



30V N-Channel MOSFET

Lead Free Package and Finish

General Features

- Proprietary New Trench Technology
- $R_{DS(ON),typ.}=2.6\text{ m}\Omega@V_{GS}=10\text{V}$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

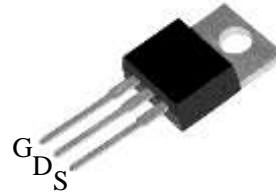
BV_{DSS}	$R_{DS(ON),typ.}$	I_D
30V	2.6m Ω	120A

Applications

- High efficiency DC/DC Converters
- Motor Bridge Switch
- Oring FET/Load Switching

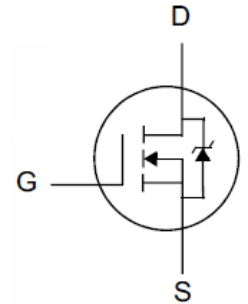
Ordering Information

Part Number	Package	Brand
PTP02N03N	TO-220	



TO-220

Package Not to Scale



Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	PTP02N03N	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	30	V
V_{GSS}	Gate-to-Source Voltage	± 20	
I_D	Continuous Drain Current $T_C=25^\circ\text{C}$	120	A
I_{DM}	Pulsed Drain Current at $V_{GS}=10\text{V}$	480	
E_{AS}	Single Pulse Avalanche Energy	135	mJ
dv/dt	Peak Diode Recovery dv/dt ^[3]	5.0	V/ns
P_D	Power Dissipation $T_C=25^\circ\text{C}$	120	W
	Power Dissipation $T_A=25^\circ\text{C}$	0.8	
	Derating Factor above 25°C	0.031	
T_L T_{PAK}	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260	$^\circ\text{C}$
T_J & T_{STG}	Operating and Storage Temperature Range	-55 to 150	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	PTP02N03N	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.25	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	



Electrical Characteristics

OFF Characteristics $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=30V, V_{GS}=0V$
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-100		$V_{GS}=-20V, V_{DS}=0V$

ON Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	2.6	3.4	m Ω	$V_{GS}=10V, I_D=24A$
		--	3.6	4.7		$V_{GS}=4.5V, I_D=24A$
$V_{GS(TH)}$	Gate Threshold Voltage	1.0	1.7	3.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	
C_{iss}	Input Capacitance	--	5700	--	pF	$V_{GS}=0V,$ $V_{DS}=25V,$ $f=1.0MHz$	
C_{rss}	Reverse Transfer Capacitance	--	460	--			
C_{oss}	Output Capacitance	--	375	--			
Q_g	Total Gate Charge	--	88	--	nC	$V_{DD}=20V,$ $I_D=30A,$	$V_{GS}=0$ to 10V
		--	45	--			$V_{GS}=0$ to 4.5V
Q_{gs}	Gate-to-Source Charge	--	9	--			
Q_{gd}	Gate-to-Drain (Miller) Charge	--	16	--			

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	12	--	nS	$V_{DD}=20V,$ $I_D=30A,$ $V_{GS}=10V$ $R_G=3.0\Omega$
t_{rise}	Rise Time	--	10	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	40	--		
t_{fall}	Fall Time	--	12	--		

**Source-Drain Body Diode Characteristics** $T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current	--	--	120	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current	--	--	480		
V_{SD}	Diode Forward Voltage	--	--	1.2	V	$I_S=30\text{A}$, $V_{GS}=0\text{V}$
trr	Reverse recovery time	--	60	--	ns	$V_{GS}=0\text{V}$, $I_F=30\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$
Qrr	Reverse recovery charge	--	120	--	nC	

Note:

- [1] $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$.
- [2] Silicon limited current only.
- [3] Package limited current.
- [4] Repetitive rating; pulse width limited by maximum junction temperature.
- [5] Pulse width $\leq 380\mu\text{s}$; duty cycle $\leq 2\%$.



Typical Characteristics

Figure 1. Transient Thermal Impedance

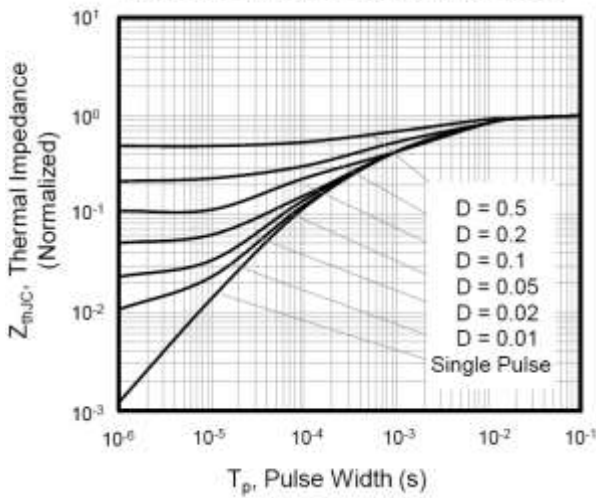


Figure 2. Output Characteristics

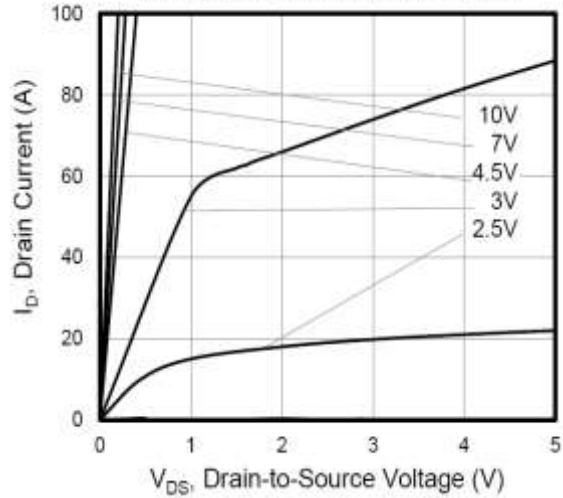


Figure 3. On-Resistance vs. Drain Current

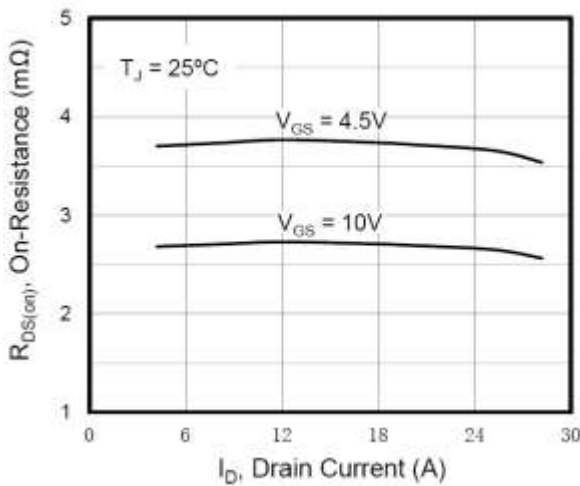


Figure 4. Capacitance

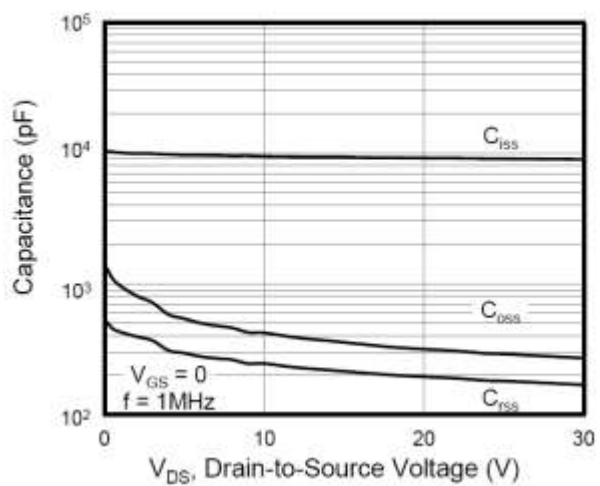


Figure 5. Gate Charge

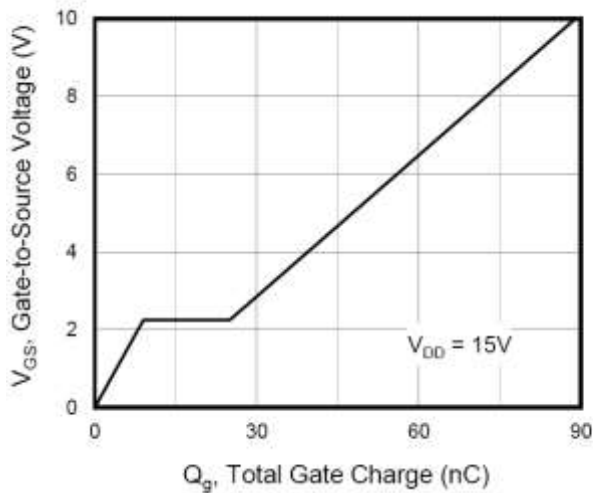
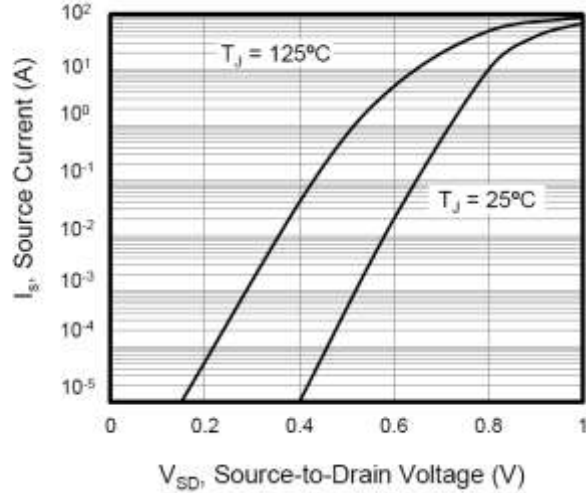


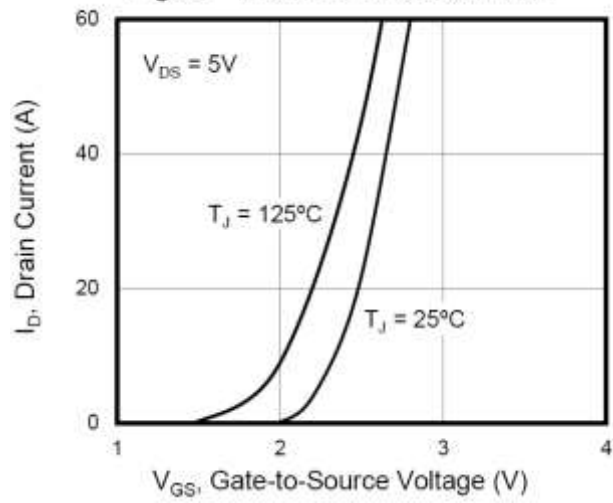
Figure 6. Body Diode Forward Voltage





Typical Characteristics

Figure 7 Transfer Characteristics



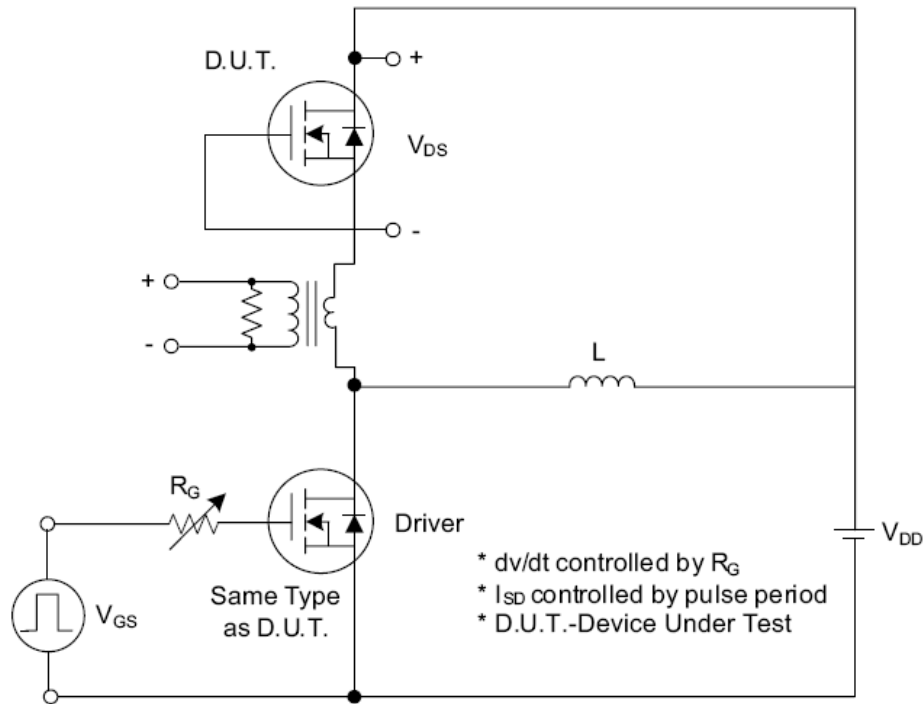
Test Circuits and Waveforms


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

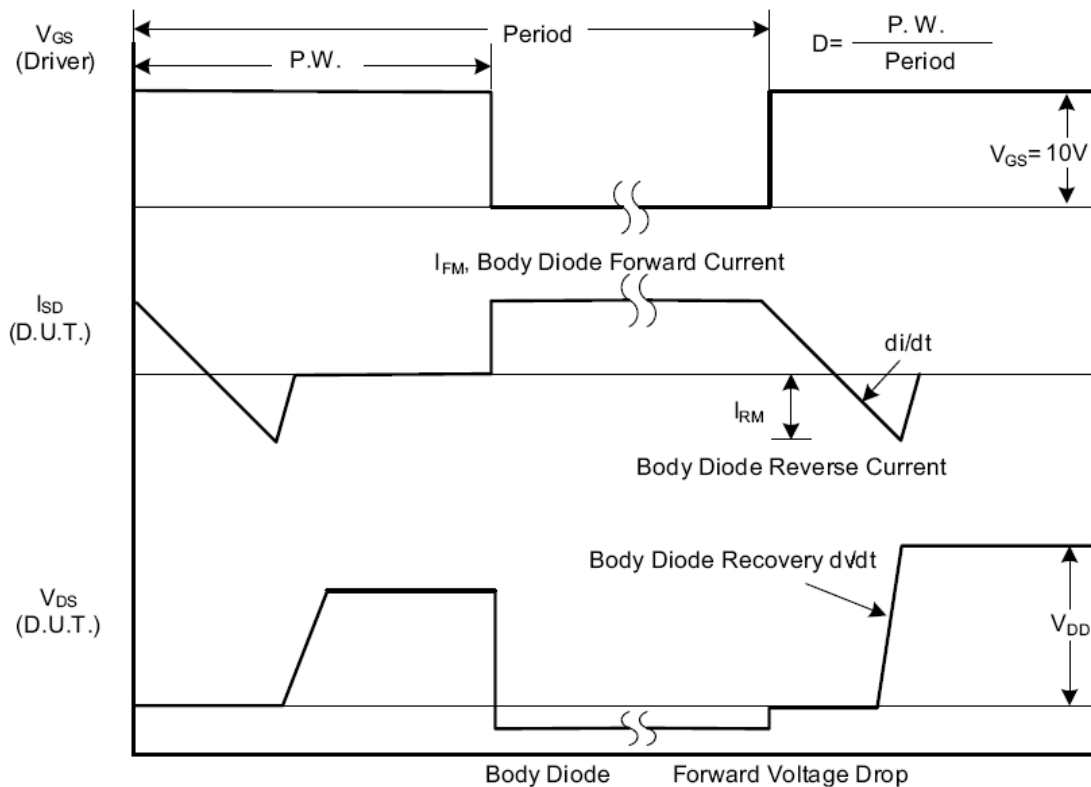


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

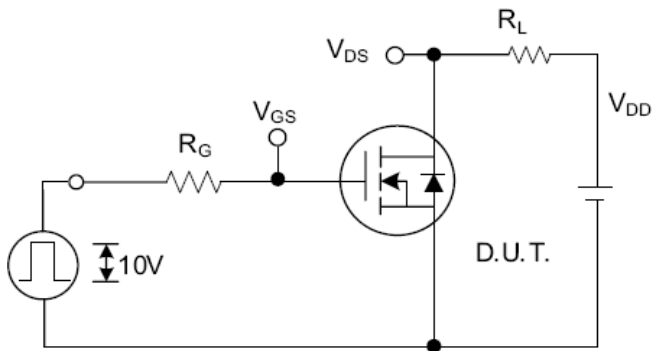
Test Circuits and Waveforms (Cont.)


Fig. 2.1 Switching Test Circuit

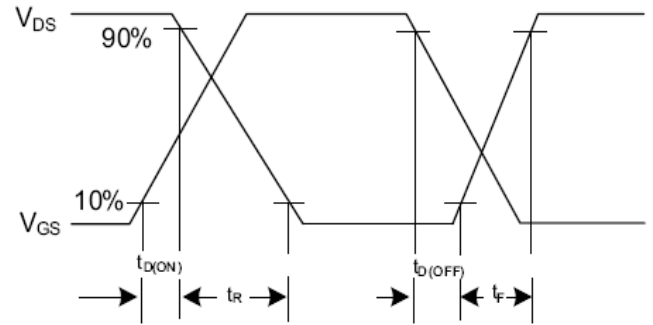


Fig. 2.2 Switching Waveforms

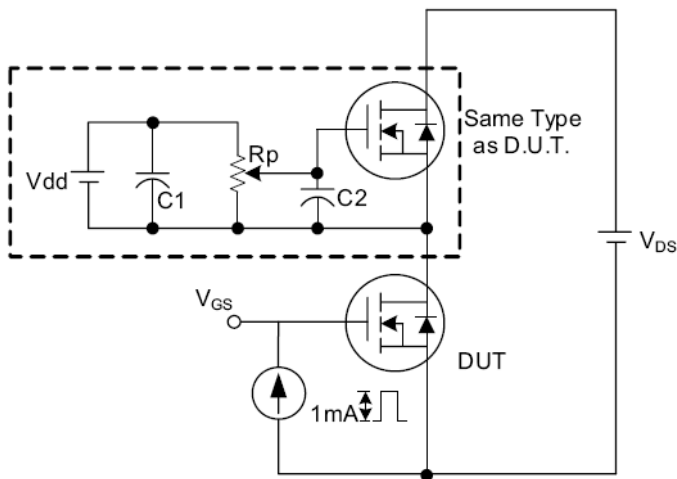


Fig. 3.1 Gate Charge Test Circuit

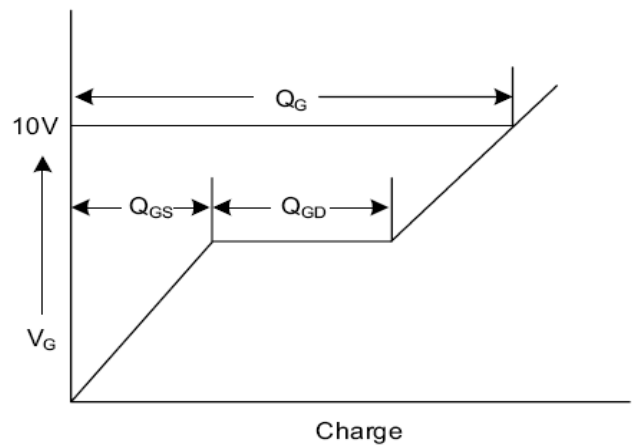


Fig. 3.2 Gate Charge Waveform

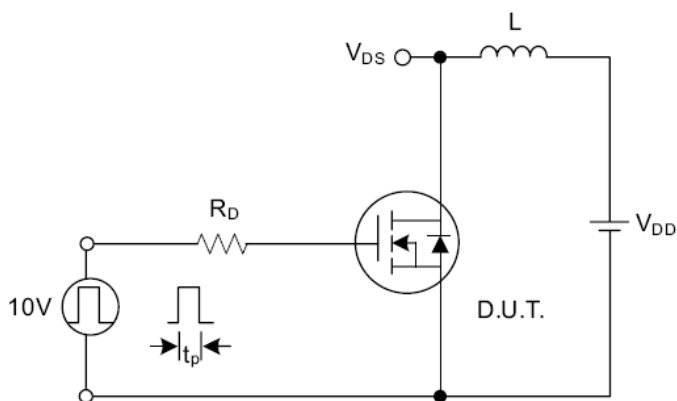


Fig. 4.1 Unclamped Inductive Switching Test Circuit

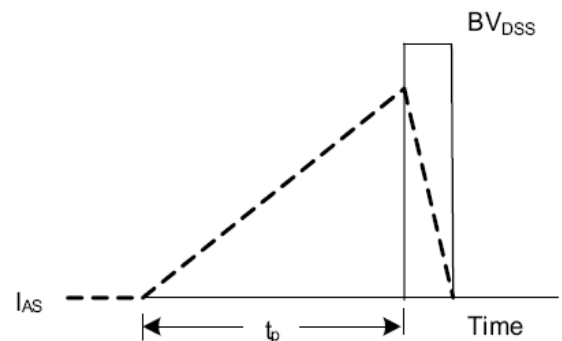


Fig. 4.2 Unclamped Inductive Switching Waveforms



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