HMD20J60

Silicon N-Channel Super-Junction Power MOSFET

General Description :

HMD20J60 the silicon N-channel Enhanced VDMOSFETS, is obtained by the self-aligned Superjunction Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-263, which accords with the RoHS standard.
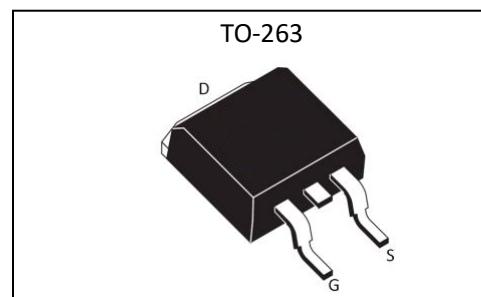
Features :

- Fast Switching
- Low Gate Charge and R_{dson}
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

Applications :

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)

$V_{DSS}(T_C=150℃)$	650	V
$V_{DSS}(T_C=25℃)$	600	V
I_D	20	A
$P_D(T_C=25℃)$	150	W
$R_{DS(ON)}$	0.12	Ω

TO-263

Inner Equivalent Principium Chart
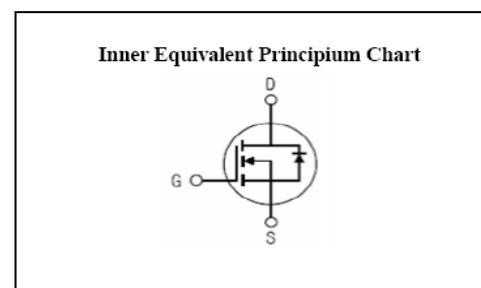
Absolute (Tc= 25℃ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current T_C = 100 °C	15	A
I_{DM} [a1]	Pulsed Drain Current	60	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS} [a2]	Single Pulse Avalanche Energy	532	mJ
E_{AR} [a1]	Avalanche Energy ,Repetitive	166	mJ
I_{AR} [a1]	Avalanche Current	12	A
dv/dt [a3]	Peak Diode Recovery dv/dt	15.0	V/ns
P_D	Power Dissipation	150	W
	Derating Factor above 25°C	1.2	W/℃
T_J , T_{stg}	Operating Junction and Storage Temperature Range	150 , −55 to 150	℃
T_L	MaximumTemperature for Soldering	300	℃

Electrical Characteristics (Tc= 25℃ unless otherwise specified) :

OFF Characteristics

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	600	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	$I_D=250uA$, Reference25℃	--	0.60	--	V/℃
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=600V, V_{GS}=0V, T_a=25℃$	--	--	1	μA
		$V_{DS}=480V, V_{GS}=0V, T_a=125℃$	--	--	250	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+30V$	--	--	10	μA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-30V$	--	--	-10	μA

ON Characteristics

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=10A$	--	0.12	0.15	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	V

Pulse width tp≤380μs,δ≤2%

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=20A$	--	18.8	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V$ f=1.0MHz	--	1600	--	pF
C_{oss}	Output Capacitance		--	14	--	
C_{rss}	Reverse Transfer Capacitance		--	225	--	

Resistive Switching Characteristics

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=300V, I_D=20A$, $V_{GS}=10V, R_g=25\Omega$	--	48	--	ns
t_r	Rise Time		--	108	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	176	--	
t_f	Fall Time		--	50	--	
Q_g	Total Gate Charge	$I_D=20A, V_{DD}=480V$ $V_{GS}=0$ to 10V	--	41	--	nC
Q_{gs}	Gate to Source Charge		--	8	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	15	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	20	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	60	A
V_{SD}	Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	0.95	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=20A, T_j=25°C$	--	440	--	ns
Q_{rr}	Reverse Recovery Charge	$dI_F/dt=100A/us, V_{GS}=0V$	--	5	--	uC
Pulse width $tp≤380μs, δ≤2\%$						

Symbol	Parameter	Typ.	Units
$R_{θJC}$	Junction-to-Case	0.83	℃/W
$R_{θJA}$	Junction-to-Ambient	62.5	℃/W

a1 : Repetitive rating; pulse width limited by maximum junction temperature

a2 : $I_{AS}=$ 6A, $V_{DD}=$ 50V, $R_G=$ 25Ω, Starting TJ = 25℃

a3 : $I_{SD}=20A, di/dt≤100A/us, V_{DD}≤BV_{DS}$, Start $T_J=25℃$

Test Circuit and Waveform
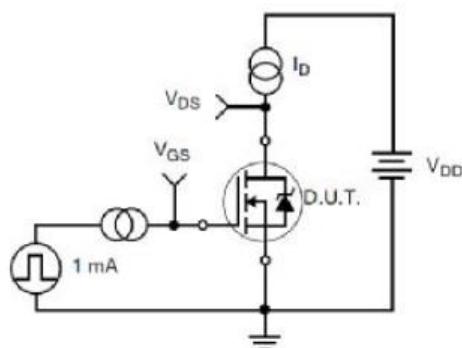
Figure 17. Gate Charge Test Circuit
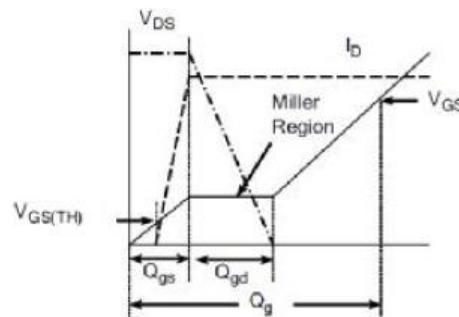
Figure 18. Gate Charge Waveform
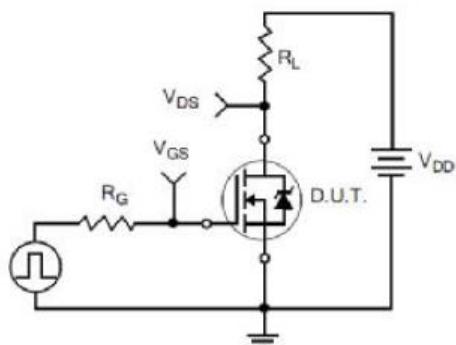

Figure 19. Resistive Switching Test Circuit
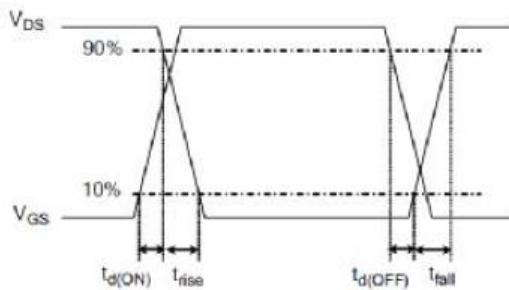
Figure 20. Resistive Switching Waveforms

## Typical Characteristics

Figure 1. Output Characteristics


Figure 2. Transfer Characteristics


Figure 3. On-Resistance vs. Drain Current


Figure 4. Capacitance

Figure 5. Gate Charge

Figure 6. Body Diode Forward Voltage
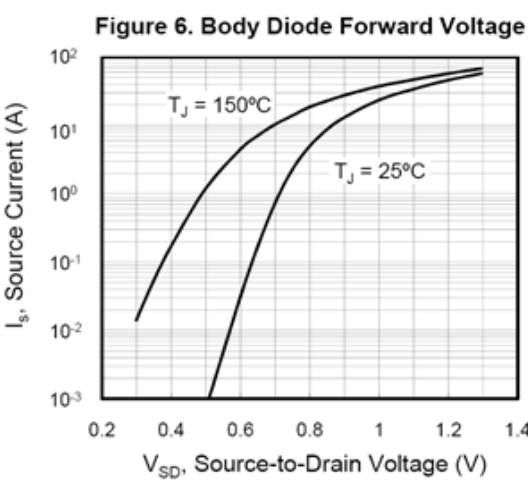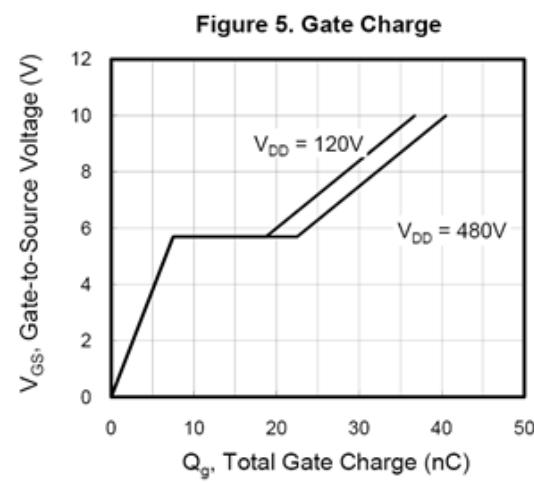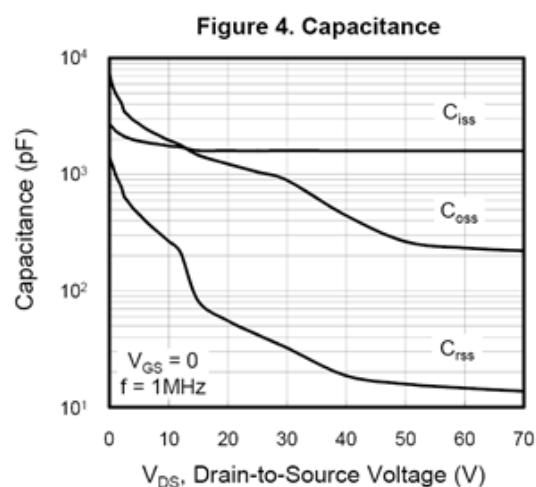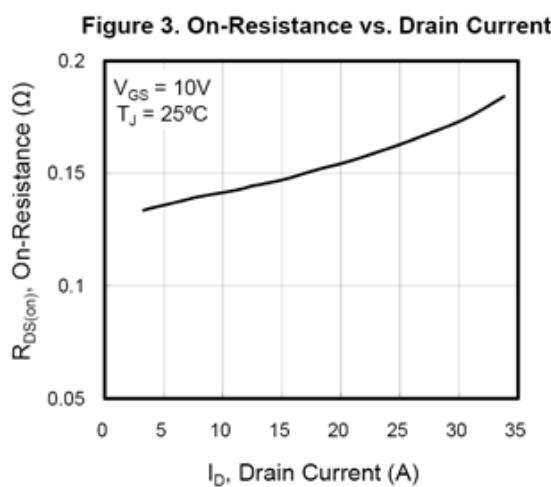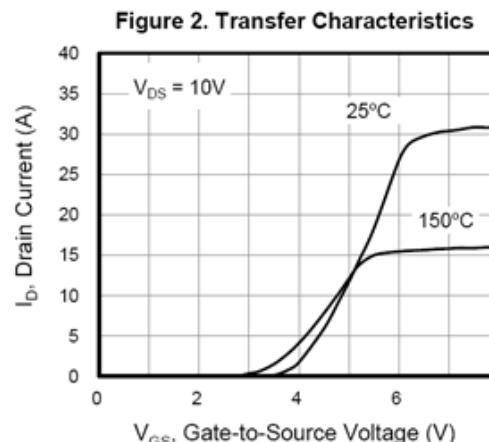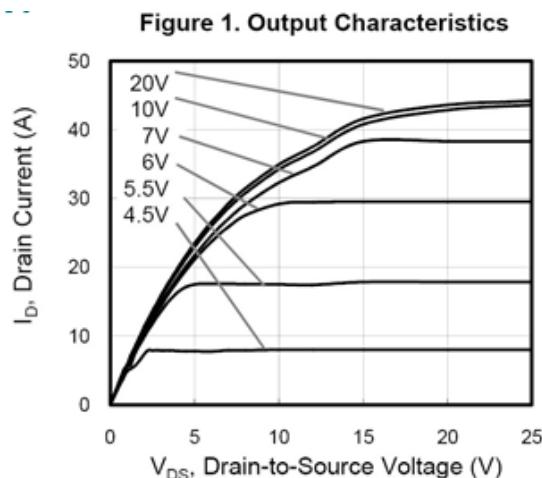
Figure 7. On-Resistance vs. Junction Temperature

$V_{GS} = 10V$
$I_D = 10A$

$R_{DS(on)}$, (Normalized) vs. T_J, Junction Temperature (°C)
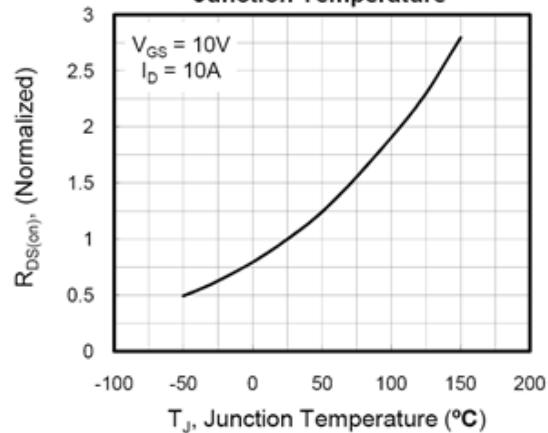
Figure 8. Threshold Voltage vs. Junction Temperature

$I_D = 250\mu A$

$V_{GS(th)}$, (Variance) vs. T_J, Junction Temperature (°C)