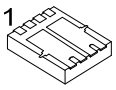
UT40NP03

Power MOSFET

DUAL MIDDLE POWER MOSFET (N-CHANNEL/P-CHANNEL)



PDFN5×6

■ DESCRIPTION

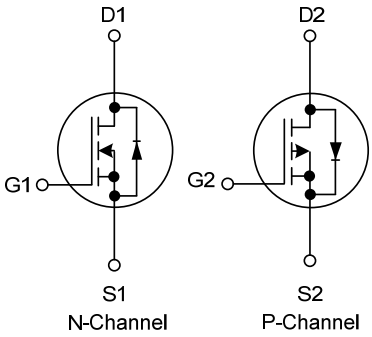
The UTC **UT40NP03** incorporates an N-channel MOSFET and a P-channel MOSFET，it uses UTC's advanced technology to provide customers a minimum on-state resistance and high-speed switching, thereby enabling high-density mounting.

The UTC **UT40NP03** is universally applied in high-speed switching, motor driver.

■ FEATURES

* N-Channel
  $R_{DS(on)}$ ≤ 9.0 mΩ @ V_{GS}=10V, I_D=20A
  $R_{DS(on)}$ ≤ 12 mΩ @ V_{GS}=4.5V, I_D=20A
* P-Channel
  $R_{DS(on)}$ ≤ 20 mΩ @ V_{GS}=-10V, I_D=-20A
  $R_{DS(on)}$ ≤ 38 mΩ @ V_{GS}=-4.5V, I_D=-20A
* Enhancement mode
* Low on-resistance RDS(on)
* Low gate charge
* Fast Switching and High efficiency

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT40NP03L-P5060-R	UT40NP03G-P5060-R	PDFN5×6	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

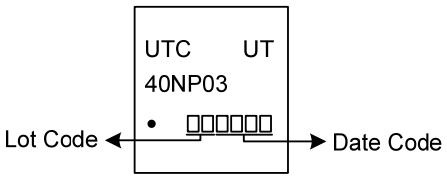
UT40NP03G-P5060-R

(1)Packing Type — (1) R: Tape Reel

(2)Package Type — (2) P5060: PDFN5×6

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



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

PARAMETER			SYMBOL	RATINGS		UNIT
				N-CH	P-CH	
Drain-Source Voltage			V_{DSS}	30	-30	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Drain Current	Continuous	T_C=25°C	I_D	40	-40	A
	Pulsed		I_{DM}	80	-80	A
Avalanche Energy, Single Pulse			E_{AS}	40	51	mJ
Power Dissipation			P_D	30		W
Junction Temperature			T_J	+150		°C
Range of 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. N-Channel: L=0.1mH, I_{AS}=28.2A, V_{DD}=25V, R_G=25Ω, Starting T_J=25°C.
P-Channel: L=0.1mH, I_{AS}=-32A, V_{DD}=-25V, R_G=25Ω, Starting T_J=25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	65	°C/W
Junction to Case	θ_{JC}	4.16 (Note)	°C/W

Note: The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

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

N-CHANNEL

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=30V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	I_{GSS}	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 (Pulsed)	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A			9.0	mΩ
		V_{GS}=4.5V, I_D=20A			12	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		1235		pF
Output Capacitance	C_{OSS}			240		pF
Reverse Transfer Capacitance	C_{RSS}			200		pF
SWITCHING PARAMETERS						
Total Gate Charge (Pulsed)	Q_G	V_{DD}=24V, V_{GS}=4.5V, I_D=40A (Note 1, 2)		25.5		nC
Gate to Source Charge (Pulsed)	Q_{GS}			5.4		nC
Gate to Drain Charge (Pulsed)	Q_{GD}			13.6		nC
Turn-ON Delay Time (Pulsed)	$t_{D(ON)}$	V_{DD}=15V, V_{GS}=10V, I_D=40A, R_G=3Ω (Note 1, 2)		7.2		ns
Rise Time (Pulsed)	t_R			18		ns
Turn-OFF Delay Time (Pulsed)	$t_{D(OFF)}$			32		ns
Fall-Time (Pulsed)	t_F			24		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS						
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_S=40A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	I_S=40A , V_{GS}=0V di/dt=100A/μs		245		ns
Reverse Recovery Charge	Q_{rr}			545		nC

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

■ ELECTRICAL CHARACTERISTICS (Cont.)

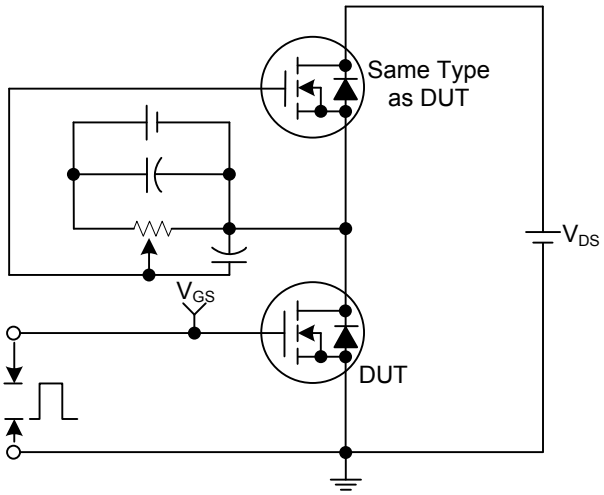
P-CHANNEL

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=-250μA, V_{GS}=0V	-30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-30V, V_{GS}=0V			-1	μA
Gate-Source Leakage Current	I_{GSS}	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 (Pulsed)	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-20A			20	mΩ
		V_{GS}=-4.5V, I_D=-20A			38	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=-25V, f=1.0MHz		1560		pF
Output Capacitance	C_{OSS}			220		pF
Reverse Transfer Capacitance	C_{RSS}			185		pF
SWITCHING PARAMETERS						
Total Gate Charge (Pulsed)	Q_G	V_{DD}=-24V, V_{GS}=-4.5V, I_D=-40A (Note 1, 2)		16		nC
Gate to Source Charge (Pulsed)	Q_{GS}			5		nC
Gate to Drain Charge (Pulsed)	Q_{GD}			8.5		nC
Turn-ON Delay Time (Pulsed)	$t_{D(ON)}$	V_{DD}=-15V, V_{GS}=-10V, I_D=-40A, R_G=3Ω (Note 1, 2)		8		ns
Rise Time (Pulsed)	t_R			18		ns
Turn-OFF Delay Time (Pulsed)	$t_{D(OFF)}$			52		ns
Fall-Time (Pulsed)	t_F			32		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS						
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_S=-40A,V_{GS}=0V			-1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	I_S=-40A , V_{GS}=0V di/dt=100A/μs		110		ns
Reverse Recovery Charge	Q_{rr}			130		nC

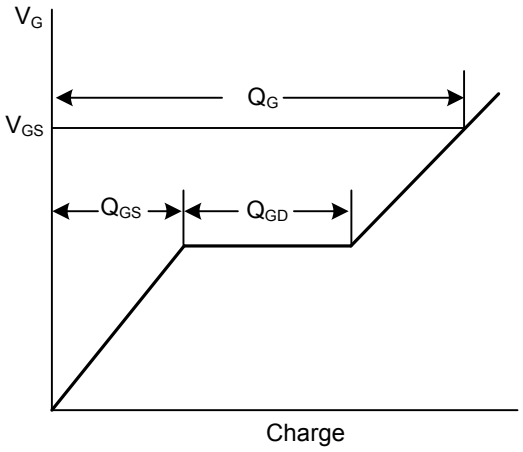
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

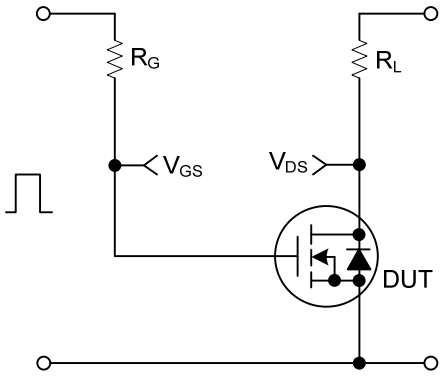
N-CHANNEL



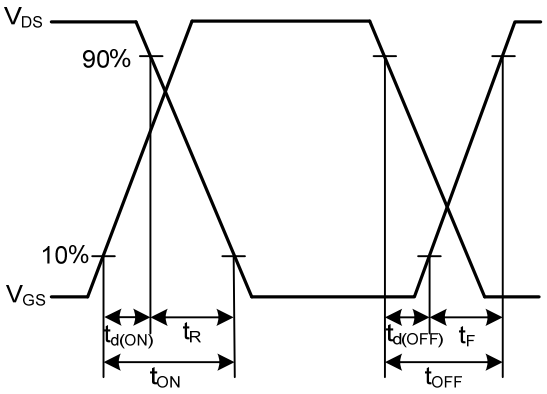
Gate Charge Test Circuit



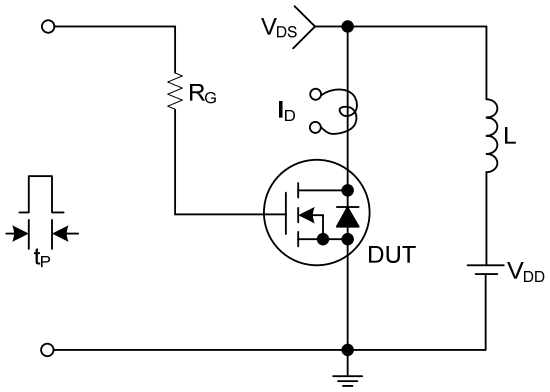
Gate Charge Waveforms



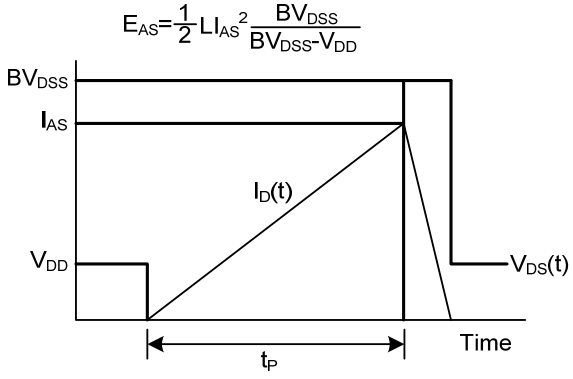
Resistive Switching Test Circuit



Resistive Switching Waveforms



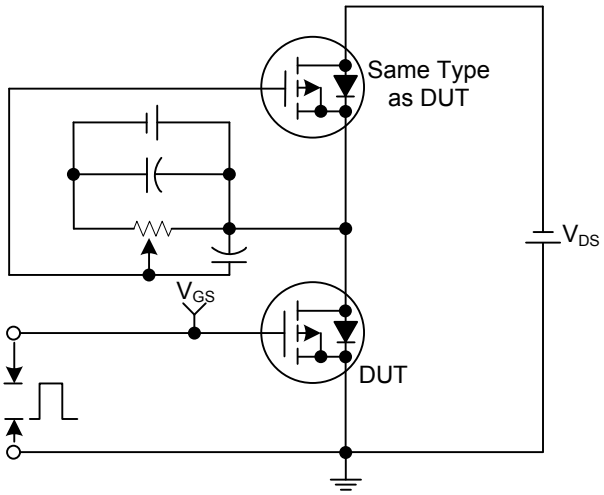
Unclamped Inductive Switching Test Circuit



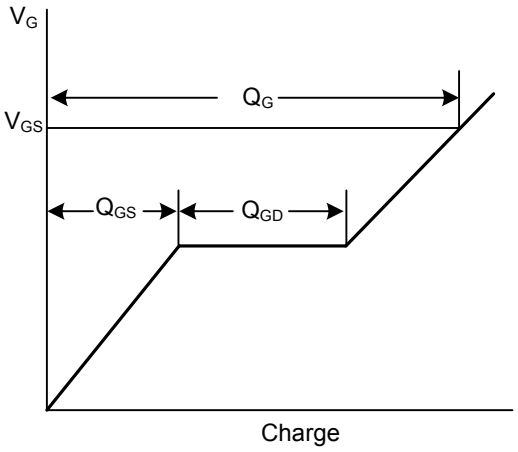
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS

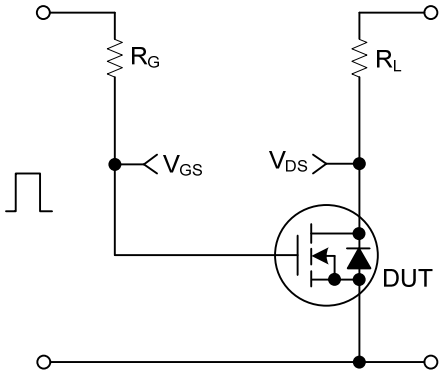
P-CHANNEL



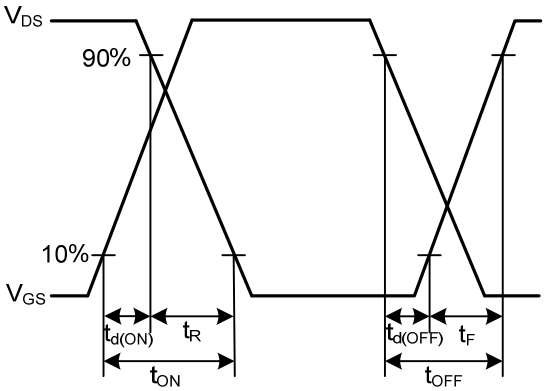
Gate Charge Test Circuit



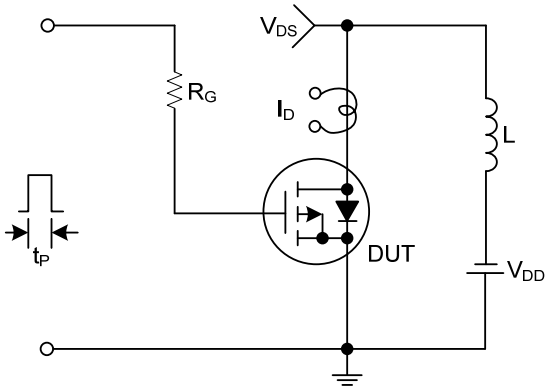
Gate Charge Waveforms



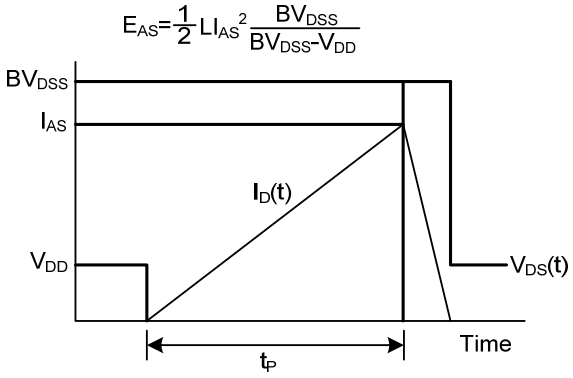
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

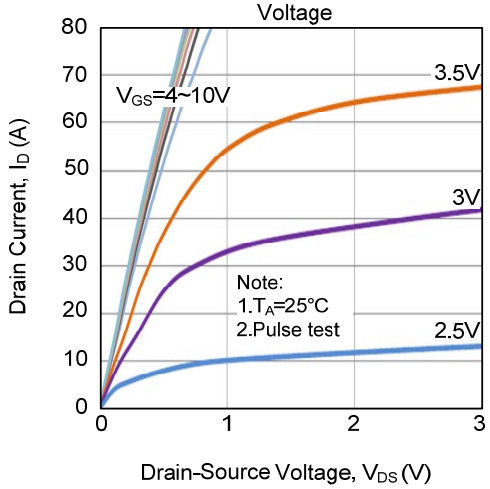


Unclamped Inductive Switching Waveforms

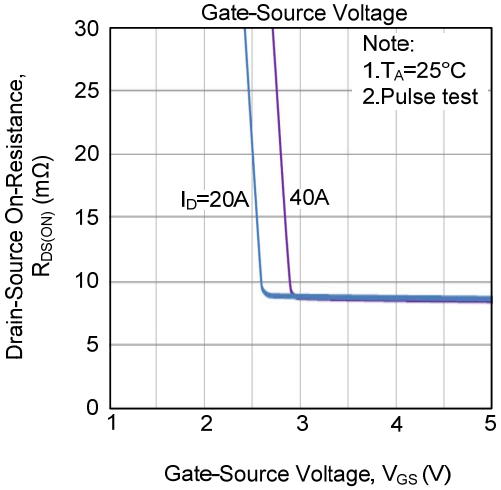
■ TYPICAL CHARACTERISTICS

N-CHANNEL

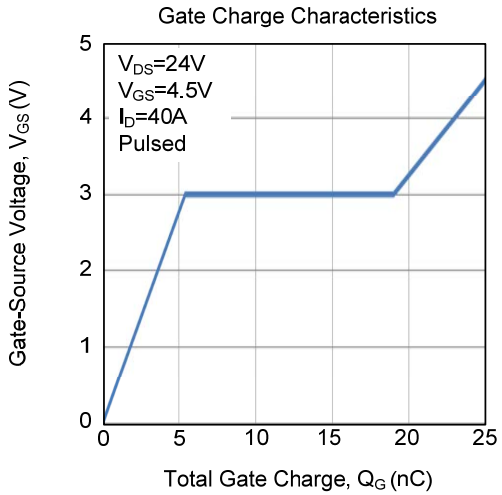
Drain Current vs. Drain-Source Voltage



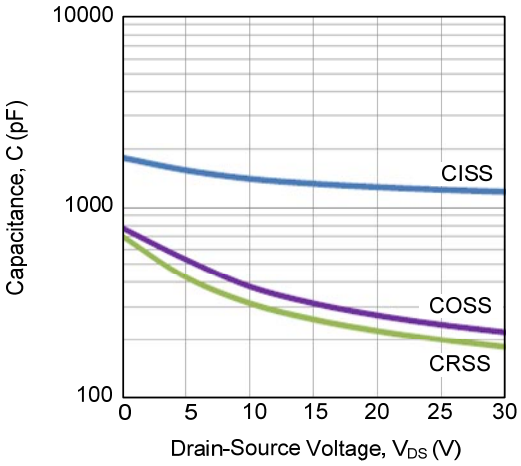
Drain-Source On-Resistance vs. Gate-Source Voltage



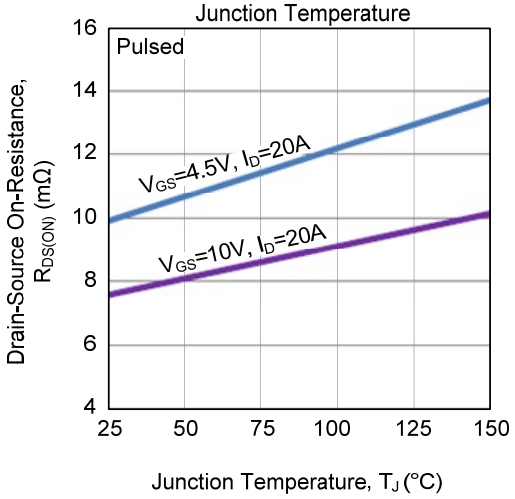
Gate Charge Characteristics



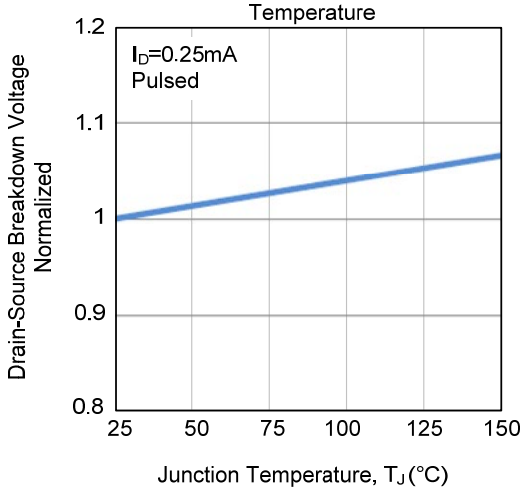
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature



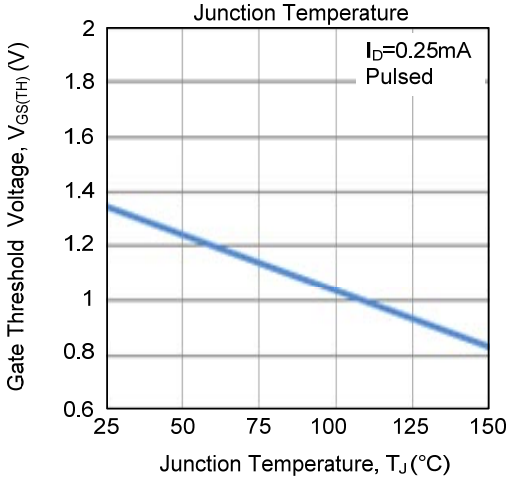
Breakdown Voltage vs. Junction Temperature



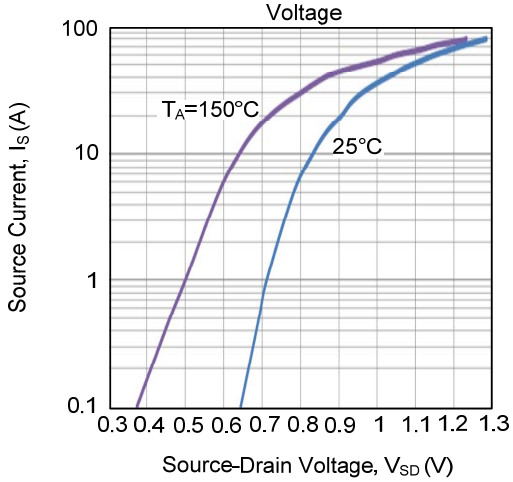
■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL

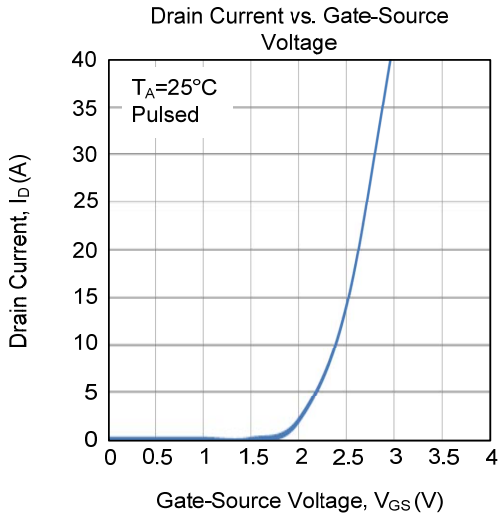
Gate Threshold Voltage vs. Junction Temperature



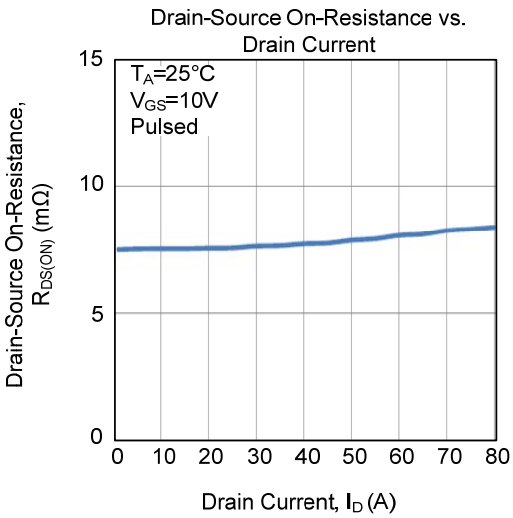
Source Current vs. Source-Drain Voltage



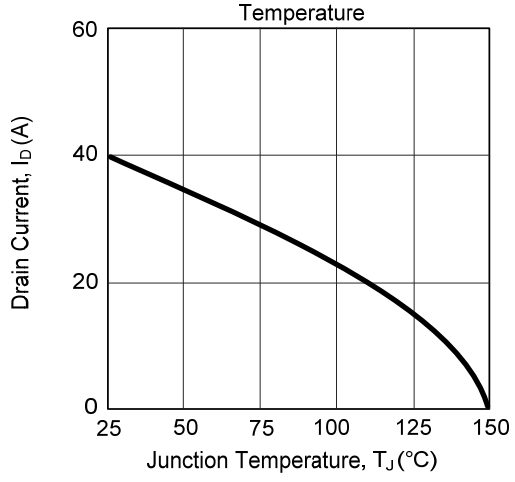
Drain Current vs. Gate-Source Voltage



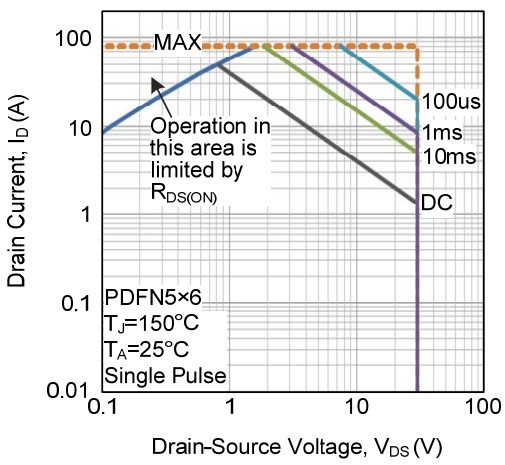
Drain-Source On-Resistance vs. Drain Current



Drain Current vs. Junction Temperature



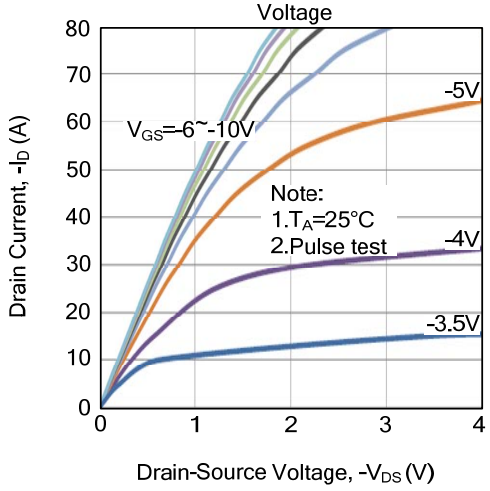
Safe Operating Area



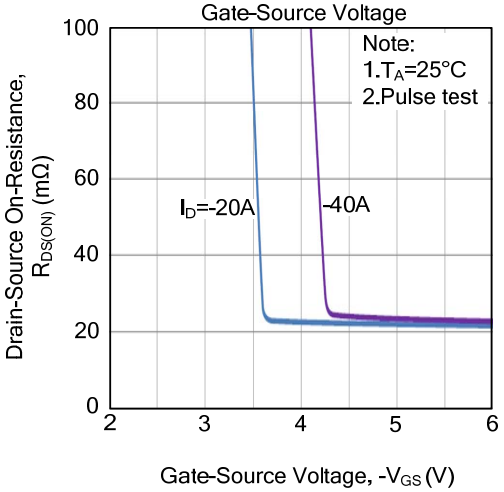
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

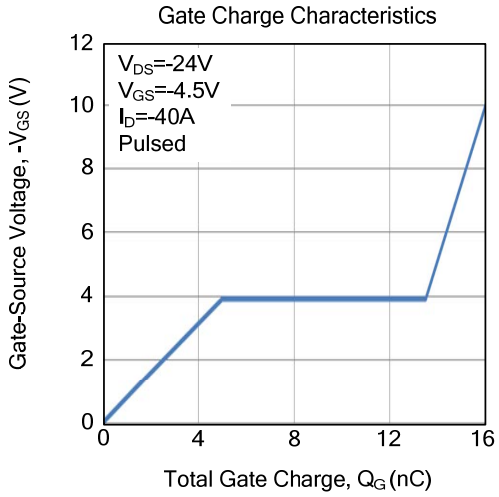
Drain Current vs. Drain-Source Voltage



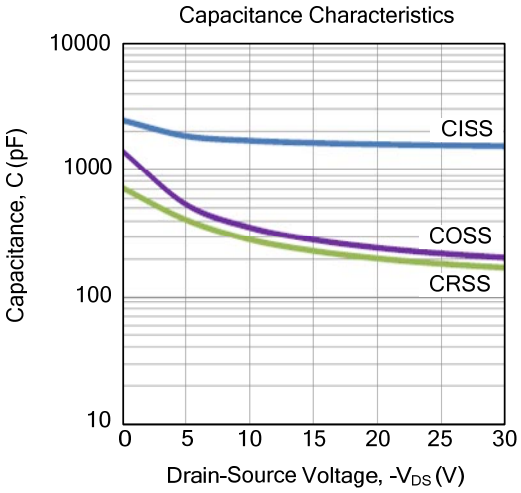
Drain-Source On-Resistance vs. Gate-Source Voltage



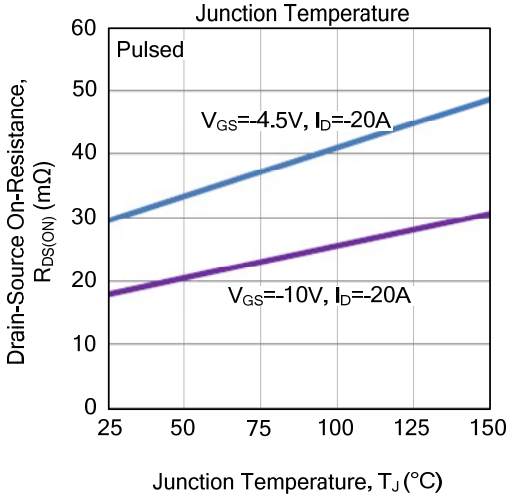
Gate Charge Characteristics



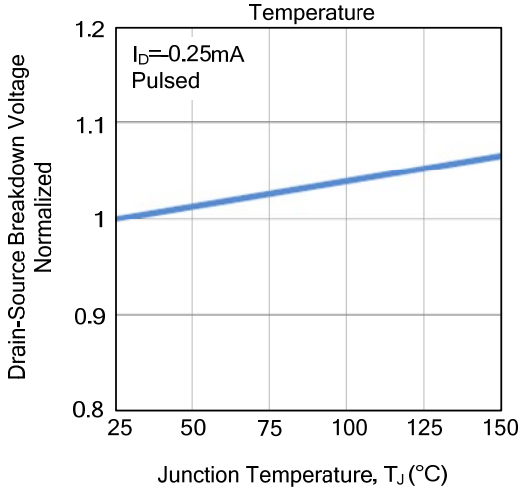
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature



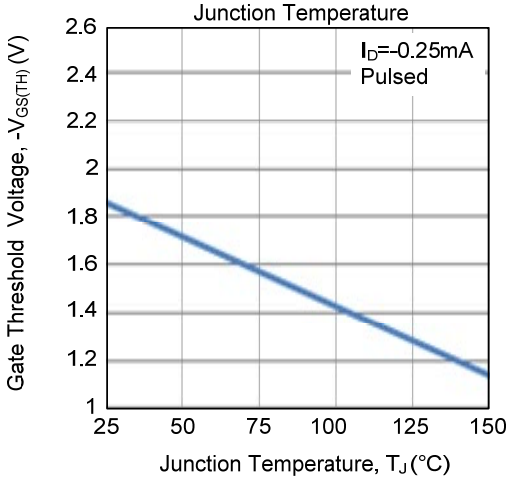
Breakdown Voltage vs. Junction Temperature



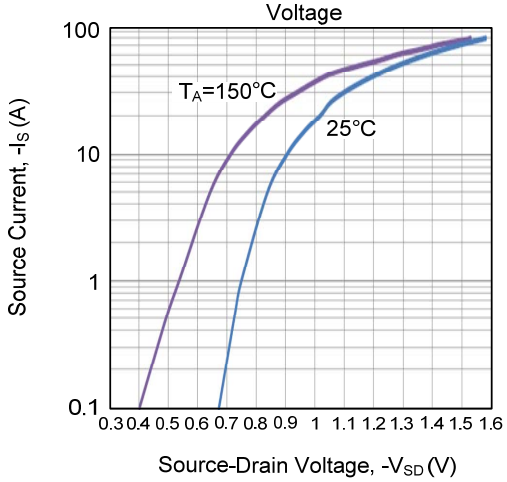
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

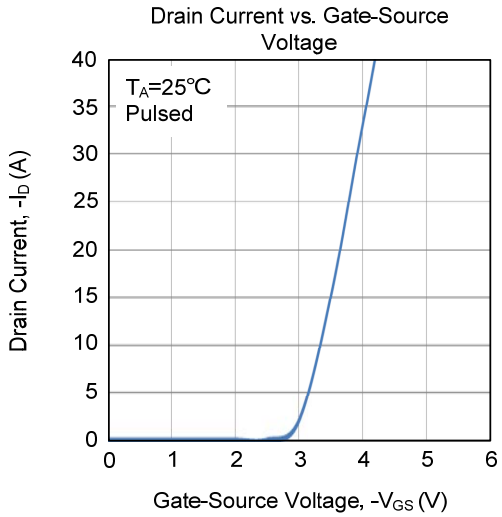
Gate Threshold Voltage vs. Junction Temperature



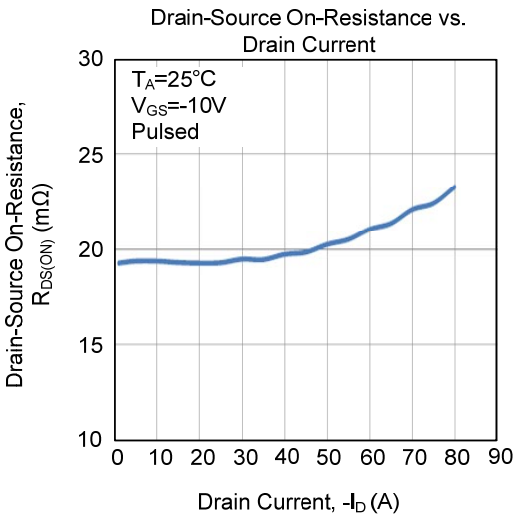
Source Current vs. Source-Drain Voltage



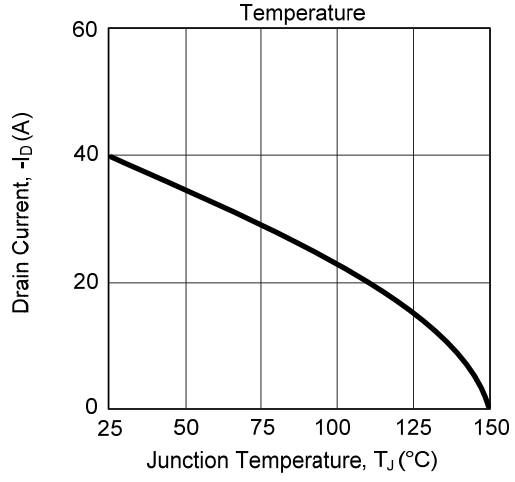
Drain Current vs. Gate-Source Voltage



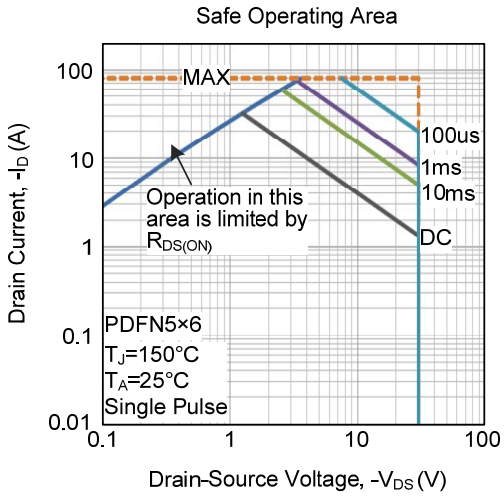
Drain-Source On-Resistance vs. Drain Current



Drain Current vs. Junction Temperature



Safe Operating Area



■ TYPICAL CHARACTERISTICS (Cont.)