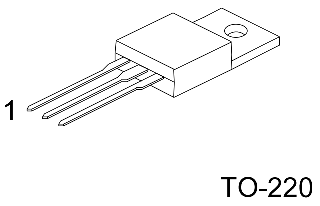
UNISONIC TECHNOLOGIES CO., LTD

16A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



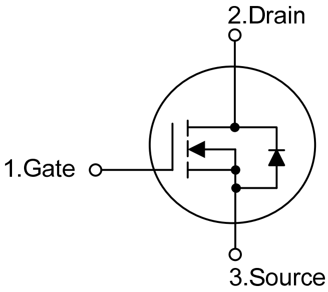
DESCRIPTION

The **UTC USJ65R310** 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 a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

* $R_{DS(ON)} \leq 0.31\ \Omega$ @ V_{GS}=10V, I_D=4.0A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

SYMBOL



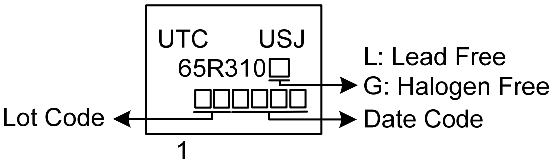
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USJ65R310L-TA3-T	USJ65R310G-TA3-T	TO-220	G	D	S	Tube

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

USJ65R310G-TA3-T (1)Packing Type	(1) T: Tube
(2)Package Type	(2) TA3: TO-220
(3)Green Package	(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}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	16	A
	Pulsed (Note 2)	I_{DM}	48	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	45	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.2	V/ns
Power Dissipation		P_D	100	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 = 100mH, I_{AS} = 0.95A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C.

4. $I_{SD} \leq$ 16A, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	1.25	°C/W

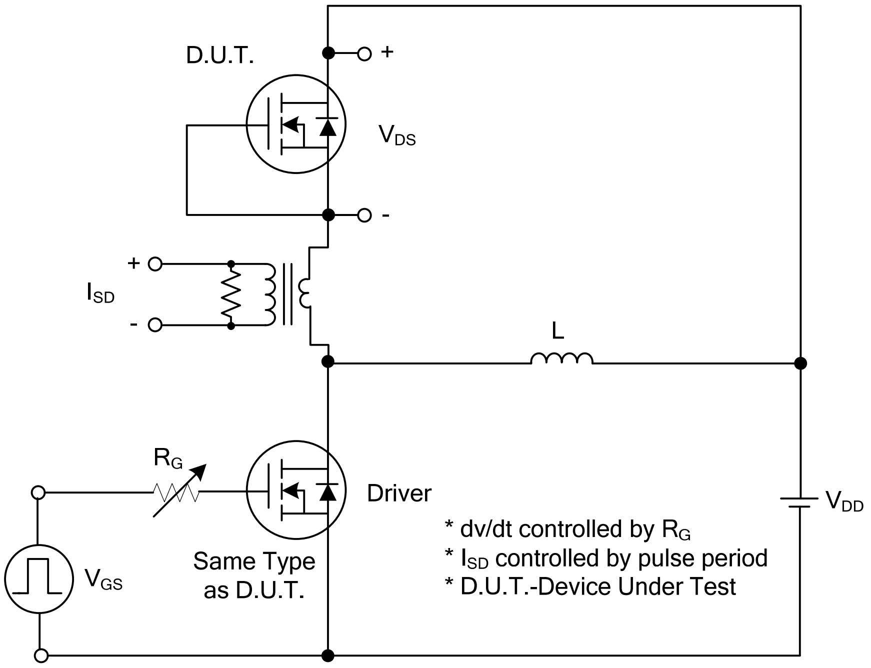
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

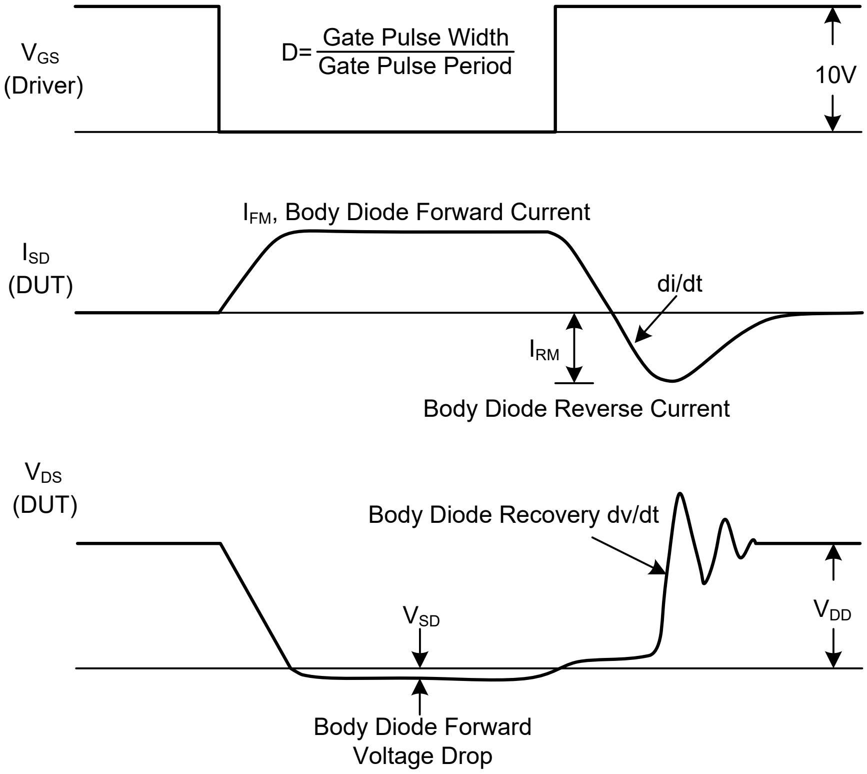
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=30V			100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.5		4.5	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=4.0A			0.31	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1.0MHz		897		pF
Output Capacitance		C_{OSS}			248		pF
Reverse Transfer Capacitance		C_{RSS}			11		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=12A (Note 1, 2)		39		nC
Gate to Source Charge		Q_{GS}			10		nC
Gate to Drain Charge		Q_{GD}			17		nC
Internal Gate Input Resistance		R_G	V_{GS}=0V, f=1MHz		2.2		Ω
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=12A, R_G=25Ω (Note 1, 2)		15		ns
Rise Time		t_R			30		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			100		ns
Fall-Time		t_F			52		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				16	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=16A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S =16A, V_{GS}=0V, dI_F/dt=100A/μs		360		ns
Body Diode Reverse Recovery Charge		Q_{rr}			4.9		μC

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

■ TEST CIRCUITS AND WAVEFORMS

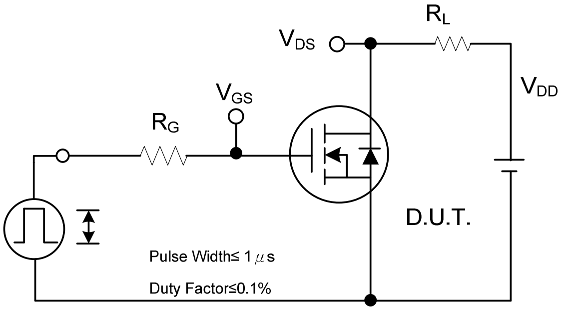


Peak Diode Recovery dv/dt Test Circuit

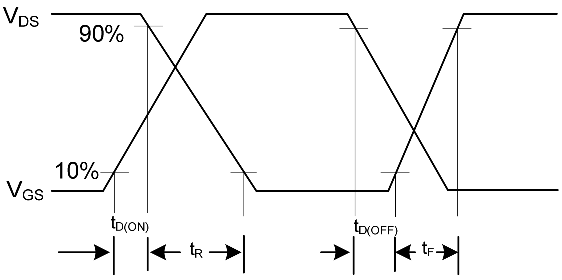


Peak Diode Recovery dv/dt Waveforms

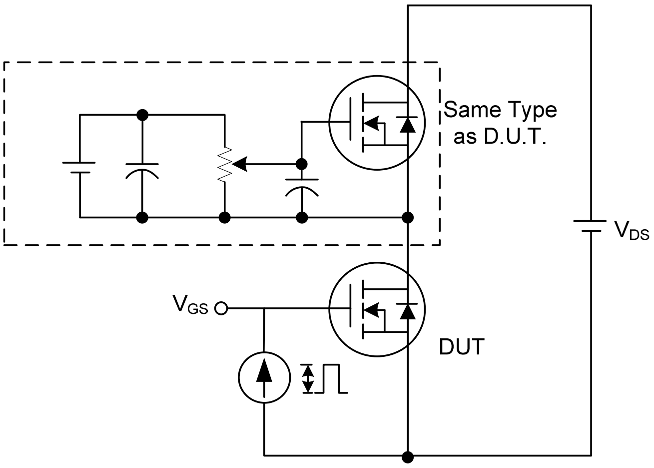
■ TEST CIRCUITS AND WAVEFORMS



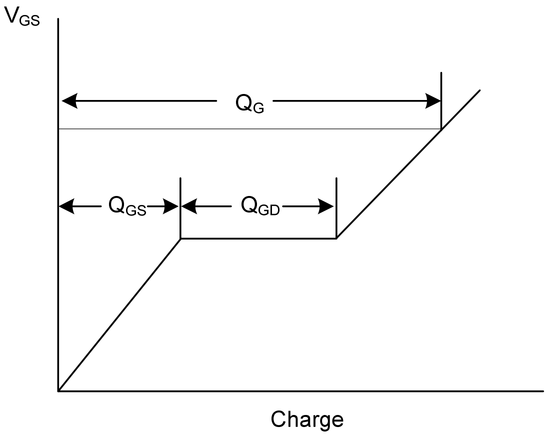
Switching Test Circuit



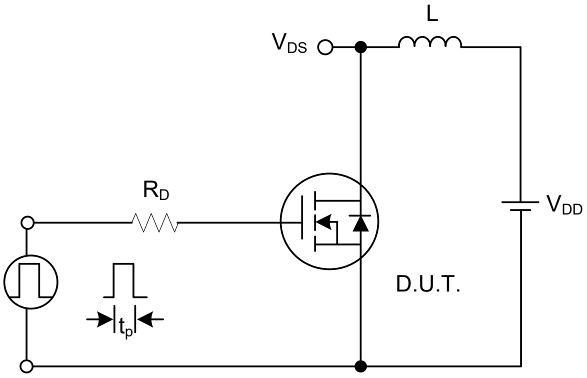
Switching Waveforms



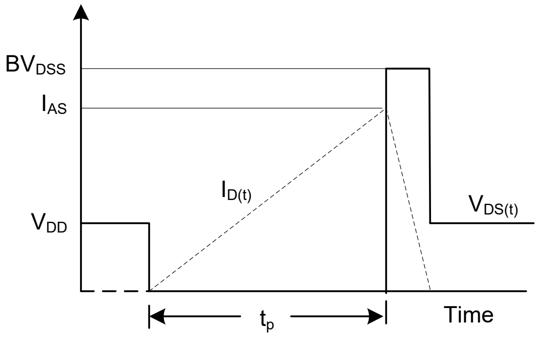
Gate Charge Test Circuit



Gate Charge Waveform

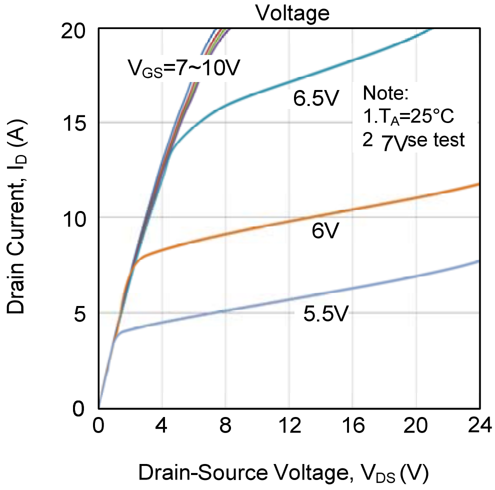


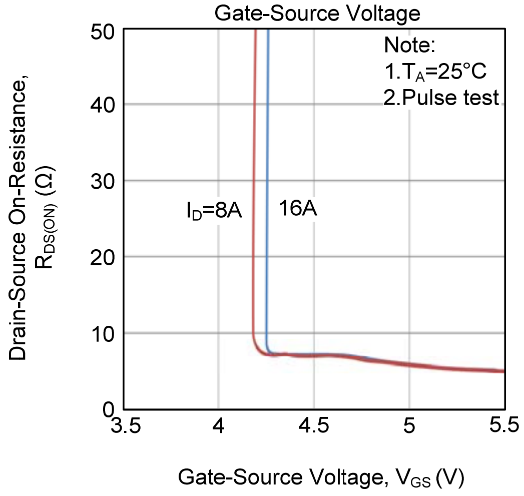
Unclamped Inductive Switching Test Circuit

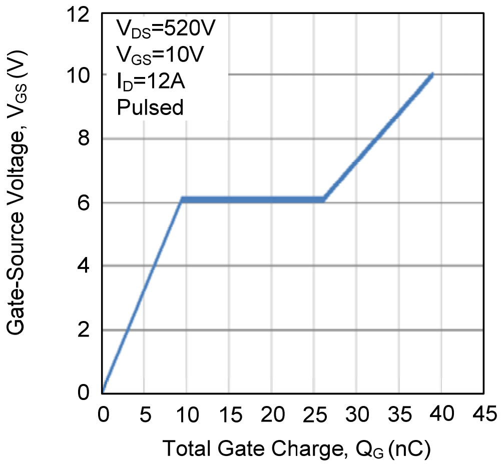


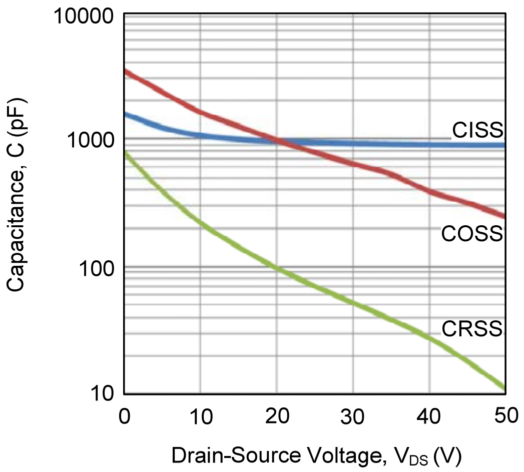
Unclamped Inductive Switching Waveforms

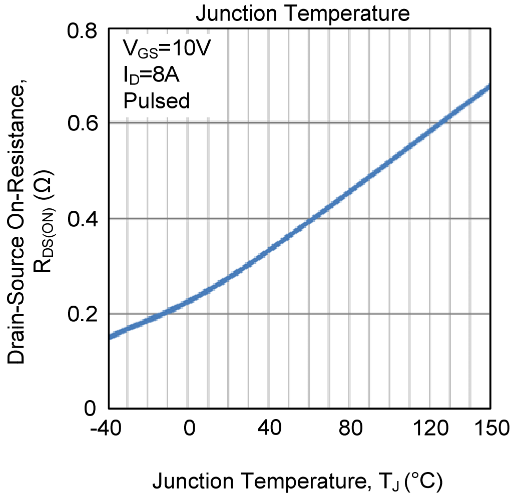
■ TYPICAL CHARACTERISTICS

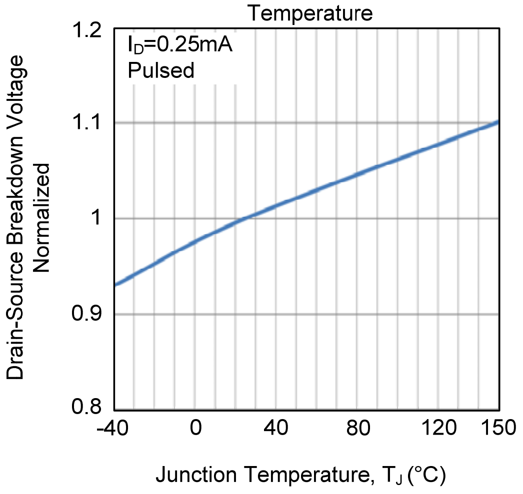

Drain Current vs. Drain-Source Voltage


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


Gate Charge Characteristics

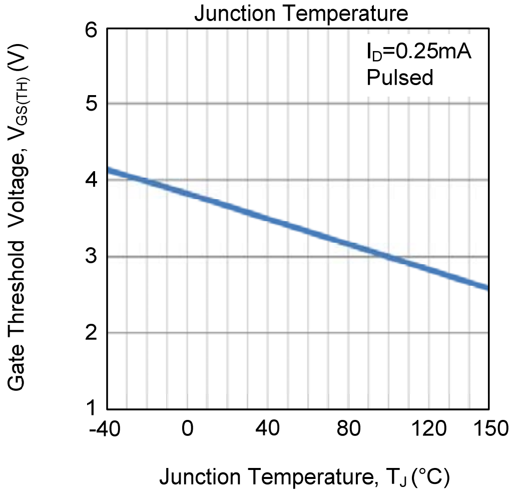

Capacitance Characteristics


Drain-Source On-Resistance vs. Junction Temperature

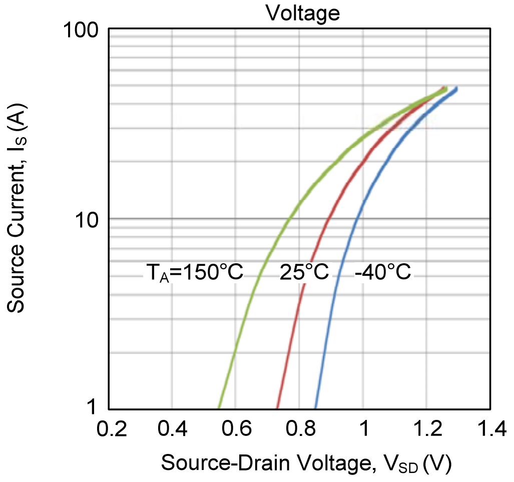

Breakdown Voltage vs. Junction Temperature

■ TYPICAL CHARACTERISTICS (Cont.)

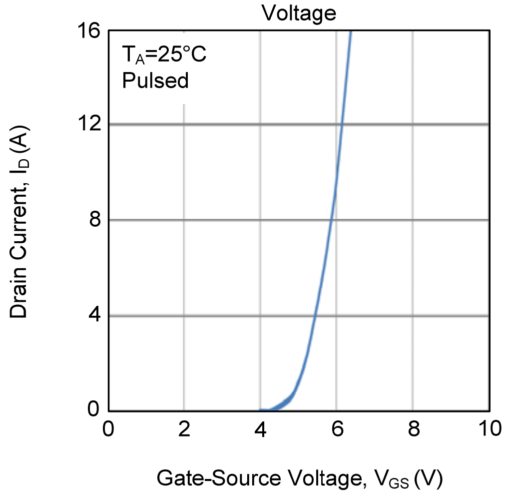
Gate Threshold Voltage vs. Junction Temperature



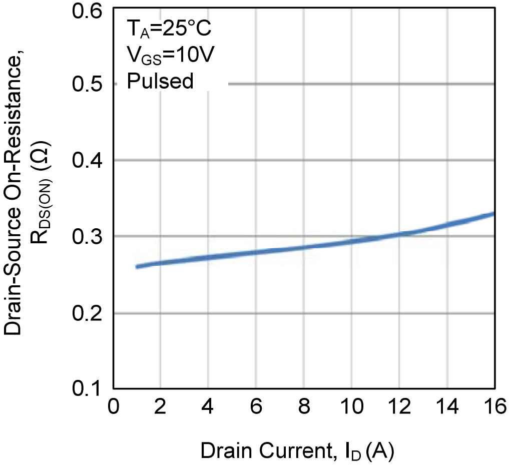
Source Current vs. Source-Drain Voltage



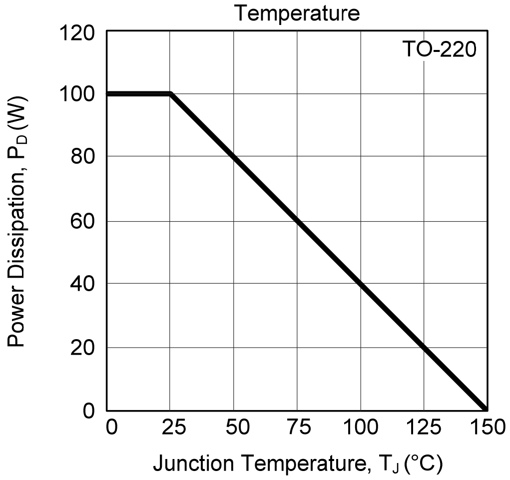
Drain Current vs. Gate-Source Voltage



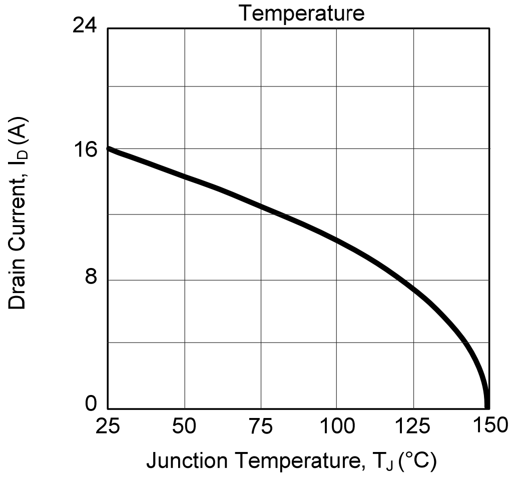
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)