



UTD413

Power MOSFET

P-CHANNEL ENHANCEMENT MODE

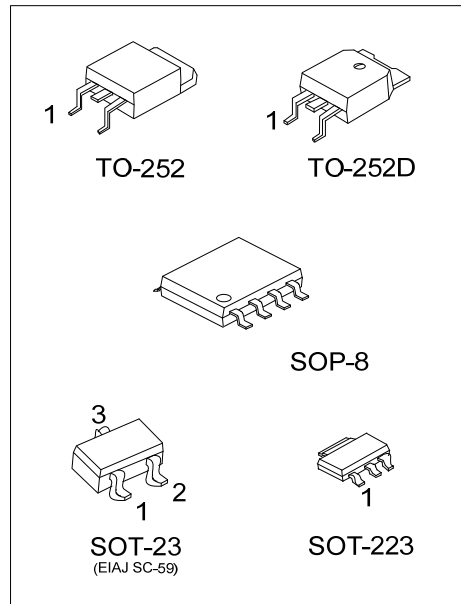
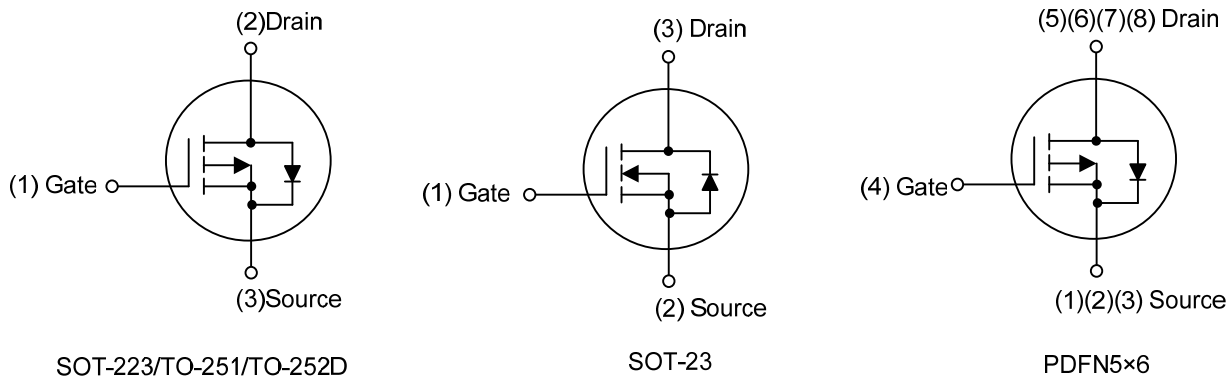
DESCRIPTION

The **UTD413** can provide excellent $R_{DS(ON)}$ and low gate charge by using UTC's advanced trench technology. The **UTD413** is well suited for high current load applications with the excellent thermal resistance of the TO-252 package. Standard Product **UTD413** is Pb-free.

FEATURES

- * $R_{DS(ON)} \leq 45 \text{ m}\Omega$ @ $V_{GS} = -10\text{V}$, $I_D = -12\text{A}$
- * $R_{DS(ON)} \leq 69 \text{ m}\Omega$ @ $V_{GS} = -4.5\text{V}$, $I_D = -8.0\text{A}$
- * Low capacitance
- * Low gate charge
- * Fast switching capability
- * Avalanche energy specified

SYMBOL



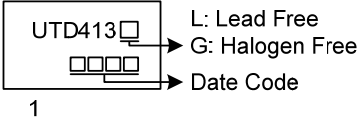
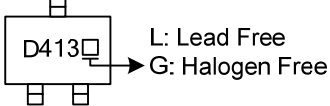
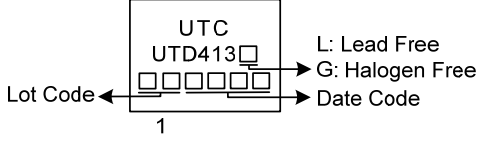
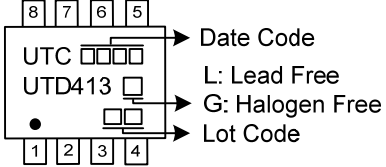
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTD413L-AA3-R	UTD413G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-AE3-R	UTD413G-AE3-R	SOT-23	G	S	D	-	-	-	-	-	Tape Reel
UTD413L-TN3-R	UTD413G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-TND-R	UTD413G-TND-R	TO-252D	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-S08-R	UTD413G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UTD413G-AA3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) AA3: SOT-223, AE3: SOT-23, TN3: TO-252, TND: TO-252D, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

PACKAGE	MARKING
SOT-223	 <p>UTD413 □ □ □ L: Lead Free G: Halogen Free Date Code 1</p>
SOT-23	 <p>D413 □ □ L: Lead Free G: Halogen Free</p>
TO-252 TO-252D	 <p>UTC UTD413 □ □ □ □ □ Lot Code → L: Lead Free G: Halogen Free Date Code 1</p>
SOP-8	 <p>8 7 6 5 UTC □ □ □ □ □ UTD413 □ □ □ • L: Lead Free G: Halogen Free Lot Code 1 2 3 4</p>

■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	-40	V
Gate-Source Voltage		V_{GSS}	± 20	V
Continuous Drain Current		I_D	-12	A
Pulsed Drain Current		I_{DM}	-30	A
Avalanche Energy		E_{AS}	37	mJ
Power Dissipation	SOT-223	P_D	2.4	W
	SOT-23		1.25	W
	TO-252/TO-252D		40	W
	SOP-8		1.7	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$

- 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. $L = 0.1\text{mH}$, $I_{AS} = -27\text{A}$, $V_{DD} = -25\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	83	$^\circ\text{C/W}$
	SOT-23		177	$^\circ\text{C/W}$
	TO-252/TO-252D		50	$^\circ\text{C/W}$
	SOP-8		90	$^\circ\text{C/W}$
Junction to Case	SOT-223	θ_{JC}	52	$^\circ\text{C/W}$
	SOT-23		100	$^\circ\text{C/W}$
	TO-252/TO-252D		3.125	$^\circ\text{C/W}$
	SOP-8		73	$^\circ\text{C/W}$

Note: When surface mounted to an FR4 board using minimum recommended pad size. (Cu. Area 0.412 sq in), Steady State.

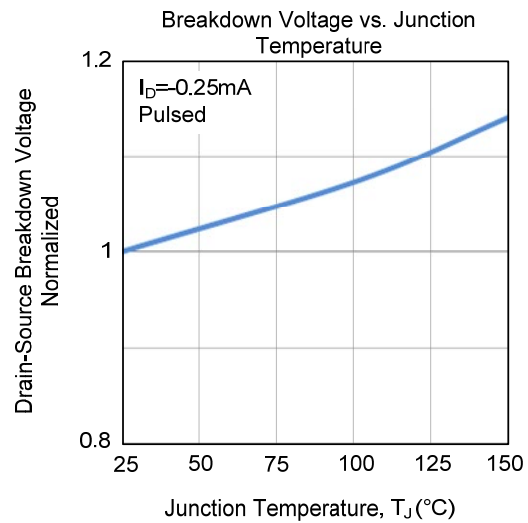
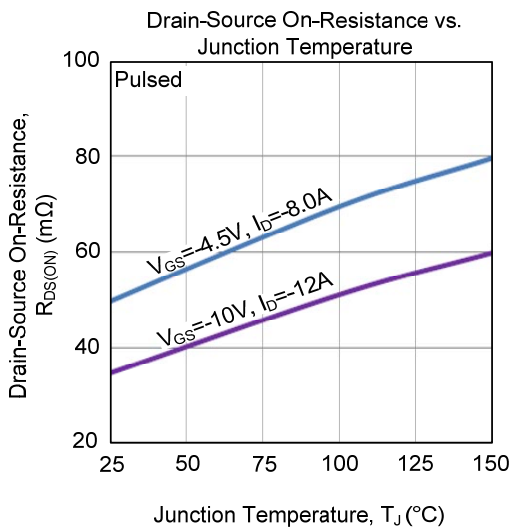
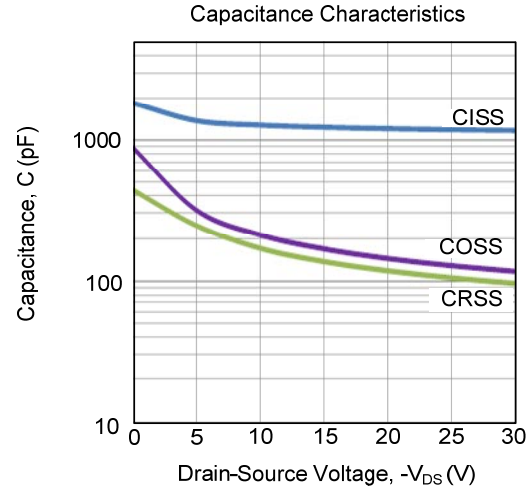
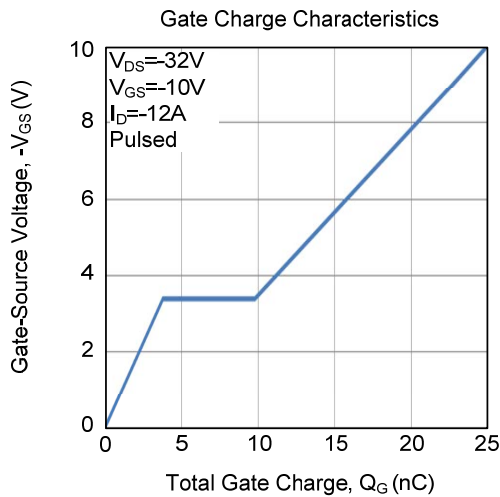
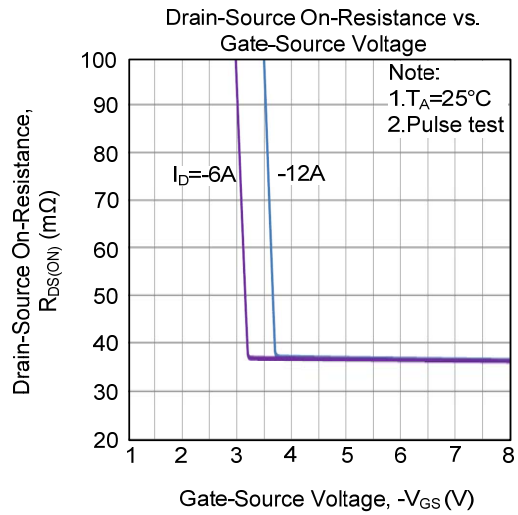
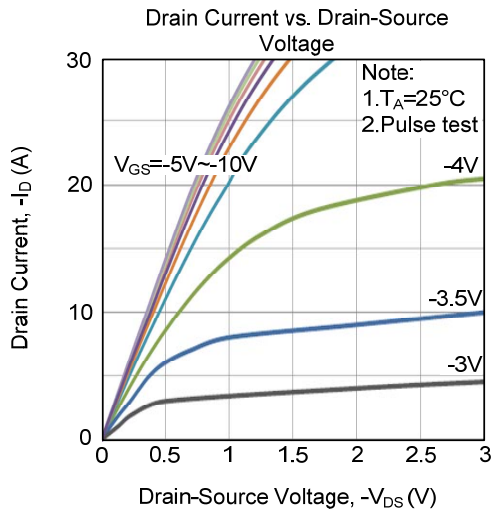
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-10mA	-40			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =-32V, V _{GS} =0V			-1	μA
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.9	-3.0	V
On State Drain Current	I _{D(ON)}	V _{DS} =-5V, V _{GS} =-10V	-30			A
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-12A		36	45	mΩ
		V _{GS} =-4.5V, I _D =-8.0A		51	69	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =-20V, V _{GS} =0V, f=1MHz		1200		pF
Output Capacitance	C _{OSS}			145		pF
Reverse Transfer Capacitance	C _{RSS}			118		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =-32V, V _{GS} =-10V, I _D =-12A		25		nC
Gate Source Charge	Q _{GS}			3.8		nC
Gate Drain Charge	Q _{GD}			6		nC
Turn-ON Delay Time	t _{D(ON)}	V _{GS} =-10V, V _{DS} =-20V, I _D =-12A, R _G =3.3Ω		7		ns
Turn-ON Rise Time	t _R			18		ns
Turn-OFF Delay Time	t _{D(OFF)}			43		ns
Turn-OFF Fall-Time	t _F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				-12	A
Diode Forward Voltage	V _{SD}	I _S =-12A, V _{GS} =0V		-1	-1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =-12A, V _{GS} =0V, dI/dt=100A/μs		56		ns
Body Diode Reverse Recovery Charge	Q _{rr}			48		nC

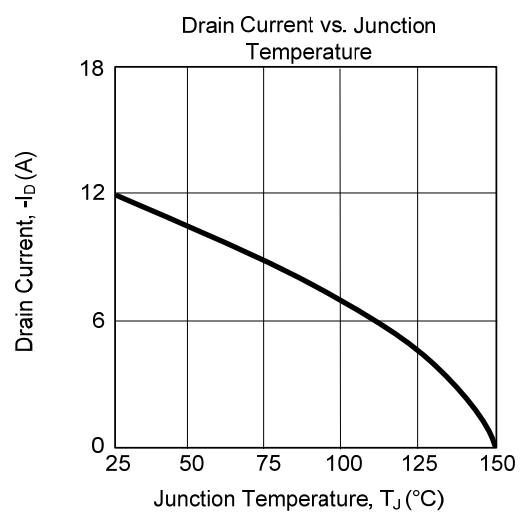
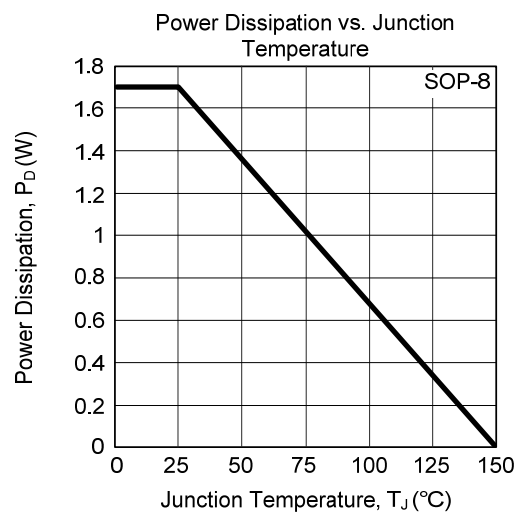
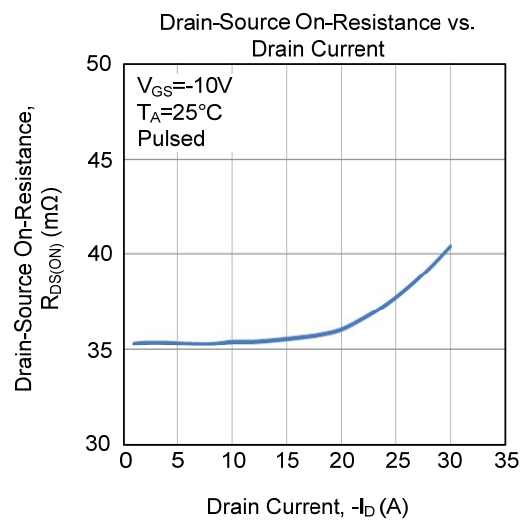
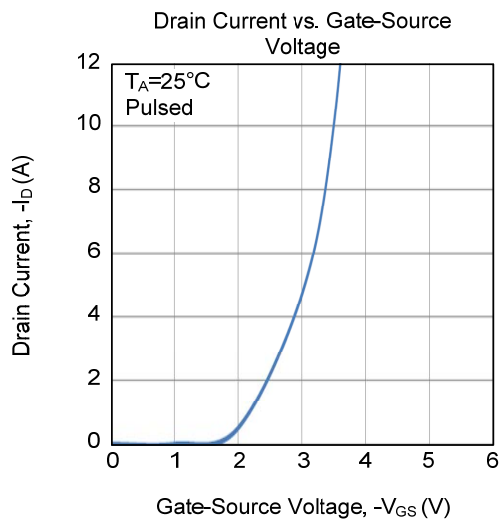
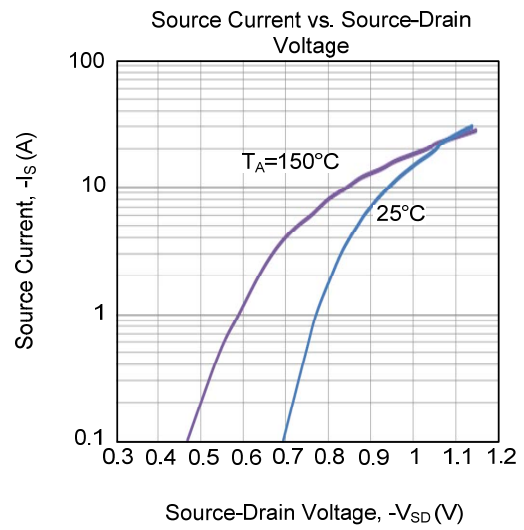
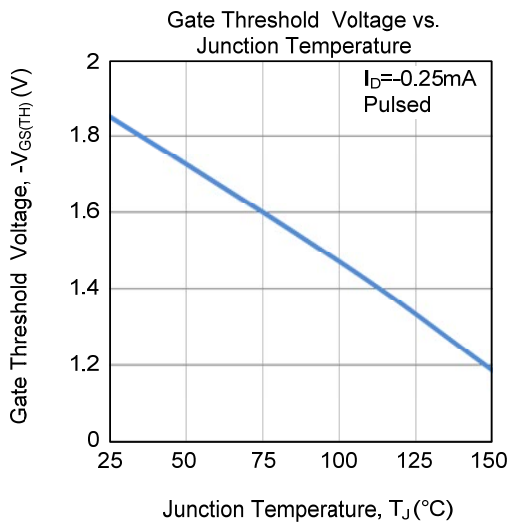
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

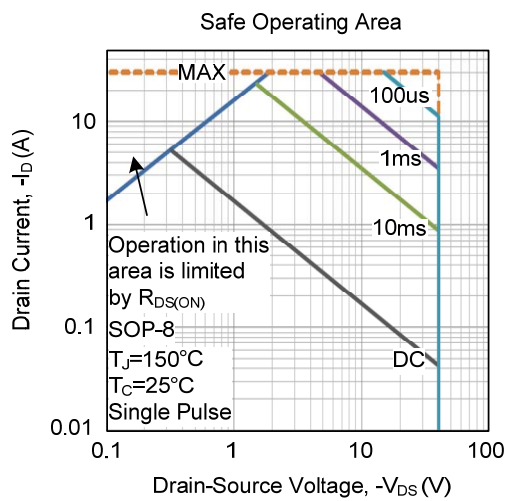
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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