

N2 Amps, 600Volts N-Channel MOSFET

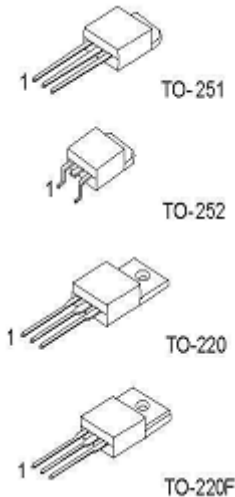
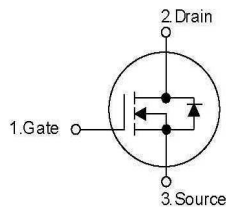
Description

The ET2N60 N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

Features

- $R_{DS(ON)} = 5.00\Omega @ V_{GS} = 10V$
- Low gate charge (typical 9nC)
- High ruggedness
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability

Symbol



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

Parameter		Symbol	Ratings				Units
			TO-220	TO-220F	TO-251	TO-252	
Drain-Source Voltage		V_{DSS}	600				V
Gate-Source Voltage		V_{GSS}	± 30				V
Drain Current Continuous	$T_c=25^\circ\text{C}$	I_D	2.0	2.0*	1.9		A
	$T_c=100^\circ\text{C}$		1.35	1.35*	1.14		A
Drain Current Pulsed (Note 1)		I_{DP}	8	8*	7.6		A
Avalanche Energy	Repetitive (Note 1)	E_{AR}	5.55		4.4		mJ
	Single Pulse (Note 1)	E_{AS}	130		120		mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5				V/ns
Total Power Dissipation	$T_c=25^\circ\text{C}$	P_D	55.5	23.6	44		W

	Derate above 25°C		0.44	0.19	0.35	W/°C
Junction Temperature	T_J		+150			°C
Storage Temperature	T_{STG}		-55~+150			°C

* Drain current limited by maximum junction temperature.

■ Thermal Characteristics

Parameter	Symbol	Ratings				Units
		TO-220	TO-220F	TO-251	TO-252	
Thermal Resistance Junction-Ambient	R _{thJA}	62.5		50* (110)		°C/W
Thermal Resistance, Case-to-Sink Typ.	R _{thCS}	0.5	--	--		
Thermal Resistance Junction-Case	R _{thJC}	2.32	5.5	2.87		

■ Electrical Characteristics ($T_J=25^\circ\text{C}$, unless Otherwise specified.)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
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	--	--	1	μA
			V _{DS} =480V, T _C =125℃	--	--	10	μA
Gate-Body Leakage Current	Forward	I _{GSS}	V _{GS} =30V, V _{DS} =0V	--	--	100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V	--	--	-100	nA
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D =250μA	--	0.7	--	V/℃
On Characteristics							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0	--	4.0	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{DS} =10V, I _D =1.0A(TO220, TO220F) I _D =0.95A(TO251, TO252)	--	4.1	5.0	Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz	--	200	--	pF
Output Capacitance		C _{OSS}		--	20	--	pF
Reverse Transfer Capacitance		C _{RSS}		--	4	--	pF
Switching Characteristics							
Turn-On Delay Time		t _{D(ON)}	V _{DD} =300V, I _D =2.0A, R _G =25Ω (Note 4, 5)	--	10	--	ns
Rise Time		t _R		--	25	--	ns
Turn-Off Delay Time		t _{D(OFF)}		--	25	--	ns
Fall Time		t _F		--	30	--	ns
Total Gate Charge		Q _G	V _{DS} =480V, I _D =2.0A V _{GS} =10V (Note 4, 5)	--	9	--	nC
Gate-Source Charge		Q _{GS}		--	1.5	--	nC
Gate-Drain Charge		Q _{GD}		--	4.0	--	nC
Drain-Source Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =2.0A(TO220, TO220F) I _{SD} =0.95A(TO251, TO252)	--	--	1.4	V
Continuous Drain-Source Current		I _{SD}	TO-220, TO-220F	--	--	2.0	A
			TO-251, TO-252	--	--	1.9	
Pulsed Drain-Source Current		I _{SM}	TO-220, TO-220F	--	--	8.0	A
			TO-251, TO-252	--	--	7.6	
Reverse Recovery Time		t _{RR}	I _{SD} =2.0A, dI _{SD} /dt=100A/μs (Note 4)	--	230	--	ns
Reverse Recovery Charge		Q _{RR}		--	1.0	--	μC

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 60\text{ mH}, I_{AS} = 2.0\text{ A}, V_{DD} = 50V, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 2.0\text{ A}, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

4. Pulse Test : Pulse width $\leq 300 \mu s$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

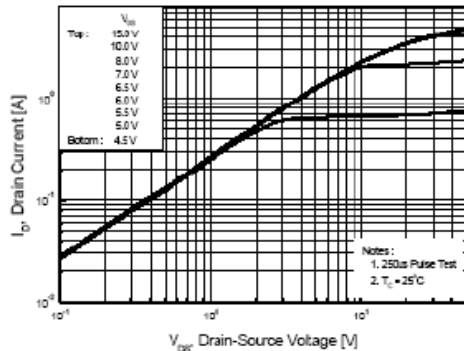


Figure 1. On-Region Characteristics

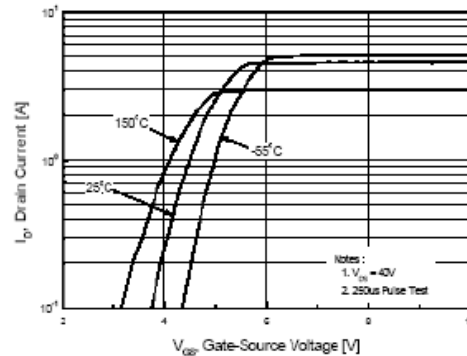


Figure 2. Transfer Characteristics

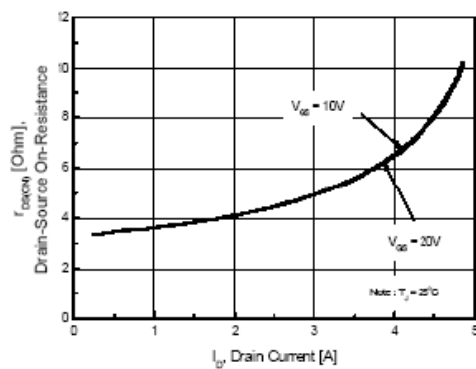


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

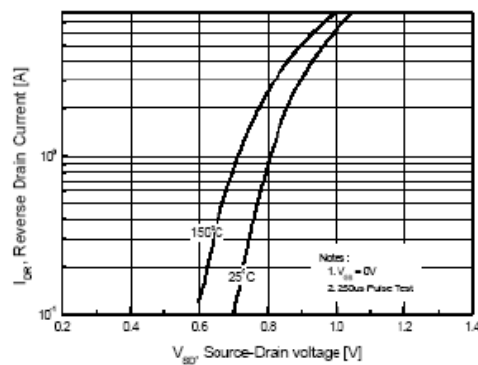


Figure 4. Body Diode Forward Voltage Variation with Source Current

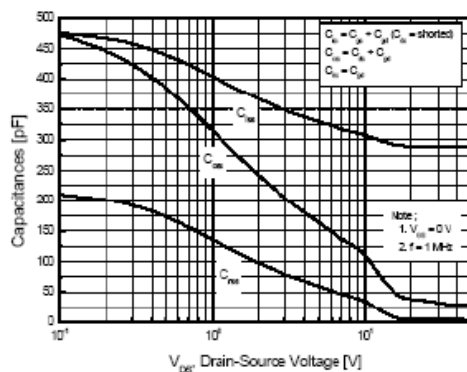


Figure 5. Capacitance Characteristics

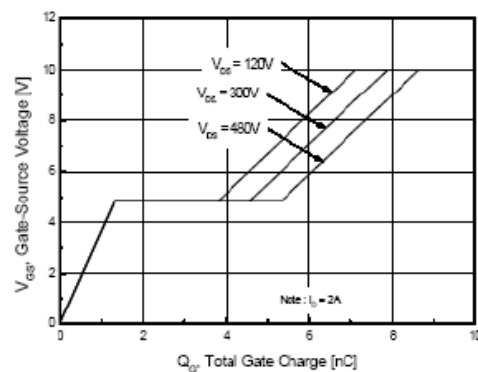


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

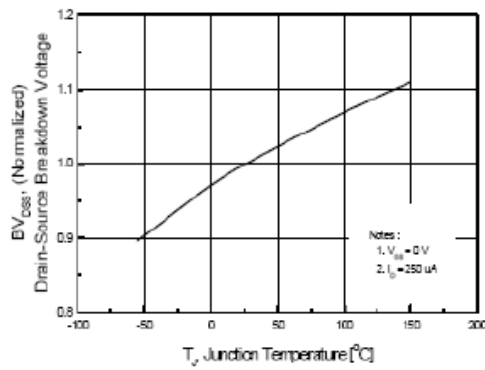


Figure 7. Breakdown Voltage Variation vs Temperature

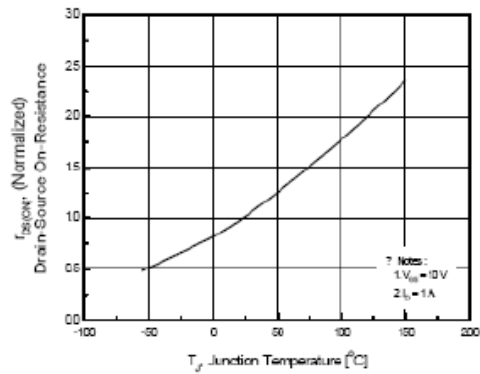


Figure 8. On-Resistance Variation vs Temperature

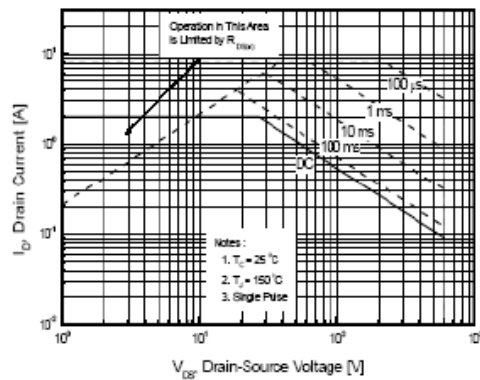


Figure 9-1. Maximum Safe Operating Area for TO220

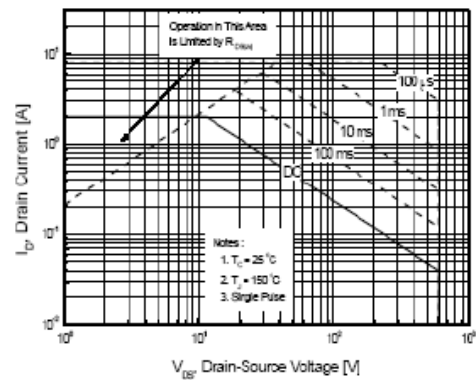


Figure 9-2. Maximum Safe Operating Area for TO220F

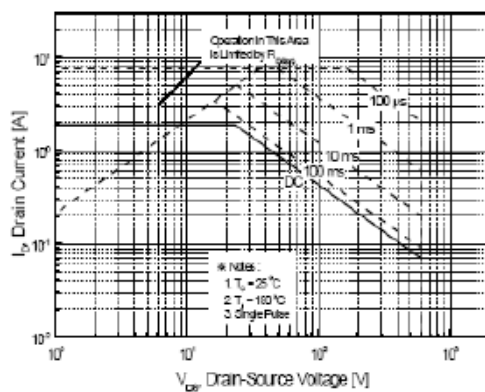


Figure 9-3. Maximum Safe Operating Area for TO251, TO252

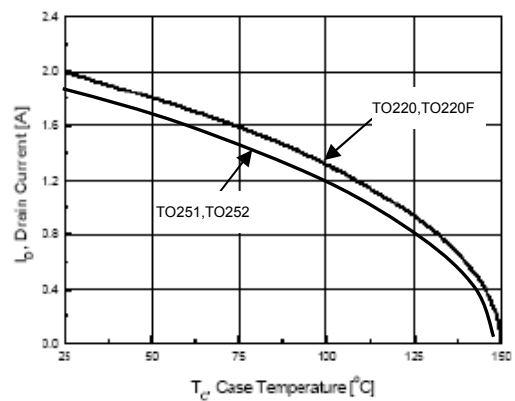


Figure 10. Maximum Drain Current vs Case Temperature

■ **Typical Characteristics** (Continued)

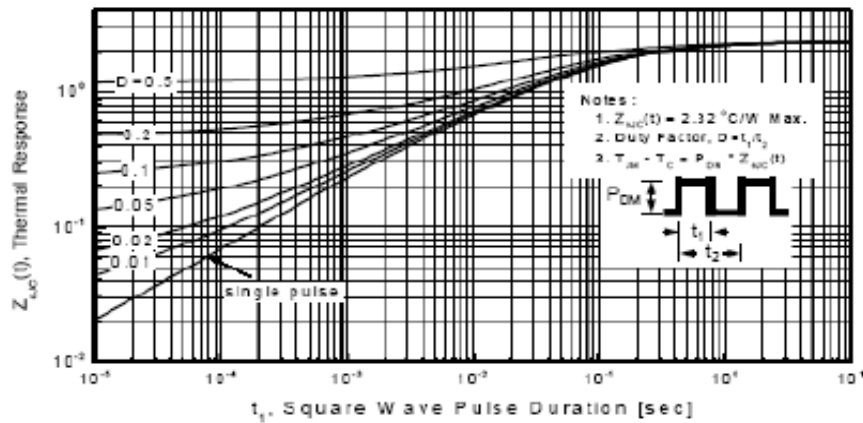


Figure 11-1. Transient Thermal Response Curve TO220

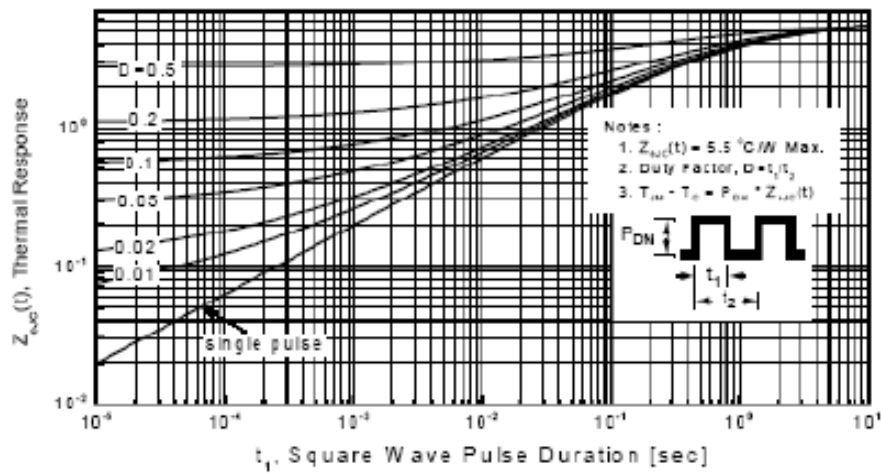


Figure 11-2. Transient Thermal Response Curve for TO220F

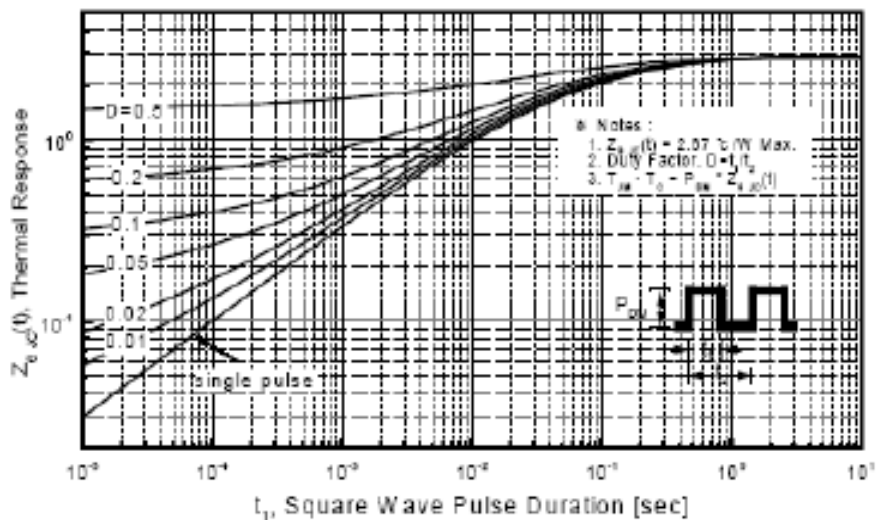


Figure 11-3. Transient Thermal Response Curve for TO251/ TO252