N-Channel Enhancement Mode Power MOSFET

Description
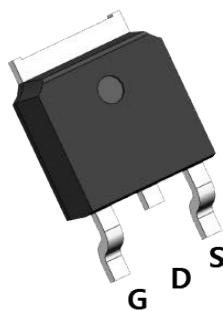
The HLDD2N60 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

Application
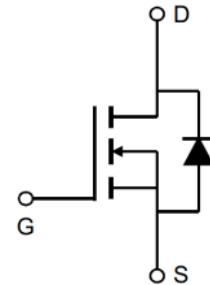
☐ Power switchingapplication

☐ Hard switched and high frequencycircuits

☐ Uninterruptible powersupply

Features

☐ VDS =600V,ID =2A

☐ RDS(ON)：5Ω@VGS=10V

☐ Low gatecharge.

☐ Green deviceavailable.

☐ AdvancedhighcelldenitytrenchtechnologyforultraRDS(ON).

☐ Excellentpackageforgoodheatdissipation.

Marking and pin assignment

N-Channel MOSFET

Absolute Maximum Ratings (T$_C$=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	±30	V
Drain Current-Continuous	I_D	2	A
Drain Current-Continuous(T$_C$=100℃)	I_D (100℃)	1.3	A
Pulsed Drain Current	I_{DM}	6	A
Maximum Power Dissipation	P_D	130	W
Derating factor		0.43	W/℃
Single pulse avalanche energy [Note 5]	E_{AS}	120	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case[Note 2]	$R_{θJC}$	0.43	℃/W

Package Marking and Ordering Information
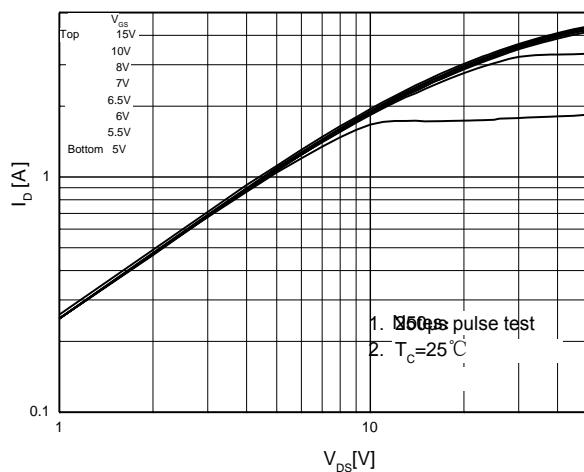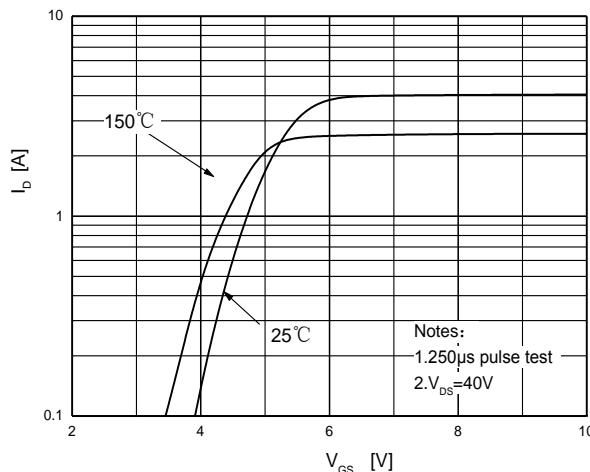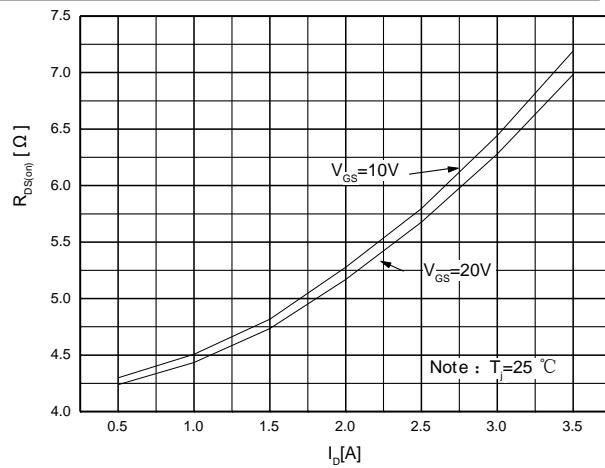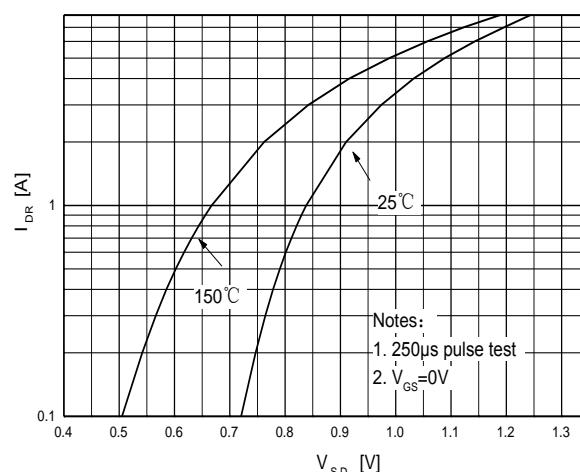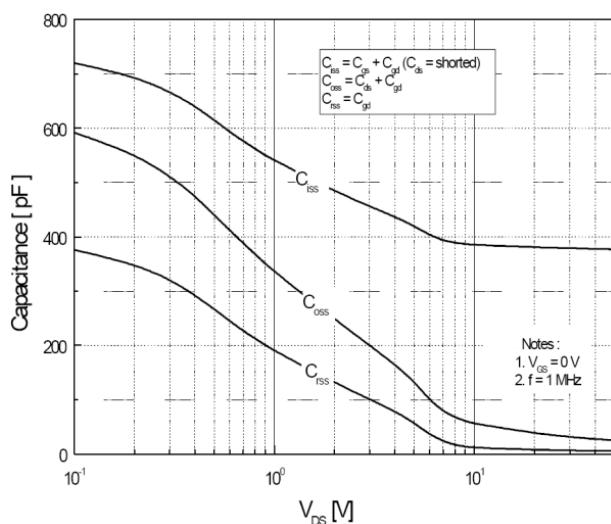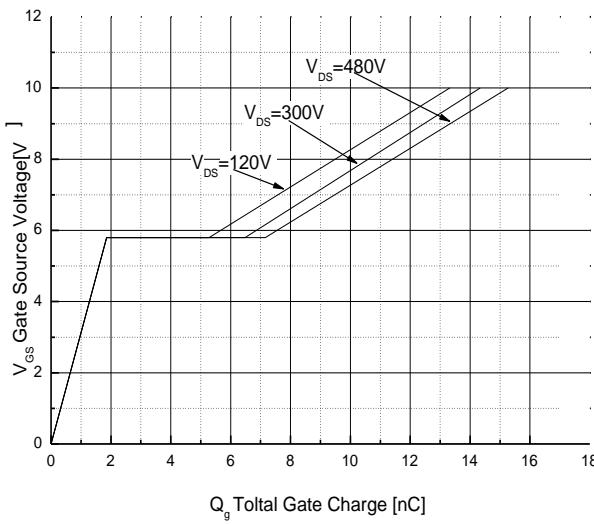
Part NO.	Marking	Package
HLDD2N60	HLDD2N60	TO-252

Electrical Characteristics (T$_C$=25℃ unless otherwise noted)
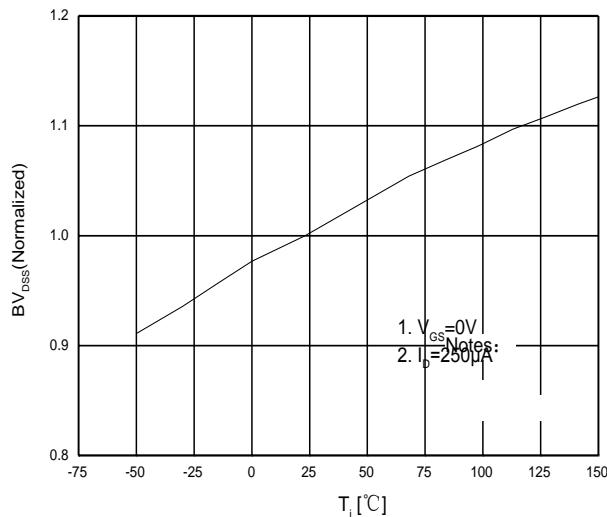
| Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=250μA	600	-	-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=600V,V$_{GS}$=0V	-	-	10	μA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±30V,V$_{DS}$=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=250μA	2	-	4	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=10V, I$_D$=1A	-	3.8	5	Ω
		V$_{GS}$=4.5V, I$_D$=0A		-	-	
Forward Transconductance	g$_{FS}$	V$_{DS}$=40V,I$_D$=1A	-	2.5	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C$_{Iss}$	V$_{DS}$=25V,V$_{GS}$=0V , F=1.0MHz	-	380	490	PF
Output Capacitance	C$_{oss}$		-	35	46	PF
Reverse Transfer Capacitance	C$_{rss}$		-	7.6	9.9	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=300V,I$_D$=2A, R$_G$=2.5Ω	-	16	40	nS
Turn-on Rise Time	t$_r$		-	50	110	nS
Turn-Off Delay Time	t$_{d(off)}$		-	40	90	nS
Turn-Off Fall Time	t$_f$		-	40	90	nS
Total Gate Charge	Q$_g$	V$_{DS}$=480V,I$_D$=2A , V$_{GS}$=10V	-	15.3		nC
Gate-Source Charge	Q$_{gs}$		-	1.8		nC
Gate-Drain Charge	Q$_{gd}$		-	7.2		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V$_{SD}$	V$_{GS}$=0V,I$_S$=2A	-		-	V
Diode Forward Current (Note 2)	I$_S$		-	-	2	A
Reverse Recovery Time	t$_{rr}$	VGS=0V,IS=2A	-	250	-	nS
Reverse Recovery Charge	Qrr	dIf/dt=100A/us	-	1.31	-	nC
Forward Turn-On Time	t$_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:
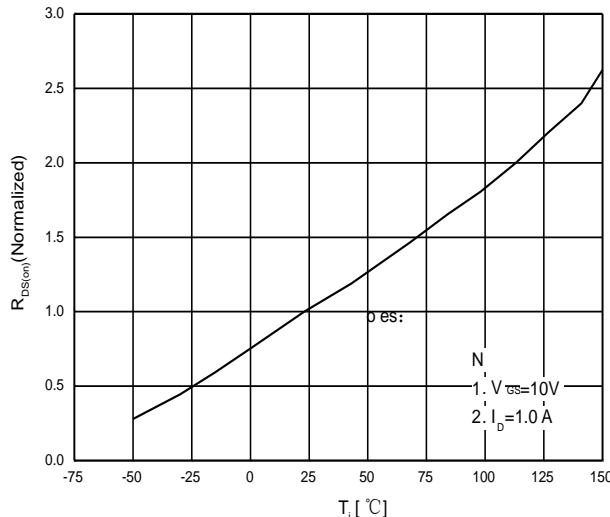
1：Pulse width limited by maximum junctiontemperature
2：L=55mH, IBASB=2.0A, VBDDB=50V, RBGB=25 Ω,StartingTBJB=25℃
3：IBSDB≤2A,di/dt≤300A/μs,VDD≤BVBDSSB, Starting TBJB=25℃
4：Pulse Test：Pulse Width≤300μs,Duty Cycle≤2%
5：Essentially independent of operating temperature

ELECTRICAL CHARACTERISTICS (curves)

### On-Region Characteristics

V_{GS}
Top 15V
10V
8V
7V
6.5V
6V
5.5V
Bottom 5V

I_D [A]

V_{DS}[V]

1. 250µs pulse test
2. T_C=25℃

Transfer Characteristics

I_D [A]

150℃

25℃

V_{GS} [V]

Notes：
1.250µs pulse test
2.V_{DS}=40V

On-Resistance Variation vs. Drain Current and Gate Voltage

$R_{DS(on)}$ [Ω]

V_{GS}=10V

V_{GS}=20V

Note：T_j=25 ℃

I_D[A]

Body Diode Forward Voltage Variation vs. Source Current and Temperature

I_{DR} [A]

25℃

150℃

Notes：
1. 250µs pulse test
2. V_{GS}=0V

V_{SD} [V]

Capacitance Characteristics

$C_{iss} = C_{gs} + C_{gd}$ (C_{ds} = shorted)
$C_{oss} = C_{ds} + C_{gd}$
$C_{rss} = C_{gd}$

Capacitance [pF]

C_{ISS}

C_{OSS}

C_{rss}

Notes：
1.V_{GS} = 0 V
2. f = 1 MHz

V_{DS} [M]

Gate Charge Characteristics

V_{GS} Gate Source Voltage[V]

V_{DS}=480V

V_{DS}=300V

V_{DS}=120V

Q_g Toltal Gate Charge [nC]

ELECTRICAL CHARACTERISTICS (curves)
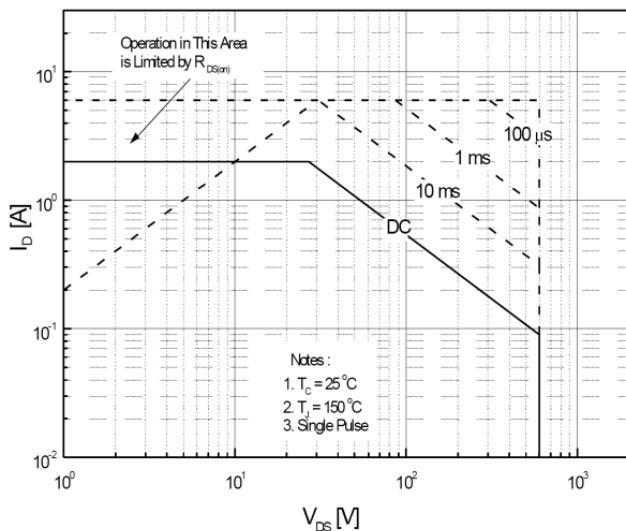
Breakdown Voltage Variation vs. Temperature

Notes:
1. $V_{GS}=0V$
2. $I_D=250\mu A$
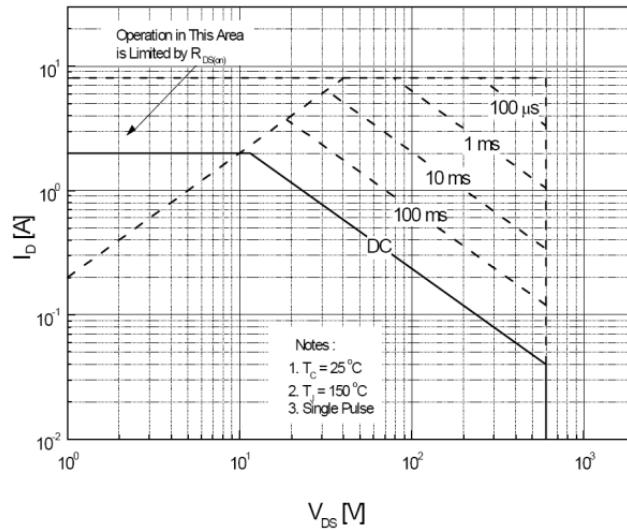
On-Resistance Variation vs. Temperature
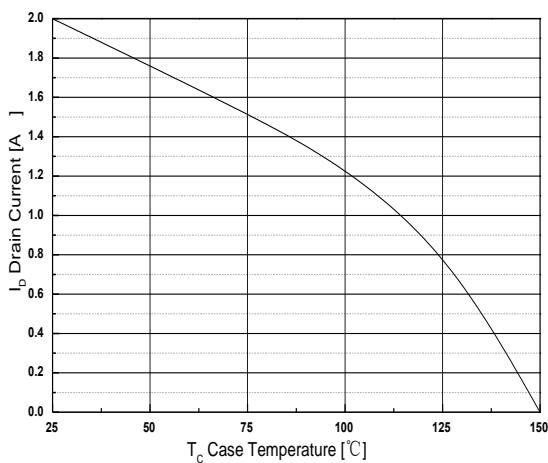
Notes:
1. $V_{GS}=10V$
2. $I_D=1.0 A$

Maximum Safe Operating Area For JCS2N60V/R/C

Operation in This Area is Limited by $R_{DS(on)}$

Notes :
1. $T_C = 25°C$
2. $T_J = 150°C$
3. Single Pulse

Maximum Safe Operating Area For JCS2N60F

Operation in This Area is Limited by $R_{DS(on)}$

Notes :
1. $T_C = 25°C$
2. $T_J = 150°C$
3. Single Pulse
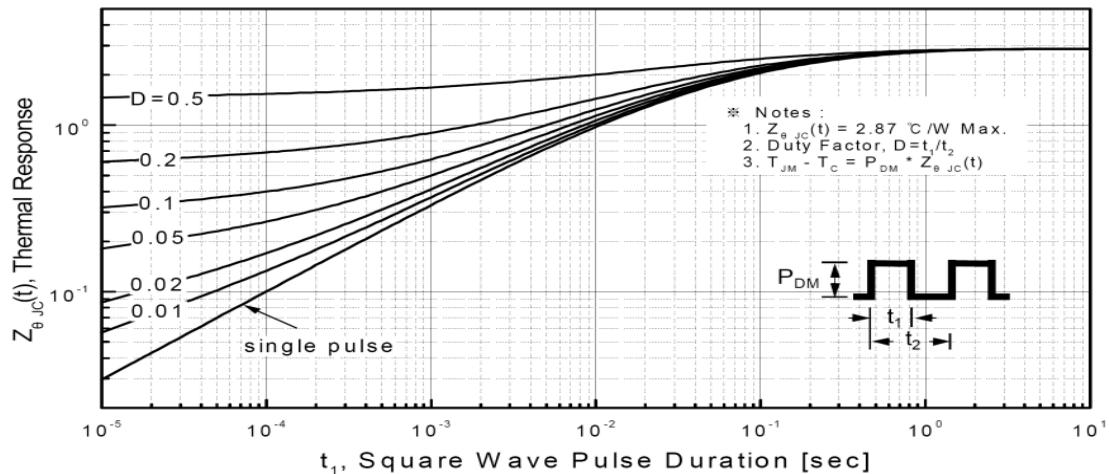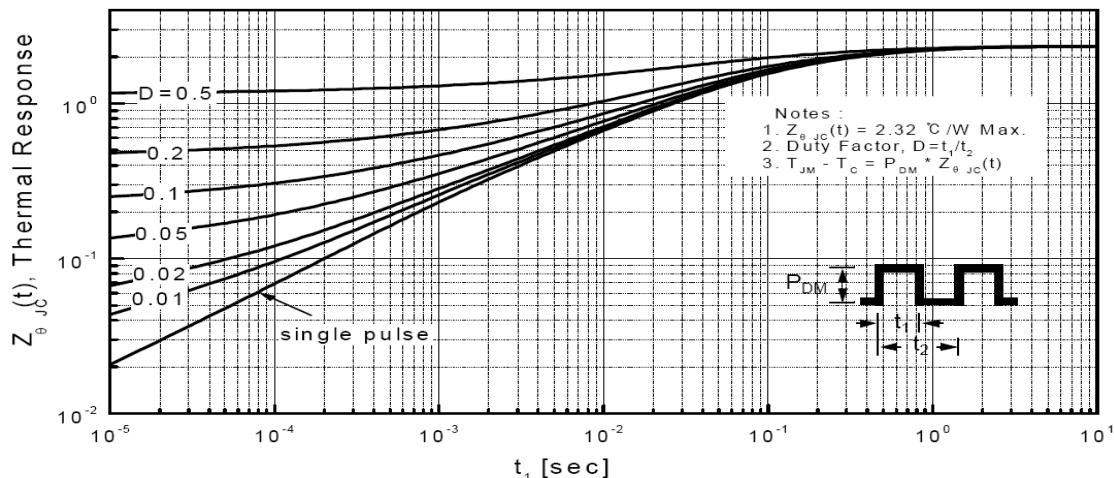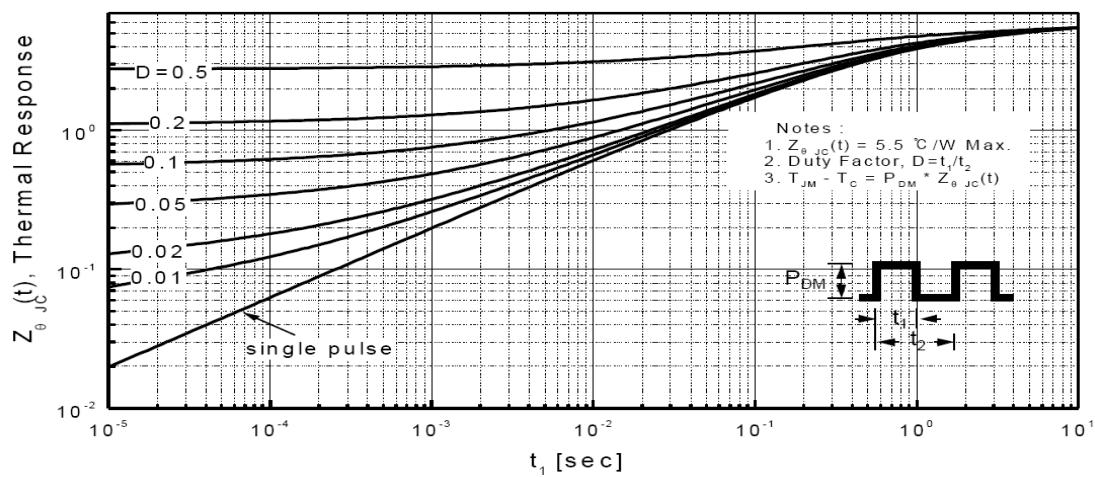
Maximum Drain Current vs. Case Temperature

ELECTRICAL CHARACTERISTICS (curves)

Transient Thermal Response Curve For JCS2N60V/R

※ Notes :
1. $Z_{\theta JC}(t) = 2.87\ ℃/W$ Max.
2. Duty Factor, $D = t_1/t_2$
3. $T_{JM} - T_C = P_{DM} * Z_{\theta JC}(t)$

Transient Thermal Response Curve For JCS2N60C

Notes :
1. $Z_{\theta JC}(t) = 2.32\ ℃/W$ Max.
2. Duty Factor, $D = t_1/t_2$
3. $T_{JM} - T_C = P_{DM} * Z_{\theta JC}(t)$

Transient Thermal Response Curve For JCS2N60F

Notes :
1. $Z_{\theta JC}(t) = 5.5\ ℃/W$ Max.
2. Duty Factor, $D = t_1/t_2$
3. $T_{JM} - T_C = P_{DM} * Z_{\theta JC}(t)$

TO-252 Package Information