

**600V / 4.0A**  
**N-Channel Enhancement Mode MOSFET**

600V,  $R_{DS(ON)}=2.4\Omega@V_{GS}=10V, I_D=2.0A$

**Features**

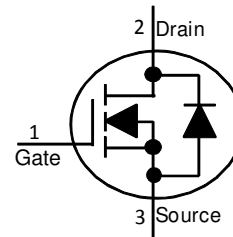
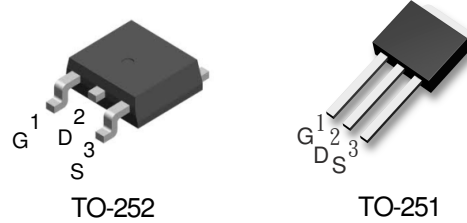
- Low ON Resistance
- Fast Switching
- Low Gate Charge & Low  $C_{RSS}$
- Fully Characterized Avalanche Voltage and Current
- Specially Designed for AC Adapter, Battery Charger and SMPS
- In compliance with EU RoHs 2002/95/EC Directives

**Mechanical Information**

- Case: TO-252 / ITO-251 Molded Plastic
- Terminals : Solderable per MIL-STD-750,Method 2026

**Marking & Ordering Information**

TYPE	MARKING	PACKAGE	PACKING
HY4N60D	4N60D	TO-252	2500PCS/REEL
HY4N60M	4N60M	TO-251	70PCS/TUBE



**Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$  unless otherwise noted )**

Parameter	Symbol	HY4N60D	HY4N60M	Units
Drain-Source Voltage	$V_{DS}$	600		V
Gate-Source Voltage	$V_{GS}$	$\pm 30$		V
Continuous Drain Current	$T_c=25^\circ\text{C}$ $I_D$	4	4	A
Pulsed Drain Current <sup>1)</sup>	$I_{DM}$	16	16	A
Maximum Power Dissipation	$T_c=25^\circ\text{C}$ $P_D$	56.8	48	W
Derating Factor		0.46	0.39	
Avalanche Energy with Single Pulse $I_{AS}=4A, VDD=90V, L=27.5mH$	$E_{AS}$	220		mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150		$^\circ\text{C}$

**Note :** 1. Maximum DC current limited by the package

**Thermal Characteristics**

PARAMETER	Symbol	HY4N60D	HY4N60M	Units
Junction-to-Case Thermal Resistance	$R_{\theta JC}$	2.2	2.6	$^\circ\text{C/W}$
Junction-to Ambient Thermal Resistance	$R_{\theta JA}$	50	110	$^\circ\text{C/W}$

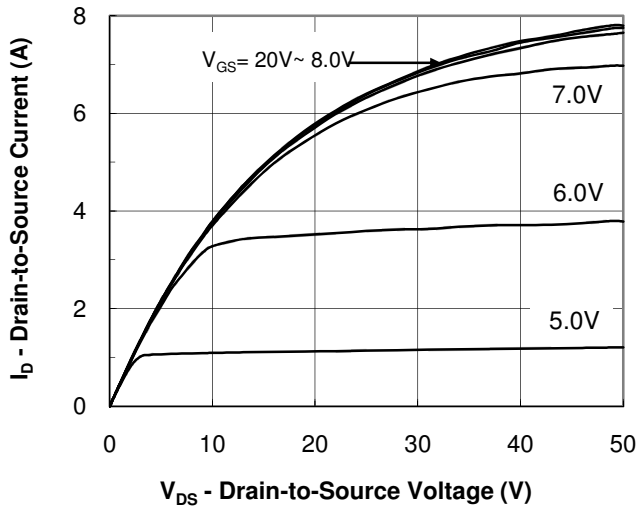
**COMPANY RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN,FUNCTIONS AND RELIABILITY WITHOUT NOTICE**

**Electrical Characteristics (  $T_c=25^{\circ}\text{C}$  unless otherwise noted )**

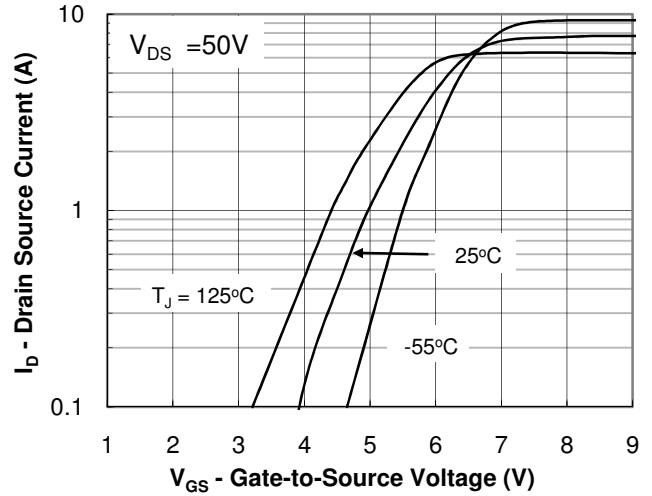
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
<b>Static</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2.0A$	-	2.0	2.4	$\Omega$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$	-	-	10	$\mu A$
Gate Body Leakage	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=480V, I_D=4.0A$ $V_{GS}=10V$	-	15.4	22	nC
Gate-Source Charge	$Q_{gs}$		-	3.8	-	
Gate-Drain Charge	$Q_{gd}$		-	5.4	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=300V, I_D=4.0A$ $V_{GS}=10V, R_G=25\Omega$	-	12.4	16	ns
Turn-On Rise Time	$t_r$		-	13.2	18	
Turn-Off Delay Time	$t_{d(off)}$		-	22.8	32	
Turn-Off Fall Time	$t_f$		-	9.6	14	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$	-	460	620	pF
Output Capacitance	$C_{oss}$		-	63	72	
Reverse Transfer Capacitance	$C_{rss}$		-	1.8	5.6	
<b>Source-Drain Diode</b>						
Max. Diode Forward Current	$I_S$	-	-	-	4.0	A
Max.Pulsed Source Current	$I_{SM}$	-	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4.0A, V_{GS}=0V$	-	-	1.4	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=4.0A$ $di/dt=100A/\mu s$	-	290	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	2.8	-	$\mu C$

**NOTE :** Plus Test : Pluse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

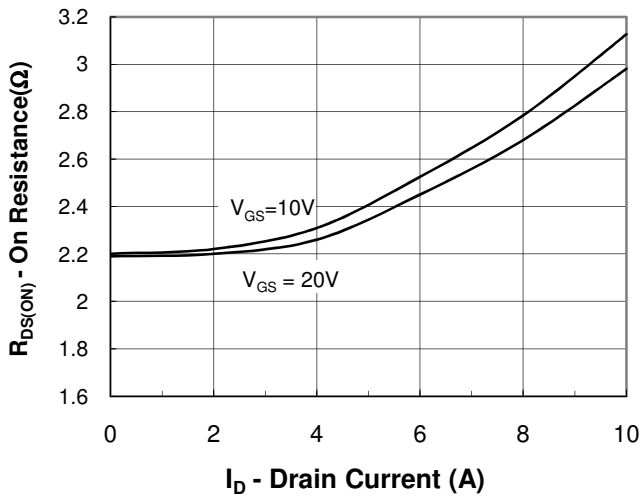
## Typical Characteristics Curves ( $T_C=25^\circ\text{C}$ , unless otherwise noted)



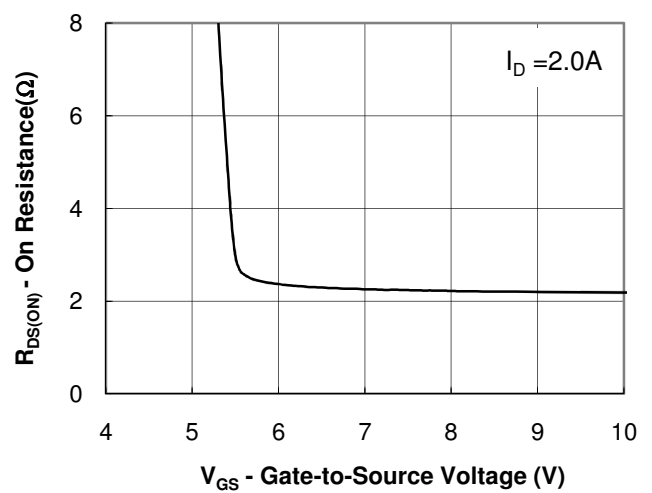
**Fig.1 Output Characteristic**



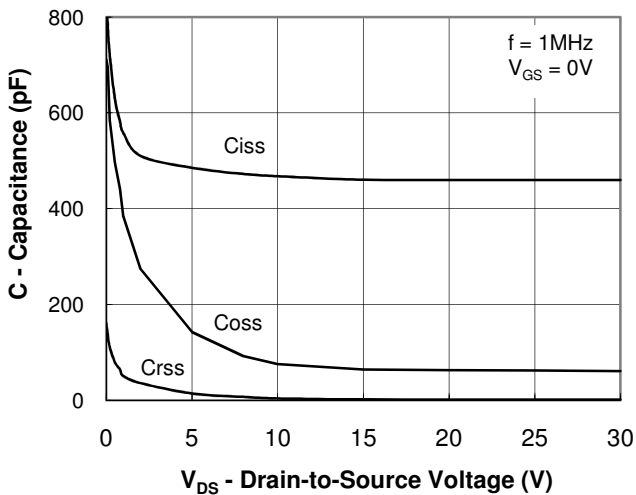
**Fig.2 Transfer Characteristic**



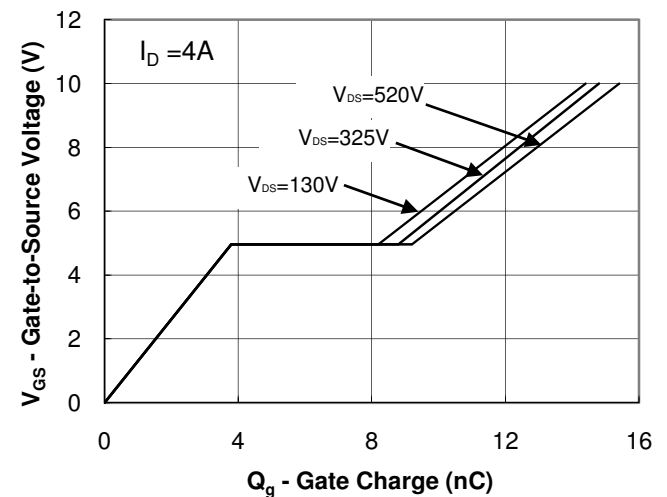
**Fig.3 On-Resistance vs Drain Current**



**Fig.4 On-Resistance vs Gate to Source Voltage**

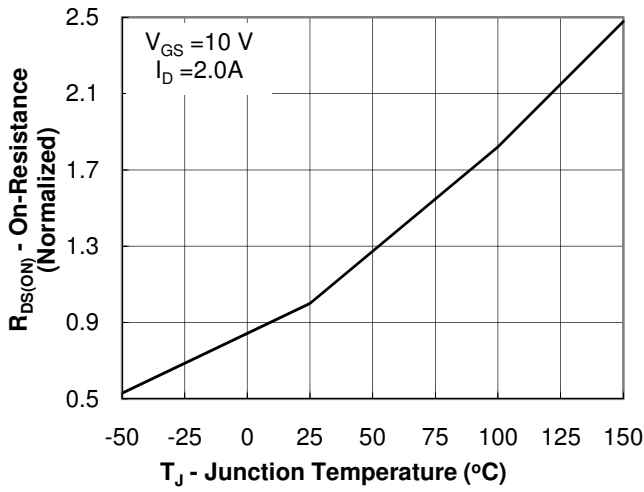


**Fig.5 Capacitance Characteristic**

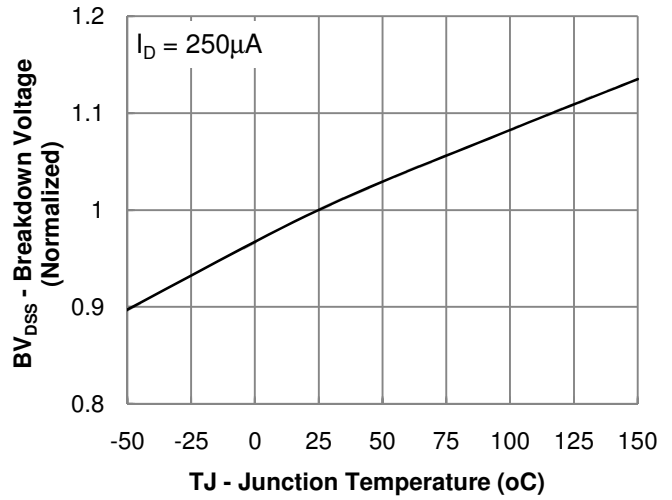


**Fig.6 Gate Charge Characteristic**

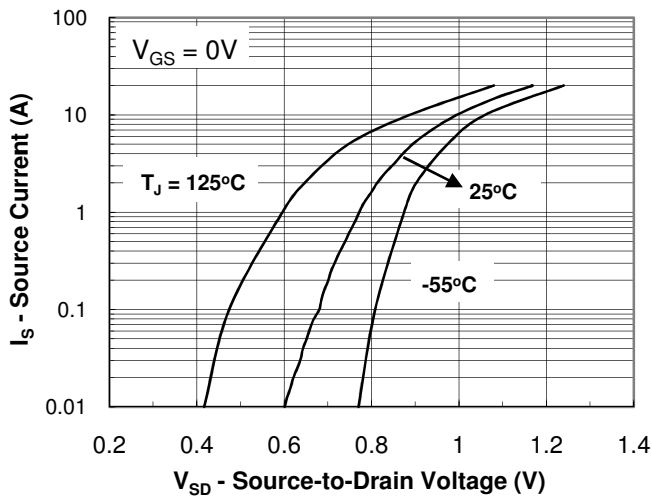
## Typical Characteristics Curves ( $T_C=25^\circ\text{C}$ , unless otherwise noted)



**Fig.7 On-Resistance vs Junction Temperature**



**Fig.8 Breakdown Voltage vs Junction Temperature**



**Fig.9 Body Diode Forward Voltage Characteristic**