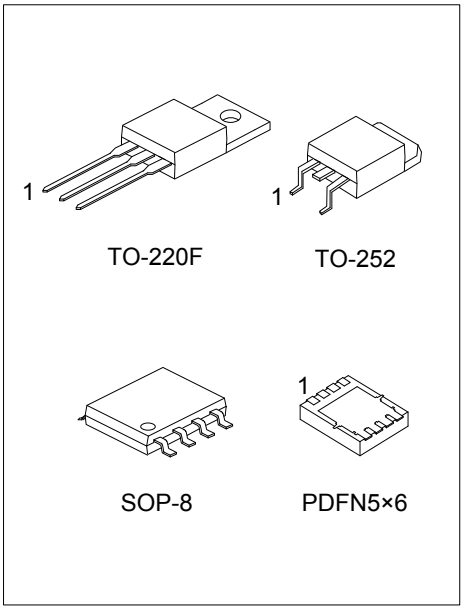
UTT50P04

Power MOSFET

-40V, -50A P-CHANNEL POWER MOSFET



■ DESCRIPTION

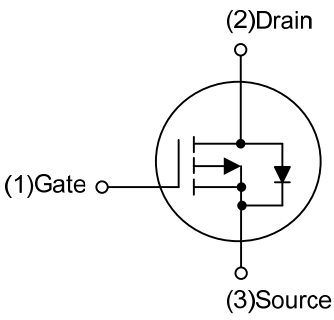
The UTC **UTT50P04** is a P-channel power MOSFET using UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance, and it can also withstand high energy in the avalanche.

This UTC **UTT50P04** is suitable for motor drivers, high-side switch and 12V board net, etc.

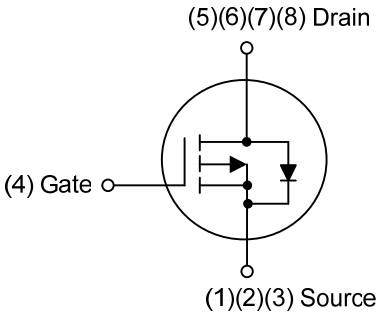
■ FEATURES

* $R_{DS(ON)}$ ≤ 15 mΩ @ V_{GS}=-10V, I_D=-30A
  $R_{DS(ON)}$ ≤ 25 mΩ @ V_{GS}=−4.5V, I_D=−20A
* High Switching Speed

■ SYMBOL



TO-220F/TO-252



SOP-8/PDFN5×6

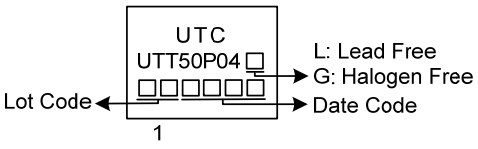
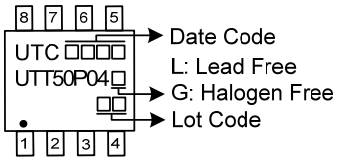
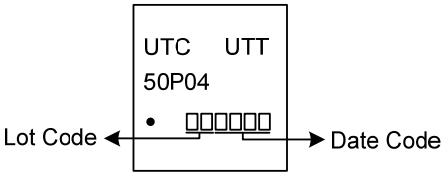
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTT50P04L-TF3-T	UTT50P04G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tape Reel
UTT50P04L-TN3-R	UTT50P04G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTT50P04L-S08-R	UTT50P04G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
UTT50P04L-P5060-R	UTT50P04G-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

UTT50P04G-TF3-T (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) TF3: TO-220F, TN3: TO-252, S08: SOP-8 P5060: PDFN5×6 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	MARKING
TO-220F / TO-252	
SOP-8	
PDFN5×6	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	-40	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	Continuous	I_D	-50 (Note 2)	A
	Pulsed	I_{DM}	-100	A
Continuous Source Current (Diode Conduction)		I_S	-50 (Note 2)	A
Avalanche Current		I_{AR}	-40	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	80	mJ
Power Dissipation	TO-220F	P_D	38	W
	TO-252		56	W
	SOP-8		2.2	W
	PDFN5×6		12	W
Junction Temperature		T_J	-55 ~ +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=1mH, I_{AS}=-12.6A, V_{DD}=25V, R_G = 25Ω, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-252	θ_{JA}	110	°C/W
	SOP-8		100 (Note 2)	°C/W
	PDFN5×6		65 (Note 2)	°C/W
Junction to Case	TO-220F	θ_{JC}	3.28	°C/W
	TO-252		2.5 (Note 2)	°C/W
	SOP-8		56 (Note 2)	°C/W
	PDFN5×6		10.4 (Note 2)	°C/W

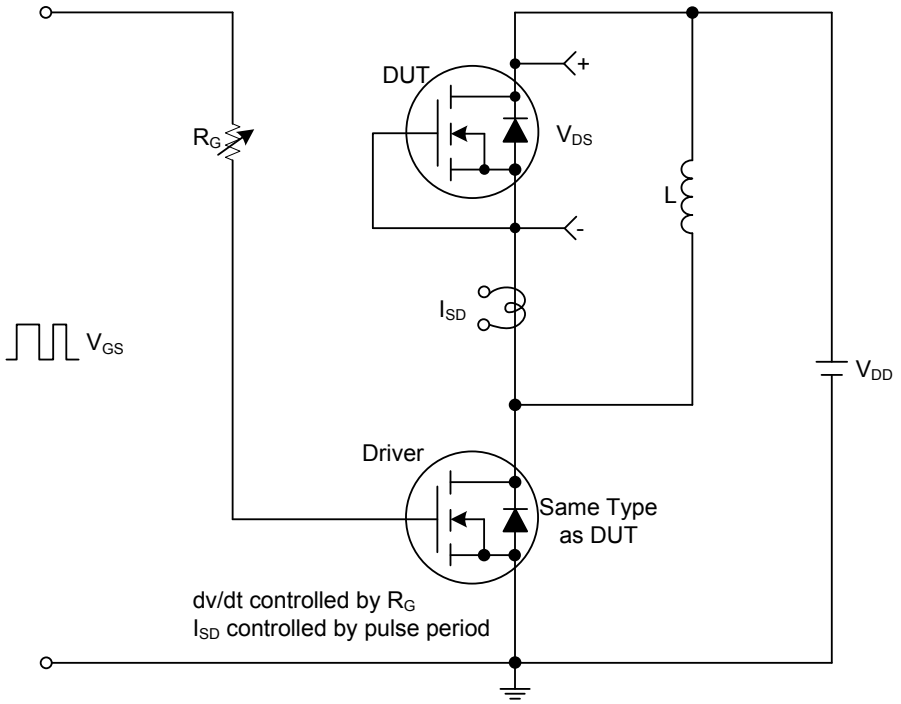
Notes: 1. Calculated based on maximum allowable Junction Temperature. Package limitation current is 50A.
2. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

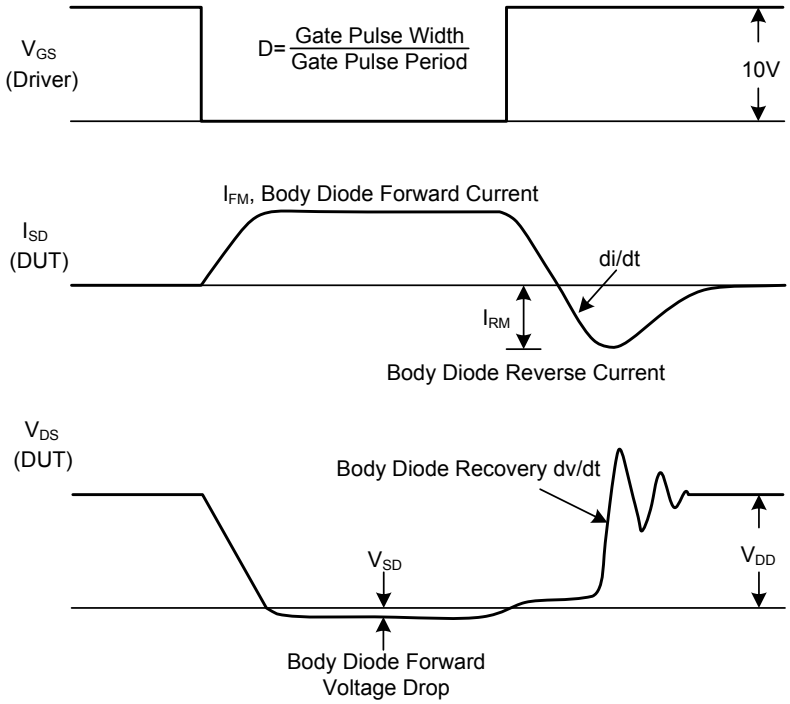
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-250μA, V_{GS}=0V	-40			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-40V, V_{GS}=0V			-1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		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		-3.0	V
Static Drain-Source On-State Resistance (Note 1)		$R_{DS(ON)}$	V_{GS}=-10V, I_D=-30A			15	mΩ
			V_{GS}=−4.5V, I_D=−20A			25	mΩ
DYNAMIC PARAMETERS (Note 2)							
Input Capacitance		C_{ISS}	V_{DS}=-25V, V_{GS}=0V, f=1MHz		2930		pF
Output Capacitance		C_{OSS}			385		pF
Reverse Transfer Capacitance		C_{RSS}			291		pF
SWITCHING PARAMETERS (Note 2)							
Total Gate Charge (Note 3)		Q_G	V_{GS}=-5V, V_{DS}=-32V, I_D=-50A		32.5		nC
			V_{GS}=-10V, V_{DS}=-32V, I_D=-50A		57.8		nC
Gate to Source Charge (Note 3)		Q_{GS}			8		nC
Gate to Drain Charge (Note 3)		Q_{GD}			16		nC
Turn-ON Delay Time (Note 3)		$t_{D(ON)}$	V_{DD}=-20V, V_{GS}=-10V, I_D=-50A, R_G=3Ω		11		ns
Rise Time (Note 3)		t_R			18		ns
Turn-OFF Delay Time (Note 3)		$t_{D(OFF)}$			53		ns
Fall-Time (Note 3)		t_F			36		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C=25°C)							
Maximum Body-Diode Pulsed Current		I_{SM}				-50	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_F=-50A, V_{GS}=0V			-1.5	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=-30A , V_{GS}=0V, di/dt=100A/μs		72		ns
Reverse Recovery Charge		Q_{rr}			100		nC

Notes: 1. Pulse test; pulse width ≤ 300μs, duty cycle ≤ 2%.
2. Guaranteed by design, not subject to production testing.
3. Independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS



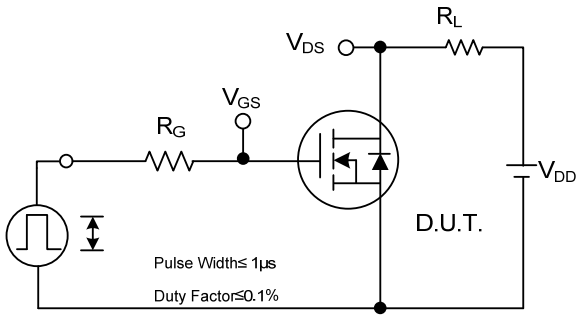
Peak Diode Recovery dv/dt Test Circuit



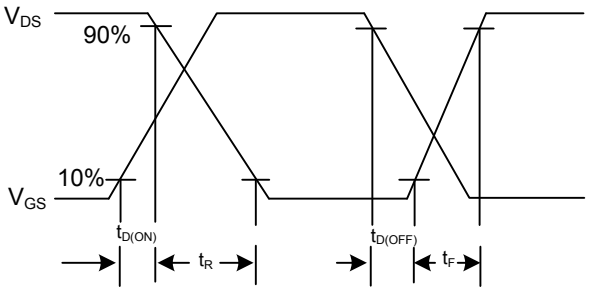
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

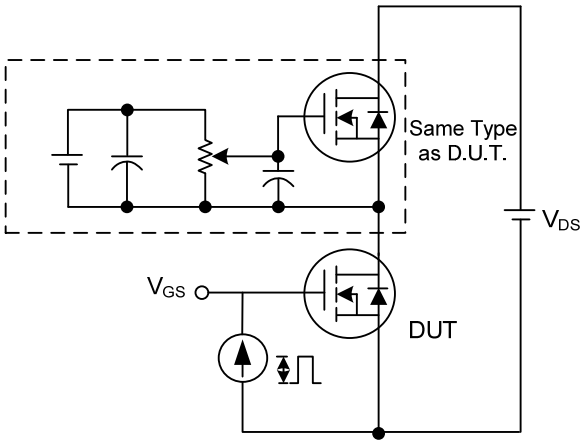
■ TEST CIRCUITS AND WAVEFORMS



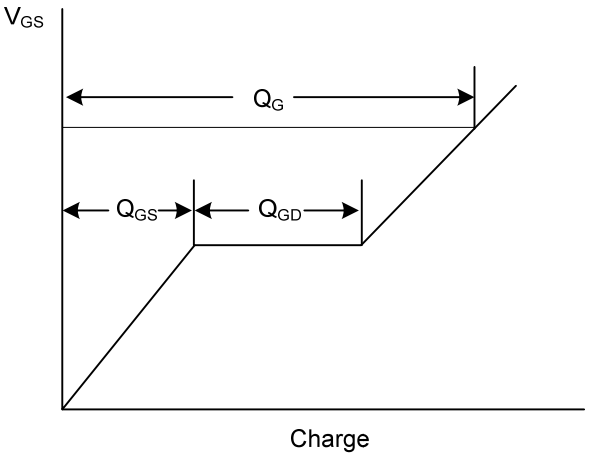
Switching Test Circuit



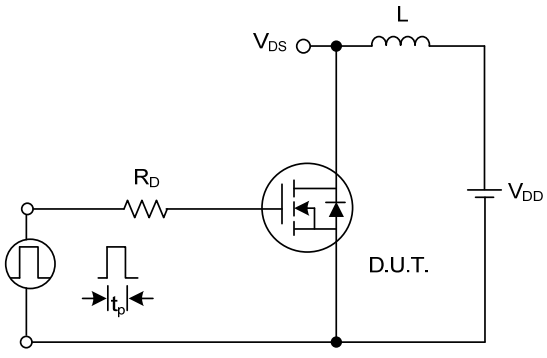
Switching Waveforms



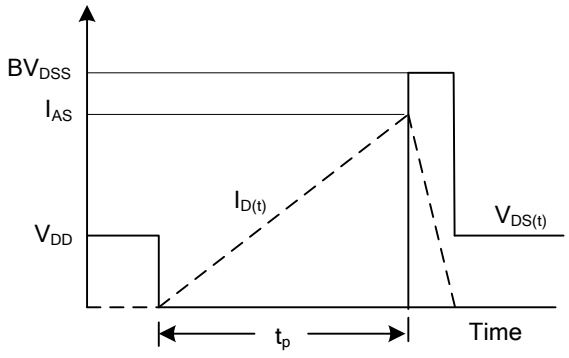
Gate Charge Test Circuit



Gate Charge Waveform



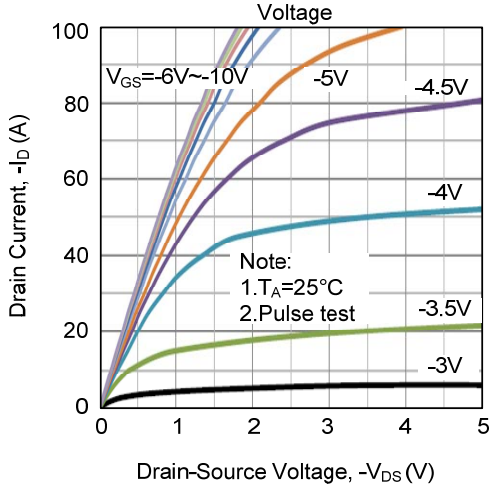
Unclamped Inductive Switching Test Circuit



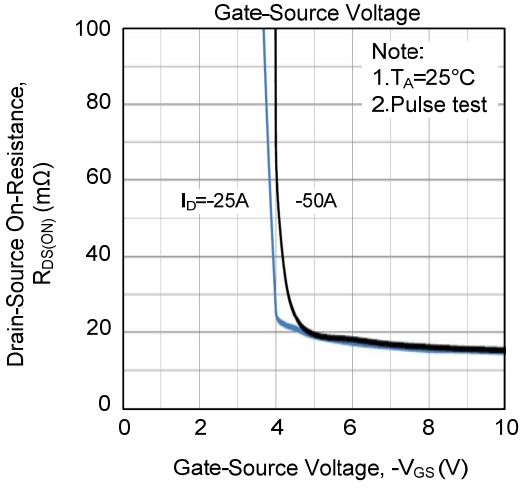
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

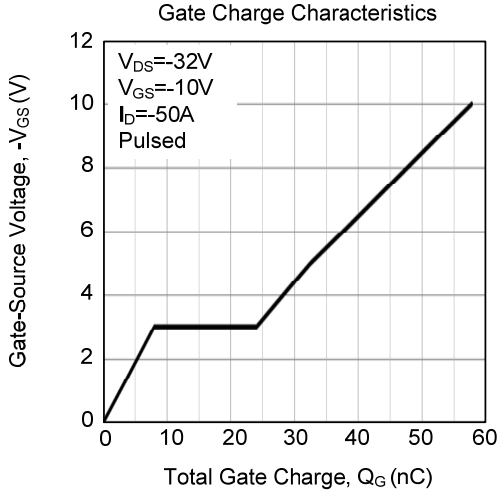
Drain Current vs. Drain-Source Voltage



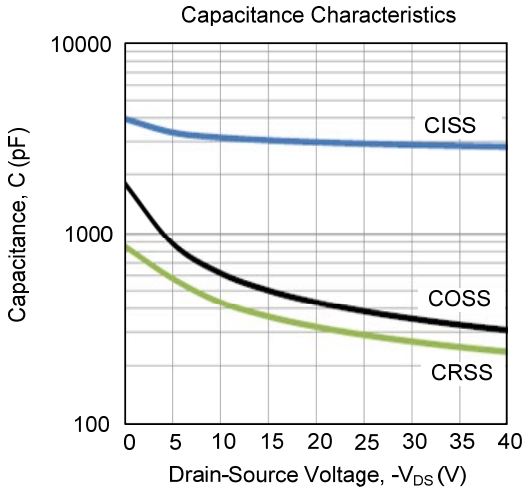
Drain-Source On-Resistance vs. Gate-Source Voltage



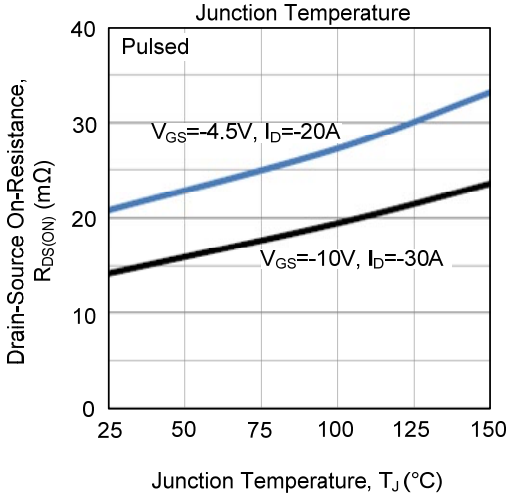
Gate Charge Characteristics



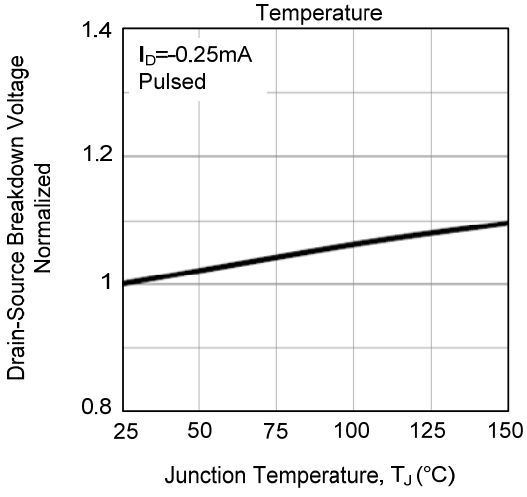
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

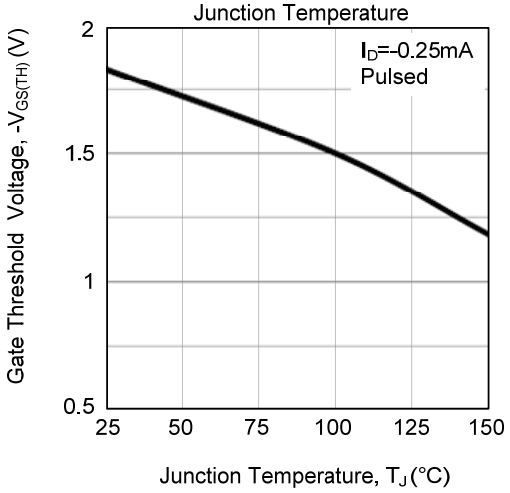


Breakdown Voltage vs. Junction Temperature

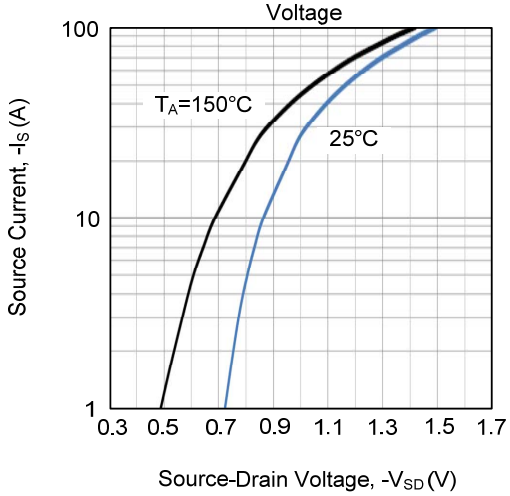


■ TYPICAL CHARACTERISTICS (Cont.)

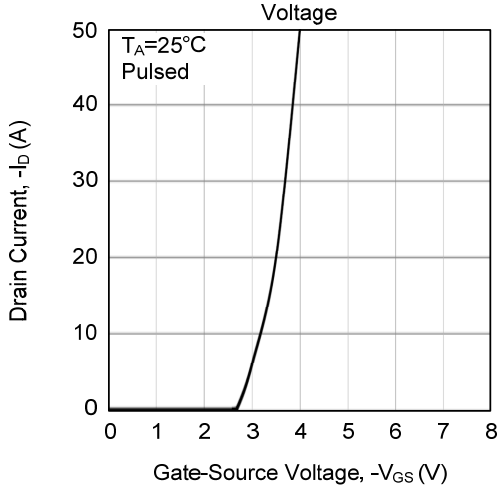
Gate Threshold Voltage vs. Junction Temperature



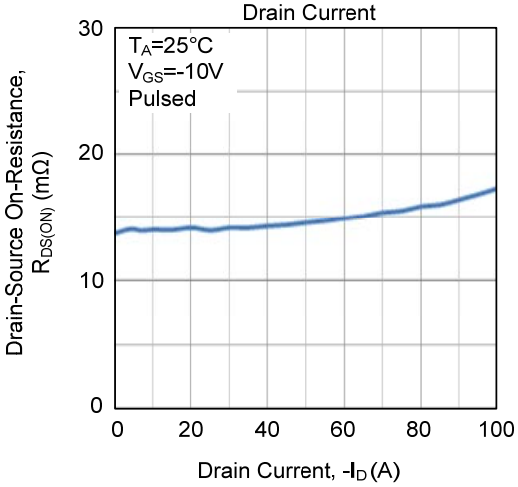
Source Current vs. Source-Drain Voltage



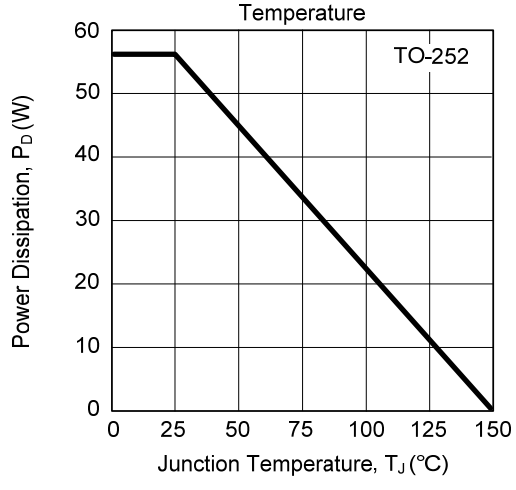
Drain Current vs. Gate-Source Voltage



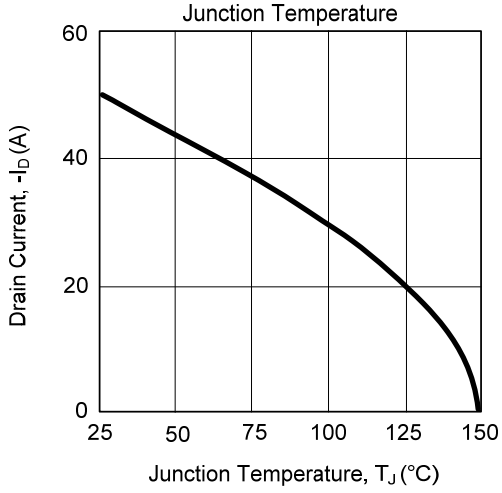
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)