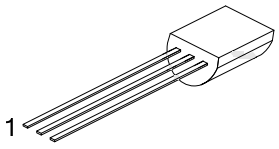
1NM60-FDQ

Power MOSFET

1A, 600V N-CHANNEL SUPER-JUNCTION MOSFET



TO-92

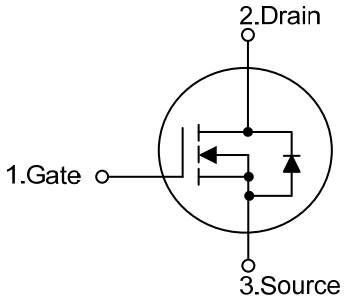
■ DESCRIPTION

The UTC **1NM60-FDQ** is a Super Junction MOSFET Structure 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

* $R_{DS(ON)}$ < 4.8Ω @ V_{GS}=10V, I_D=0.5A
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

■ SYMBOL



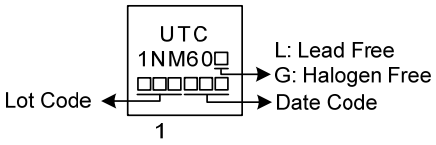
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1NM60L-T92-B	1NM60G-T92-B	TO-92	G	D	S	Tape Box
1NM60L-T92-K	1NM60G-T92-K	TO-92	G	D	S	Bulk

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

1NM60G-T92-B (1)Packing Type (2)Package Type (3)Green Package	(1) B: Tape Box, K: Bulk (2) T92: TO-92 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ 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
Continuous Drain Current		I_D	1	A
Pulsed Drain Current (Note 2)		I_{DM}	3	A
Avalanche Energy (Note 3)	Single Pulsed	E_{AS}	8.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	31	V/ns
Power Dissipation (T_A=25°C)		P_D	1.4	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 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=10mH, I_{AS}=1.7A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤1.0A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

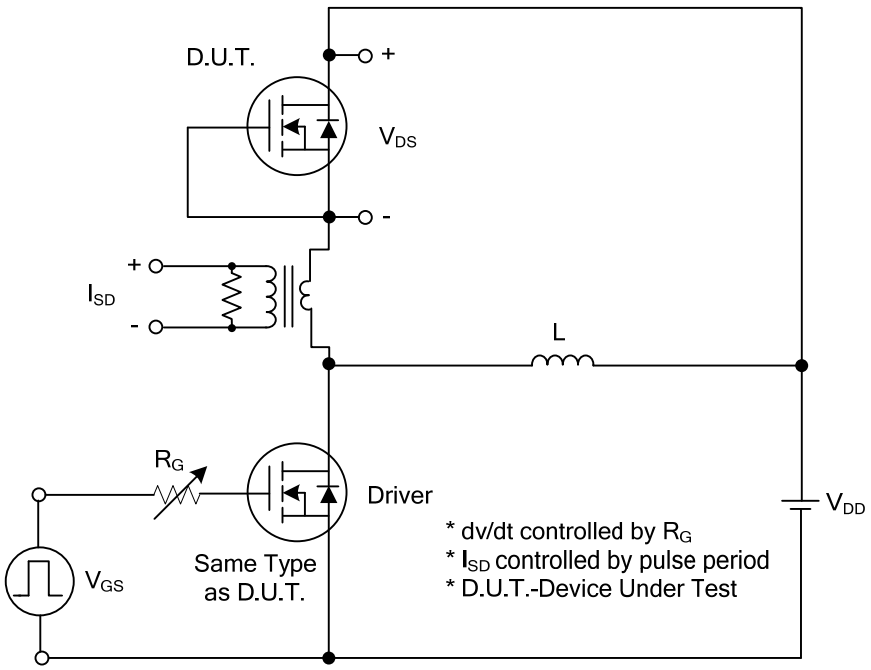
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	140	°C/W
Junction to Case	θ_{JC}	80	°C/W

■ ELECTRICAL CHARACTERISTICS (T_C =25°C, unless otherwise specified)

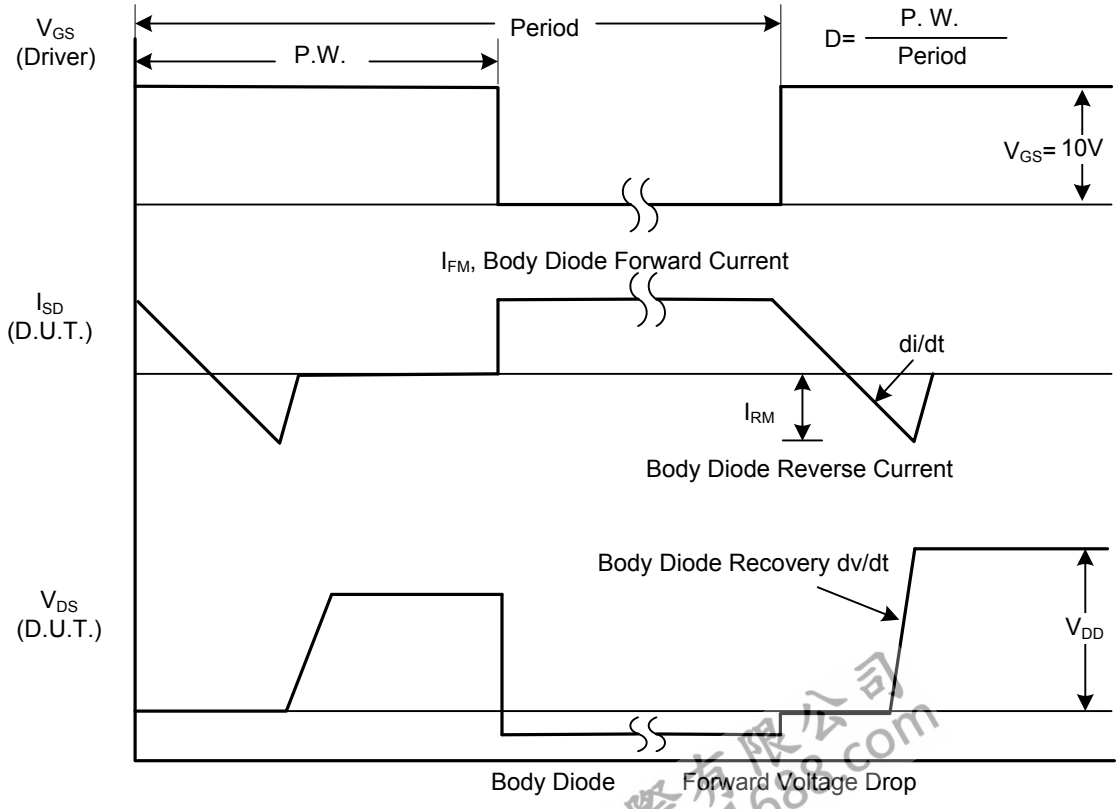
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D =0.5A			4.8	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS} =25V, V_{GS} =0V, f =1MHz		83		pF
Output Capacitance		C_{OSS}			62.3		pF
Reverse Transfer Capacitance		C_{RSS}			8.2		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=100V, V_{GS}=10V, I_D=1A, I_G=3mA (Note 1, 2)		9.7		nC
Gate-Source Charge		Q_{GS}			3.5		nC
Gate-Drain Charge		Q_{GD}			1.5		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DD} =50V, V_{GS}=10V, I_D =1A, R_G=25Ω (Note 1, 2)		4		ns
Turn-On Rise Time		t_R			15		ns
Turn-Off Delay Time		$t_{D(OFF)}$			16		ns
Turn-Off Fall Time		t_F			10		ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				1.0	A
Continuous Drain-Source Current		I_{SD}				3.0	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=1.0A, V_{GS}=0V			1.4	V
Reverse Recovery Time		t_{rr}	I_F=1.0A, V_{DD}=100V di/dt = 100A/μs		136		ns
Reverse Recovery Charge		Q_{rr}			0.5		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle≤2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

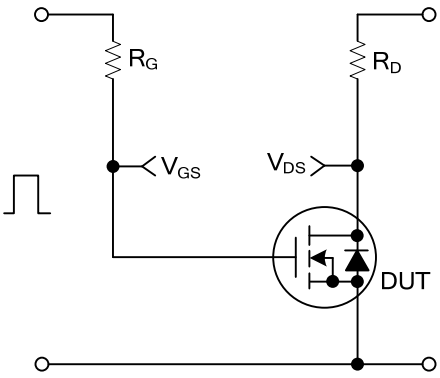


Peak Diode Recovery dv/dt Test Circuit

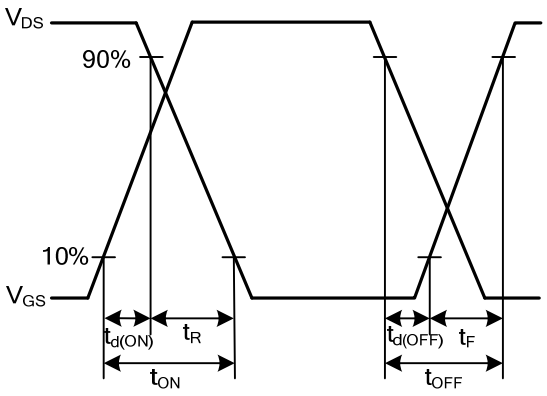


Peak Diode Recovery dv/dt Waveforms

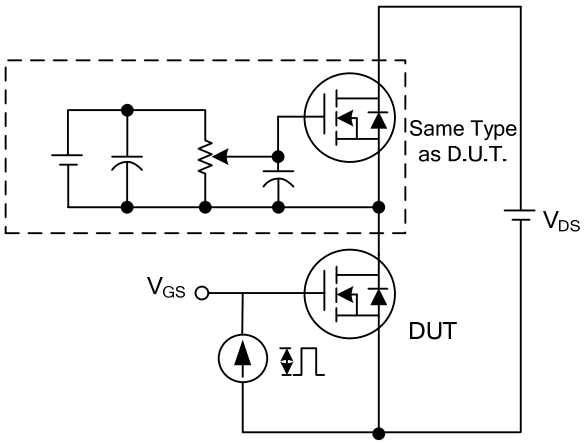
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



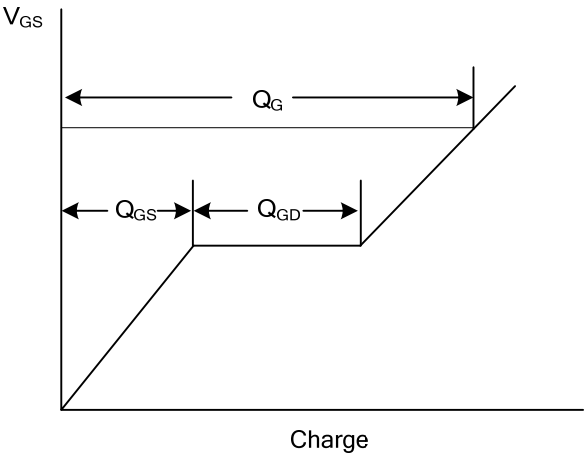
itching Test Circuit



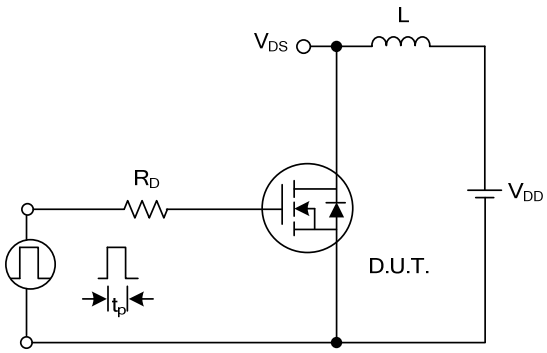
Switching Waveforms



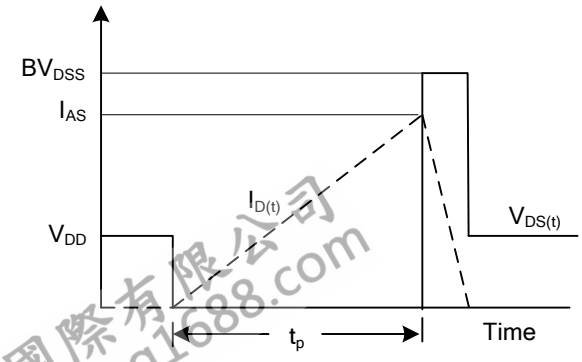
Gate Charge Test Circuit



Gate Charge Waveform



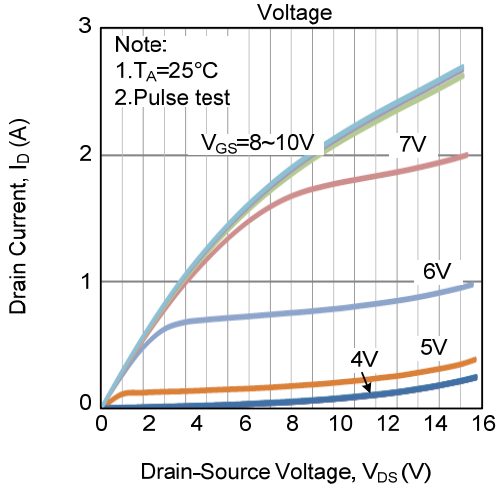
Unclamped Inductive Switching Test Circuit



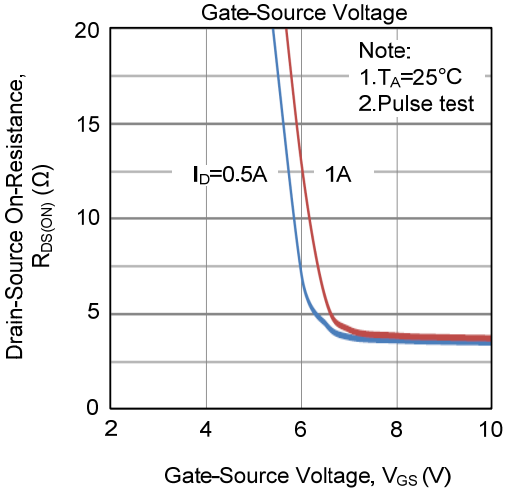
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

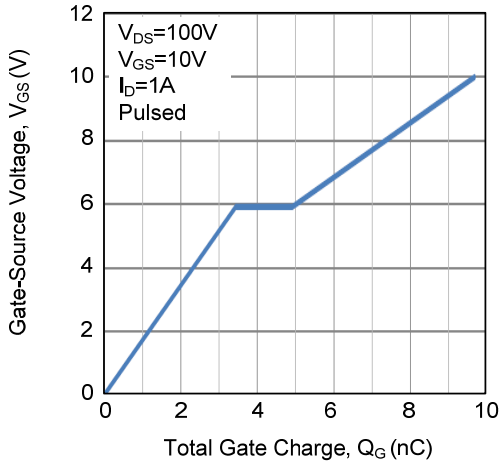
Drain Current vs. Drain-Source Voltage



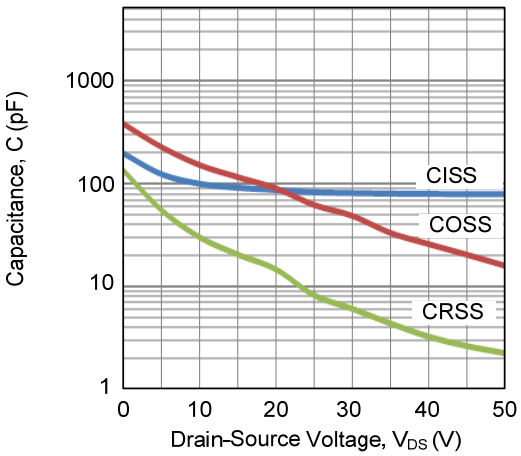
Drain-Source On-Resistance vs. Gate-Source Voltage



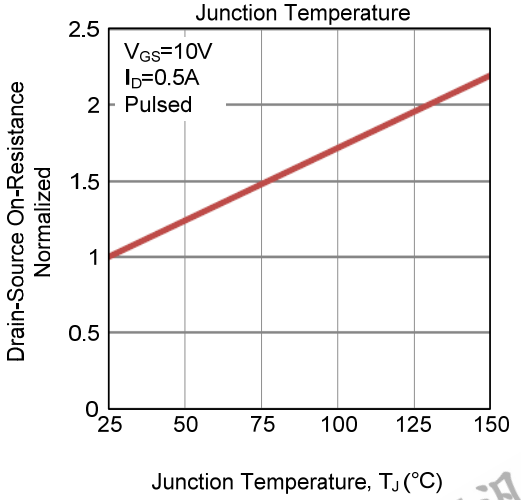
Gate Charge Characteristics



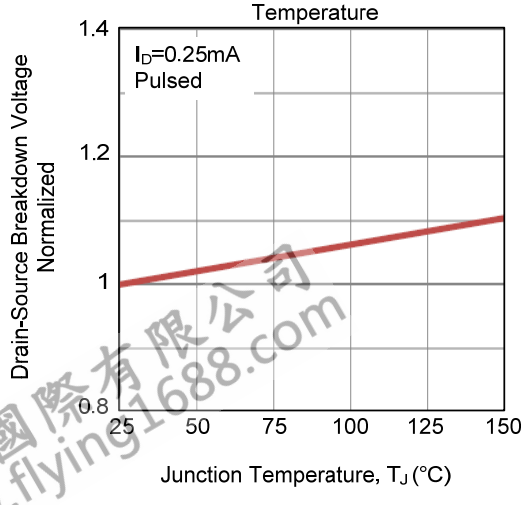
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

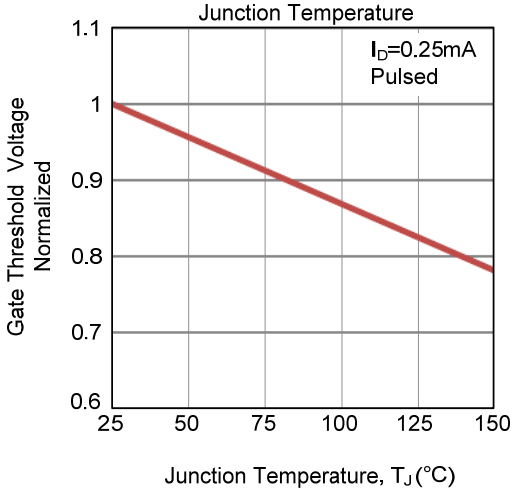


Breakdown Voltage vs. Junction Temperature

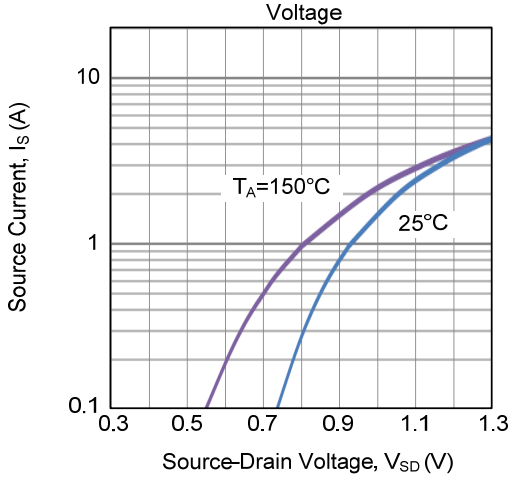


■ TYPICAL CHARACTERISTICS (Cont.)

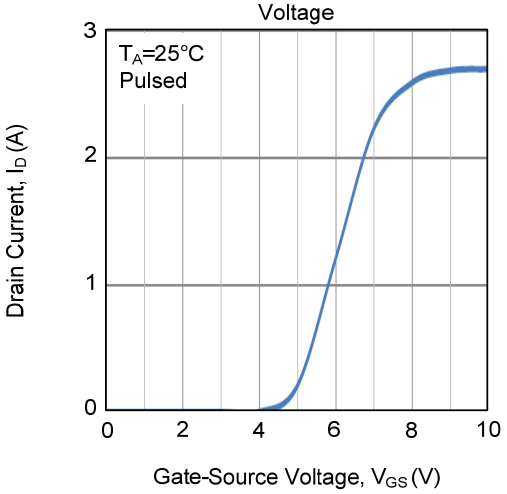
Gate Threshold Voltage vs. Junction Temperature



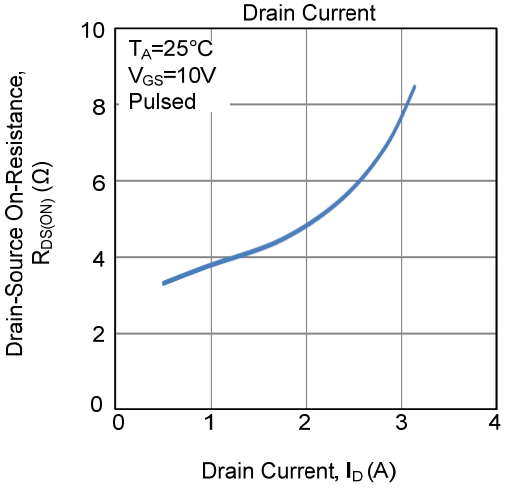
Source Current vs. Source-Drain Voltage



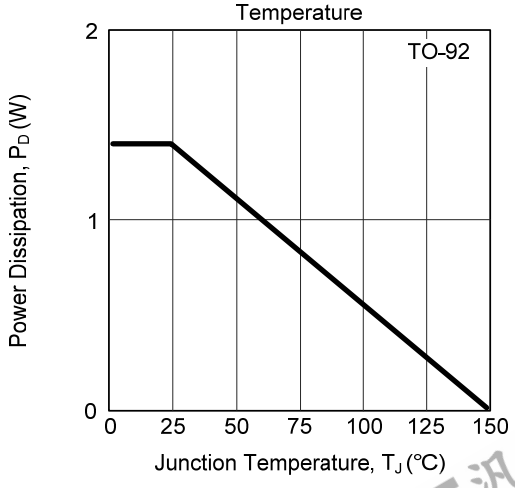
Drain Current vs. Gate-Source Voltage



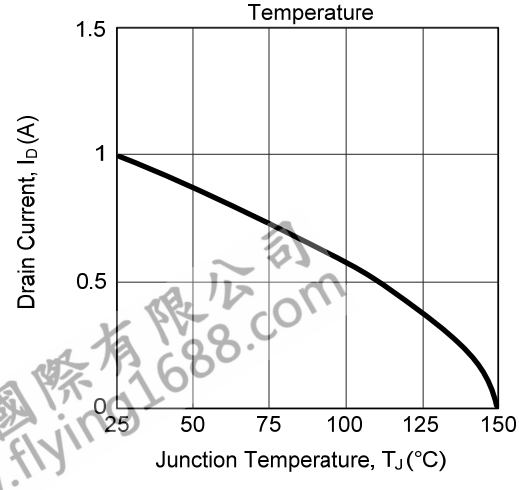
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)