



## 1500V N-ch High Planar MOSFET

Lead Free Package and Finish

### General Features

- RoHS Compliant
- $R_{DS(ON),typ.}=5.4\ \Omega @ V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

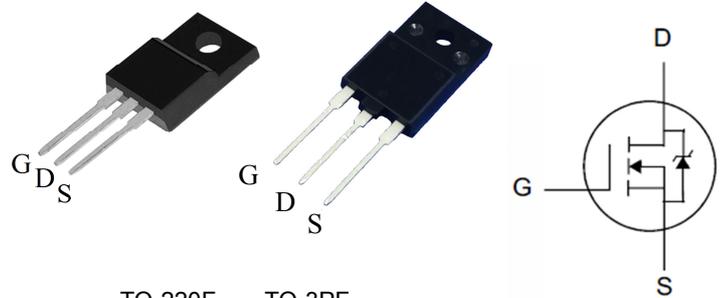
$BV_{DSS}$	$R_{DS(ON),typ.}$	$I_D$
1500V	5.4 $\Omega$	3A

### Applications

- Adaptor
- Charger
- SMPS Standby Power

### Ordering Information

Part Number	Package	Brand
PTH03N150	TO-3PF	
PTA03N150	TO-220F	



TO-220F TO-3PF

Package No to Scale

### Absolute Maximum Ratings

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

Symbol	Parameter	PTH03N150	PTA03N150	Unit
$V_{DSS}$	Drain-to-Source Voltage	1500		V
$V_{GSS}$	Gate-to-Source Voltage	$\pm 30$		
$I_D$	Continuous Drain Current	3		A
$I_{DM}$	Pulsed Drain Current at $V_{GS}=10V$	12		
$E_{AS}$	Single Pulse Avalanche Energy, $L=30mH$	500		mJ
$P_D$	Power Dissipation	90	35	W
	Derating Factor above $25^\circ\text{C}$	0.72	0.28	W/ $^\circ\text{C}$
$T_L$	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300		$^\circ\text{C}$
$T_J \& T_{STG}$	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	PTH03N150	PTA03N150	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.38	3.57	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	50	100	



## 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	1500	--	--	V	$V_{GS}=0V, I_D=250\mu A$
$I_{DSS}$	Drain-to-Source Leakage Current	--	--	1	$\mu A$	$V_{DS}=1500V, V_{GS}=0V$
		--	--	500		$V_{DS}=1200V, V_{GS}=0V, T_J=125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Leakage Current	--	--	+100	$nA$	$V_{GS}=+30V, V_{DS}=0V$
		--	--	-100		$V_{GS}=-30V, V_{DS}=0V$

### 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	--	5.4	8.2	$\Omega$	$V_{GS}=10V, I_D=2.0A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.5	--	4.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance	--	3.0	--	S	$V_{DS}=15V, I_D=3A$

### Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$C_{iss}$	Input Capacitance	--	1600	--	$pF$	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$
$C_{rss}$	Reverse Transfer Capacitance	--	33	--		
$C_{oss}$	Output Capacitance	--	100	--		
$R_g$	Gate input resistance	--	4.5	--	$\Omega$	$f=1\text{ MHz}$ Gate DC Bias=0 Test signal level=20mV open drain
$Q_g$	Total Gate Charge	--	36	--	$nC$	$V_{DD}=750V, I_D=3A, V_{GS}=0\text{ to }10V$
$Q_{gs}$	Gate-to-Source Charge	--	9.5	--		
$Q_{gd}$	Gate-to-Drain (Miller) Charge	--	12	--		

### Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	25	--	$nS$	$V_{DD}=750V, I_D=3A, V_{GS}=10V, R_g=4.7\Omega$
$t_{rise}$	Rise Time	--	48	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	57	--		
$t_{fall}$	Fall Time	--	52	--		



**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 <sup>[2]</sup>	--	--	3	A	Integral pn-diode in MOSFET
$I_{SM}$	Pulsed Source Current <sup>[2]</sup>	--	--	12		
$V_{SD}$	Diode Forward Voltage	--	--	1.5	V	$I_S=3\text{A}$ , $V_{GS}=0\text{V}$
$t_{rr}$	Reverse Recovery Time	--	255	--	ns	$V_{GS}=0\text{V}$ $I_F=3\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$
$Q_{rr}$	Reverse Recovery Charge	--	1.1	--	uC	

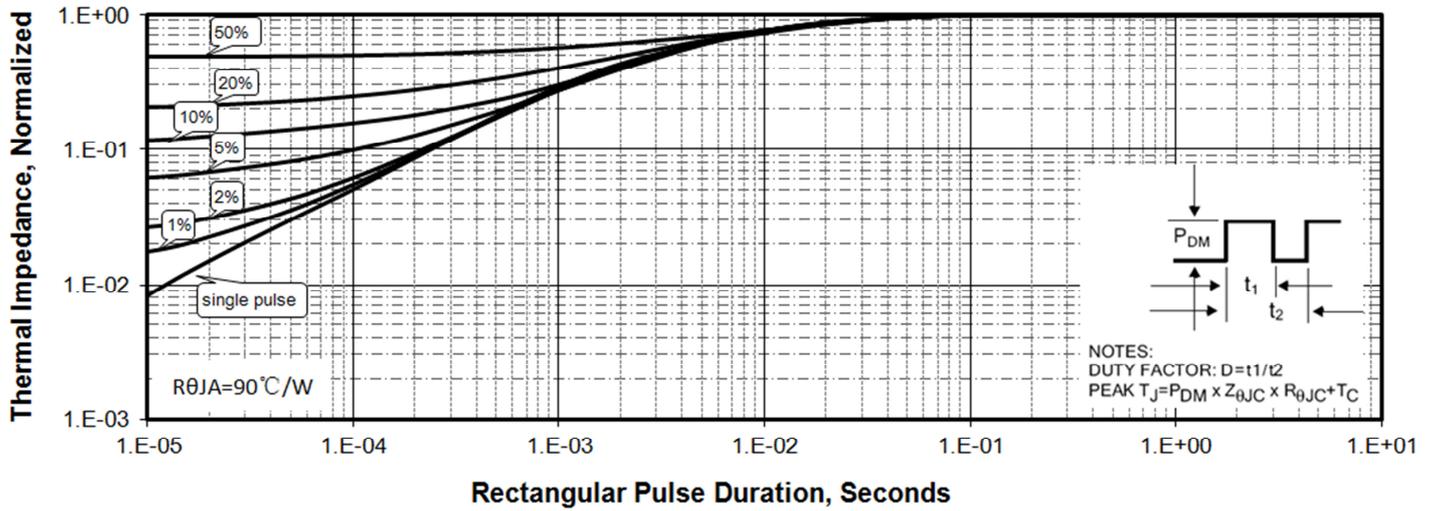
**Note:**

- [1]  $T_J=+25^\circ\text{C}$  to  $+150^\circ\text{C}$   
[2] Pulse width $\leq 380\mu\text{s}$ ; duty cycle $\leq 2\%$ .

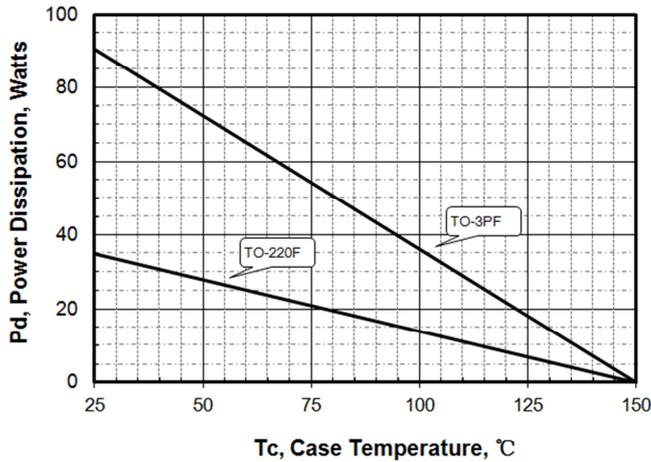


## Typical Characteristics

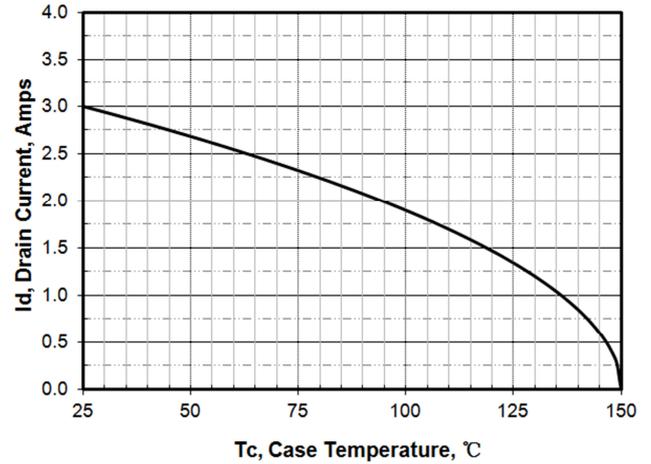
### Figure 1. Maximum Transient Thermal Impedance



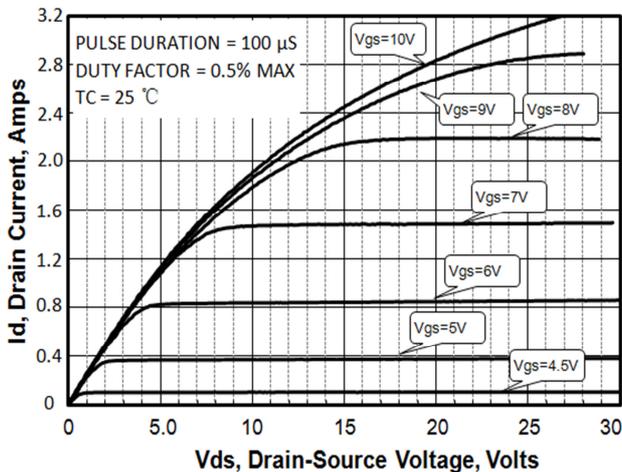
### Figure 2 . Max. Power Dissipation vs Case Temperature



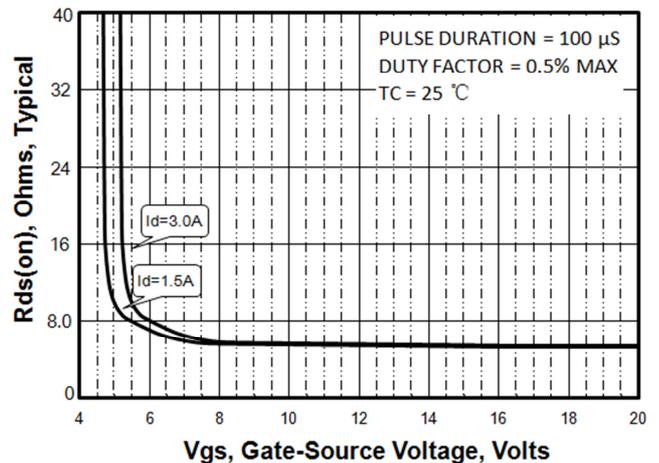
### Figure 3 .Maximum Continuous Drain Current vs $T_c$



### Figure 4. Output Characteristics



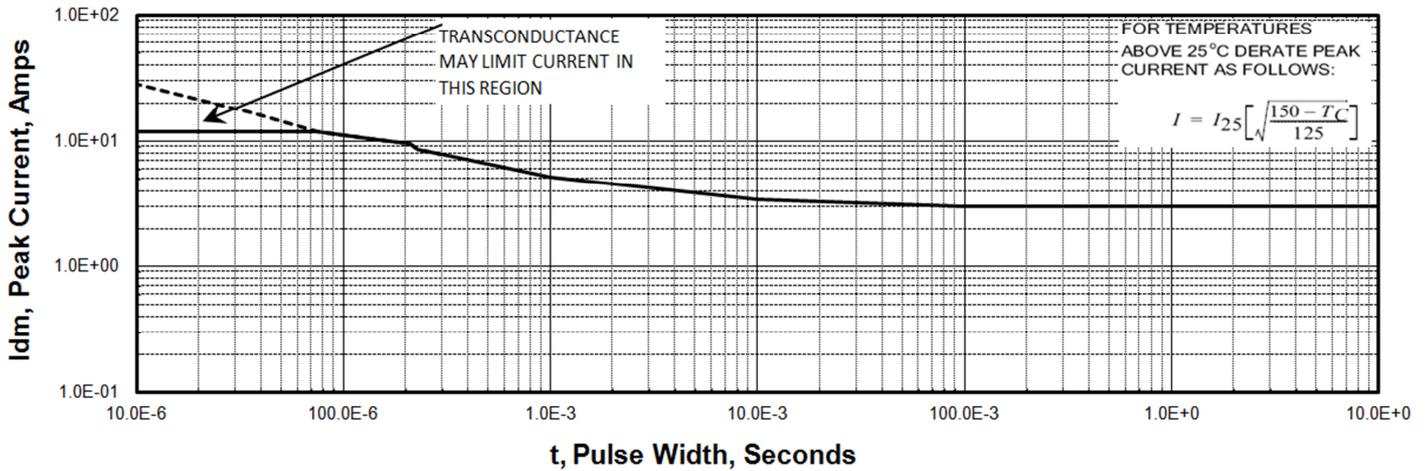
### Figure 5. $R_{ds(on)}$ vs Gate Voltage



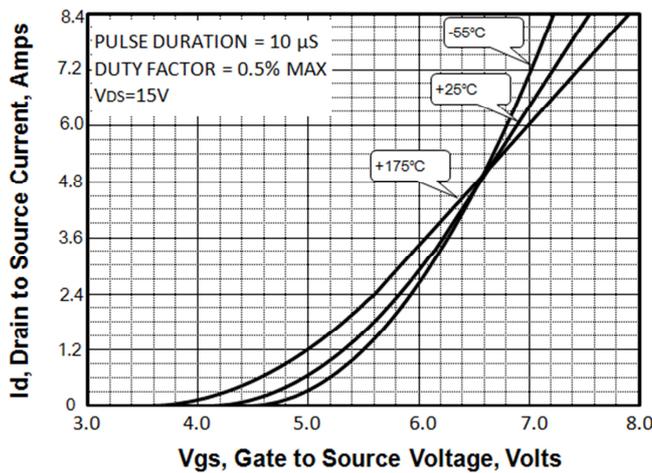


### Typical Characteristics(Cont.)

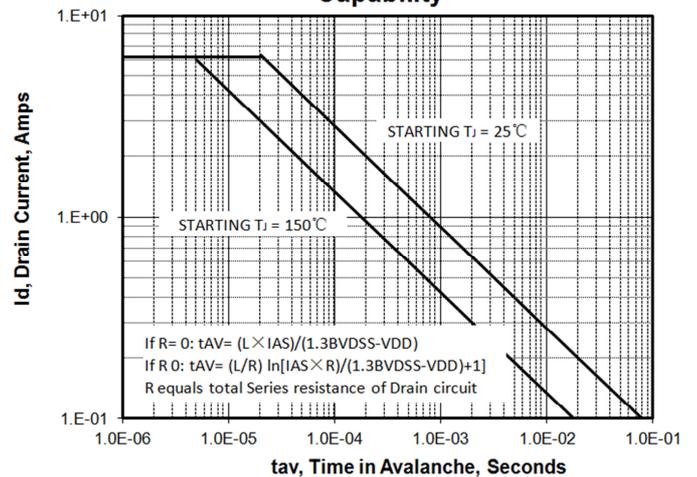
#### Figure 6. Peak Current Capability



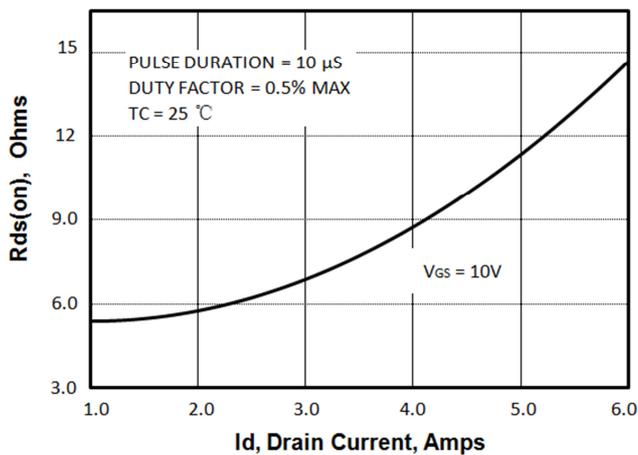
#### Figure 7. Transfer Characteristics



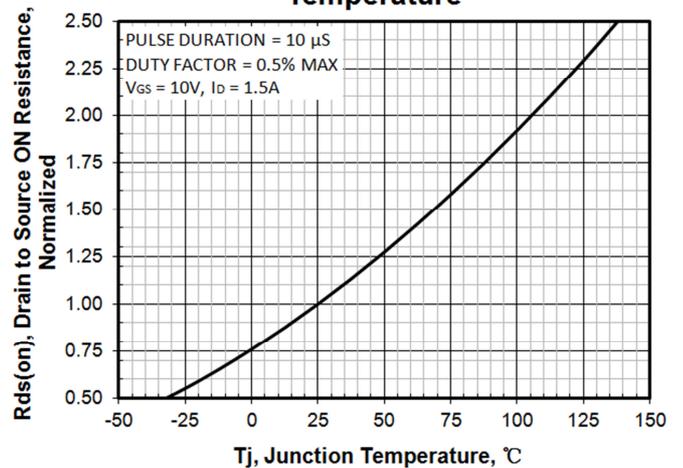
#### Figure 8. Unclamped Inductive Switching Capability



#### Figure 9. Drain to Source ON Resistance vs Drain Current



#### Figure 10. Rds(on) vs Junction Temperature





## Typical Characteristics (Cont.)

Figure 11. Breakdown Voltage vs Temperature

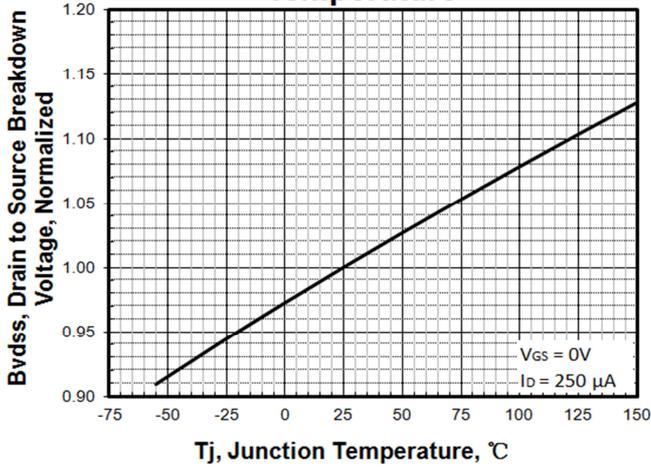


Figure 12. Threshold Voltage vs Temperature

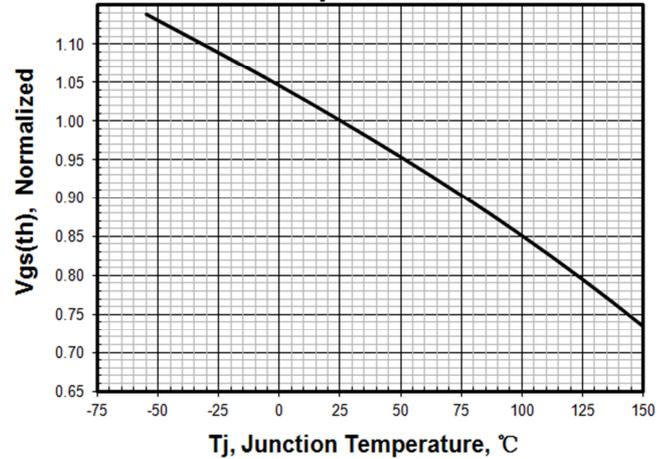


Figure 13. Maximum Safe Operating Area (TO-3PF)

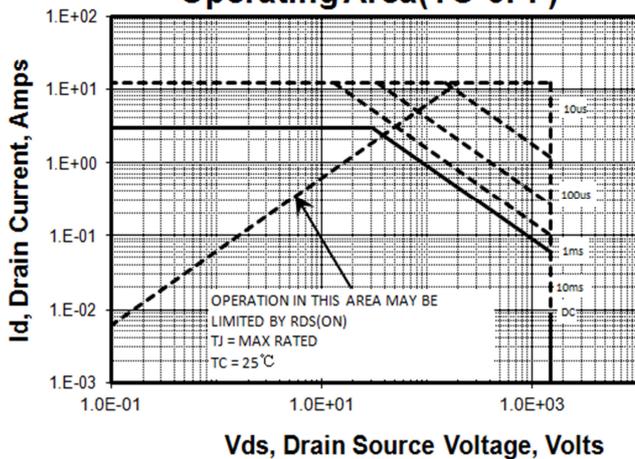


Figure 14. Maximum Safe Operating Area (TO-220F)

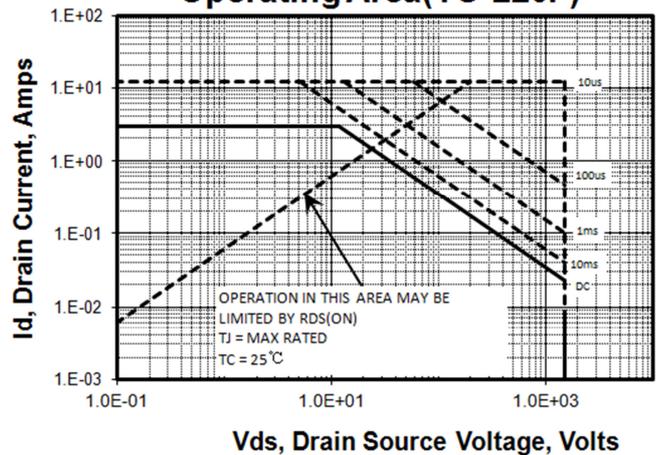


Figure 15. Capacitance vs Vds

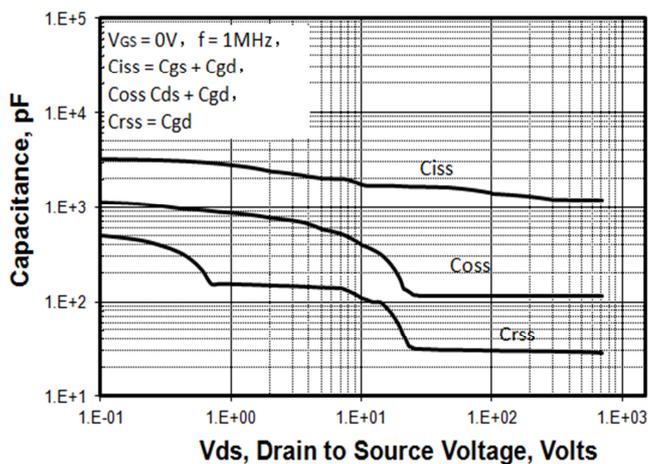
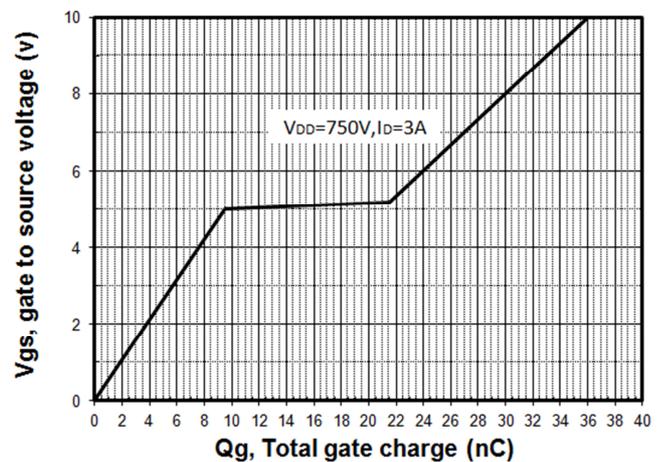


Figure 16. Typical Gate Charge



## Test Circuits and Waveforms

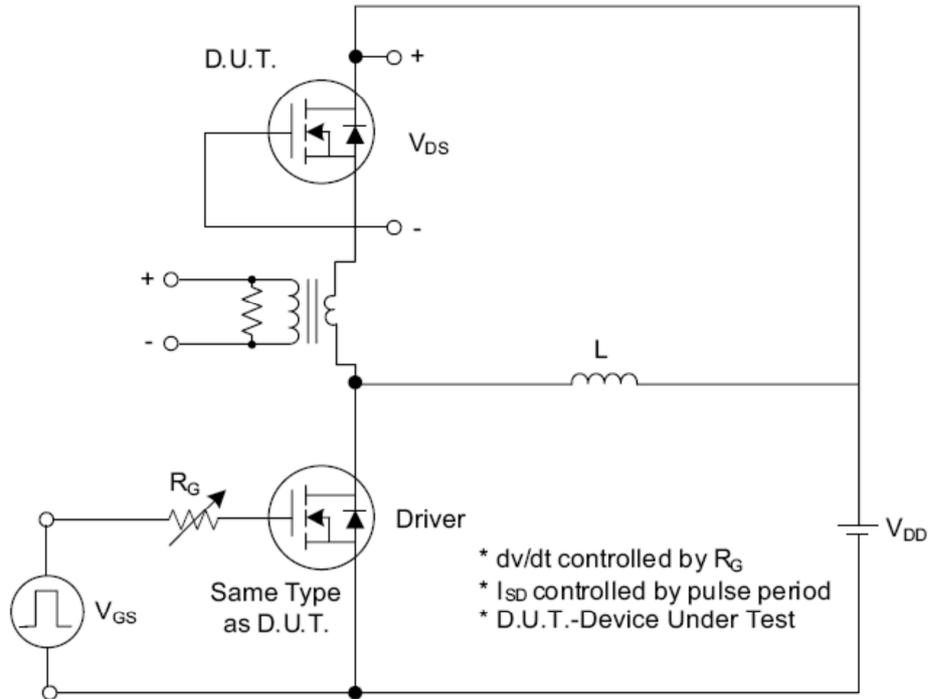


Fig. 1.1 Peak Diode Recovery  $dv/dt$  Test Circuit

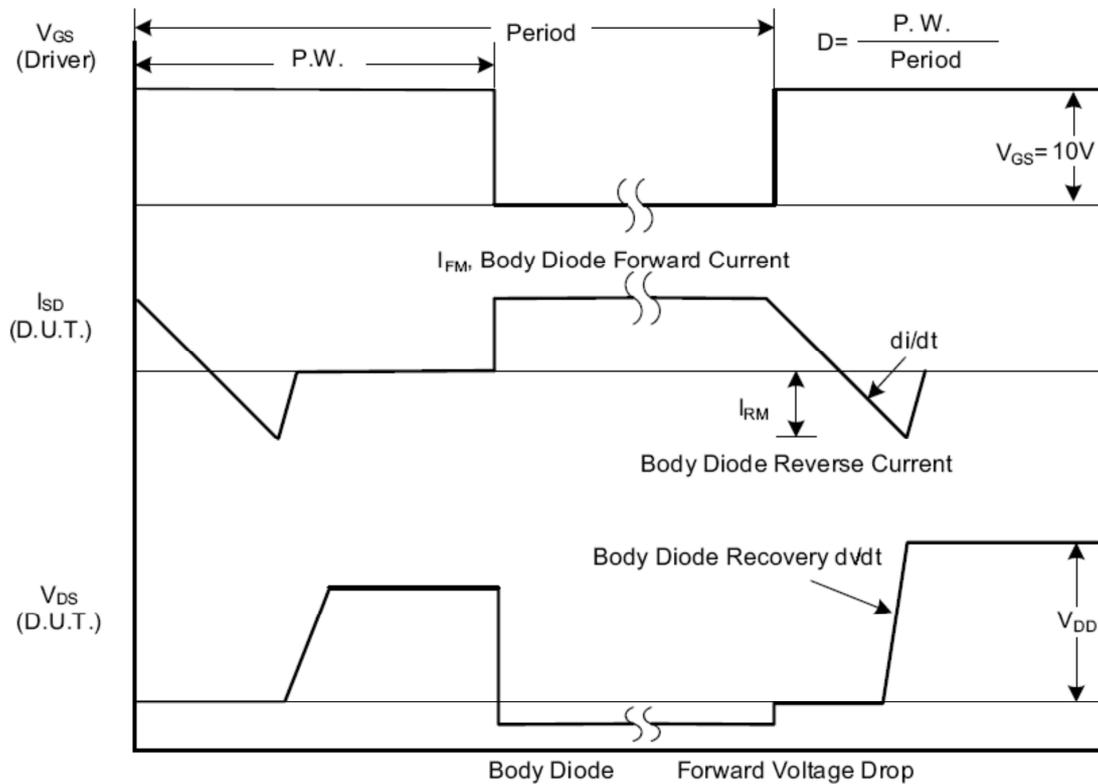


Fig. 1.2 Peak Diode Recovery  $dv/dt$  Waveforms



### Test Circuits and Waveforms (Cont.)

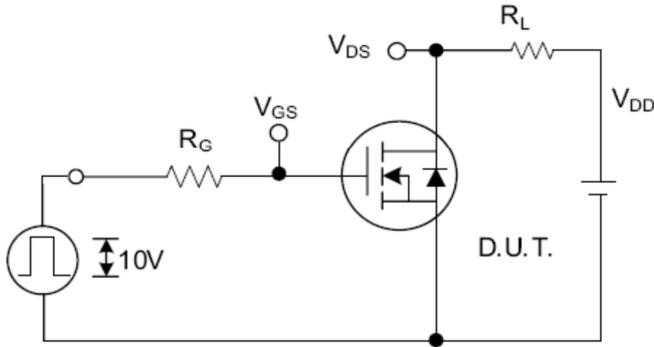


Fig. 2.1 Switching Test Circuit

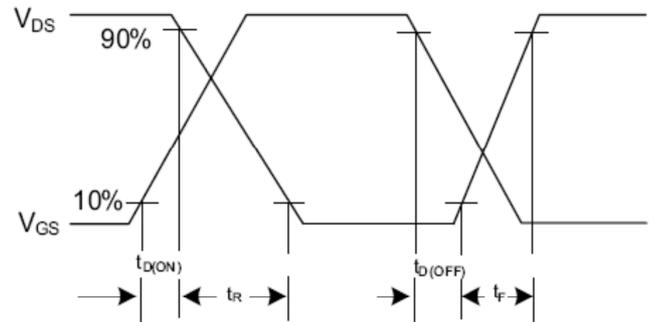


Fig. 2.2 Switching Waveforms

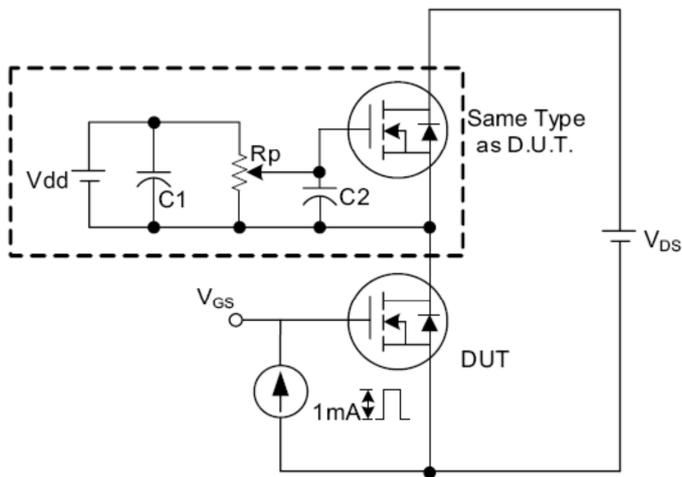


Fig. 3.1 Gate Charge Test Circuit

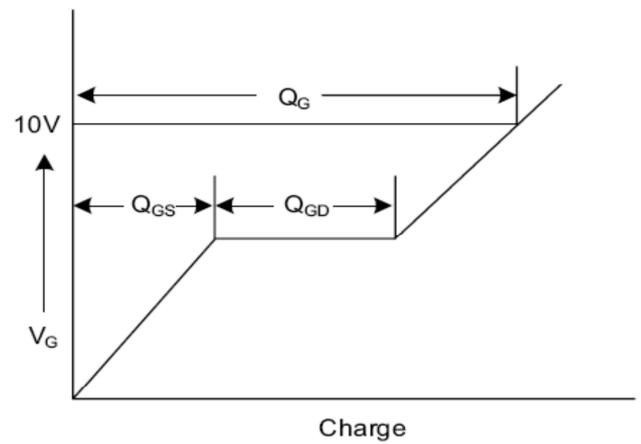


Fig. 3.2 Gate Charge Waveform

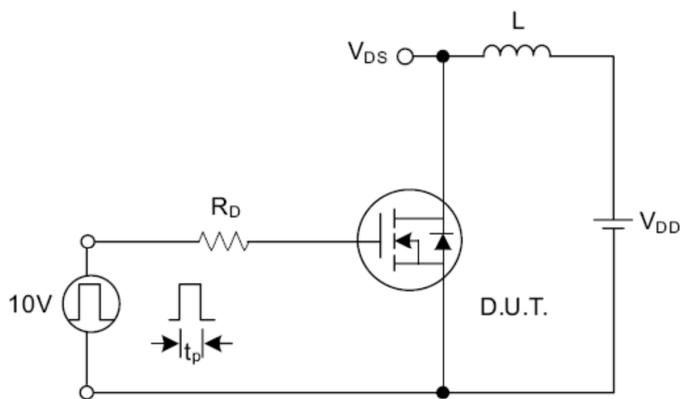


Fig. 4.1 Unclamped Inductive Switching Test Circuit

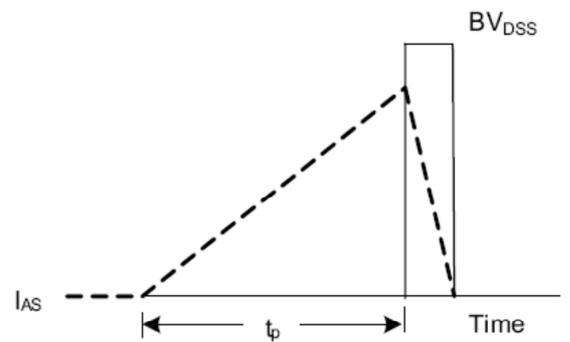


Fig. 4.2 Unclamped Inductive Switching Waveforms



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