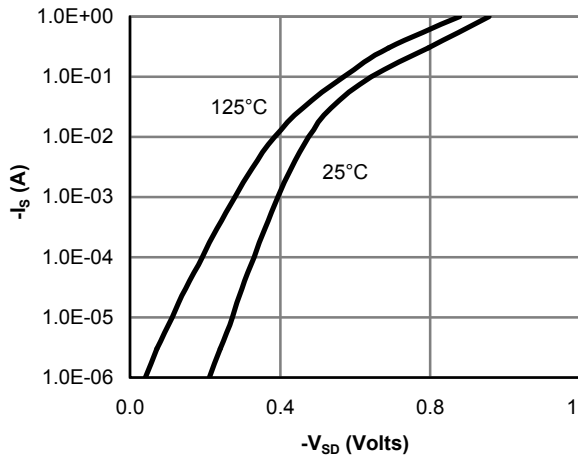


Figure 6: Body-Diode Characteristics

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

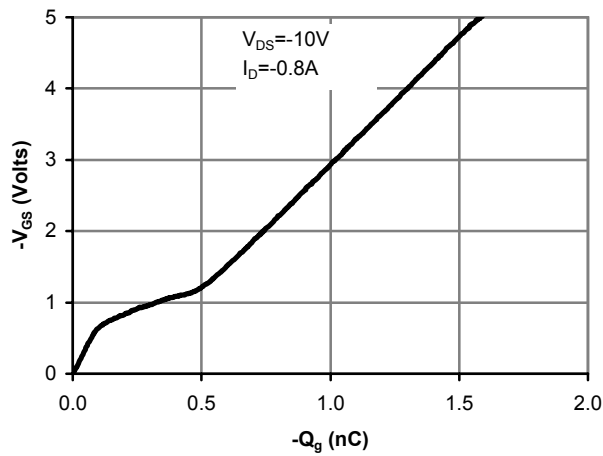


Figure 7: Gate-Charge Characteristics

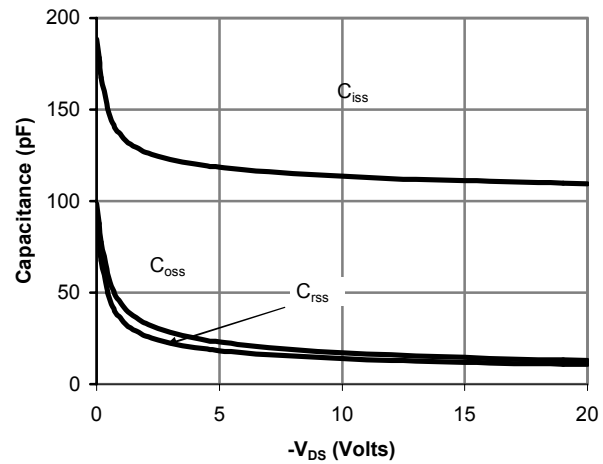


Figure 8: Capacitance Characteristics

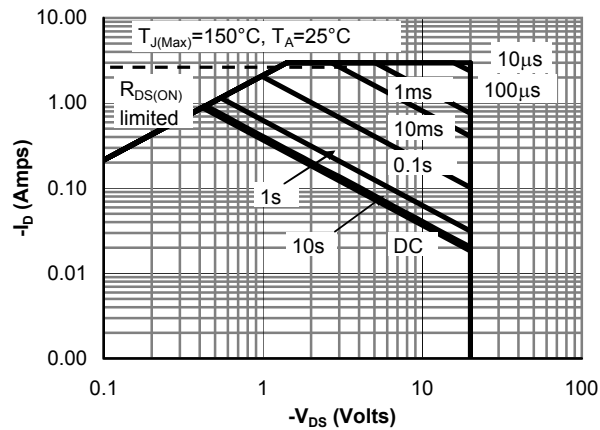


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

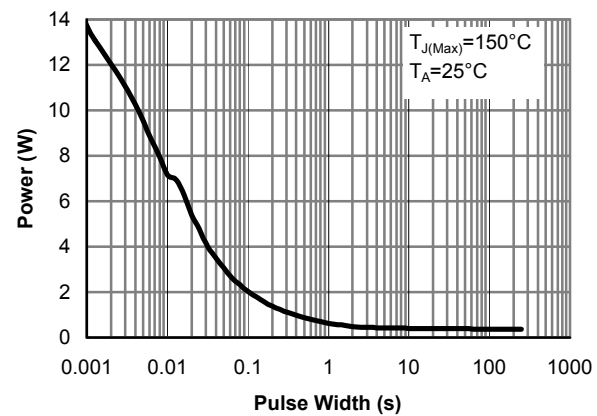


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

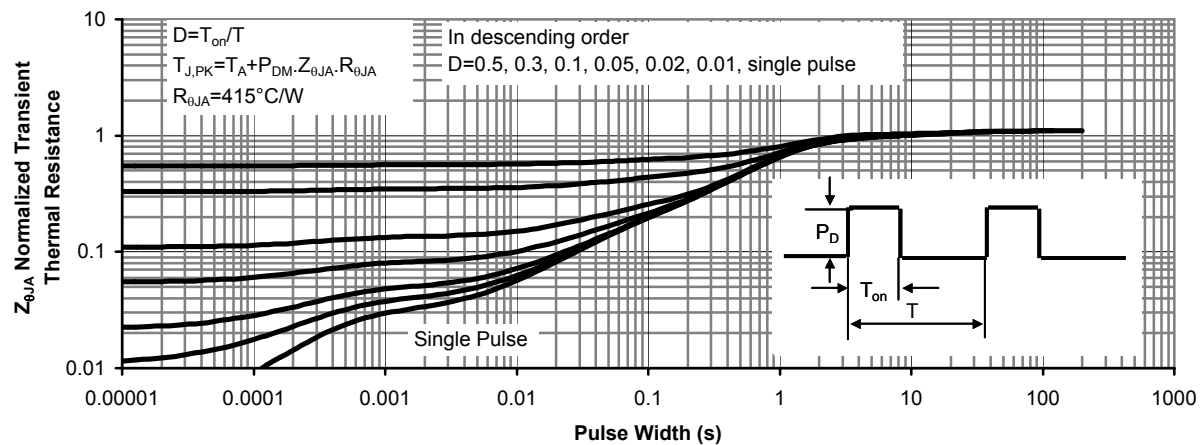
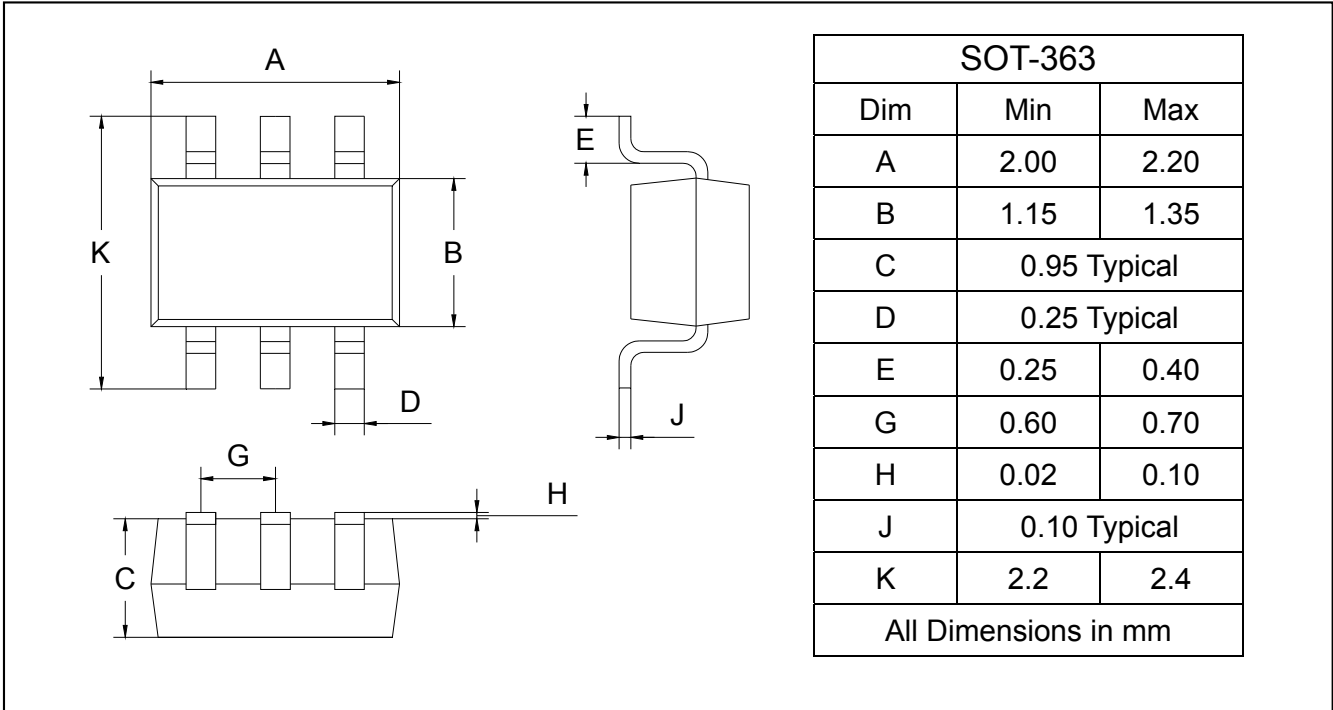


Figure 11: Normalized Maximum Transient Thermal Impedance

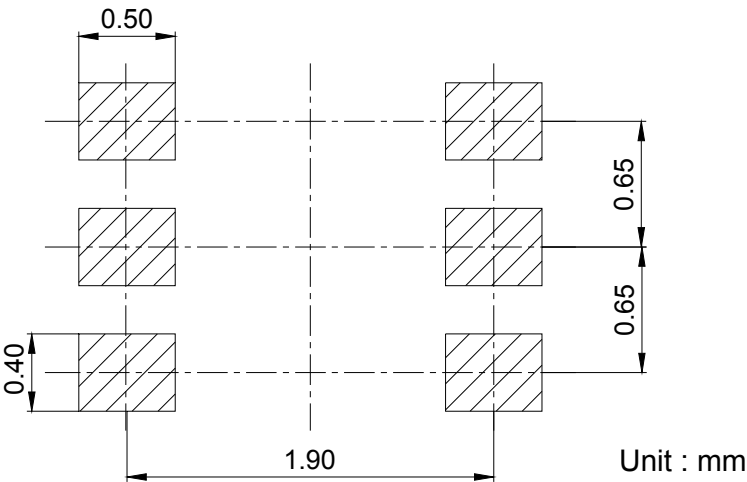
PACKAGE OUTLINE

Plastic surface mounted package

SOT-363



SOLDERING FOOTPRINT



PACKAGE INFORMATION

Device	Package	Shipping
HM6604BWKR	SOT-363	3000/Tape&Reel