

## 60V N-Ch Power MOSFET

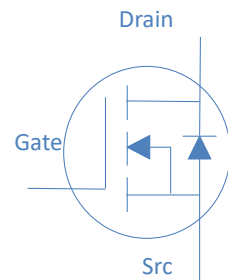
### Feature

- ◇ Optimized for high speed switching
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

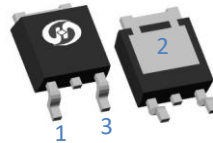
### Application

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ Power Tools
- ◇ UPS
- ◇ Motor Control

$V_{DS}$		60	V
$R_{DS(on),typ}$	$V_{GS}=10V$	30	mΩ
$R_{DS(on),typ}$	$V_{GS}=4.5V$	33	mΩ
$I_D$ (Silicon Limited)		16	A



TO-252



Part Number	Package	Marking
HTD480N06P	TO-252	TD480N06P

### Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current (Silicon Limited)	$I_D$	$T_C=25^\circ\text{C}$	16	A
		$T_C=100^\circ\text{C}$	10	
Drain to Source Voltage	$V_{DS}$	-	60	V
Gate to Source Voltage	$V_{GS}$	-	$\pm 20$	V
Pulsed Drain Current	$I_{DM}$	-	30	A
Avalanche Energy, Single Pulse	$E_{AS}$	$L=0.1\text{mH}, T_C=25^\circ\text{C}$	12.80	mJ
Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	20	W
Operating and Storage Temperature	$T_J, T_{stg}$	-	-55 to 150	$^\circ\text{C}$

### Absolute Maximum Ratings

Parameter	Symbol	Max	Unit
Thermal Resistance Junction-Case	$R_{\theta JC}$	6.25	$^\circ\text{C/W}$
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	110	$^\circ\text{C/W}$

**Electrical Characteristics at  $T_j=25^{\circ}\text{C}$  (unless otherwise specified)**
**Static Characteristics**

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	0.8	1.35	2	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=48V, T_j=25^{\circ}\text{C}$	-	-	1	$\mu A$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain to Source on Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$	-	30	50	$m\Omega$
		$V_{GS}=4.5V, I_D=8A$	-	33	55	$m\Omega$
Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=10A$	-	10	-	S
Gate Resistance	$R_G$	$V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$	-	3.40	-	$\Omega$

**Dynamic Characteristics**

Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=20V, f=1\text{MHz}$	-	776	-	pF
Output Capacitance	$C_{oss}$		-	51	-	
Reverse Transfer Capacitance	$C_{rss}$		-	44	-	
Total Gate Charge (10V)	$Q_g (10V)$	$V_{DD}=20V, I_D=10A, V_{GS}=10V$	-	17.5	-	nC
Gate to Source Charge	$Q_{gs}$		-	2.6	-	
Gate to Drain (Miller) Charge	$Q_{gd}$		-	3.6	-	
Turn on Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=1A, V_{GS}=10V,$ $R_G=6\Omega,$	-	7.6	-	ns
Rise time	$t_r$		-	16.2	-	
Turn off Delay Time	$t_{d(off)}$		-	40.6	-	
Fall Time	$t_f$		-	7.0	-	

**Reverse Diode Characteristics**

Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_F=15A$	-	0.87	1.3	V
Reverse Recovery Time	$t_{rr}$	$I_F=5A, dI_F/dt=100A/\mu s$	-	12.1	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	8.8	-	nC

Fig 1. Typical Output Characteristics

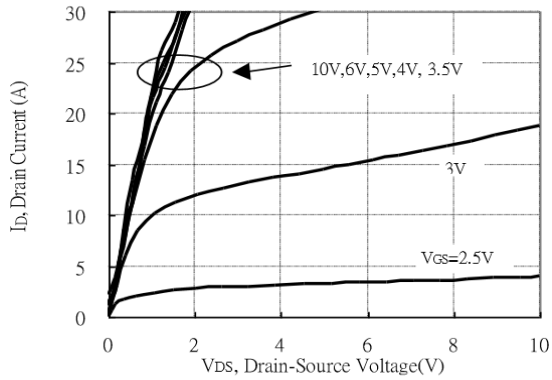


Figure 2. On-Resistance vs. Gate-Source Voltage

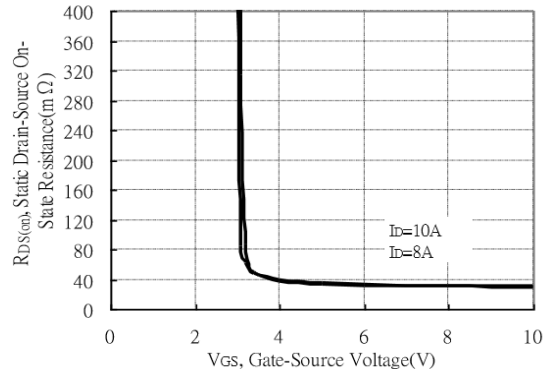


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

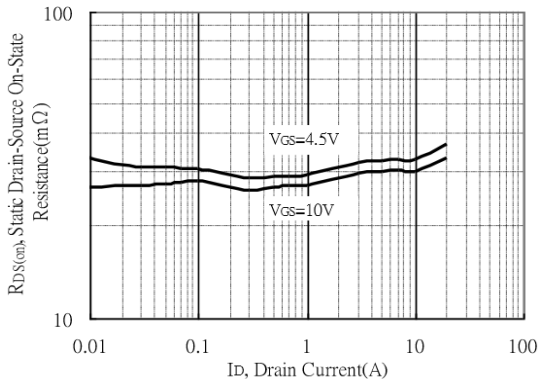


Figure 4. Normalized On-Resistance vs. Junction Temperature

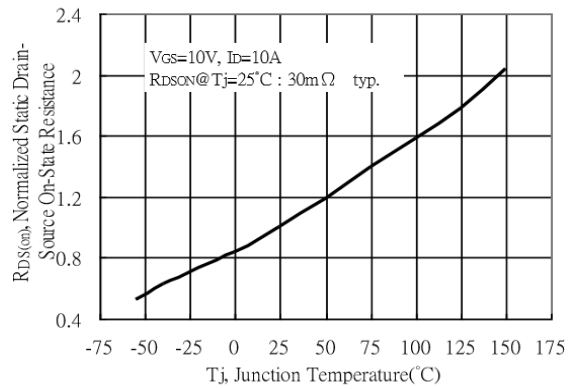


Figure 5. Normalized Threshold Voltage vs. Junction Temperature

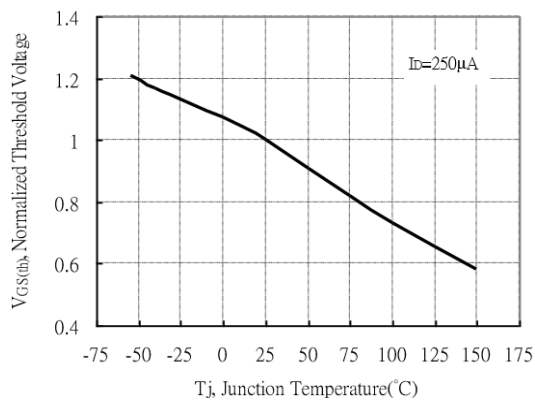


Figure 6. Typical Source-Drain Diode Forward Voltage

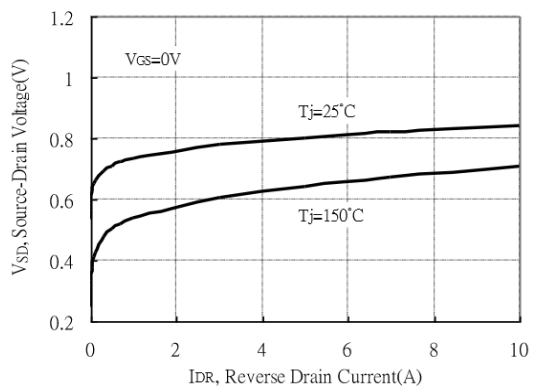


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

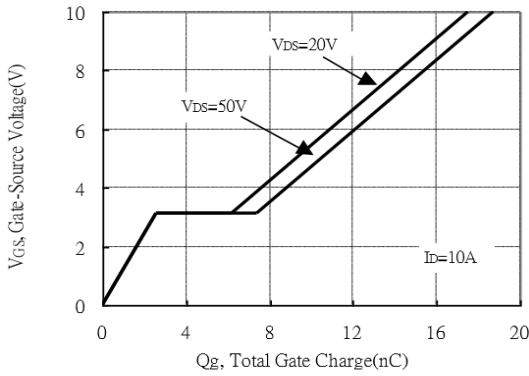


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

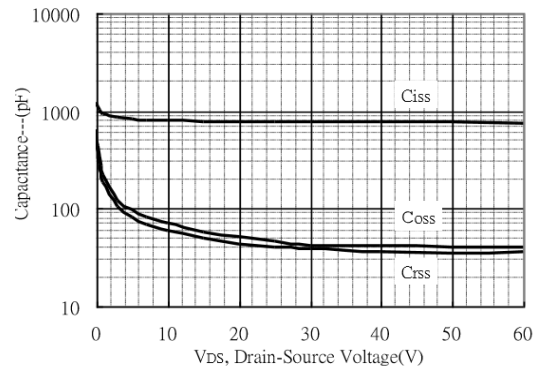


Figure 9. Maximum Safe Operating Area

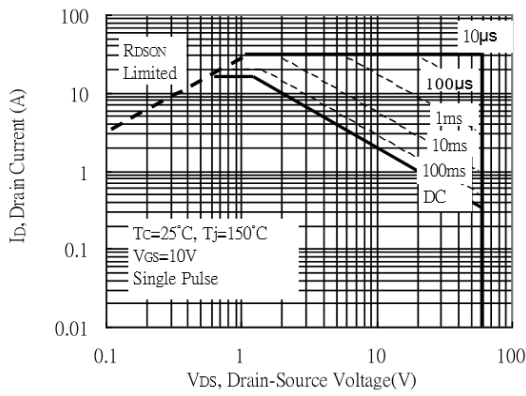


Figure 10. Maximum Drain Current vs. Case Temperature

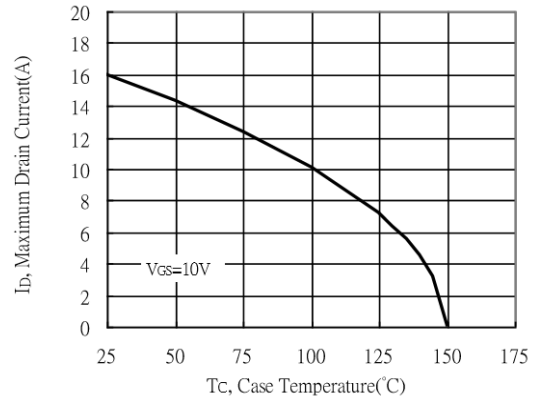
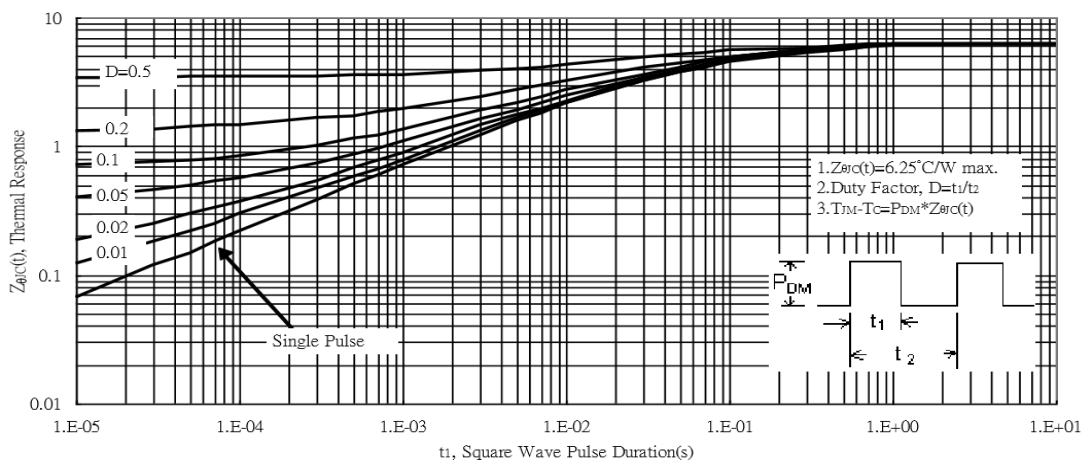
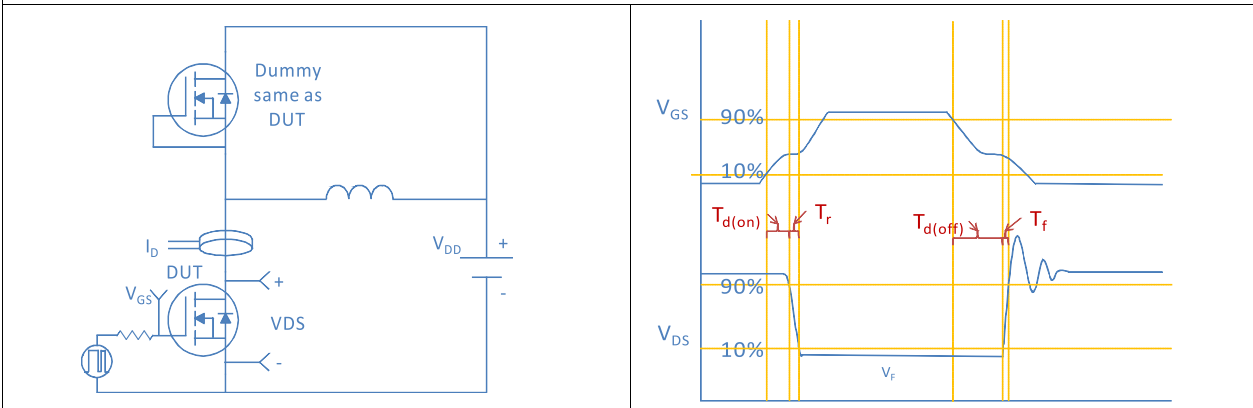


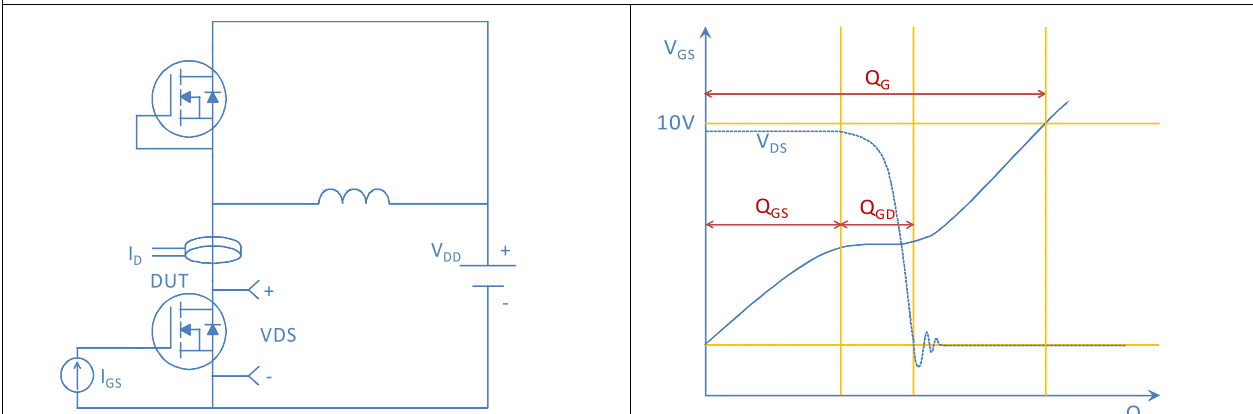
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



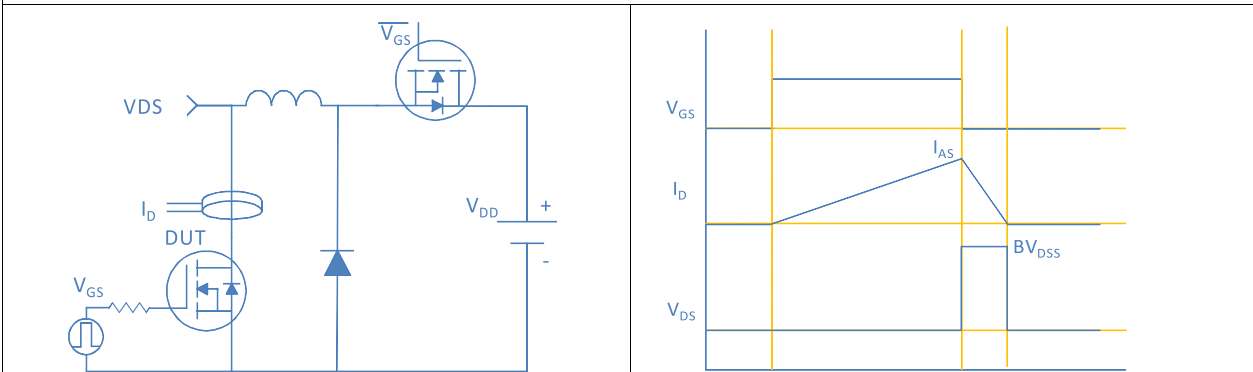
## Inductive switching Test



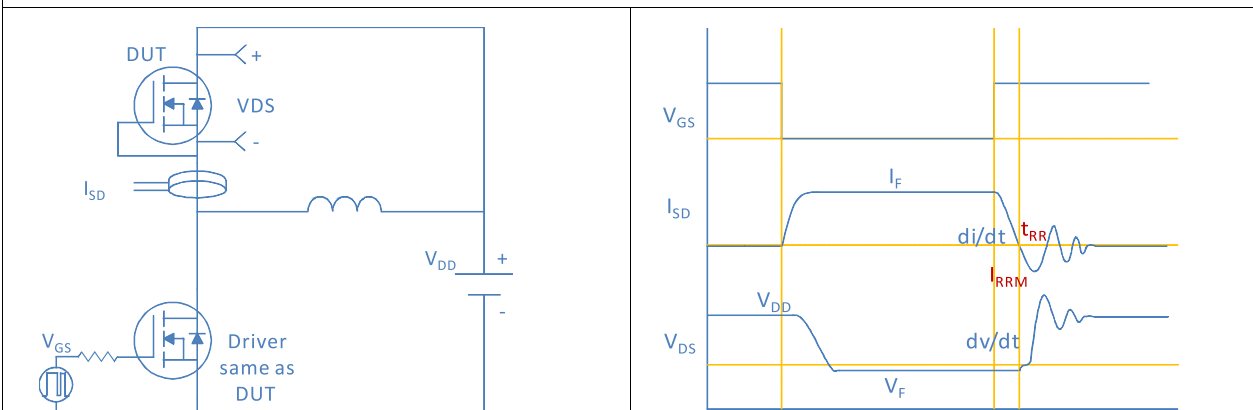
## Gate Charge Test

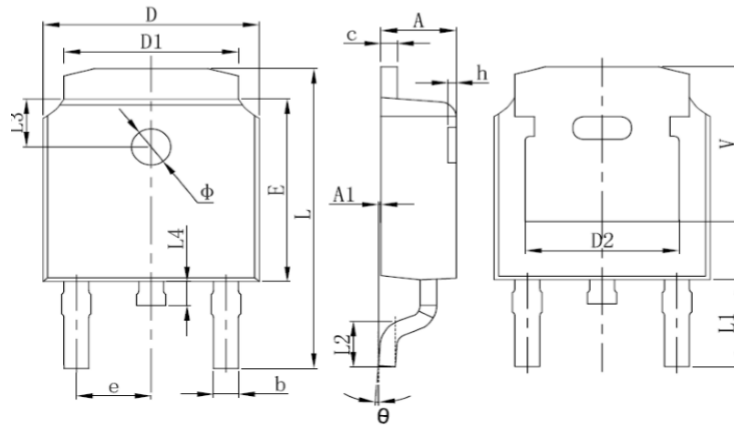


## Uclamped Inductive Switching (UIS) Test



## Diode Recovery Test



**Package Outline**
**TO-252, 2 Leads**


DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	L	0.382	0.406	9.712	10.312
A1	0.000	0.005	0.000	0.127	L1	0.114	REF	2.900	REF
b	0.025	0.030	0.635	0.770	L2	0.055	0.067	1.400	1.700
c	0.018	0.023	0.460	0.580	L3	0.063	REF	1.600	REF
D	0.256	0.264	6.500	6.700	L4	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	Φ	0.043	0.051	1.100	1.300
D2	0.190	REF	4.830	REF	θ	0°	8°	0°	8°
E	0.236	0.244	6.000	6.200	h	0.000	0.012	0.000	0.300
e	0.086	0.094	2.186	2.386	v	0.207	REF	5.250	REF