2 Amps, 600 Volts

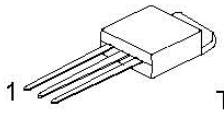
N-CHANNEL MOSFET

Description

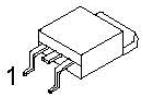
The 2N60 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

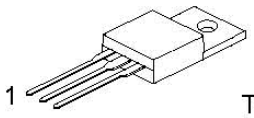
* RDS(ON) = 3.8Ω@VGS = 10V.
* Ultra Low gate charge (typical 9.0nC)
* Low reverse transfer capacitance (Crss = typical 5.0 pF)
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness



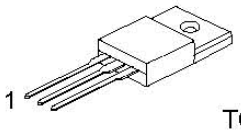
TO-251



TO-252



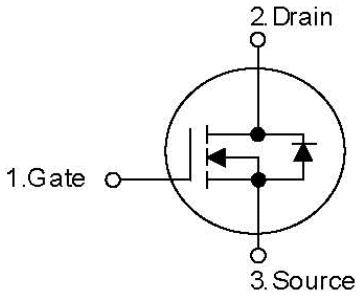
TO-220



TO-220F

Pb-free plating product number: 2N60L

SYMBOL



ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
2N60-TA3-T	2N60L-TA3-T	TO-220	G	D	S	Tube
2N60-TF3-T	2N60L-TF3-T	TO-220F	G	D	S	Tube
2N60-TM3-T	2N60L-TM3-T	TO-251	G	D	S	Tube
2N60-TN3-R	2N60L-TM3-T	TO-252	G	D	S	Tape Reel
2N60-TN3-T	2N60L-TN3-T	TO-252	G	D	S	Tube

Note: Pin Assignment: G: Gate D: Drain S: Source

2N60L-TA3-T (1)Packing Type (2)Package Type (3)Lead Plating	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TM3: TO-251, TN 3: TO-252 (3) L: Lead Free Plating, Blank: Pb/Sn

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	2.0	A
Drain Current Continuous	T_C = 25°C	I_D	2.0	A
	T_C = 100°C		1.26	A
Drain Current Pulsed (Note 2)		I_{DP}	8.0	A
Avalanche Energy	Repetitive(Note 2)	E_{AR}	4.5	mJ
	Single Pulse(Note 3)	E_{AS}	140	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Total Power Dissipation	T_C = 25°C	P_D	45	W
	Derate above 25°C		0.36	W/°C
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Note:1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L=64mH, IAS=2.0A, VDD=50V, RG=25 Ω, Starting TJ = 25°C
4. ISD≤ 2.4A, di/dt ≤ 200A/μs, VDD ≤ BVDSS, Starting TJ = 25°C

THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Thermal Resistance Junction-Ambient	TO-251	θJA	112	°C / W
	TO-252		112	
	TO-220		54	
	TO-220F		54	
Thermal Resistance Junction-Case	TO-251	θJc	12	
	TO-252		12	
	TO-220		4	
	TO-220F		4	

ELECTRICAL CHARACTERISTICS (T_J =25°C, unless Otherwise specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	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
			V_{DS} = 480V, T_C = 125°C			100	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		$\triangle BV_{DSS}/\triangle T_J$	I_D = 250 μA		0.4		V/°C
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_{GS} = 10V, I_D =1A		3.8	5	Ω
Forward Transconductance		g_{FS}	V_{DS} = 50V, I_D = 1A (Note 1)		2.25		S
Dynamic Characteristics							
Input Capacitance		CISS	VDS =25V, VGS =0V, f =1MHz		270	350	pF
Output Capacitance		COSS			40	50	pF
Reverse Transfer Capacitance		CRSS			5	7	pF

ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Switching Characteristics						
Turn-On Delay Time	$t_{D\ (ON)}$	V_{DD} =300V, I_D =2.4A, R_G=25Ω (Note 1,2)		10	30	ns
Rise Time	t_R			25	60	ns
Turn-Off Delay Time	$t_{D(OFF)}$			20	50	ns
Fall Time	t_F			25	60	ns
Total Gate Charge	Q_G	V_{DS}=480V, V_{GS}=10V, I_D=2.4A (Note 1, 2)		9.0	11	nC
Gate-Source Charge	Q_{GS}			1.6		nC
Gate-Drain Charge	Q_{GD}			4.3		nC
Drain-Source Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_{SD} = 2.0 A			1.4	V
Continuous Drain-Source Current	I_{SD}				2.0	A
Pulsed Drain-Source Current	I_{SM}				8.0	A
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_{SD} = 2.4A, di/dt = 100 A/μs (Note1)		180		ns
Reverse Recovery Charge	Q_{RR}			0.72		μC

Note: 1. Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%

2. Essentially Independent of Operating Temperature

TEST CIRCUITS AND WAVEFORMS

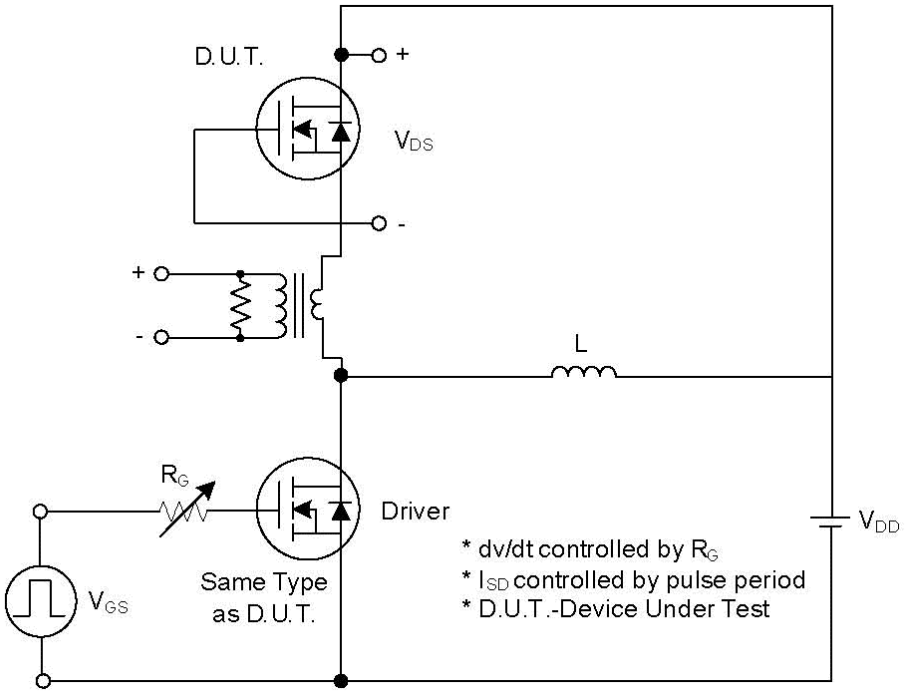


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

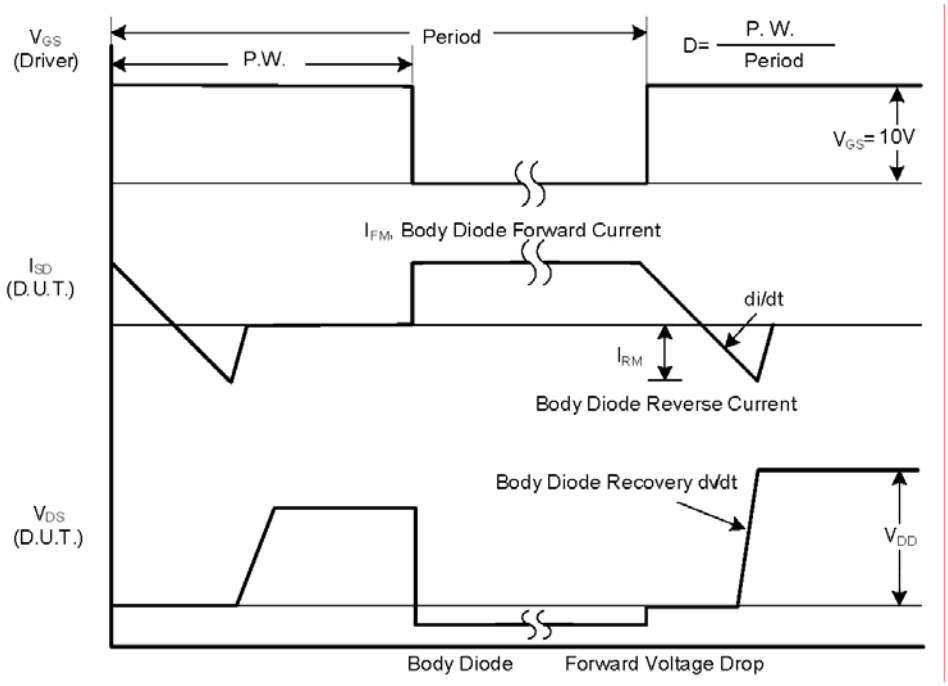


Fig. 1B Peak Diode Recovery dv/dt Waveforms

TEST CIRCUITS AND WAVEFORMS (Cont.)

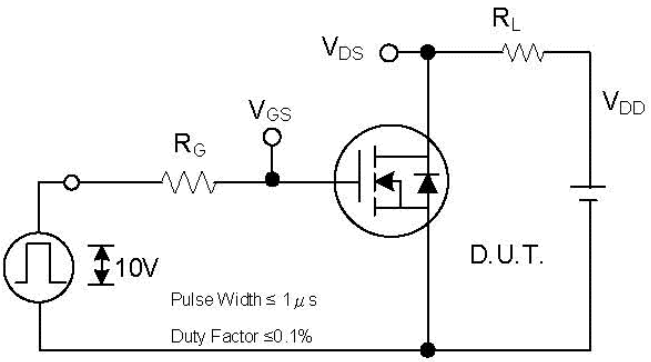


Fig. 2A Switching Test Circuit

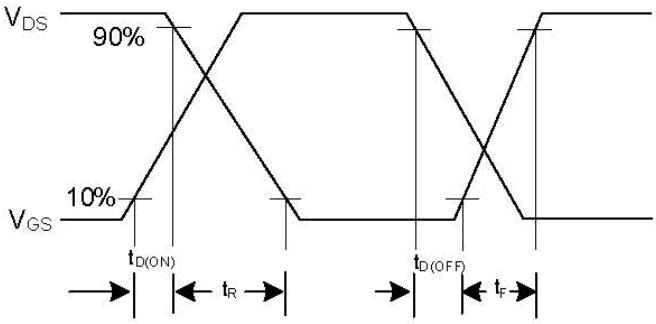


Fig. 2B Switching Waveforms

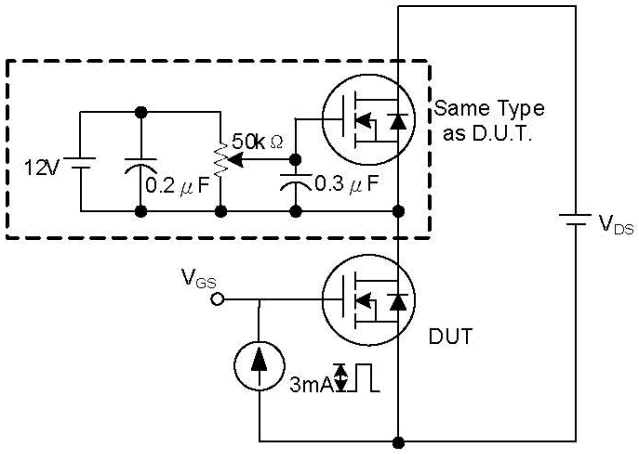


Fig. 3A Gate Charge Test Circuit

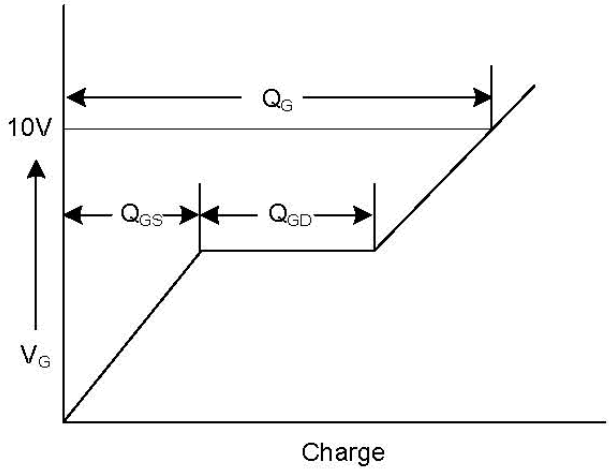


Fig. 3B Gate Charge Waveform

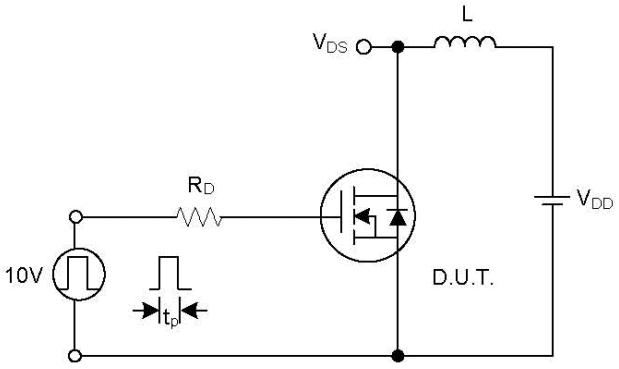


Fig. 4A Unclamped Inductive Switching Test Circuit

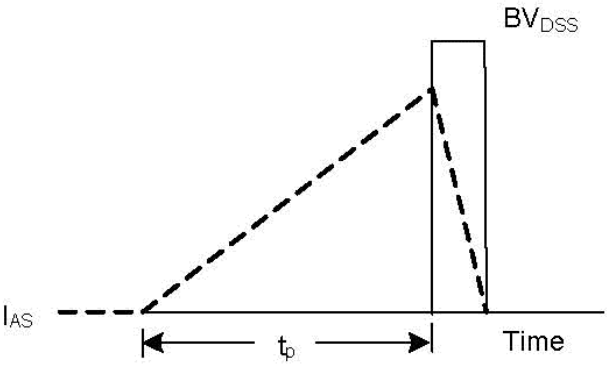
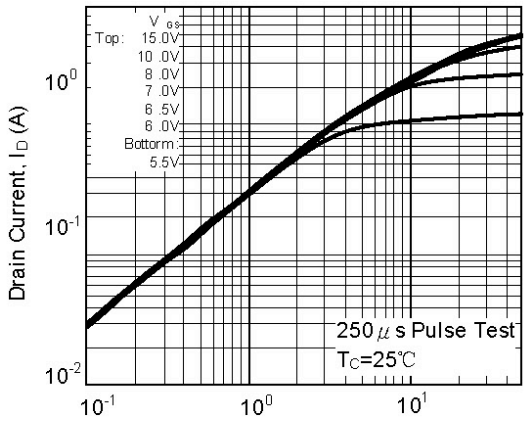


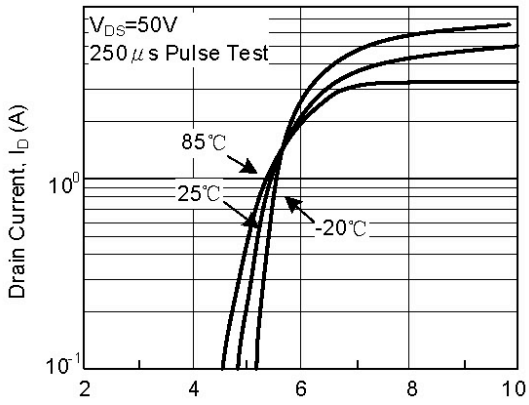
Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS

On-Region Characteristics

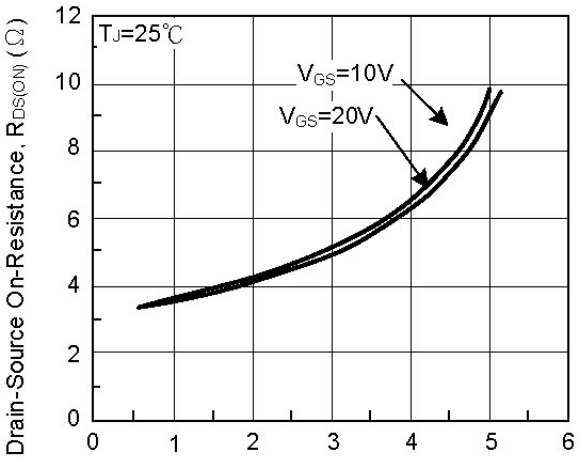


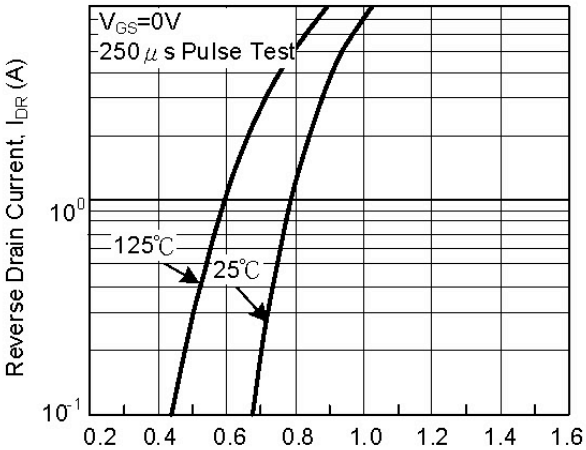
Transfer Characteristics



On-Resistance Variation vs. Drain Current and Gate Voltage

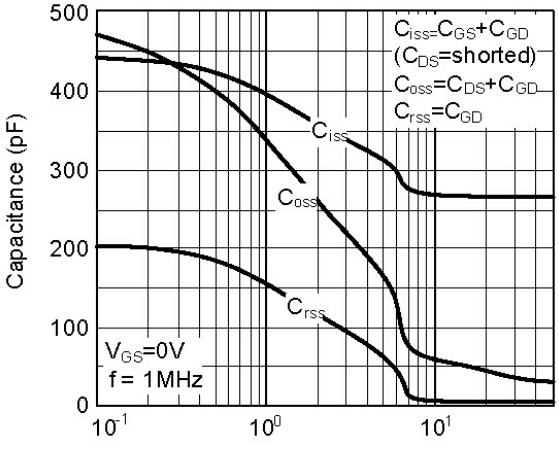
Body Diode Forward Voltage Variation vs. Source Current and Temperature

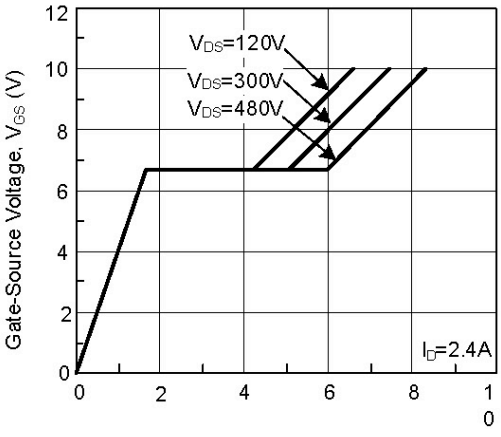




Capacitance vs. Drain-Source Voltage

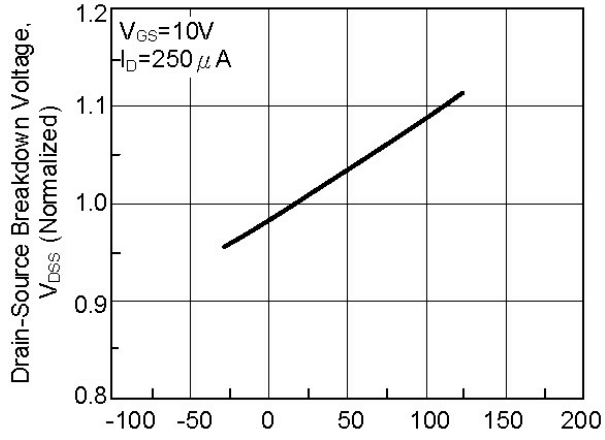
Gate Charge vs. Gate Charge Voltage



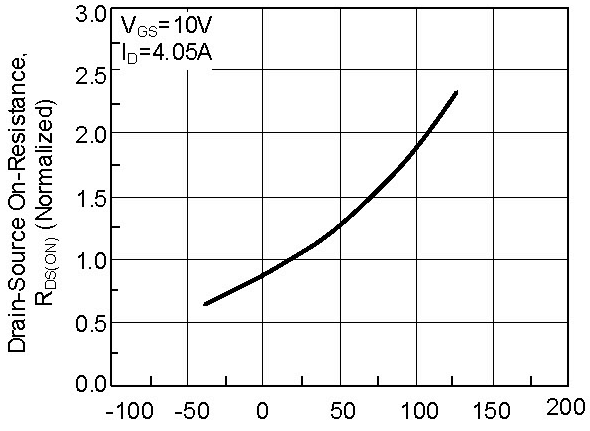


TYPICAL CHARACTERISTICS(Cont.)

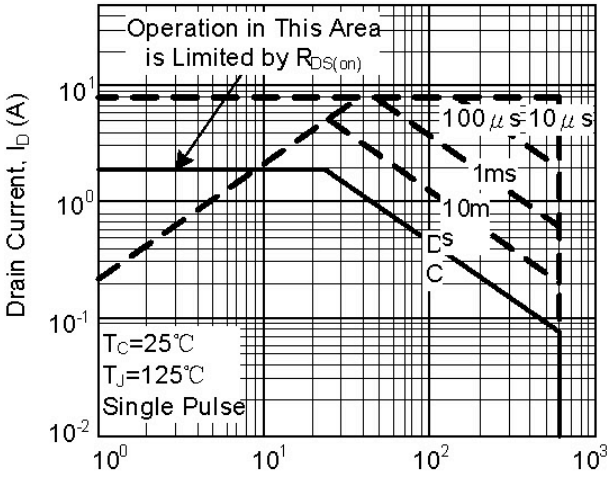
Breakdown Voltage vs. Temperature



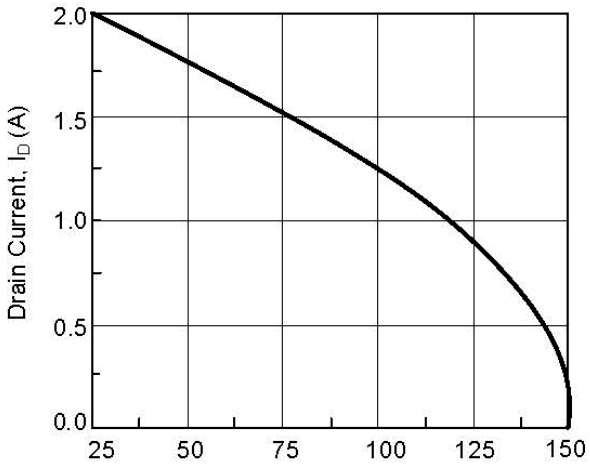
On-Resistance vs. Temperature



Max. Safe Operating Area



Max. Drain Current vs. Case Temperature



Thermal Response