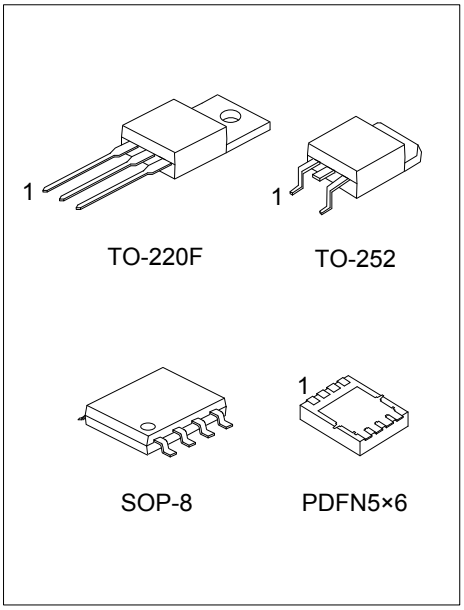
UTT50P04

Power MOSFET

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



■ DESCRIPTION

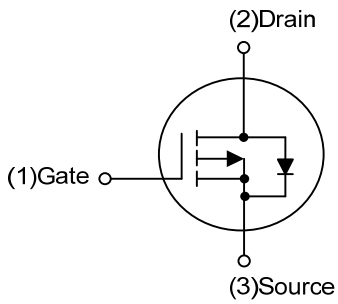
The UTC **UTT50P04** is a P-channel power MOSFET using UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance, and it can also withstand high energy in the avalanche.

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

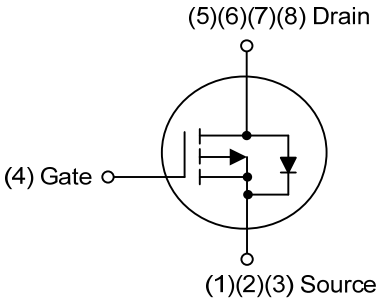
■ FEATURES

* $R_{DS(ON)}$ ≤ 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

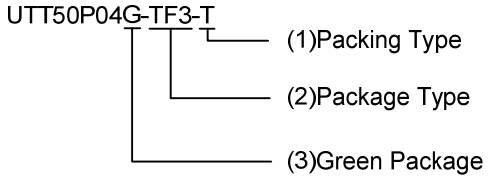


SOP-8/PDFN5×6

■ 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

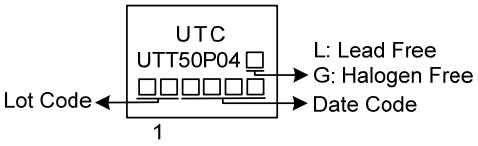
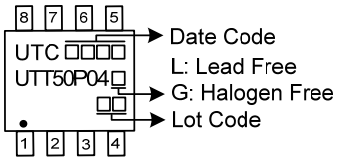
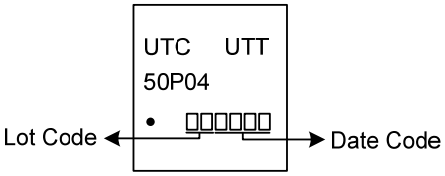


(1) R: Tape Reel

(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		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

Note: 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.

■ 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

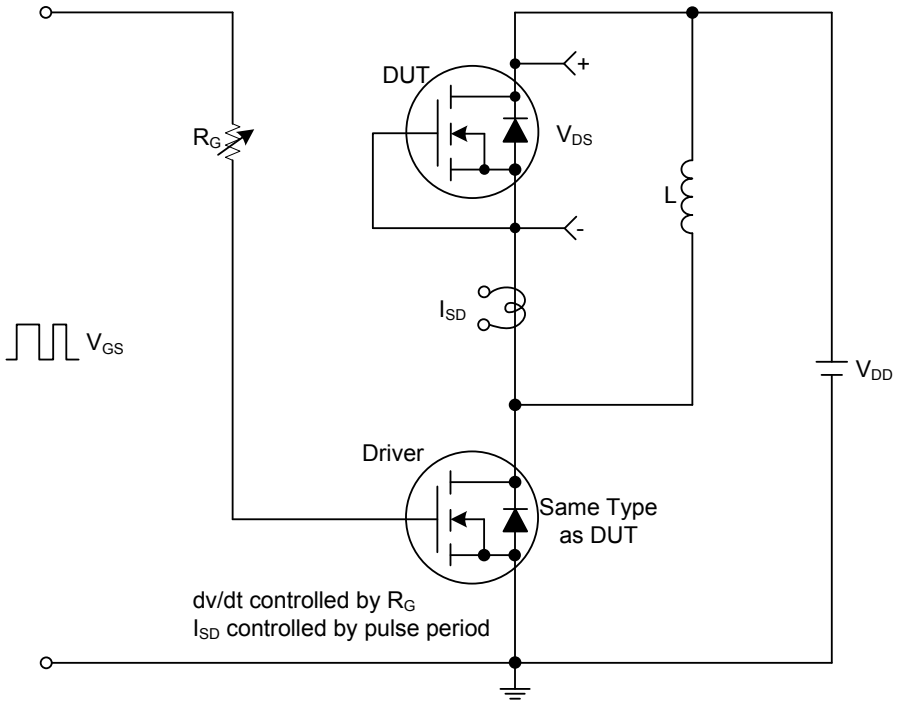
Notes: 1. Calculated based on maximum allowable Junction Temperature. Package limitation current is 50A.
2. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

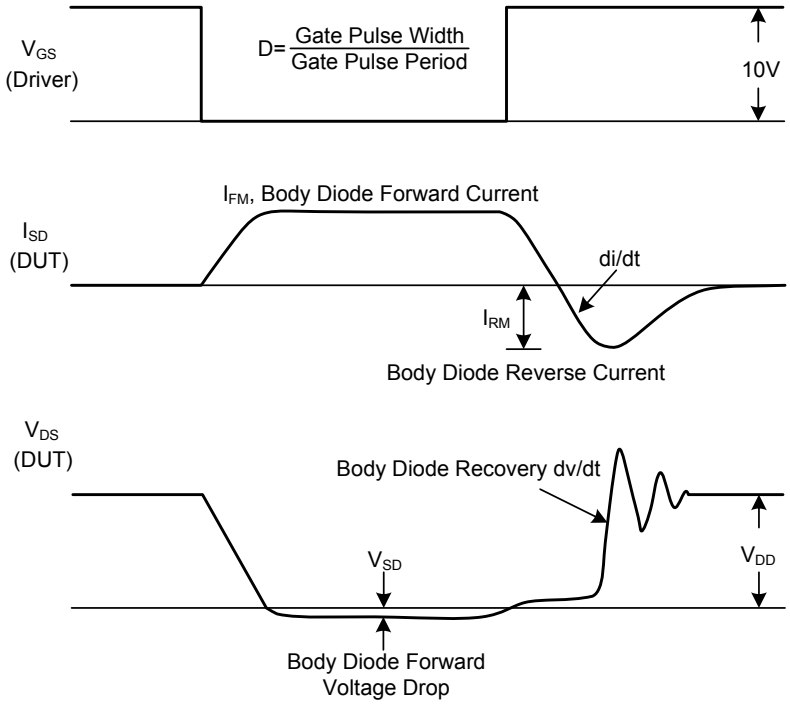
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-250μA, V_{GS}=0V	-40			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-40V, V_{GS}=0V			-1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		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 I_G=1mA		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_{GEN}=-10V, I_D≈-50A, R_L=0.4Ω , 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



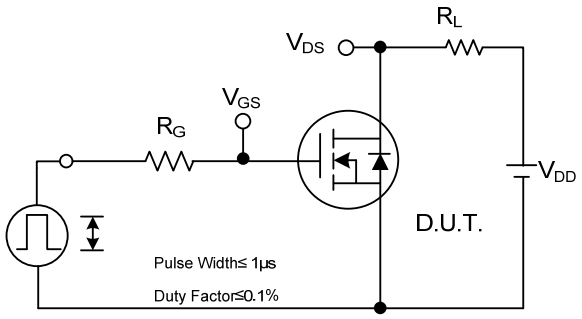
Peak Diode Recovery dv/dt Test Circuit



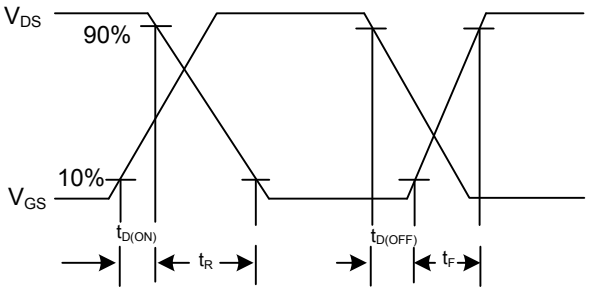
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

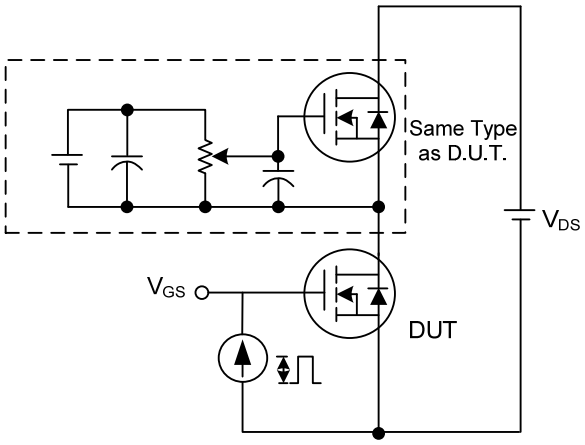
■ TEST CIRCUITS AND WAVEFORMS



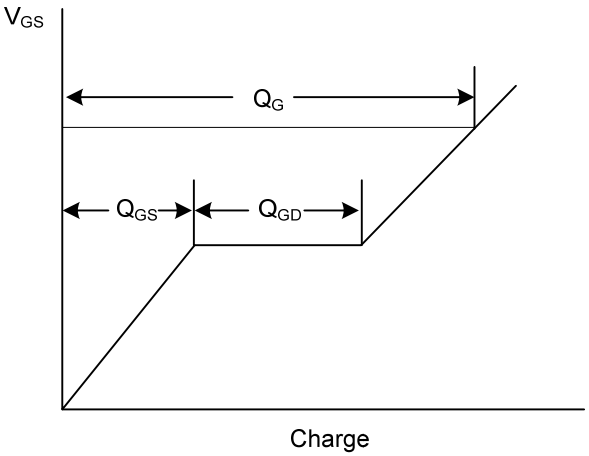
Switching Test Circuit



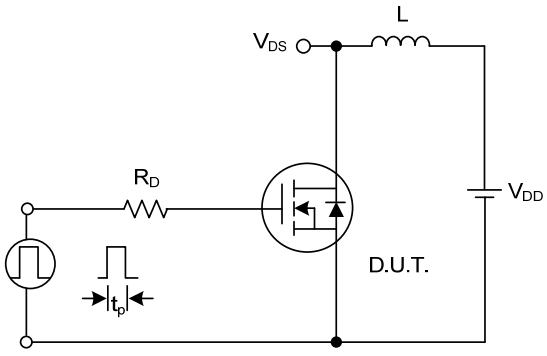
Switching Waveforms



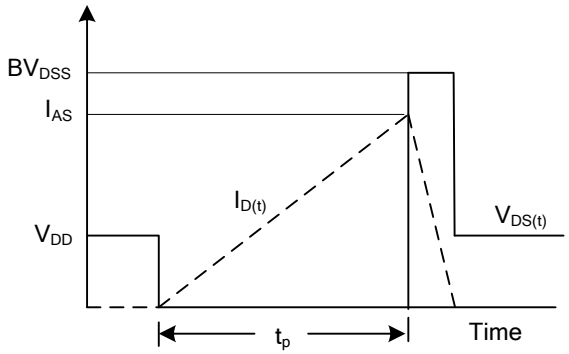
Gate Charge Test Circuit



Gate Charge Waveform



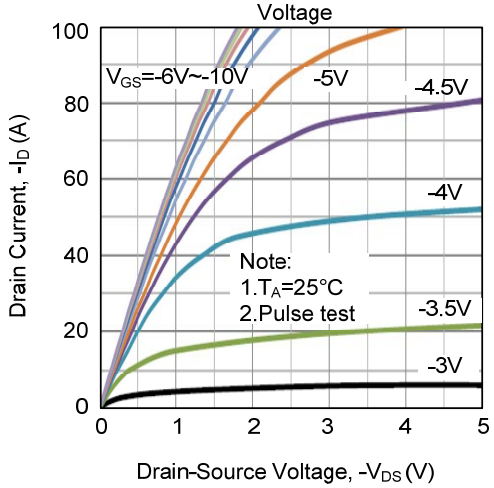
Unclamped Inductive Switching Test Circuit



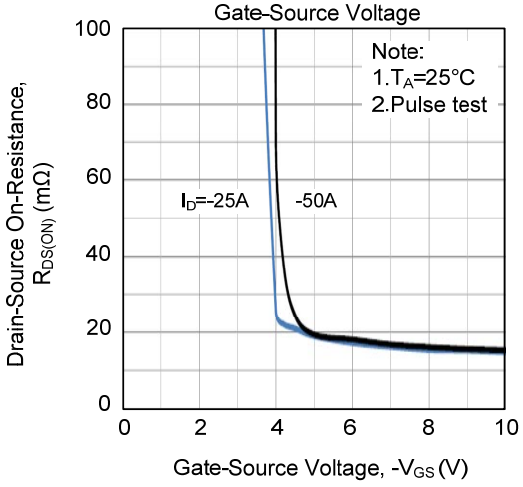
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

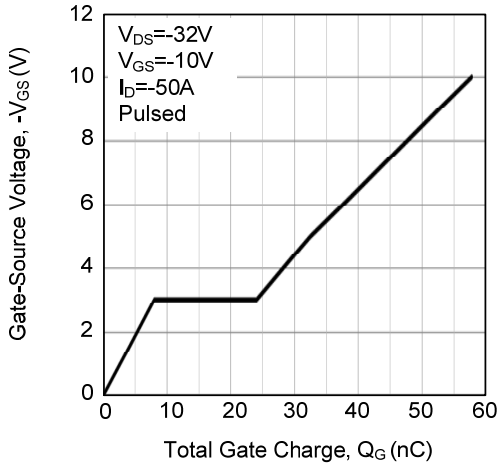
Drain Current vs. Drain-Source Voltage



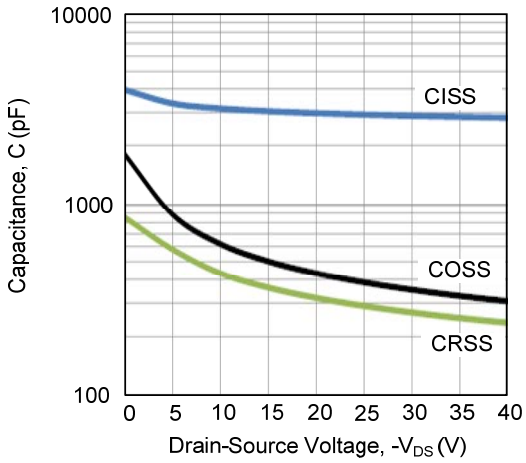
Drain-Source On-Resistance vs. Gate-Source Voltage



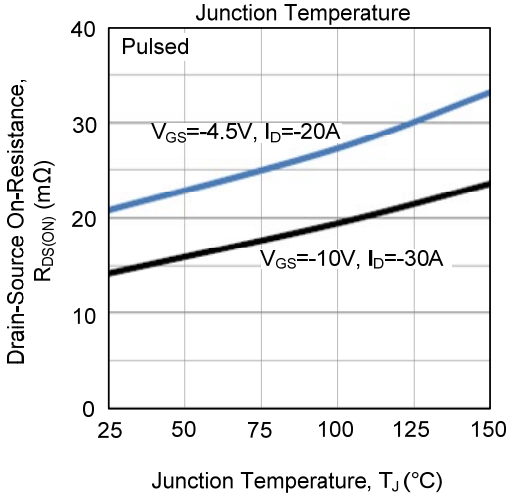
Gate Charge Characteristics



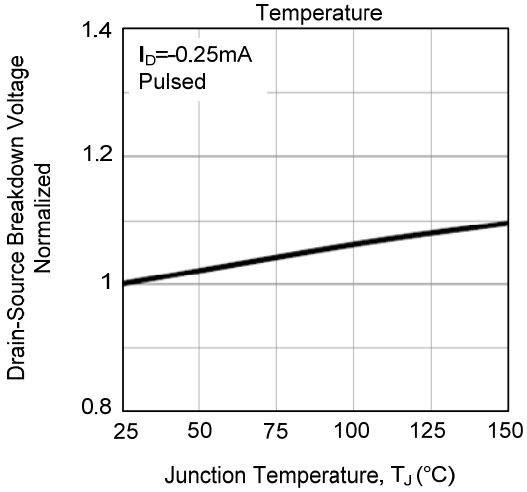
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

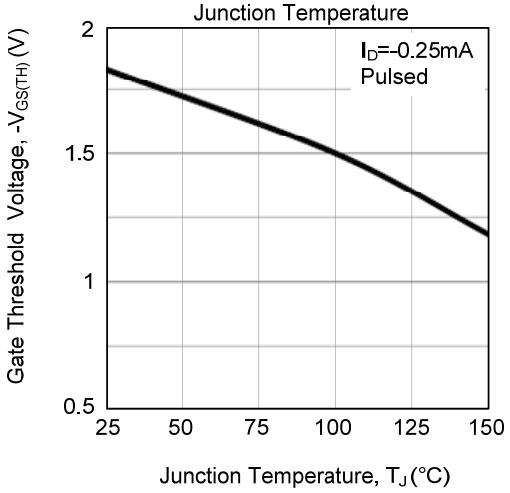


Breakdown Voltage vs. Junction Temperature

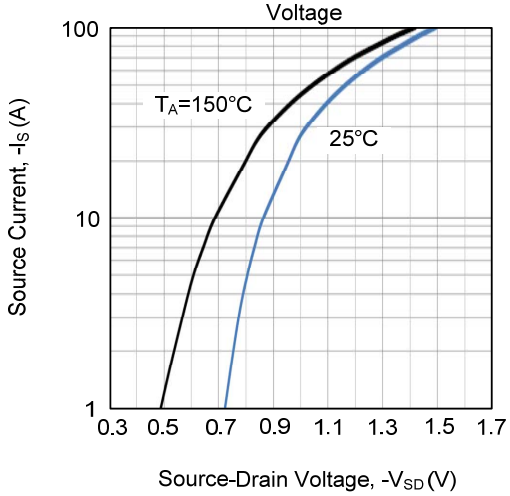


■ TYPICAL CHARACTERISTICS (Cont.)

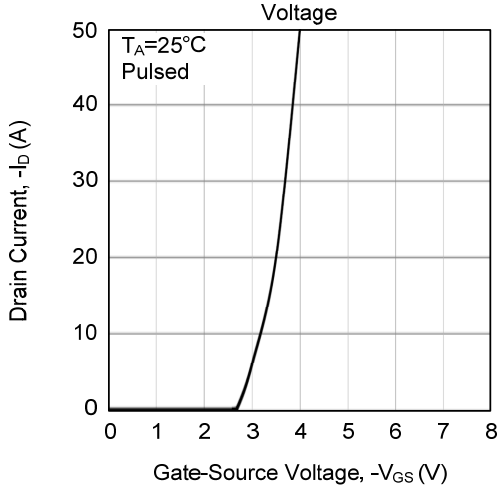
Gate Threshold Voltage vs. Junction Temperature



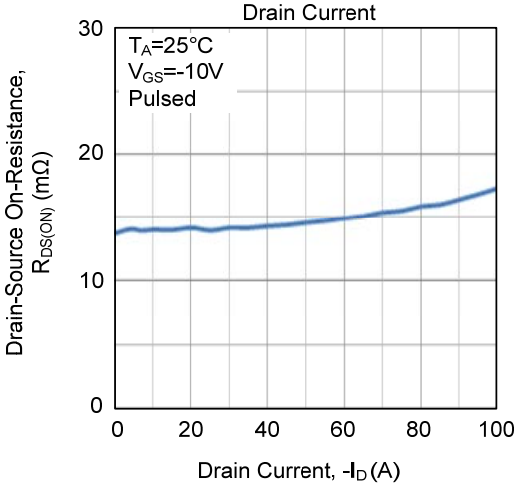
Source Current vs. Source-Drain Voltage



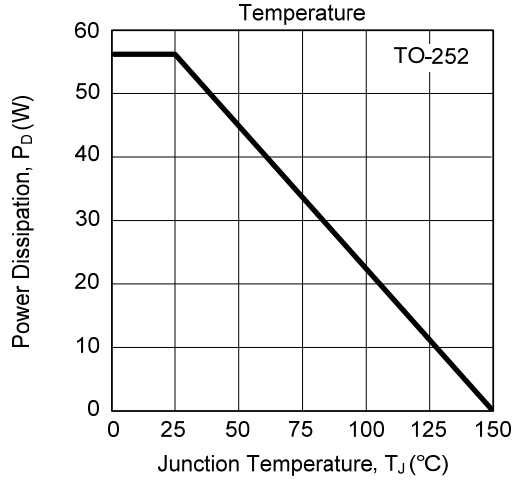
Drain Current vs. Gate-Source Voltage



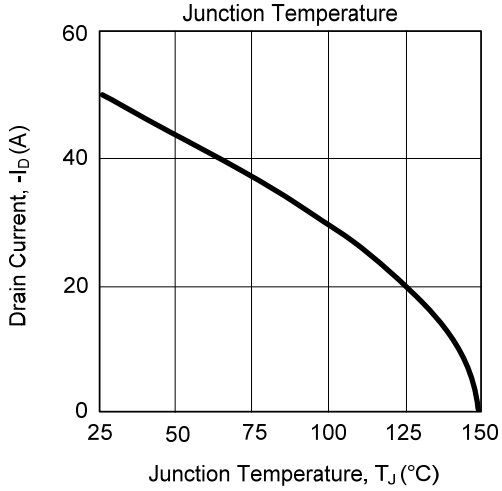
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature

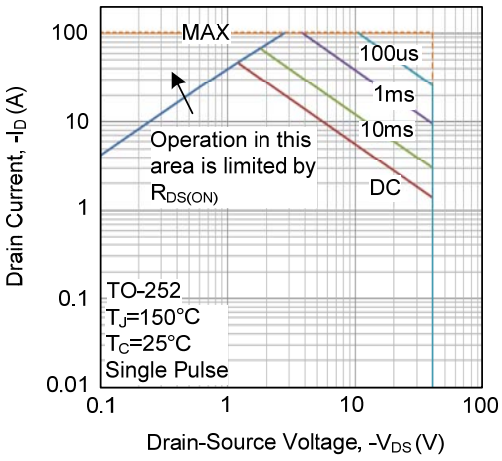


Drain Current vs. Junction Temperature

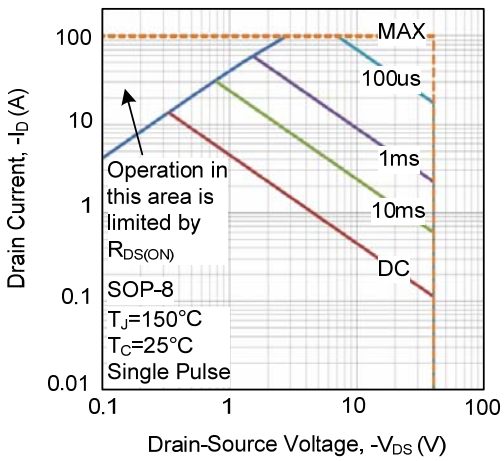


■ TYPICAL CHARACTERISTICS (Cont.)

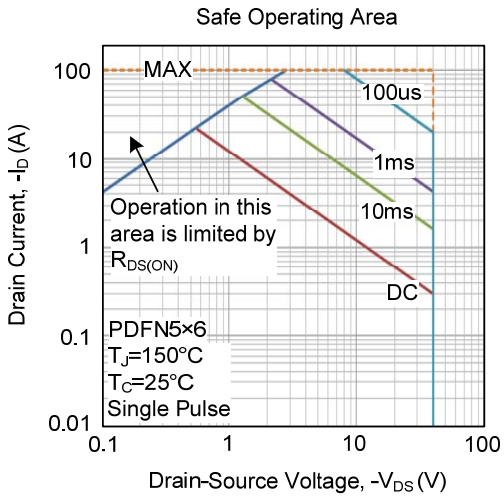
Safe Operating Area



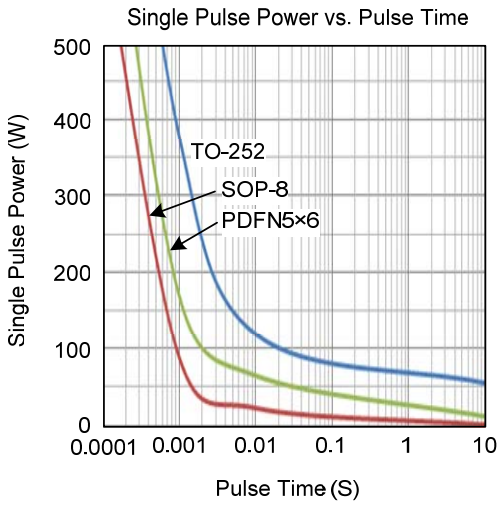
Safe Operating Area



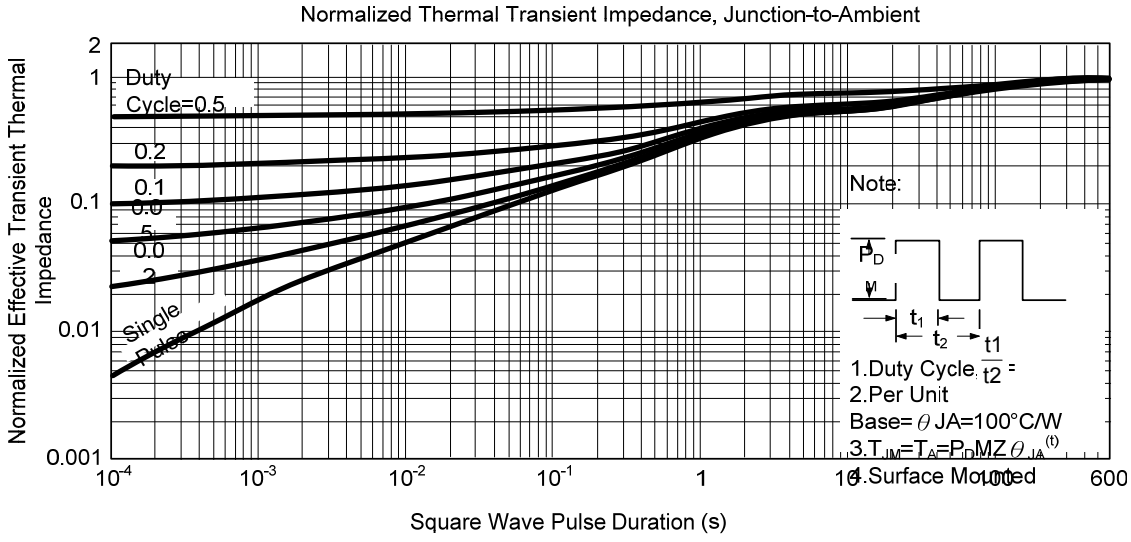
Safe Operating Area



Single Pulse Power vs. Pulse Time



Normalized Thermal Transient Impedance, Junction-to-Ambient



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