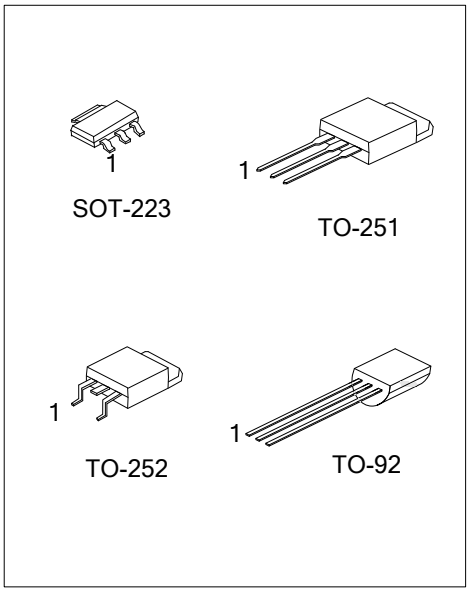
1N60-LC1

Power MOSFET

1A, 600V N-CHANNEL POWER MOSFET



■ DESCRIPTION

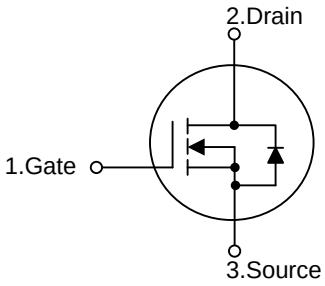
The UTC **1N60-LC1** is an N-channel power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance and superior switching performance.

The UTC **1N60-LC1** is generally applied in low power switching mode power appliances and electronic ballast.

■ FEATURES

* $R_{DS(ON)} \leq 10\ \Omega$ @ V_{GS}=10V, I_D=0.5A
* High Switching Speed
* 100% Avalanche Tested

■ SYMBOL



■ ORDERING INFORMATION

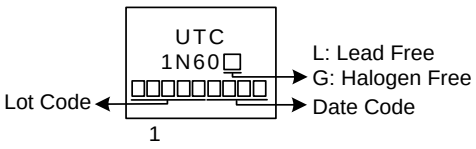
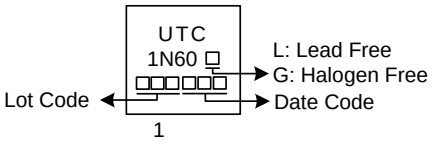
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60L-AA3-R	1N60G-AA3-R	SOT-223	G	D	S	Tape Reel
1N60L-TM3-T	1N60G-TM3-T	TO-251	G	D	S	Tube
1N60L-TN3-R	1N60G-TN3-R	TO-252	G	D	S	Tape Reel
1N60L-T92-B	1N60G-T92-B	TO-92	G	D	S	Tape Box
1N60L-T92-K	1N60G-T92-K	TO-92	G	D	S	Bulk

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

1N60G-AA3-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel, B: Tape Box, K: Bulk, T: Tube
(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252, T92: TO-92
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-251 / TO-252	TO-92
	

■ 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
Drain Current	Continuous	I_D	1	A
	Pulsed (Note 2)	I_{DM}	2	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	11.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.675	V/ns
Power Dissipation	SOT-223	P_D	8	W
	TO-251/TO-252		27	W
	TO-92		2.5	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} = 1.5A, V_{DD} = 50V, R_G = 25Ω, 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	SOT-223	θ_{JA}	150	°C/W
	TO-251/TO-252		100	°C/W
	TO-92		132	°C/W
Junction to Case (Note)	SOT-223	θ_{JC}	14	°C/W
	TO-251/TO-252		4.63	°C/W
	TO-92		50	°C/W

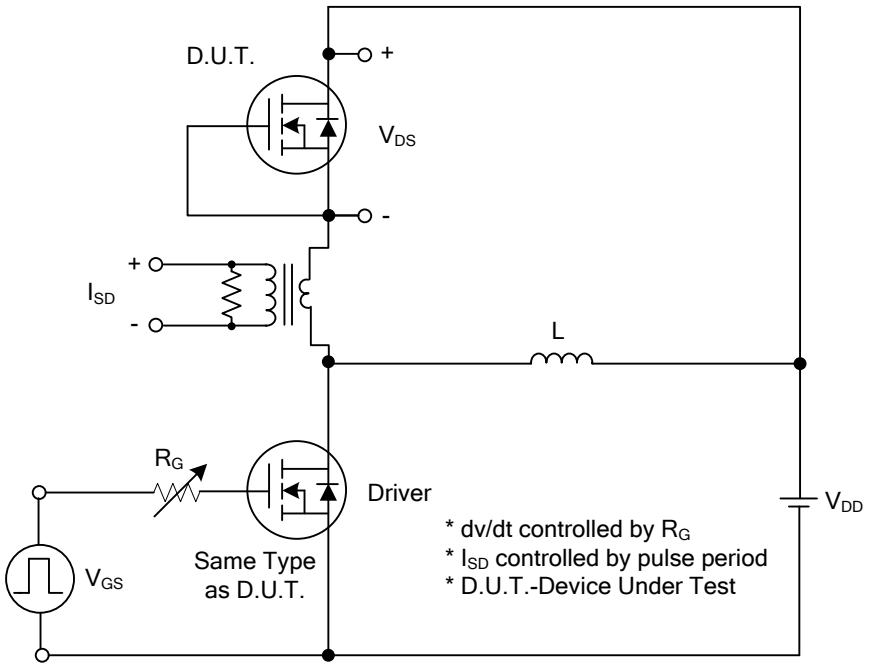
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

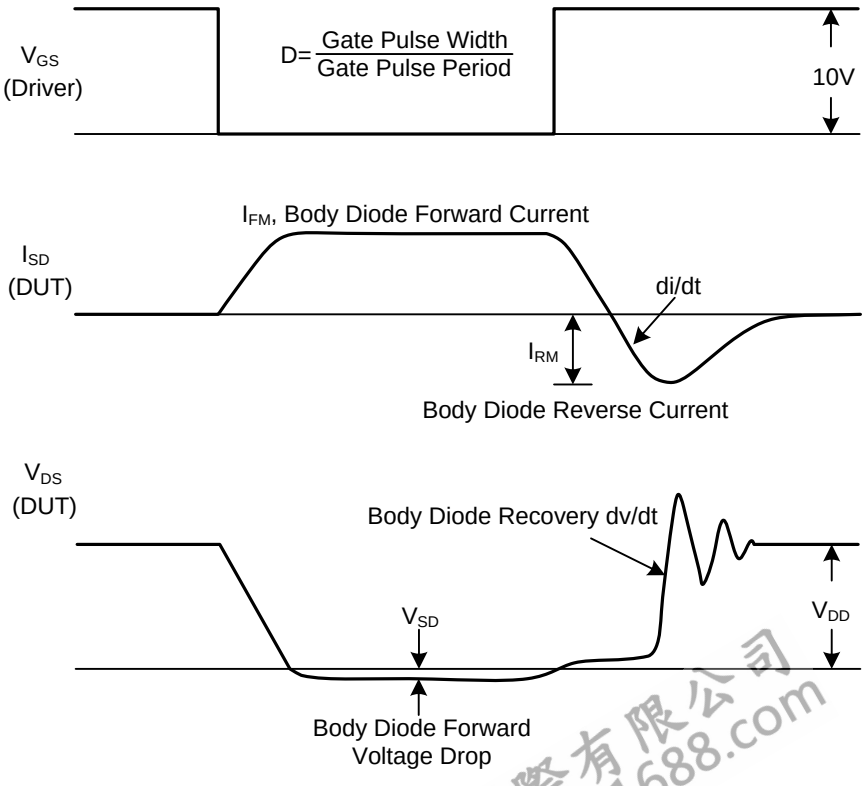
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A			10	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		134		pF
Output Capacitance		C_{OSS}			18		pF
Reverse Transfer Capacitance		C_{RSS}			1.9		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=480V, V_{GS}=10V, I_D=1A I_G=1mA (Note 1, 2)		4.6		nC
Gate to Source Charge		Q_{GS}			2.3		nC
Gate to Drain Charge		Q_{GD}			0.7		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=1A, R_G=25Ω (Note 1, 2)		2.5		ns
Rise Time		t_R			15.3		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			12.5		ns
Fall-Time		t_F			33		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				1	A
Maximum Body-Diode Pulsed Current (Note 1)		I_{SM}				2	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=1A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=1A, V_{GS}=0V, dI_F/dt=100A/μs		200		ns
Body Diode Reverse Recovery Charge		Q_{rr}			0.45		μC

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

■ TEST CIRCUITS AND WAVEFORMS

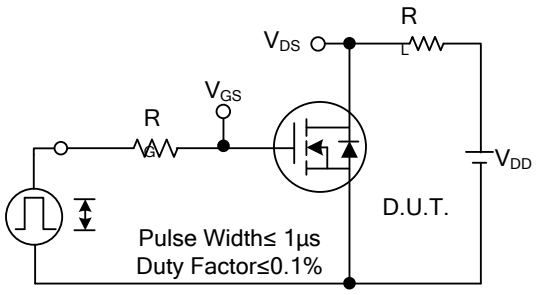


Peak Diode Recovery dv/dt Test Circuit

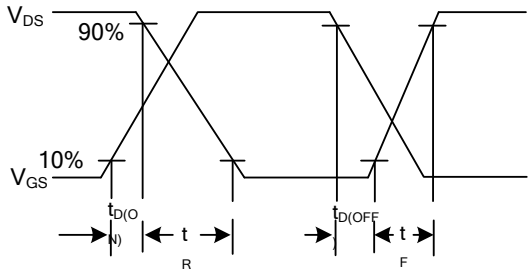


Peak Diode Recovery dv/dt Waveforms

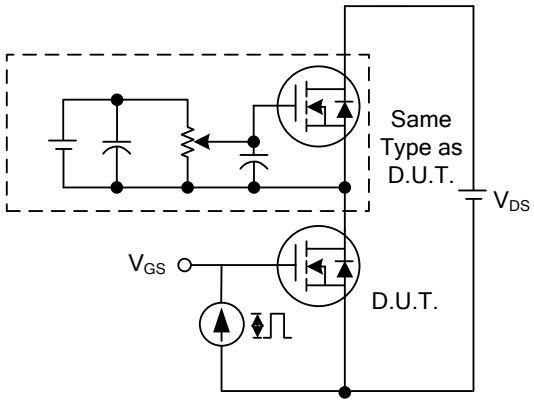
■ TEST CIRCUITS AND WAVEFORMS



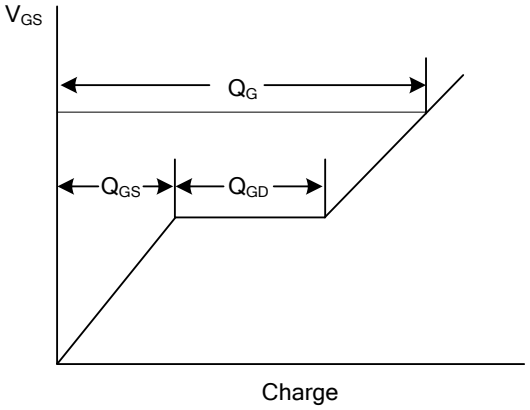
Switching Test Circuit



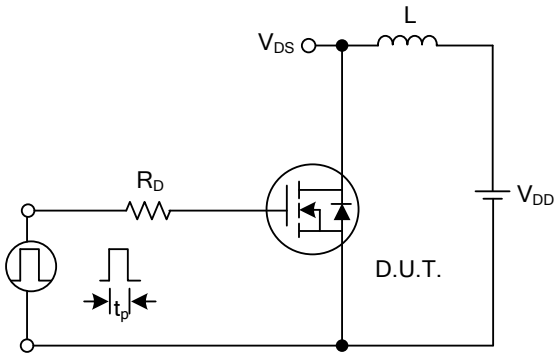
Switching Waveforms



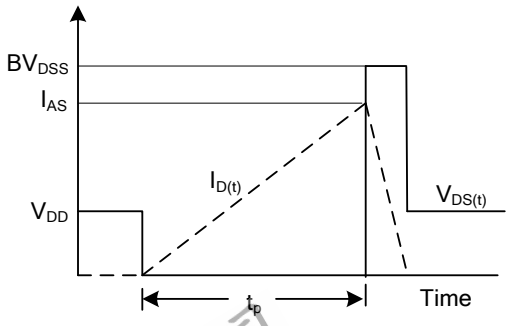
Gate Charge Test Circuit



Gate Charge Waveform



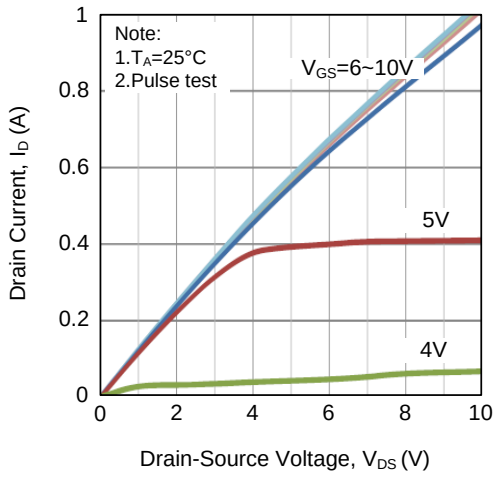
Unclamped Inductive Switching Test Circuit



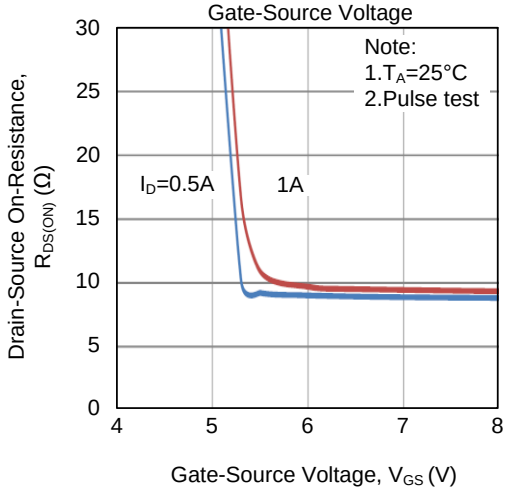
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

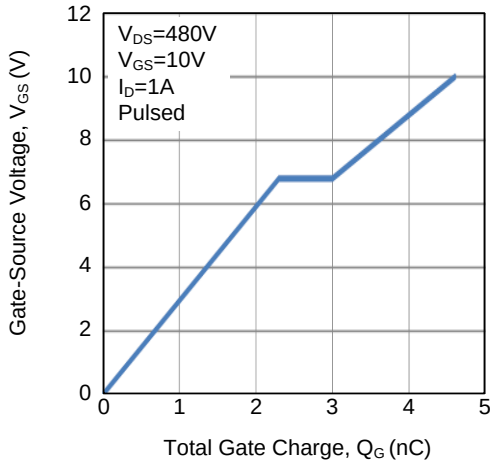
Drain Current vs. Drain-Source Voltage



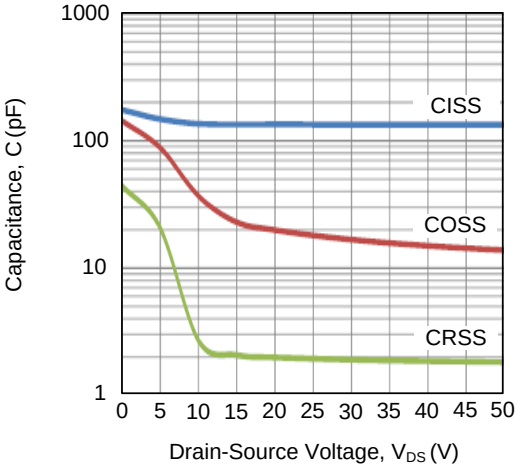
Drain-Source On-Resistance vs. Gate-Source Voltage



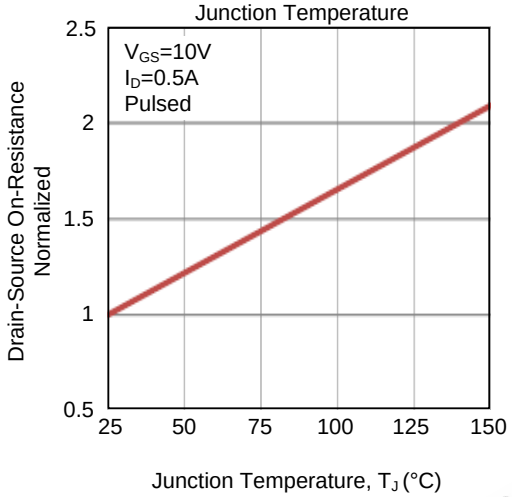
Gate Charge Characteristics



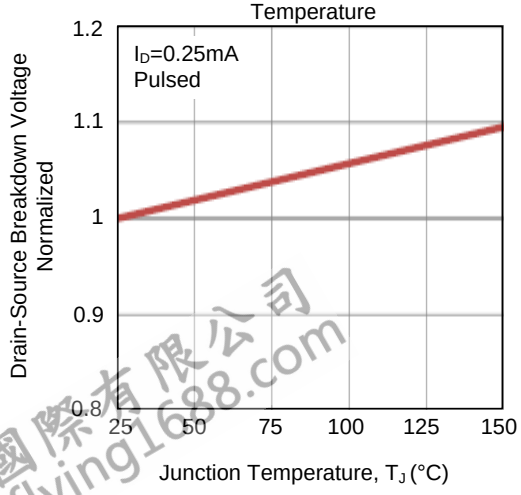
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

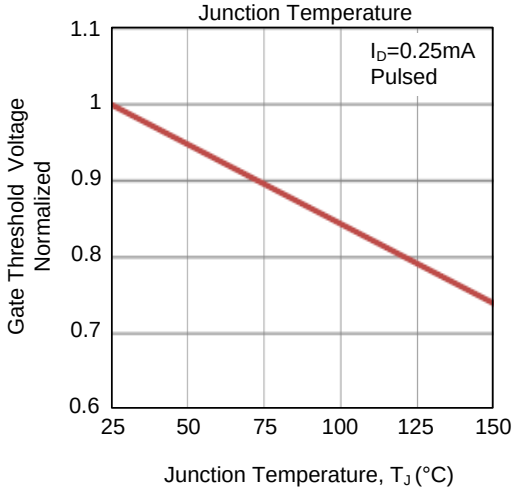


Breakdown Voltage vs. Junction Temperature

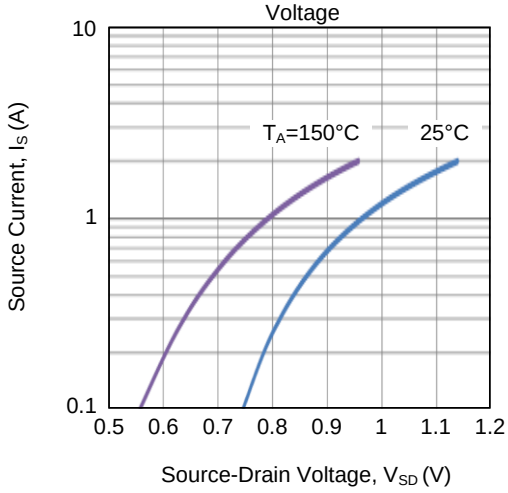


■ TYPICAL CHARACTERISTICS (Cont.)

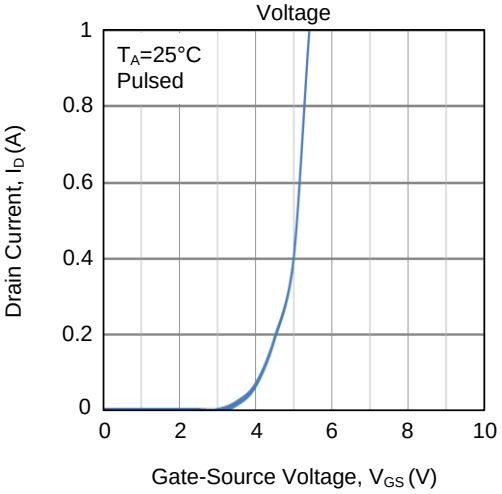
Gate Threshold Voltage vs. Junction Temperature



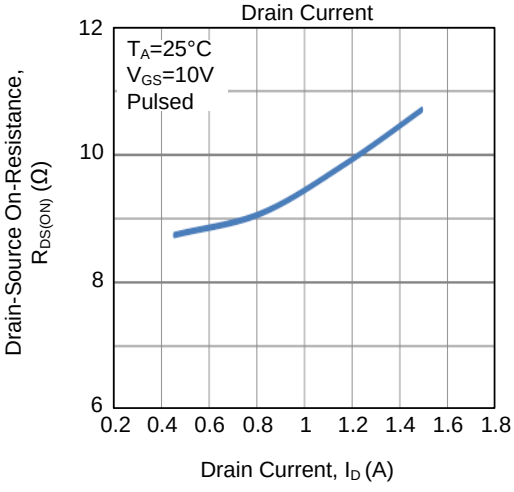
Source Current vs. Source-Drain Voltage



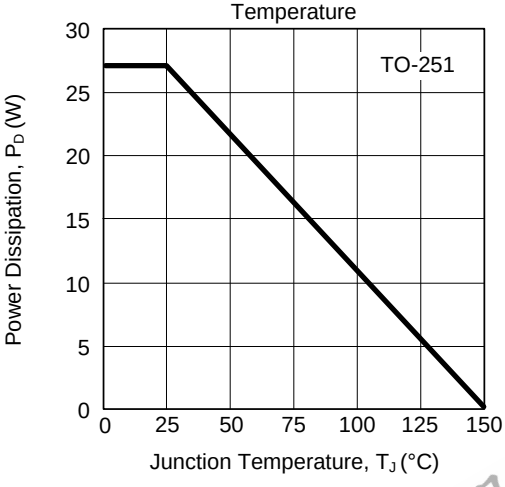
Drain Current vs. Gate-Source Voltage



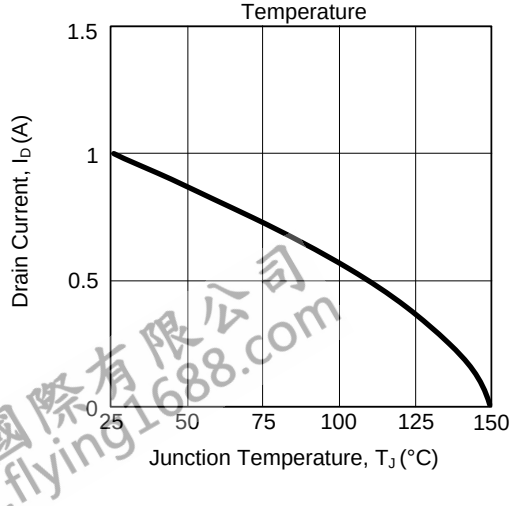
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)