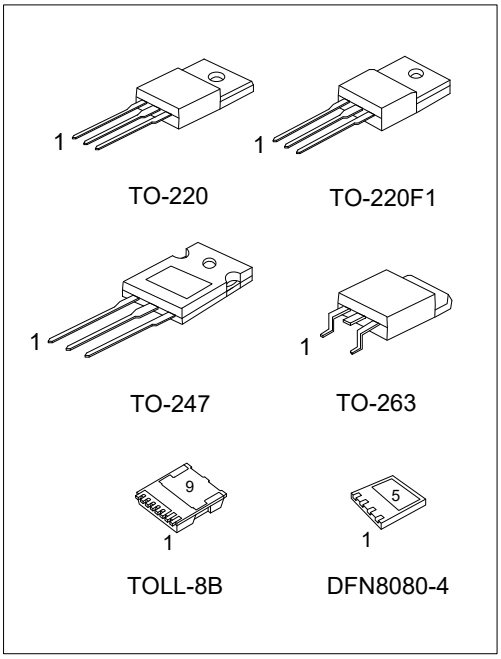
F30NM65

Power MOSFET

30A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



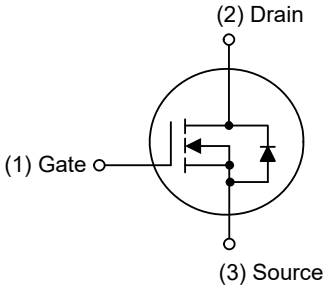
■ DESCRIPTION

The **UTC F30NM65** is a 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.

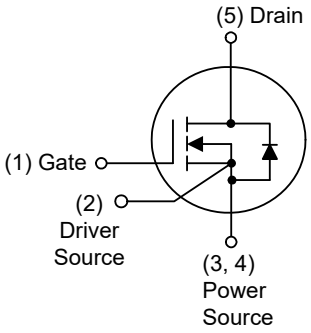
■ FEATURES

* $R_{DS(ON)} \leq 0.15\ \Omega$ @ V_{GS}=10V, I_D=15A
* Fast body diode MOSFET technology
* Low switching losses due to reduced Qrr
* Single Pulse Avalanche Energy Rated
* Fast Switching Speeds
* Linear Transfer Characteristics
* High Input Impedance
* Avalanche energy tested

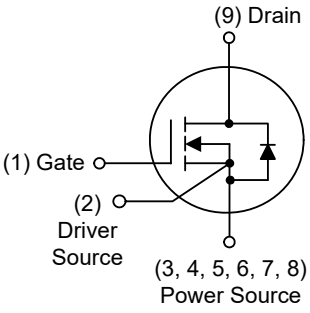
■ SYMBOL



TO-220 / TO-220F1
TO-247 / TO-263



DFN8080-4



TOLL-8B

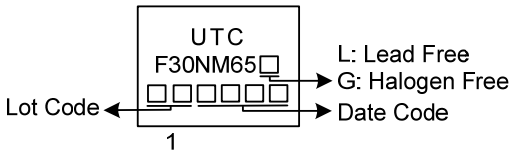
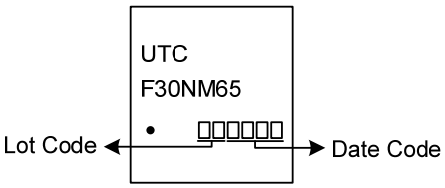
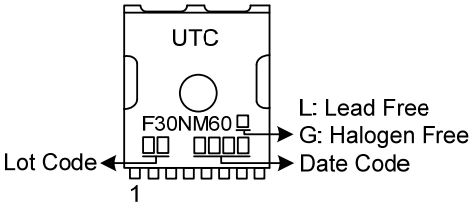
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
F30NM65L-TA3-T	F30NM65G-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube
F30NM65L-TF1-T	F30NM65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
F30NM65L-TQ2-T	F30NM65G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
F30NM65L-TQ2-R	F30NM65G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
F30NM65L-T47-T	F30NM65G-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
F30NM65L-T8B-R	F30NM65G-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel
F30NM65L-K04-8080-R	F30NM65G-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel

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

F30NM65G-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R:Tape Reel (2) TA3: TO-220, TF1: TO-220F1, T47: TO-247, TQ2: TO-263, T8B: TOLL-8B, K04-8080: DFN8080-4 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	MARKING
TO-220 / TO-220F1 TO-247 / TO-263	
DFN8080-4	
TOLL-8B	

■ 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	30	A
	Pulsed (Note 2)	I_{DM}	60	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	1188	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	10.8	V/nS
Power Dissipation	TO-220/TO-220F1 TO-263	P_D	40	W
	TO-247		145	W
	TOLL-8B		210	W
	DFN8080-4		70	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 = 60 mH, I_{AS} = 6.29A, 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	TO-220/TO-220F1 TO-263	θ_{JA}	62.5	°C/W
	TO-247		40	°C/W
	TOLL-8B/DFN8080-4		35 (Note)	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	0.96	°C/W
	TO-220F1		3.12	°C/W
	TO-247		0.86	°C/W
	TOLL-8B		0.59 (Note)	°C/W
	DFN8080-4		1.78 (Note)	°C/W

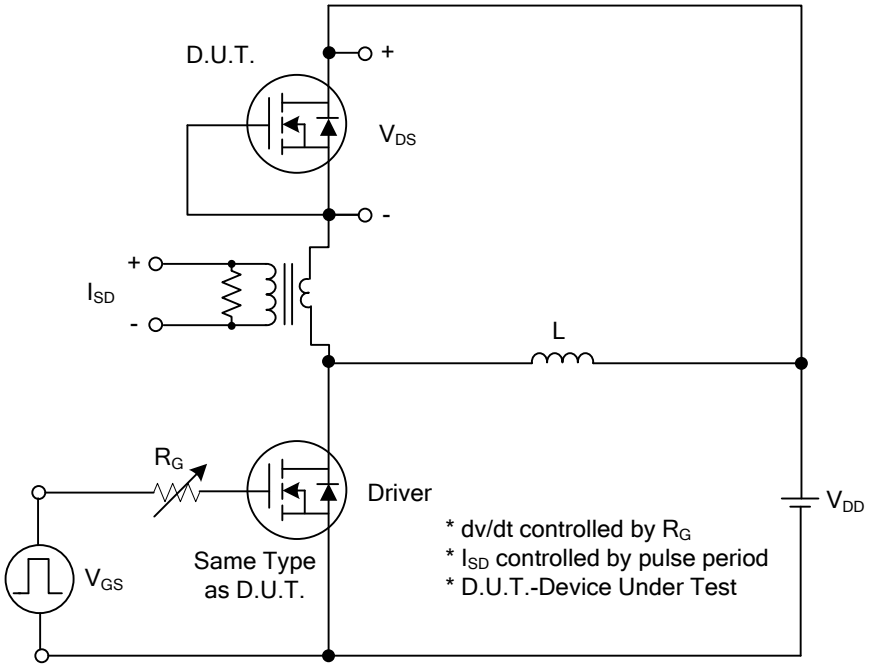
Note: Surface mounted on 1 in^2 copper pad of FR4 board; 270°C/W when mounted on min. copper pad.

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

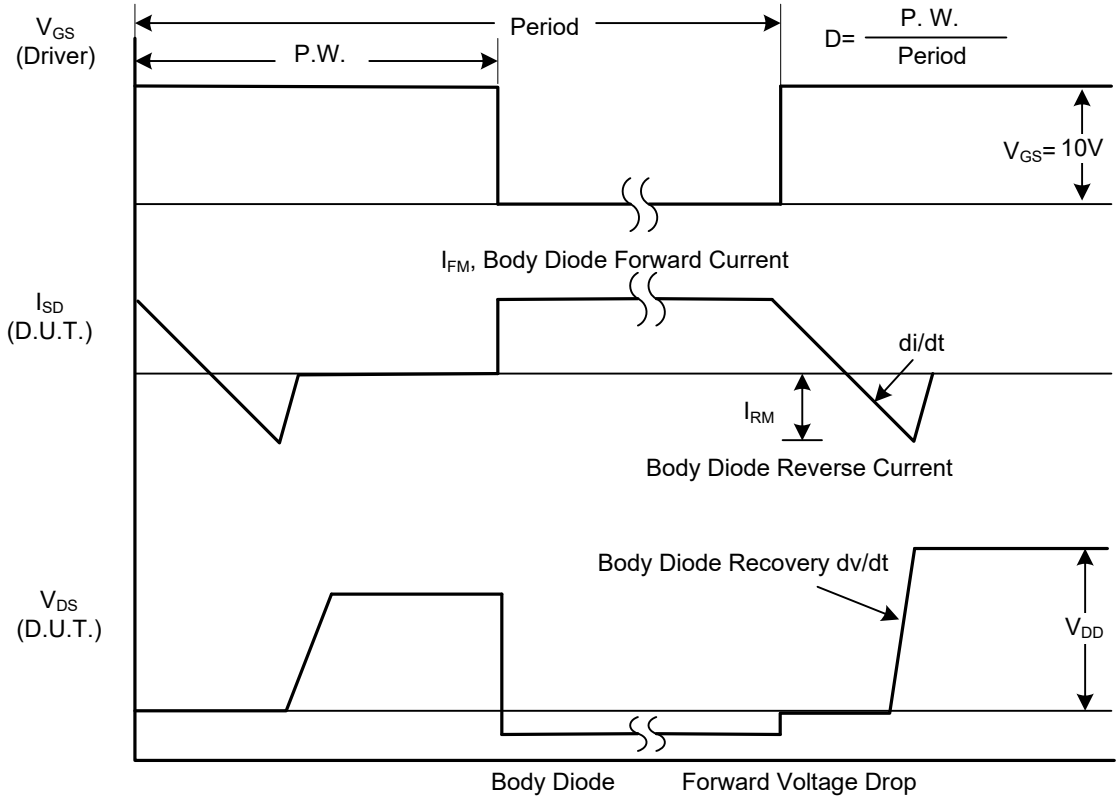
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		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=15A			0.15	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		2580		pF
Output Capacitance		C_{OSS}			1750		pF
Reverse Transfer Capacitance		C_{RSS}			130		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=30A (Note1, 2)		94		nC
Gate to Source Charge		Q_{GS}			22		nC
Gate to Drain Charge		Q_{GD}			35		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=100V, V_{GS}=10V, I_D=30A, R_G=25Ω (Note1, 2)		34		ns
Rise Time		t_R			31		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			290		ns
Fall-Time		t_F			128		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				30	A
Maximum Body-Diode Pulsed Current		I_{SM}				60	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=30A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt=100A/μs		232		ns
Body Diode Reverse Recovery Charge		Q_{rr}			2.1		μC

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

■ TEST CIRCUITS AND WAVEFORMS



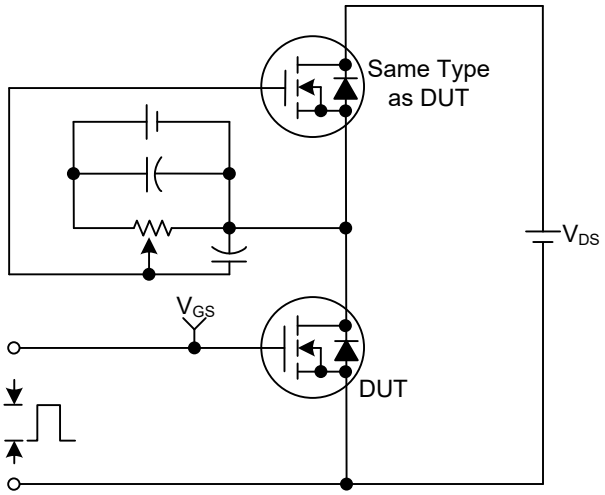
Peak Diode Recovery dv/dt Test Circuit



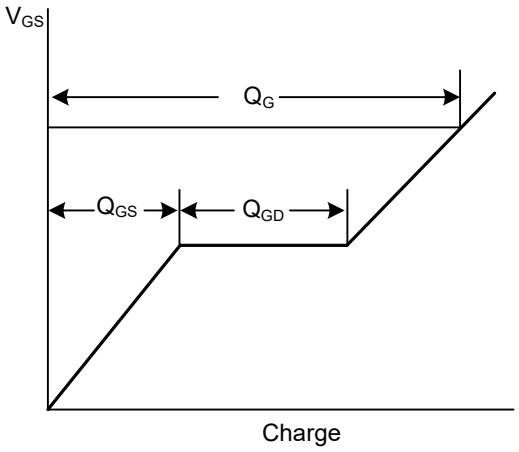
Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS

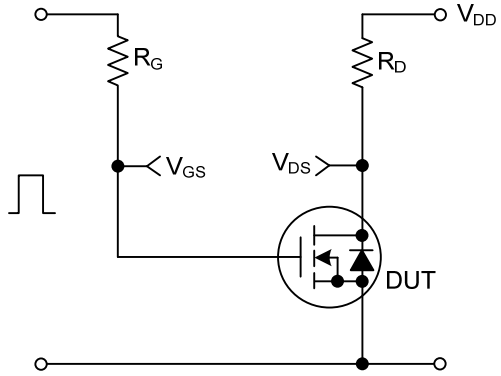
Gate Charge Test Circuit



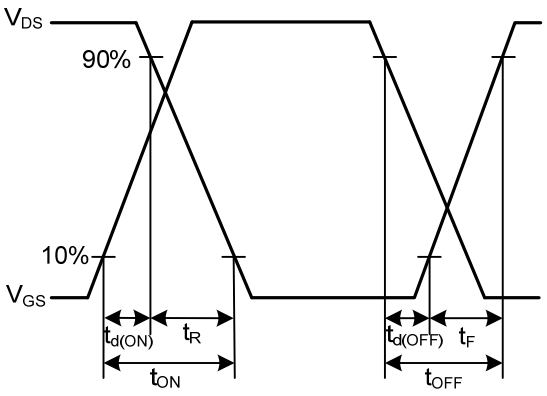
Gate Charge Waveforms



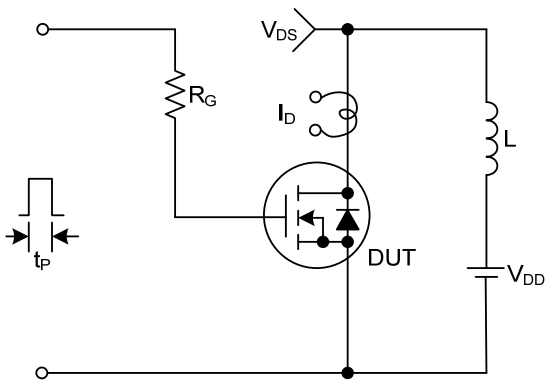
Resistive Switching Test Circuit



Resistive Switching Waveforms

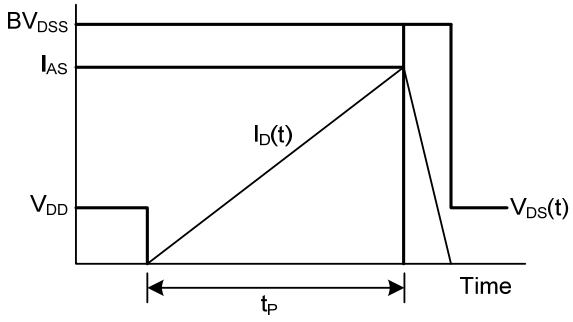


Unclamped Inductive Switching Test Circuit



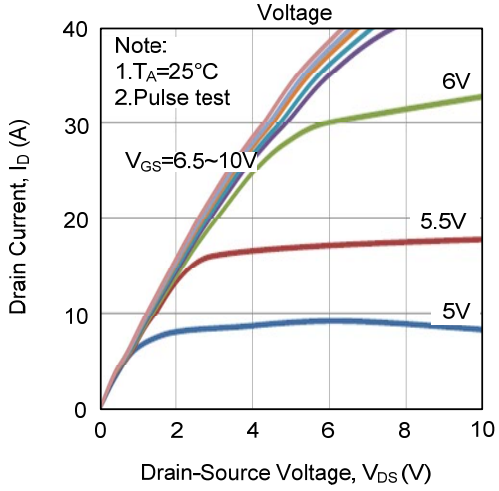
Unclamped Inductive Switching Waveforms

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$

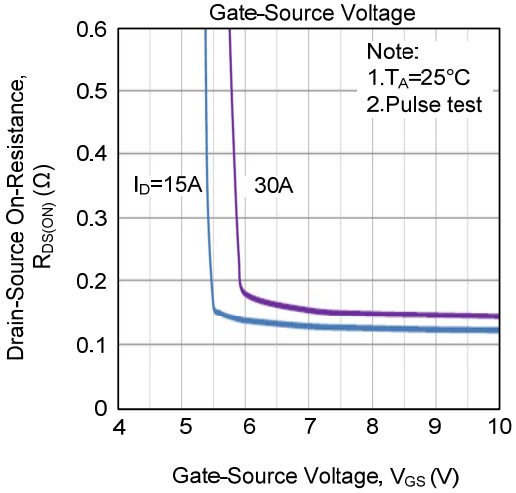


■ TYPICAL CHARACTERISTICS

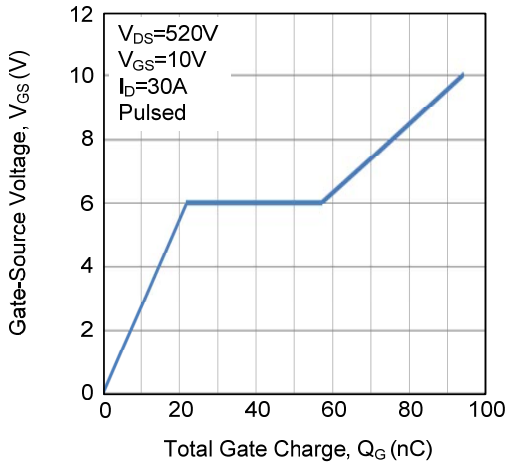
Drain Current vs. Drain-Source Voltage



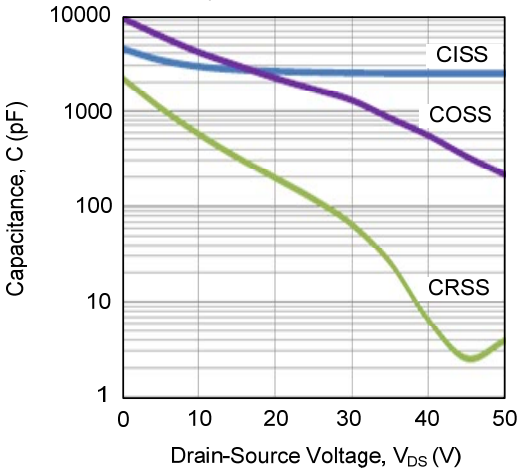
Drain-Source On-Resistance vs. Gate-Source Voltage



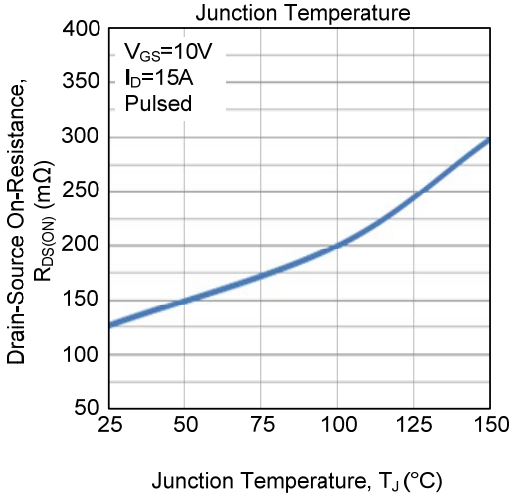
Gate Charge Characteristics



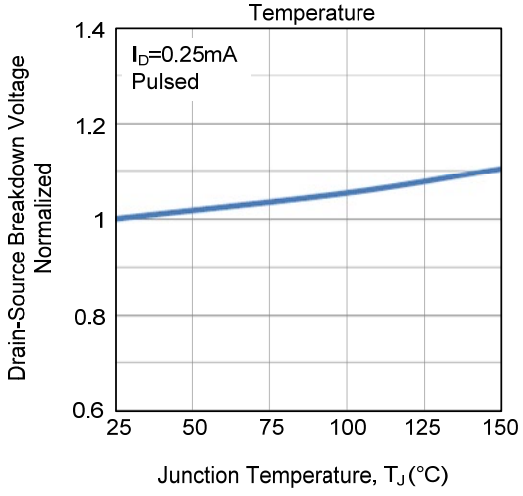
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

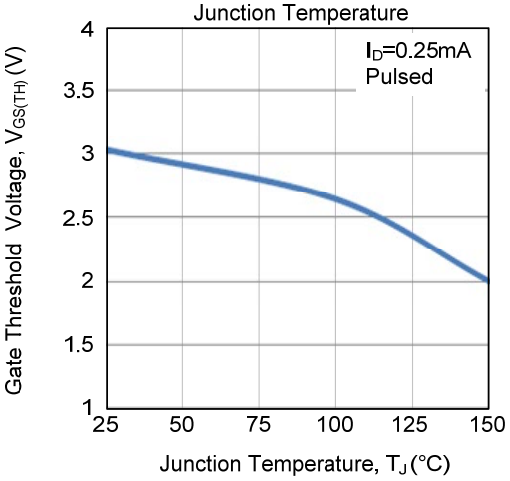


Breakdown Voltage vs. Junction Temperature

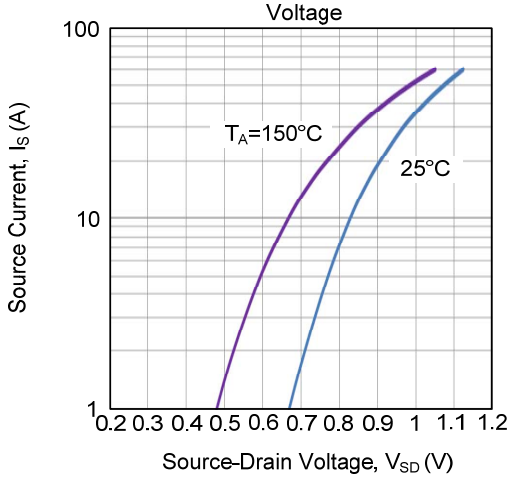


■ TYPICAL CHARACTERISTICS (Cont.)

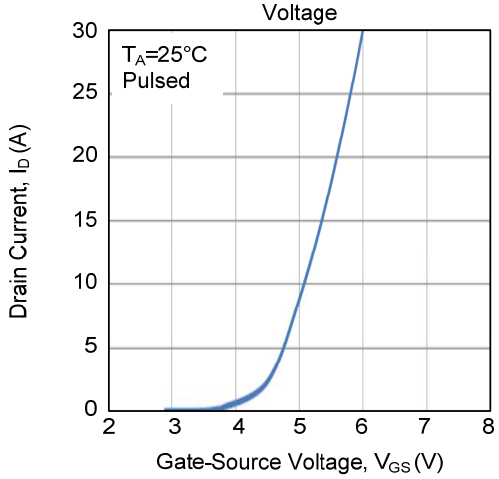
Gate Threshold Voltage vs. Junction Temperature



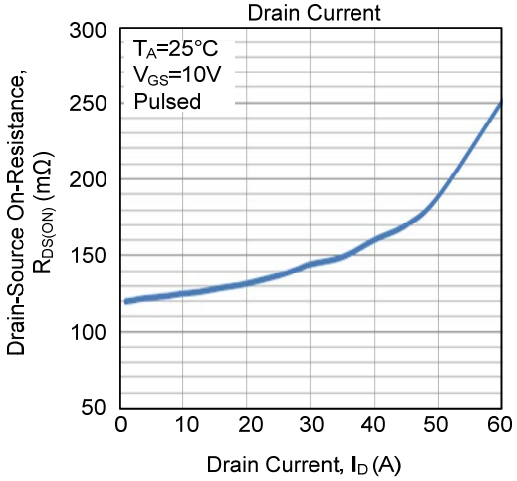
Source Current vs. Source-Drain Voltage



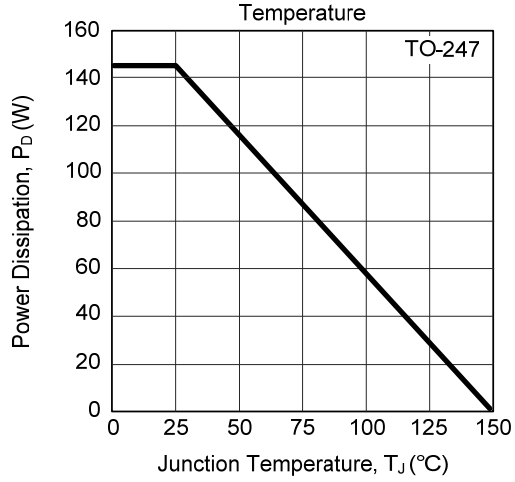
Drain Current vs. Gate-Source Voltage



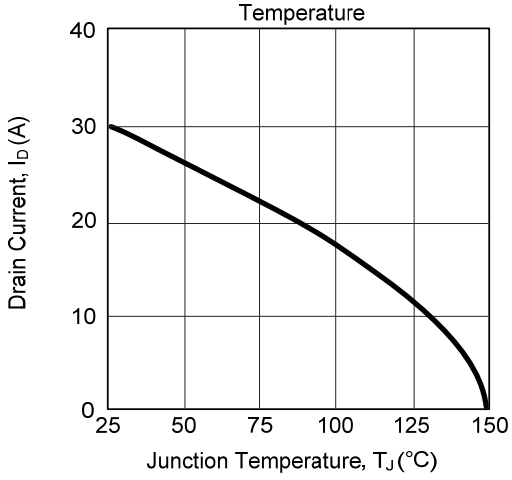
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)