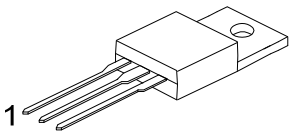
F40N25-HC

POWER MOSFET

40A, 250V N-CHANNEL POWER MOSFET



TO-220

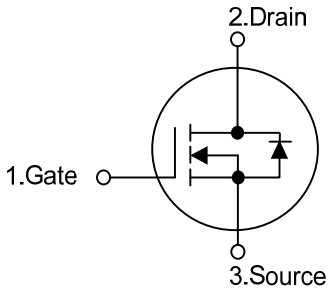
■ DESCRIPTION

The UTC **F40N25-HC** N-Channel enhancement mode silicon gate power MOSFET with Fast Body Diode. is designed high voltage, high speed power switching applications such. such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics.

■ FEATURES

* $R_{DS(ON)} \leq 68\ m\Omega$ @ V_{GS}=10V, I_D=20A
* Fast body diode MOSFET technology
* Low switching losses due to reduced Qrr
* Fast Switching Speeds
* 100% avalanche tested
* Linear Transfer Characteristics
* High Input Impedance
* Avalanche energy tested

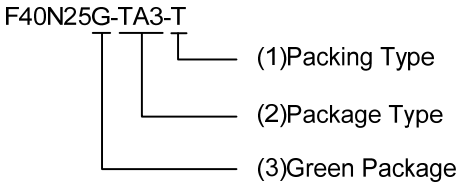
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
F40N25L-TA3-T	F40N25G-TA3-T	TO-220	G	D	S	Tube

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

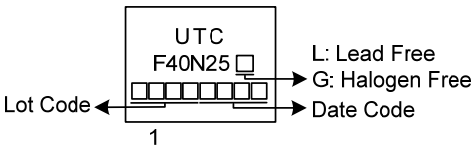


(1) T: Tube

(2) TA3: TO-220

(3) G: Halogen Free and Lead Free L: Lead Free

■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	250	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	DC	I_D	40	A
	Pulsed (Note 2)	I_{DM}	80	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	760	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.3	V/ns
Power Dissipation		P_D	135	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		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=1mH, I_{AS} = 39A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C.
4. I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J=25°C.

■ THERMAL DATA

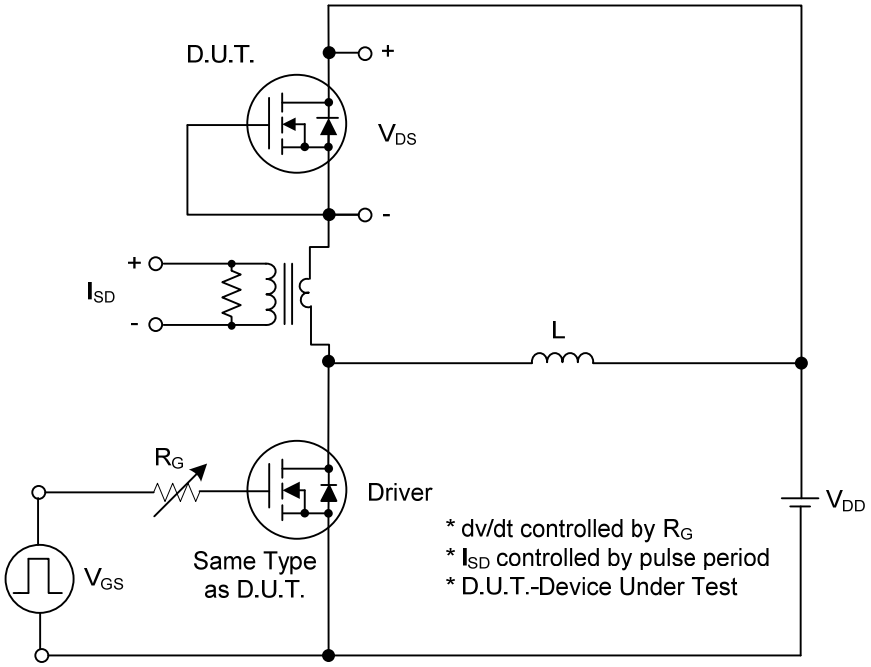
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	0.92	°C/W

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

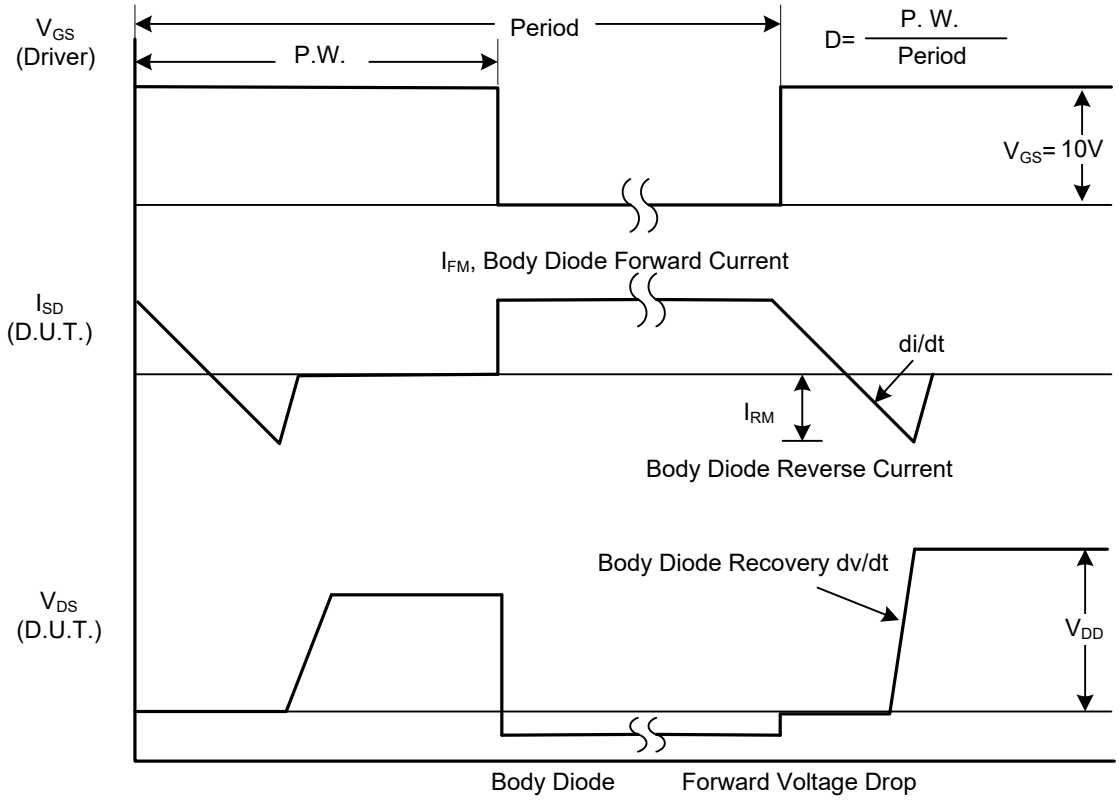
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	250			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=250V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		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=20A			68	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		3100		pF
Output Capacitance		C_{OSS}			940		pF
Reverse Transfer Capacitance		C_{RSS}			235		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=200V, V_{GS}=10V, I_D=40A (Note 1, 2)		108		nC
Gate to Source Charge		Q_{GS}			31		nC
Gate to Drain Charge		Q_{GD}			34		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=40A, R_G=3Ω (Note 1, 2)		14		ns
Rise Time		t_R			21		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			52		ns
Fall-Time		t_F			19		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				40	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				80	A
Diode Forward Voltage		V_{SD}	I_F=40A, V_{GS}=0V			1.4	V
Reverse Recovery Time		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt = 100 A/μs		118		ns
Reverse Recovery Charge (Note 1)		Q_{rr}			415		nC

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

■ TEST CIRCUITS AND WAVEFORMS

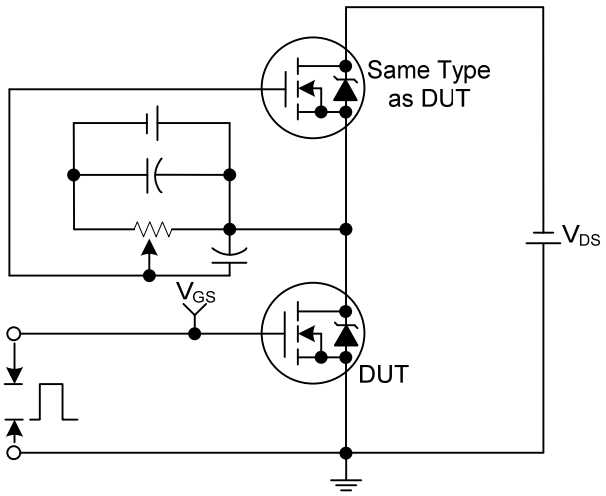


Peak Diode Recovery dv/dt Test Circuit

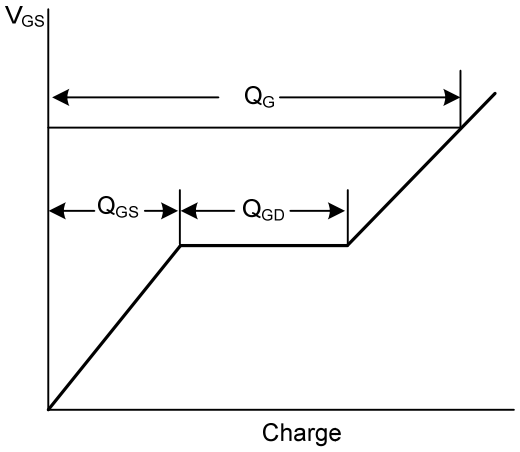


Peak Diode Recovery dv/dt Waveforms

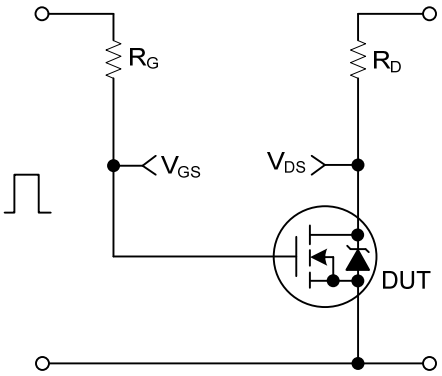
■ TEST CIRCUITS AND WAVEFORMS



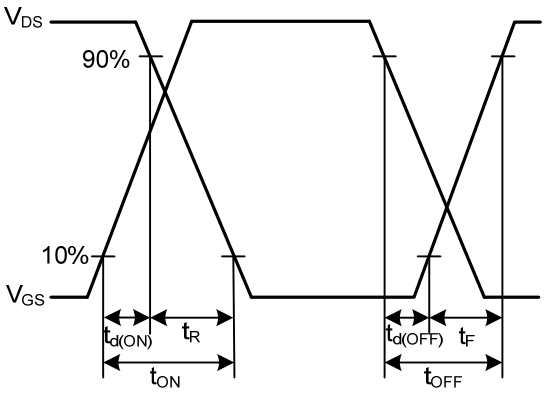
Gate Charge Test Circuit



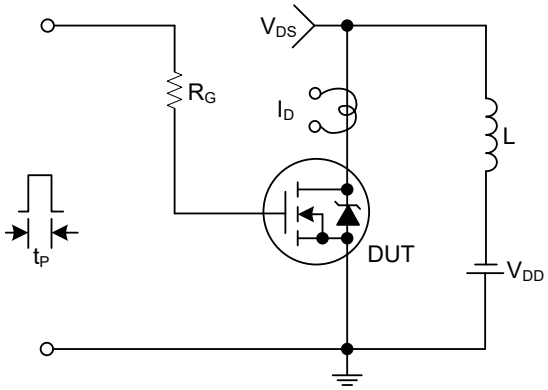
Gate Charge Waveforms



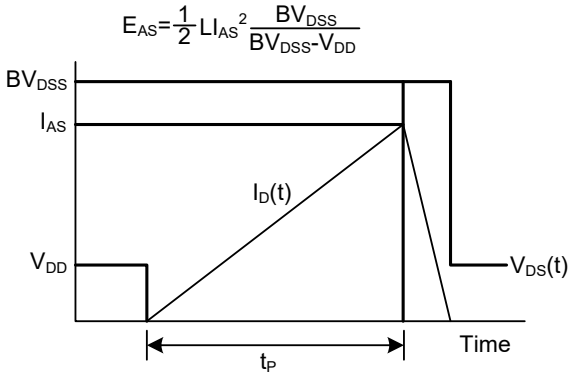
Resistive Switching Test Circuit



Resistive Switching Waveforms

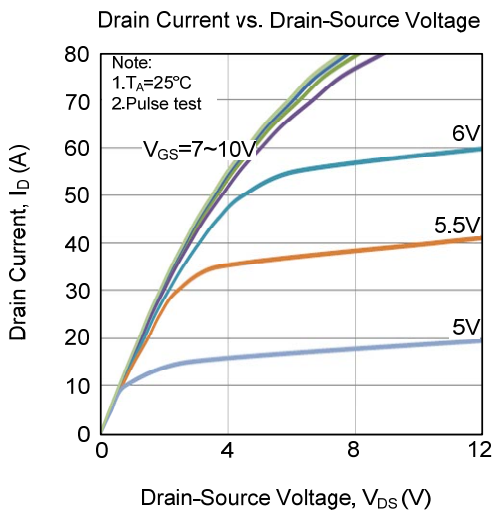


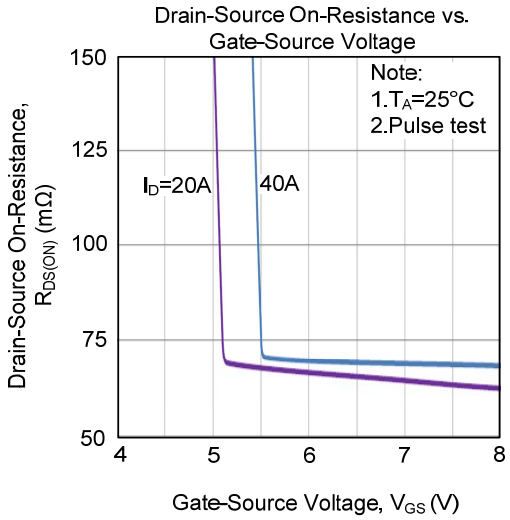
Unclamped Inductive Switching Test Circuit

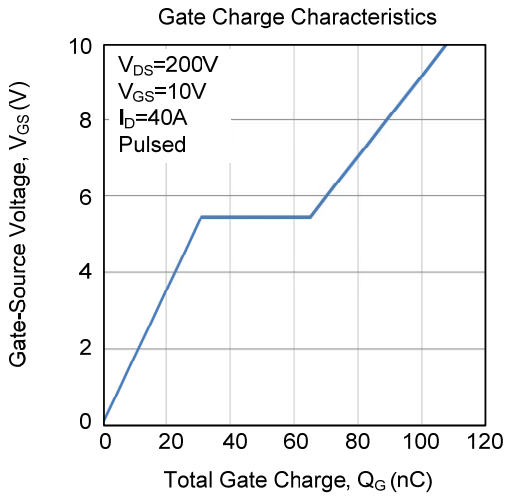


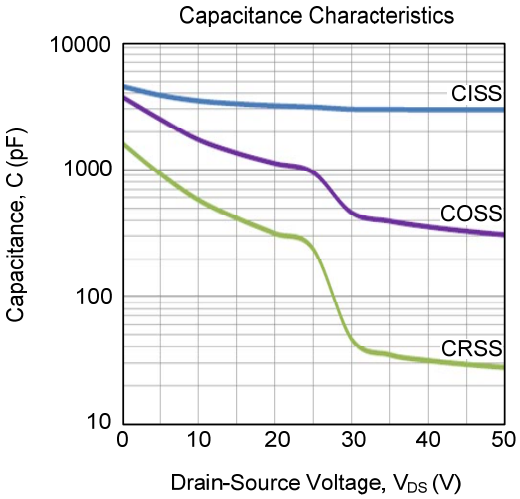
Unclamped Inductive Switching Waveforms

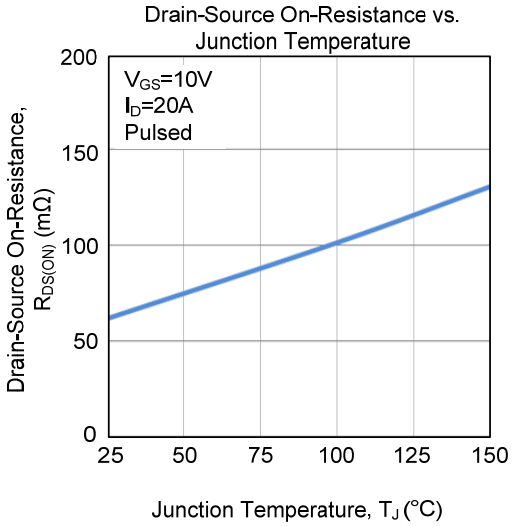
■ TYPICAL CHARACTERISTICS

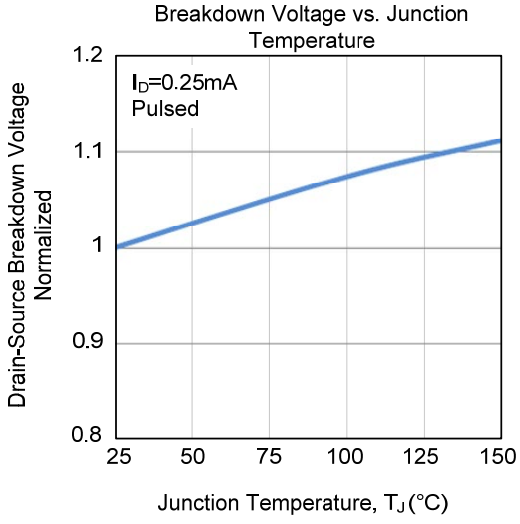






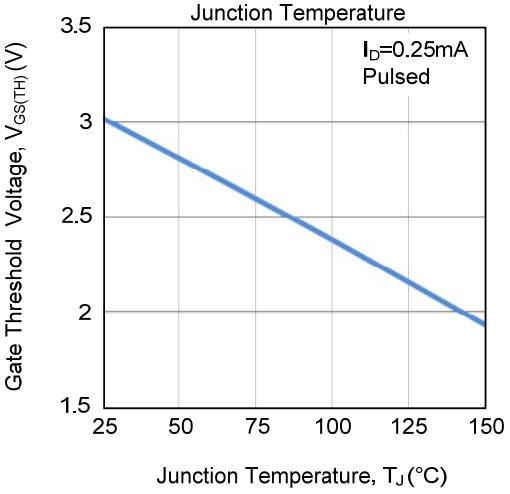




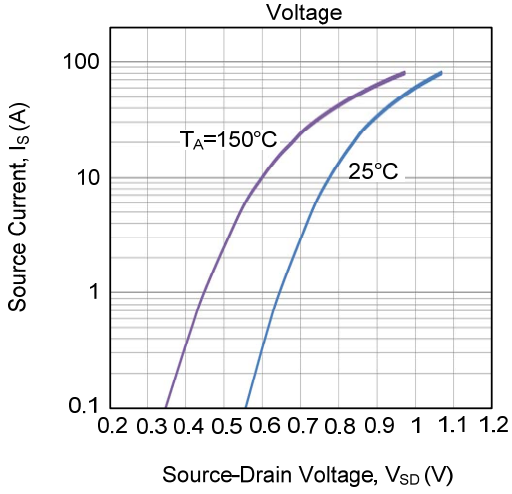


■ TYPICAL CHARACTERISTICS (Cont.)

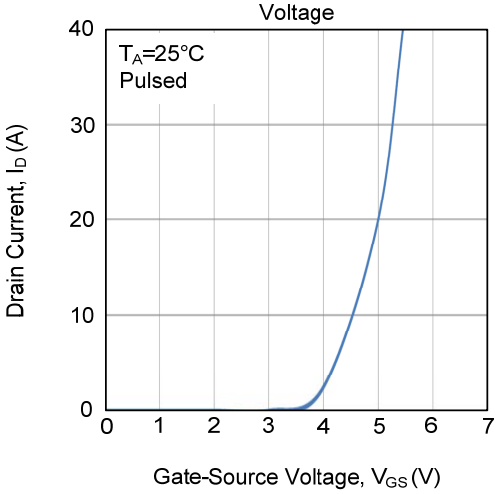
Gate Threshold Voltage vs. Junction Temperature



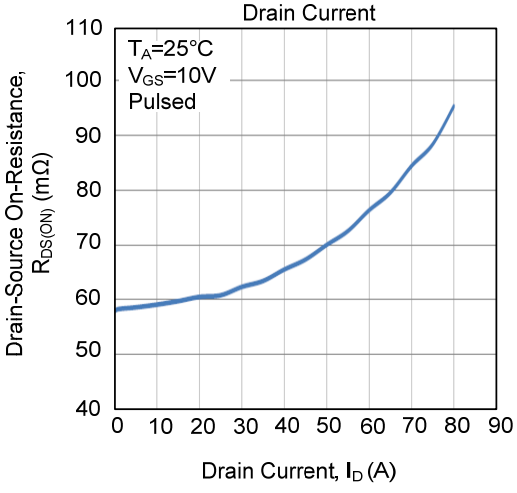
Source Current vs. Source-Drain Voltage



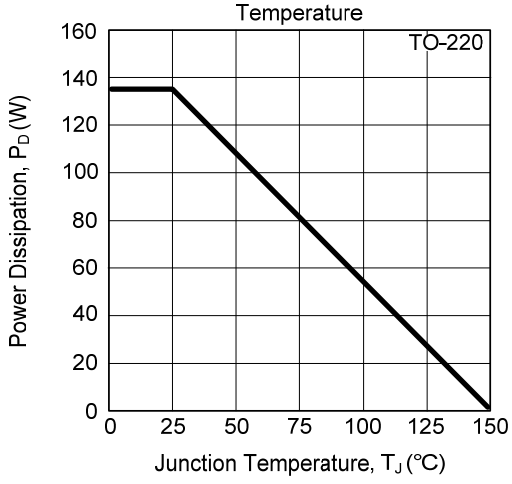
Drain Current vs. Gate-Source Voltage



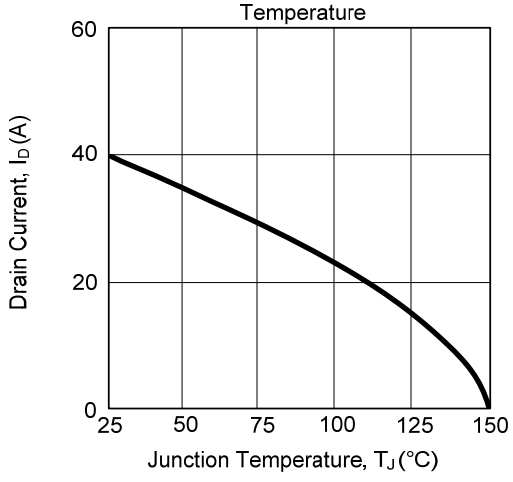
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)