

-60V_{DS}/±20V_{GS} P-Channel Advanced Mode MOSFET

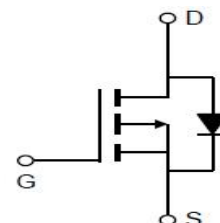
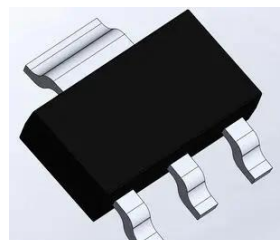
Features

- $V_{DS}=-60V, I_D=-4A$
- $R_{DS(ON)}=85m\Omega$ (TYP.) $V_{GS}=-10V$
- $R_{DS(ON)}=105m\Omega$ (TYP.) $V_{GS}=-4.5V$
- Fast Switching
- Low On-Resistance

SOT-223

Applications

- Switch switching
- Power management in portable/desktop PCs



Ordering Information

Device	package	Device Marking	Package Qty.
HM60P04R	SOT-223	M60P04R	2500/PCS

Absolute Maximum Ratings (T_a=25°C, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V _{GS} =0V)	V _{DS}	-60	V
Gate-Source Voltage (V _{GS} =0V, static)	V _{GS}	±20	V
Continuous Drain Current (T _a =25°C)	I _D	-4	A
Continuous Drain Current (T _a =70°C)		-2.5	A
Pulse Drain Current	I _{DM}	-20	A
Avalanche Energy, Single Pulsed	E _{AS}	13	mJ
Maximum Power Dissipation (T _a =25°C)	P _D	1.5	W
Maximum Power Dissipation (T _a =70°C)		0.6	W
Operating, Storage Temperature Range	T _J , T _{STG}	-55~150	°C

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, V _{GS} =0V	-	-	-1	μA
Gate -Source Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =-250μA	-1.4	-1.9	-2.4	V
Drain-Source On-stage Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-1A	-	60	90	mΩ
		V _{GS} =-4.5V, I _D =-1A	-	85	110	

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	-	75	-	$^{\circ}\text{C}/\text{W}$
Thermal Resistance,Junction-to-Ambient	$R_{\theta JA}$	-	24	-	$^{\circ}\text{C}/\text{W}$

Dynamic Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$V_{DS}=-15\text{V}$	-	1150	-	pF
Output capacitance	C_{oss}	$V_{GS}=0\text{V}$	-	95	-	
Reverse transfer capacitance	C_{rss}	$f=1\text{MHz}$	-	77	-	
Gate Resistance	R_g	$f=1\text{MHz}$	-	7.5	-	Ω
Total Gate Charge	Q_g	$V_{DS}=-15\text{V}$	-	46	-	nC
Gate Source Charge	Q_{gs}	$V_{GS}=-10\text{V}$	-	15.5	-	
Gate Drain Charge	Q_{gd}	$I_D=-15\text{A}$	-	18	-	
Turn-on delay Time	$t_{d(on)}$	$V_{GS}=-10\text{V}$	-	15	-	ns
Rise time	t_r	$V_{DS}=-15\text{V}$	-	17	-	
Turn-off delay Time	$t_{d(off)}$	$R_L=1\Omega$	-	68	-	
Fall time	t_f	$R_G=3\Omega$	-	39	-	

Reverse Diode Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Body Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}, I_{SD}=-1\text{A}$	-	-0.9	-1.2	V
Reverse Recovery Time	t_{rr}	$V_{GS}=0\text{V}, I_{SD}=-15\text{A}$	-	37	-	ns
Reverse Recovery Charge	Q_{rr}	$d_i/d_t=100\text{A}/\mu\text{s}$	-	5.3	-	nC

Electrical Characteristics Diagrames

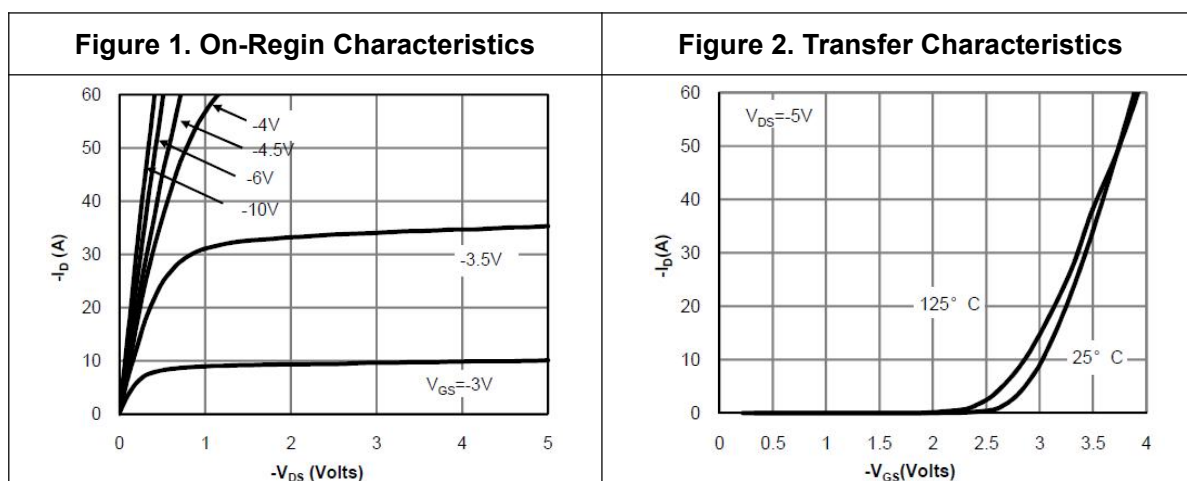


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

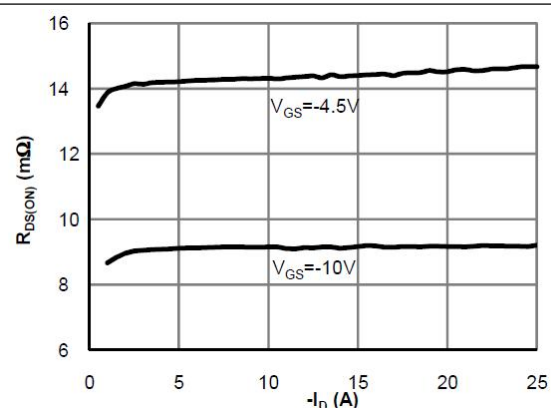


Figure 4. On-Resistance vs. Junction Temperature

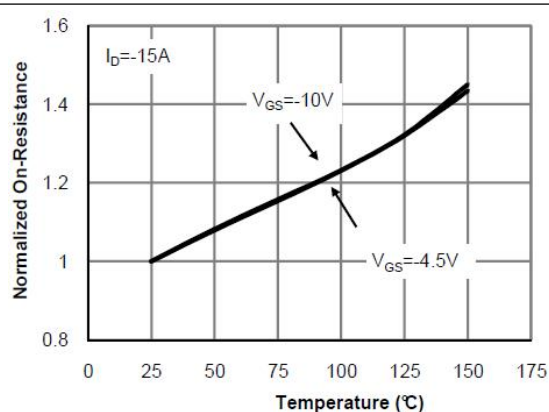


Figure 5. On-Resistance vs. Gate-Source Voltage

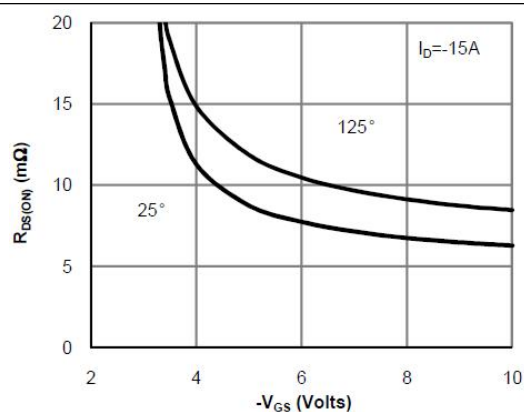


Figure 6. Body-Diode Characteristics

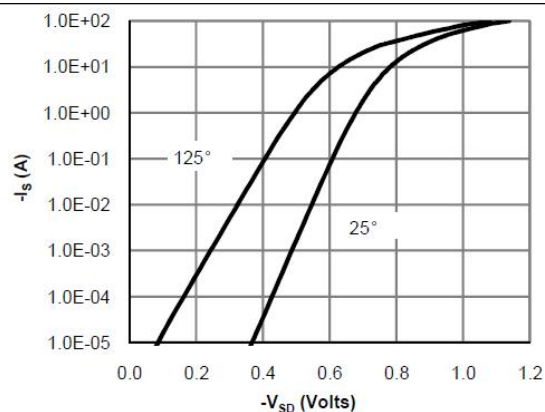


Figure 7. Gate-Charge Characteristics

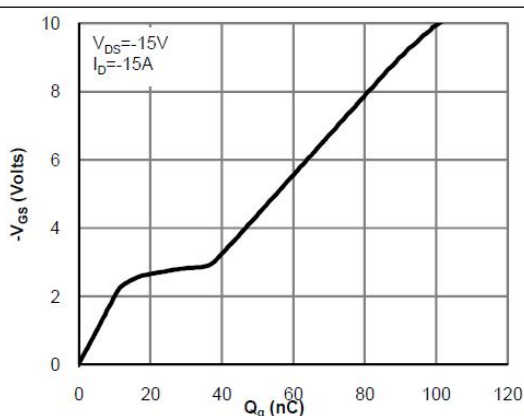


Figure 8. Capacitance Characteristics

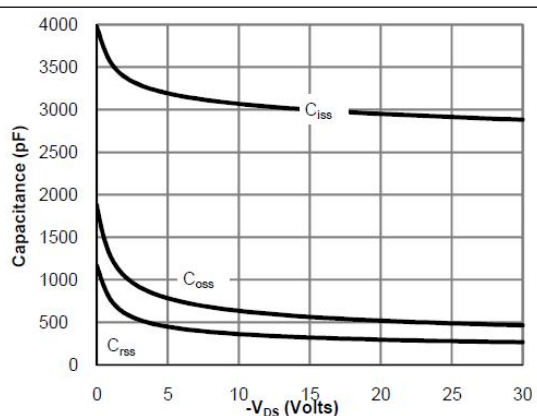


Figure 9. Maximum Forward Biased Safe Operating Area

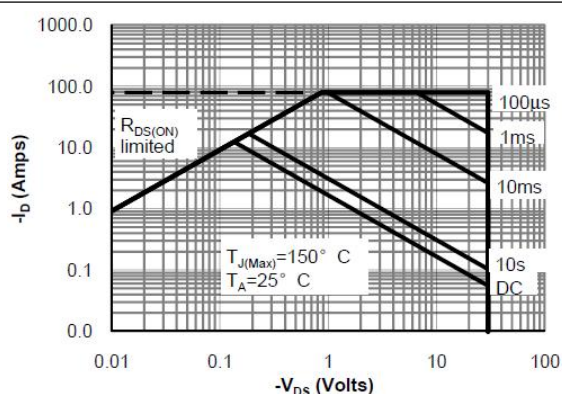


Figure 10. Single Pulse Power Rating Junction-to-Ambient

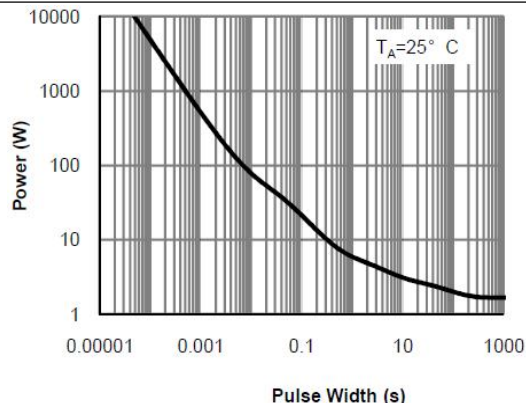
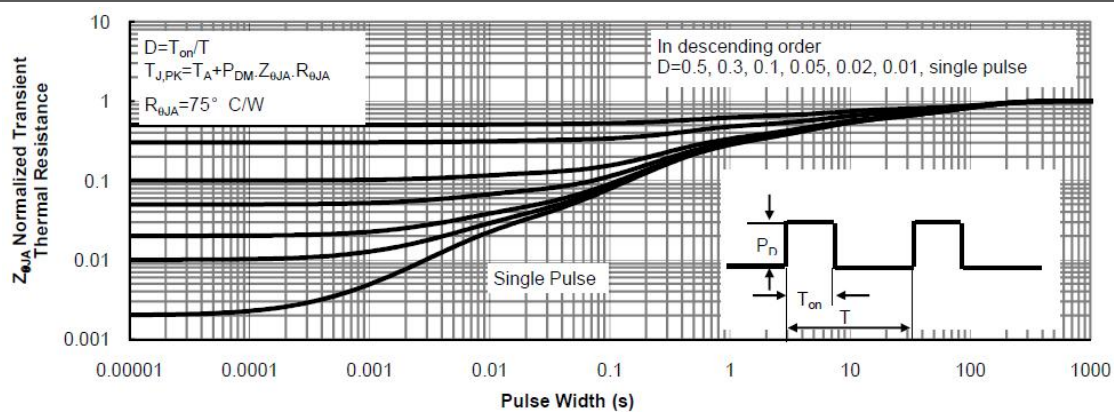


Figure 11. Normalized Maximum Transient Thermal Impedance



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