ELECTRONIC CORP

ST1N60

POWER MOSFET

GENERAL DESCRIPTION

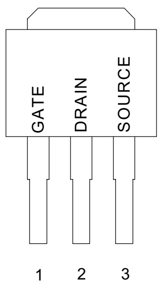
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

FEATURES

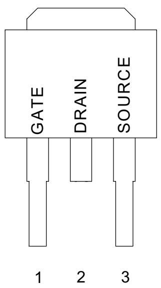
- ◆ Robust High Voltage Termination
- ◆ Avalanche Energy Specified
- ◆ Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- ◆ Diode is Characterized for Use in Bridge Circuits
- ◆ I_{DSS} and V_{DS}(on) Specified at Elevated Temperature

PIN CONFIGURATION

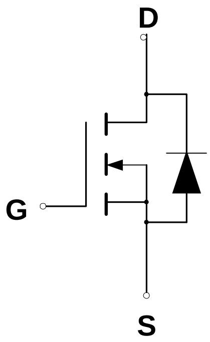
TO-251
Front View



TO-252
Front View



SYMBOL



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current — Continuous	I_D	1.0	A
— Pulsed	I_{DM}	9.0	
Gate-to-Source Voltage — Continue	V_{GS}	±30	V
— Non-repetitive	V_{GSM}	±40	V
Total Power Dissipation	P_D		W
TO-251/252		50	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃
Single Pulse Drain-to-Source Avalanche Energy — T_J = 25℃ (V_{DD} = 100V, V_{GS} = 10V, I_{AS} = 2A, L = 10mH, R_G = 25Ω)	E_{AS}	20	mJ
Thermal Resistance — Junction to Case	θ_{JC}	1.0	℃/W
— Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	℃

ORDERING INFORMATION

Part Number	Package
ST1N60-251	TO-251
ST1N60-252	TO-252

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_J = 25℃.

Characteristic		Symbol	ST1N60 Min	Typ	Max	Units
Drain-Source Breakdown Voltage (V_{GS} = 0 V, I_D = 250 μA)		$V_{(BR)DSS}$	600			V
Drain-Source Leakage Current		I_{DSS}				mA
(V_{DS} = 600 V, V_{GS} = 0 V)					0.1	
(V_{DS} = 480 V, V_{GS} = 0 V, T_J = 125℃)					0.3	
Gate-Source Leakage Current-Forward (V_{gsf} = 20 V, V_{DS} = 0 V)		I_{GSSF}			100	nA
Gate-Source Leakage Current-Reverse (V_{gsr} = 20 V, V_{DS} = 0 V)		I_{GSSR}			100	nA
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μA)		$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance (V_{GS} = 10 V, I_D = 0.6A) *		$R_{DS(on)}$			8.0	Ω
Forward Transconductance (V_{DS} ≧ 50 V, I_D = 0.5A) *		g_{FS}	0.5			mhos
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}		210		pF
Output Capacitance		C_{oss}		28		pF
Reverse Transfer Capacitance		C_{rss}		4.2		pF
Turn-On Delay Time	(V_{DD} = 300 V, I_D = 1.0 A, V_{GS} = 10 V, R_G = 18Ω) *	$t_{d(on)}$		8		ns
Rise Time		t_r		21		ns
Turn-Off Delay Time		$t_{d(off)}$		18		ns
Fall Time		t_f		24		ns
Total Gate Charge	(V_{DS} = 400 V, I_D = 1.0 A, V_{GS} = 10 V)*	Q_g		8.5	14	nC
Gate-Source Charge		Q_{gs}		1.8		nC
Gate-Drain Charge		Q_{gd}		4		nC
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)		L_D		4.5		nH
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)		L_S		7.5		nH
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	(I_S = 1.0 A, V_{GS} = 0 V, d_{IS}/d_t = 100A/μs)	V_{SD}			1.5	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		350	500	ns

* Pulse Test: Pulse Width ≦300μs, Duty Cycle ≦2%

** Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

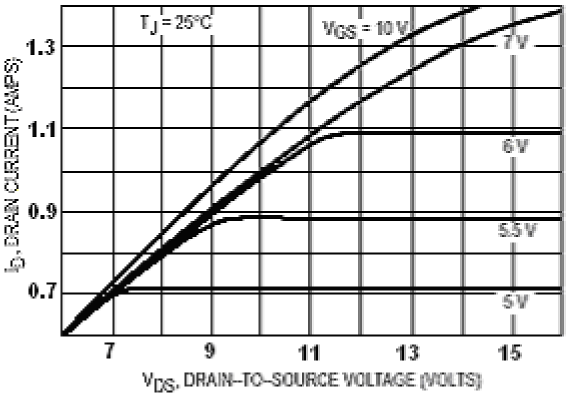


Figure 1. On–Region Characteristics

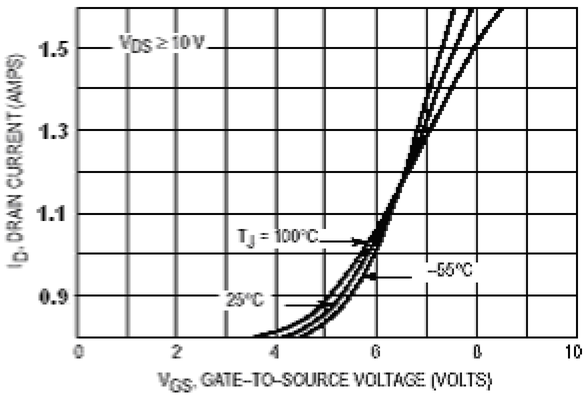
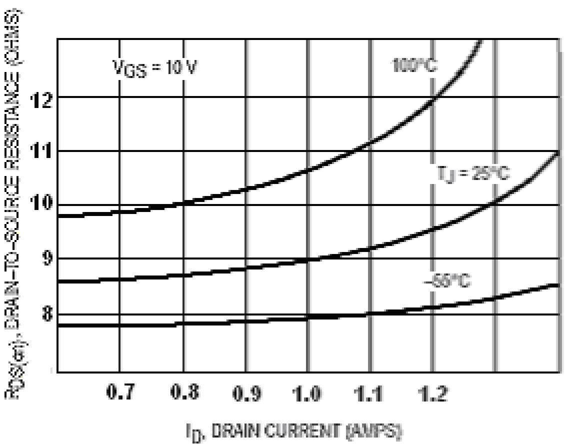


Figure 2. Transfer Characteristics



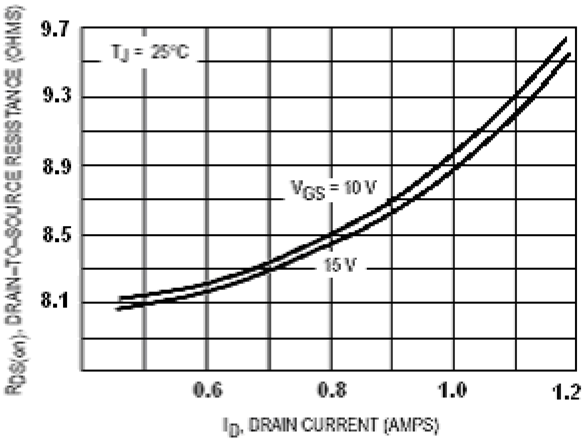


Figure 3. On–Resistance versus Drain Current and Temperature

Figure 4. On–Resistance versus Drain Current and Gate Voltage

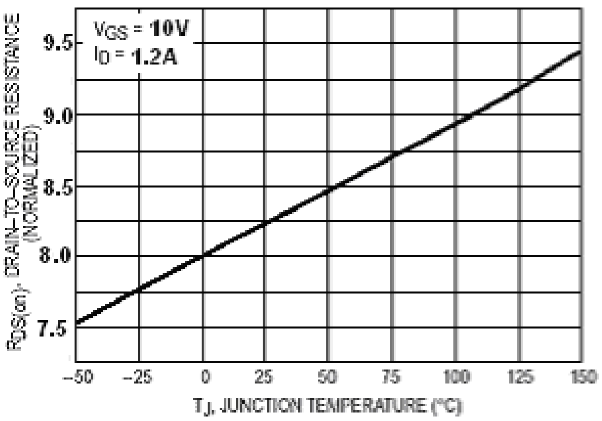


Figure 5. On–Resistance Variation with Temperature

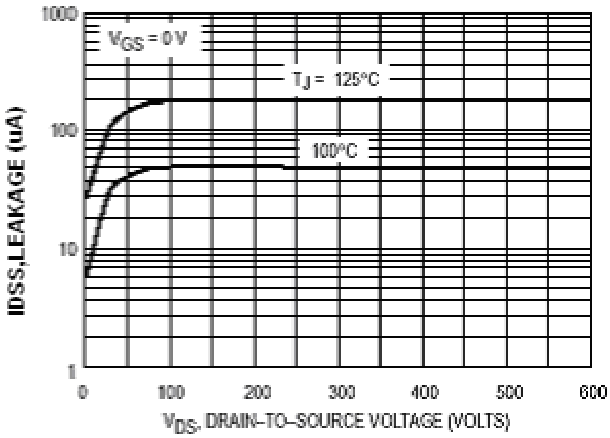
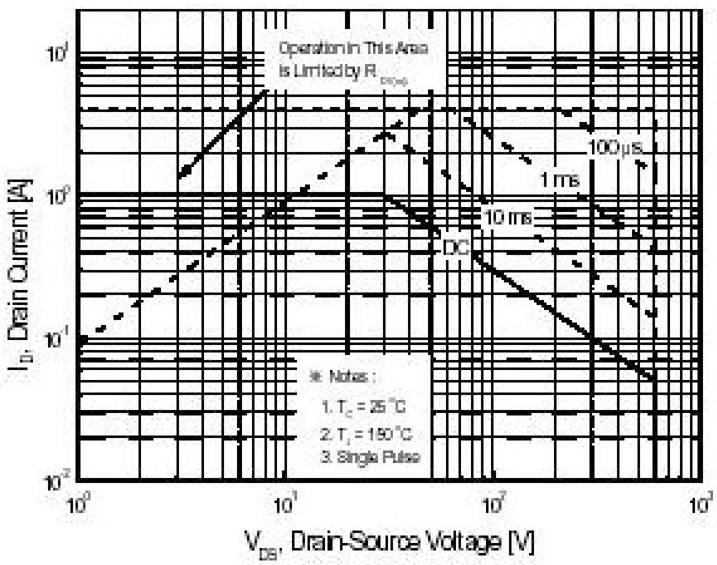


Figure 6. Drain–To–Source Leakage Current versus Voltage



Maximum Safe Operating Area

TO-251/TO-252