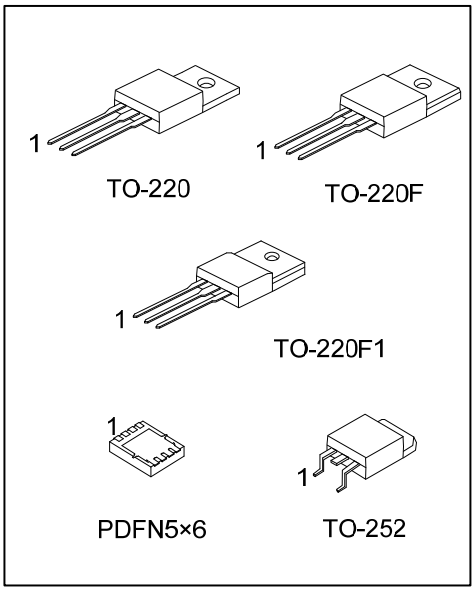
USG10R044M

Power MOSFET

N-CHANNEL SGT ENHANCEMENT POWER MOSFET



■ DESCRIPTION

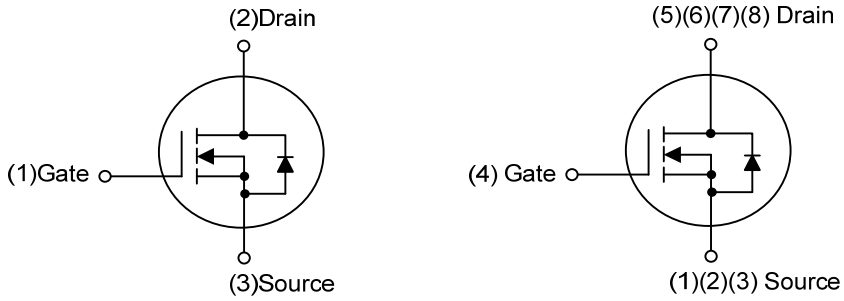
The UTC **USG10R044M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with high switching speed and low gate charge, etc.

The UTC **USG10R044M** applies to primary side switch, synchronous rectifier, Motor Drives, etc.

■ FEATURES

* $R_{DS(ON)} \leq 4.4\ m\Omega$ @ V_{GS}=10V, I_D=30A
  $R_{DS(ON)} \leq 5.9\ m\Omega$ @ V_{GS}=4.5V, I_D=20A
* High Cell Density Trench Technology
* High Power and Current Handling Capability

■ SYMBOL



TO-220 / TO-220F
TO-220F1 / TO-252

PDFN5×6

■ ORDERING INFORMATION

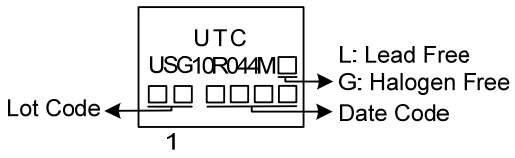
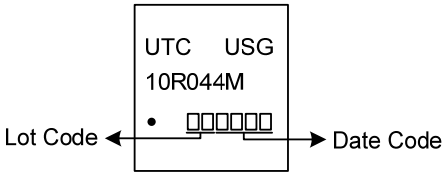
Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
USG10R044ML-TA3-T	USG10R044MG-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
USG10R044ML-TF1-T	USG10R044MG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
USG10R044ML-TF3-T	USG10R044MG-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
USG10R044ML-TN3-R	USG10R044MG-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
USG10R044ML-P5060-R	USG10R044MG-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

USG10R044MG-TA3-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F
TN3: TO-252, P5060: PDFN5×6
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220 / TO-252	PDFN5×6
	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	100	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	Continuous	I_D	140	A
	Pulsed (Note 2)	I_{DM}	280	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	55	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.3	V/ns
Power Dissipation	TO-220	P_D	135	W
	TO-220F/TO-220F1		44	W
	TO-252		65	W
	PDFN5×6		88	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 = 0.1mH, I_{AS} = 33.2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, T_J ≤ T_{JMAX}, T_J = 25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1	θ_{JA}	62.5	°C/W
	TO-252		110	°C/W
	PDFN5×6		65 (Note)	°C/W
Junction to Case (Note)	TO-220	θ_{JC}	0.92	°C/W
	TO-220F/TO-220F1		2.84	°C/W
	TO-252		1.92(Note)	°C/W
	PDFN5×6		1.42 (Note)	°C/W

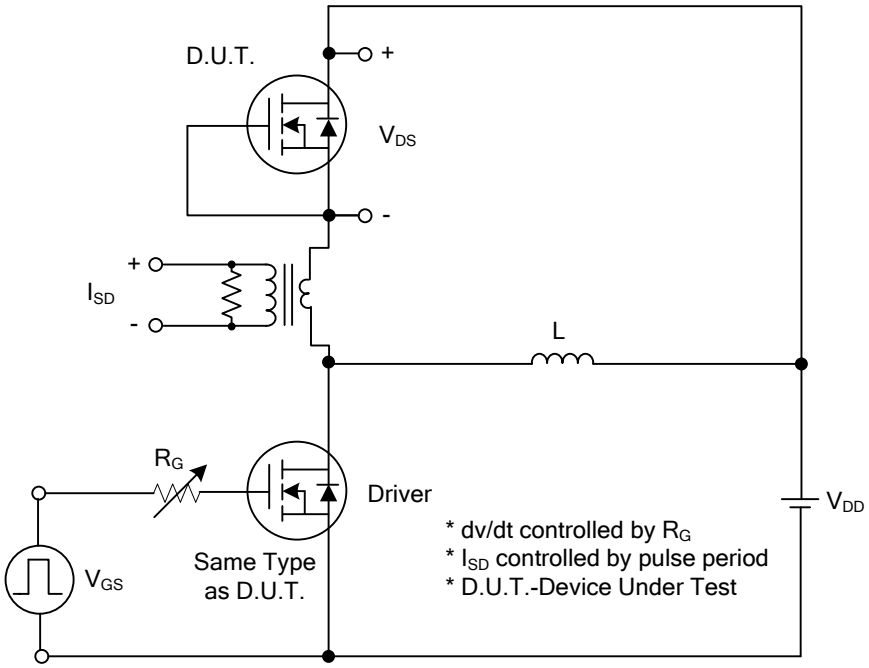
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

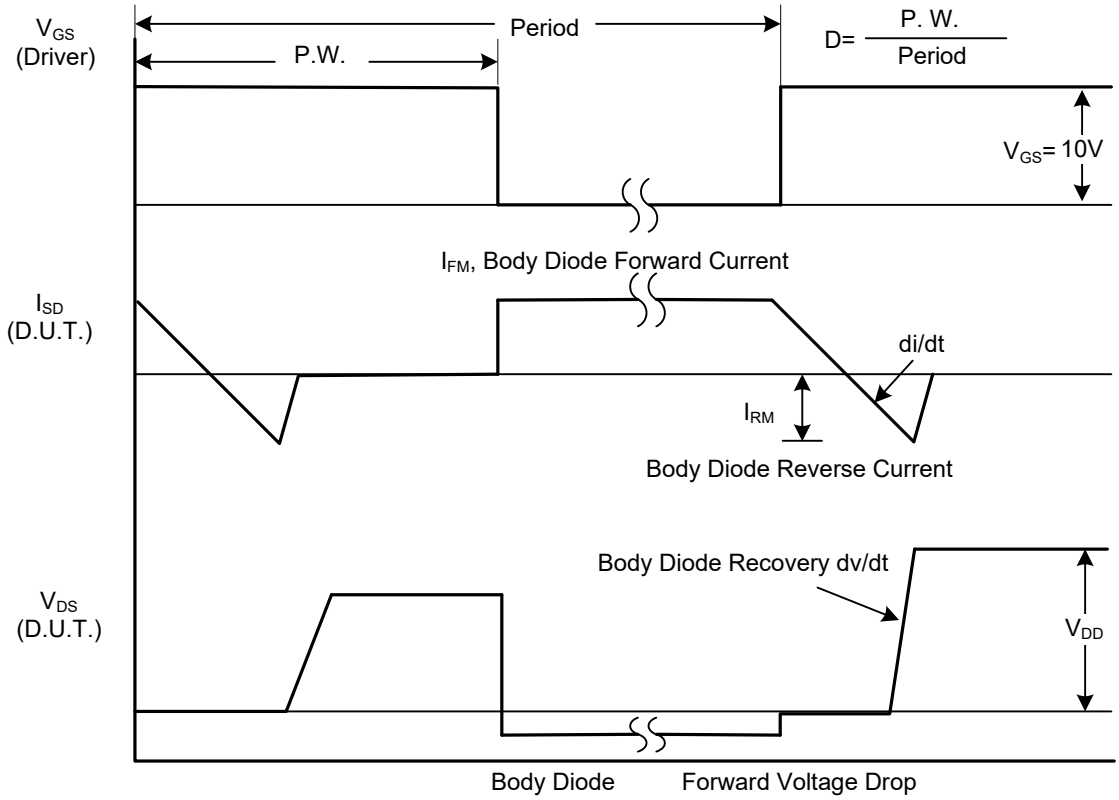
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	100			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=100V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	1.0		2.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=70A			4.4	mΩ
			V_{GS}=4.5V, I_D=70A			5.9	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0MHz		4643		pF
Output Capacitance		C_{OSS}			2120		pF
Reverse Transfer Capacitance		C_{RSS}			288		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=80V, V_{GS}=10V, I_D=70A		117		nC
Gate to Source Charge		Q_{GS}			12		nC
Gate to Drain Charge		Q_{GD}			49		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=50V, V_{GS}=10V, I_D=70A, R_G =3Ω		14		ns
Rise Time		t_R			22		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			82		ns
Fall-Time		t_F			33		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				140	A
Maximum Body-Diode Pulsed Current		I_{SM}				280	A
Drain-Source Diode Forward Voltage		V_{SD}	I_F=30A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=30A, dI/dt=100A/μs		256		ns
Body Diode Reverse Recovery Charge		Q_{rr}			737		nC

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

■ TEST CIRCUITS AND WAVEFORMS

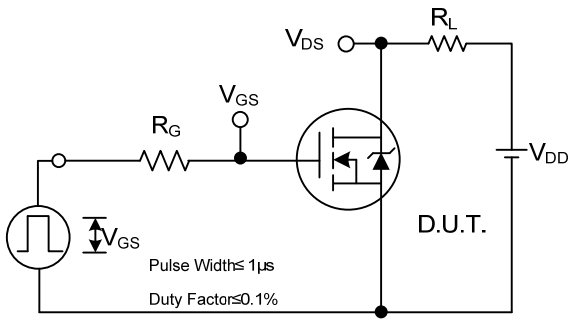


Peak Diode Recovery dv/dt Test Circuit

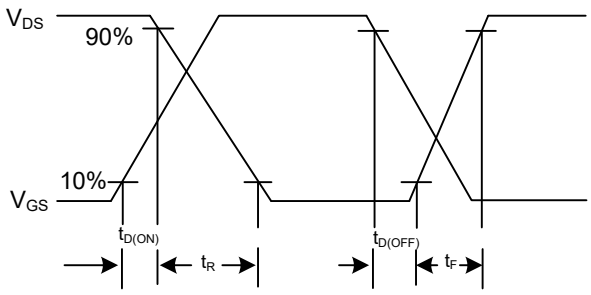


Peak Diode Recovery dv/dt Waveforms

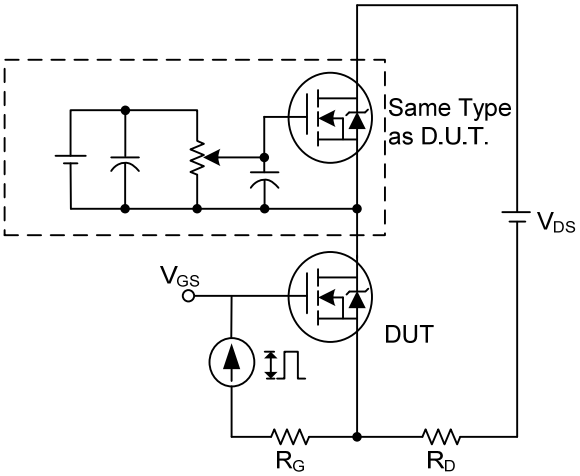
■ TEST CIRCUITS AND WAVEFORMS



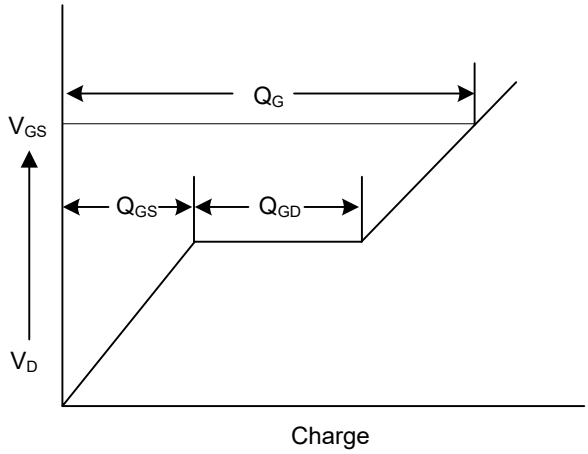
Switching Test Circuit



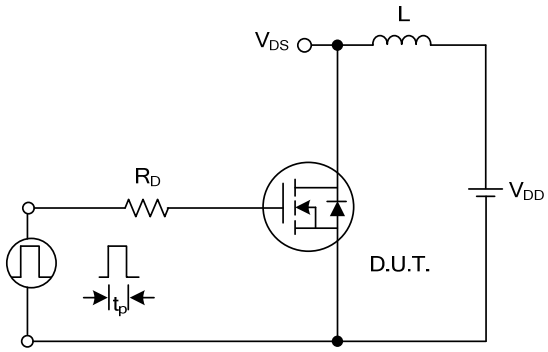
Switching Waveforms



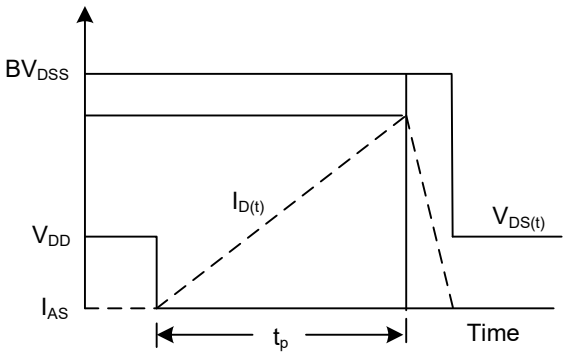
Gate Charge Test Circuit



Gate Charge Waveform



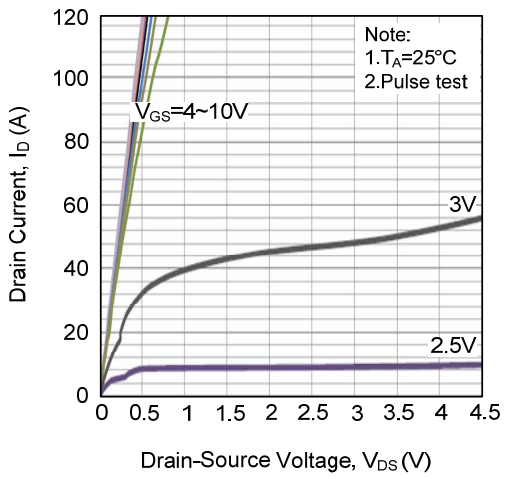
Unclamped Inductive Switching Test Circuit



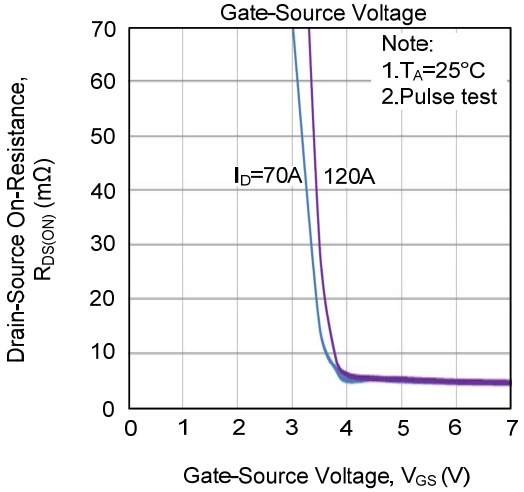
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

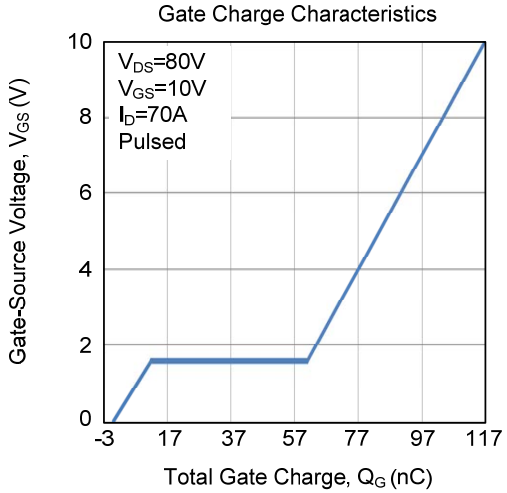
Drain Current vs. Drain-Source Voltage



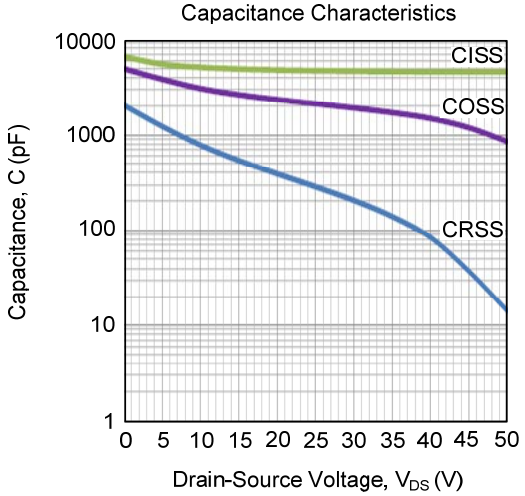
Drain-Source On-Resistance vs. Gate-Source Voltage



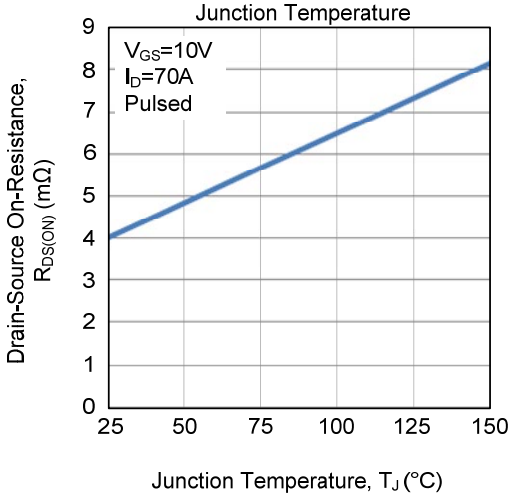
Gate Charge Characteristics



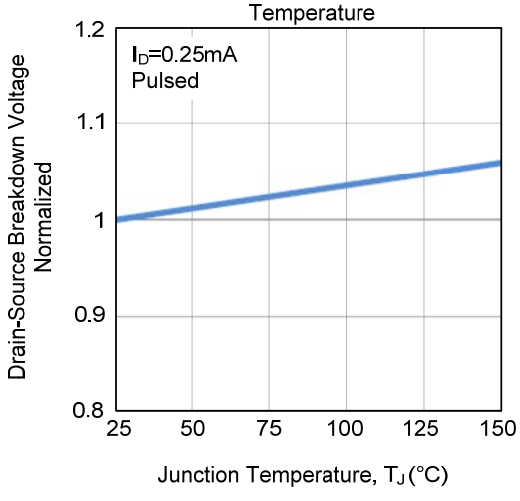
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

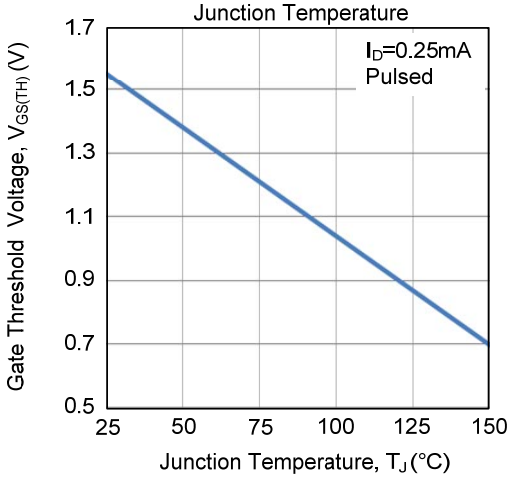


Breakdown Voltage vs. Junction Temperature

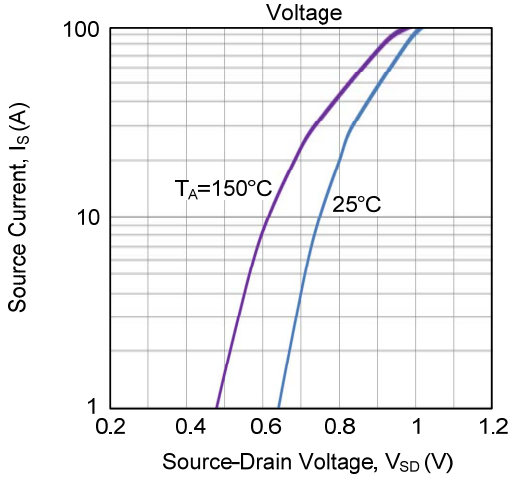


■ TYPICAL CHARACTERISTICS (Cont.)

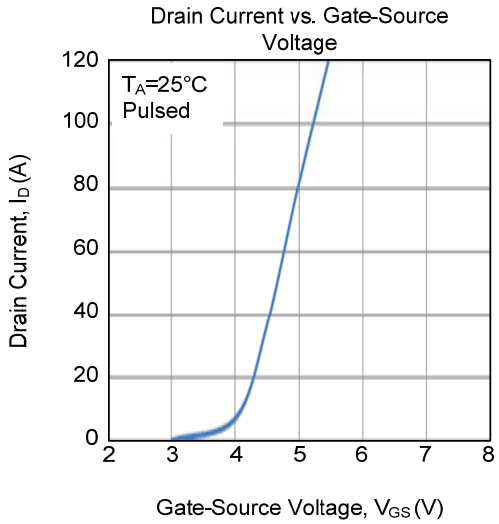
Gate Threshold Voltage vs. Junction Temperature



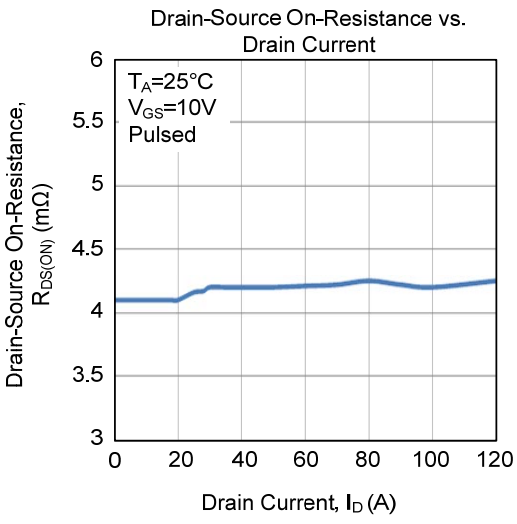
Source Current vs. Source-Drain Voltage



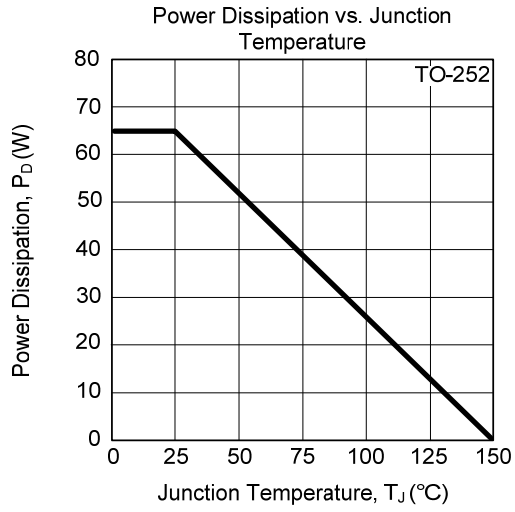
Drain Current vs. Gate-Source Voltage



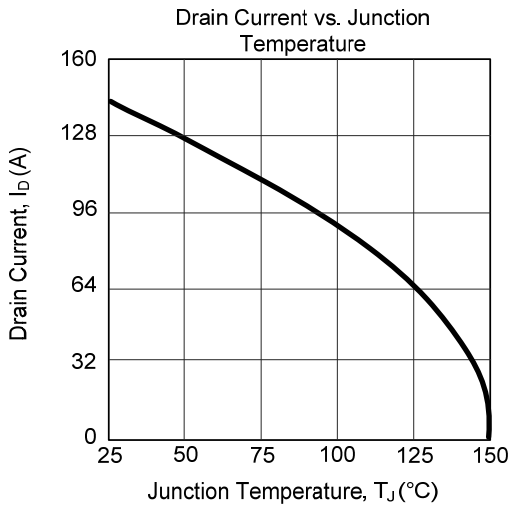
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)