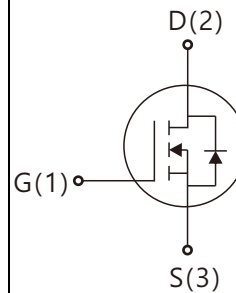
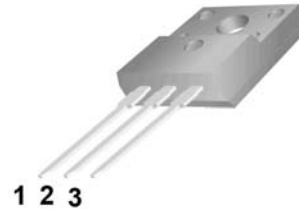


**4N65**
**Features:**

- Low Intrinsic Capacitances.
- Excellent Switching Characteristics.
- Extended Safe Operating Area.
- Unrivalled Gate Charge : $Q_g=14\text{nC}$  (Typ.).
- $BV_{DSS}=650\text{V}, I_D=4\text{A}$
- $R_{DS(on)} : 2.50\Omega$  (Max) @ $V_G=10\text{V}$
- 100% Avalanche Tested

**TO-220F**


- 1.Gate (G)
- 2.Drain (D)
- 3.Source (S)

**Absolute Maximum Ratings** ( $T_a=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	650	V
$I_D$	Drain Current	$T_j=25^\circ\text{C}$	4.0
		$T_j=100^\circ\text{C}$	2.7
$V_{GS(TH)}$	Gate Threshold Voltage	30	V
$E_{AS}$	Single Pulse Avalanche Energy (note1)	120	mJ
$I_{AR}$	Avalanche Current (note2)	4.0	A
$P_D$	Power Dissipation ( $T_j=25^\circ\text{C}$ )	50	W
$T_j$	Junction Temperature(Max)	150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature	-55~+150	$^\circ\text{C}$
$TL$	Maximum lead temperature for soldering purpose, 1/8' from case for 5 seconds	300	$^\circ\text{C}$

**Thermal Characteristics**

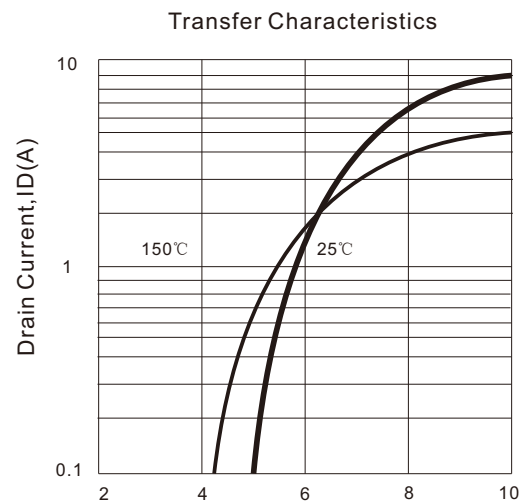
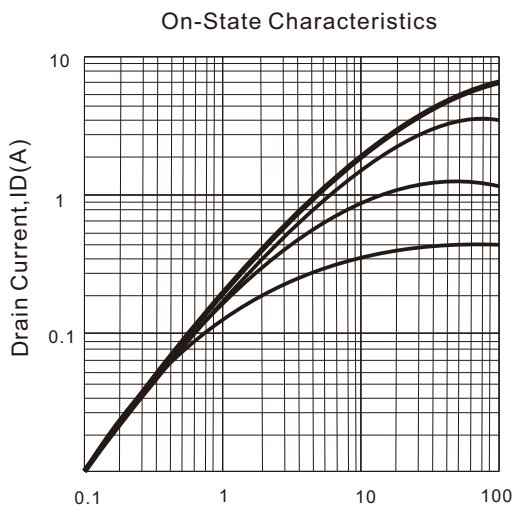
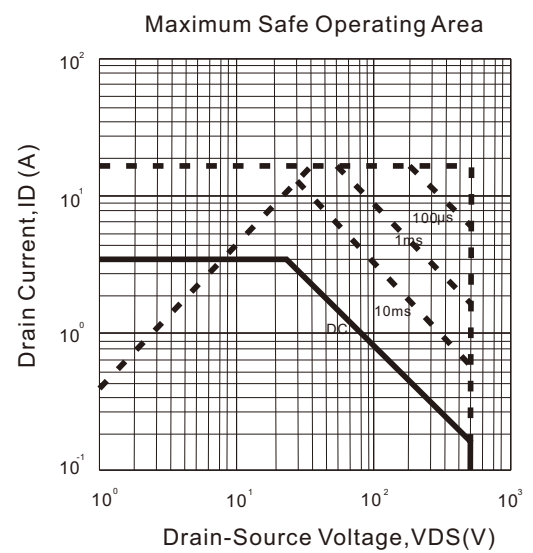
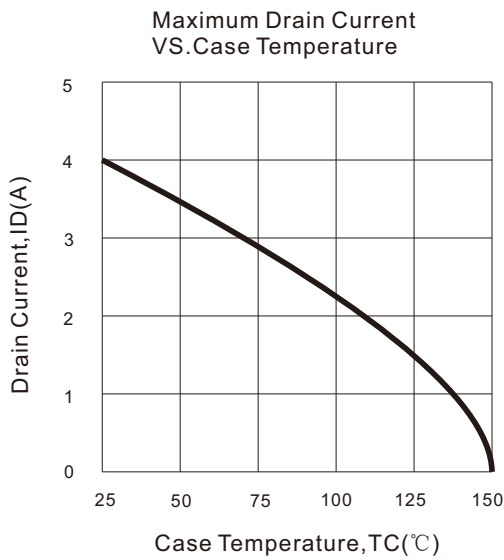
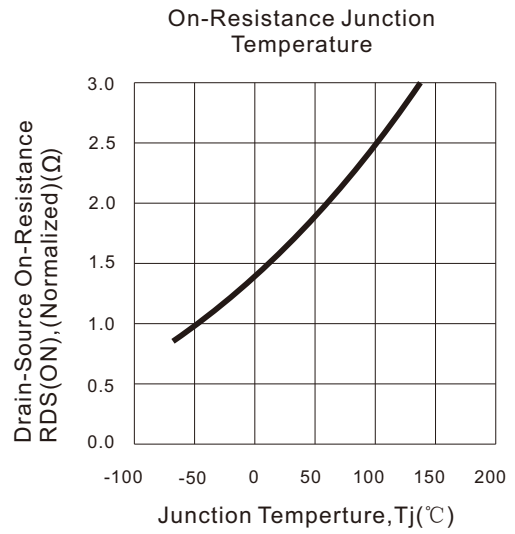
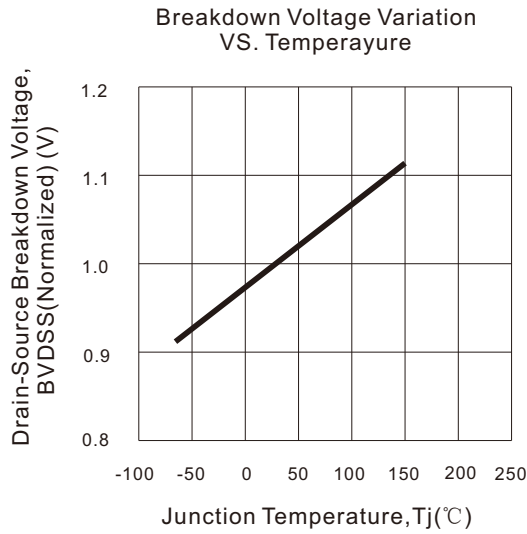
Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	-	2.4	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		62.5	$^\circ\text{C}/\text{W}$

**Electrical Characteristics (Ta=25°C unless otherwise noted)**

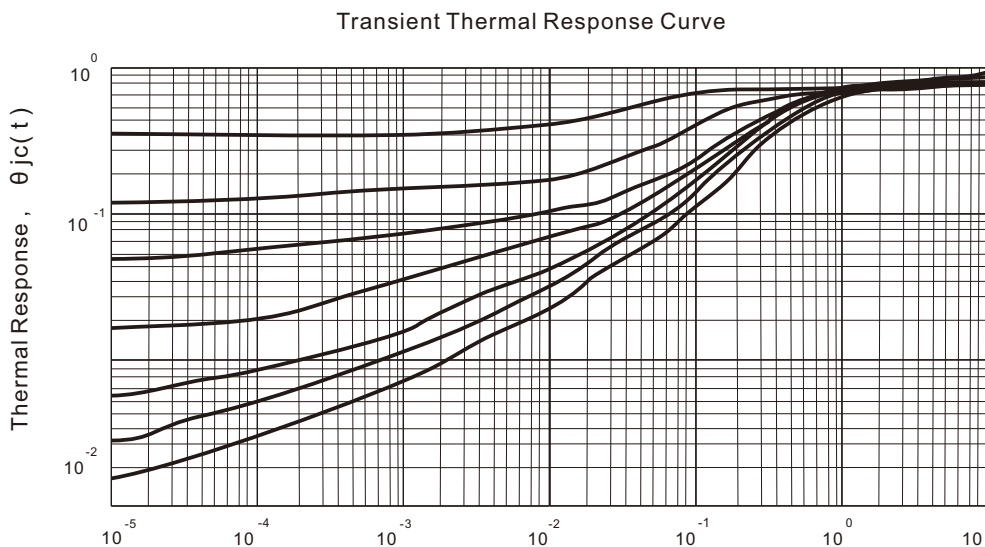
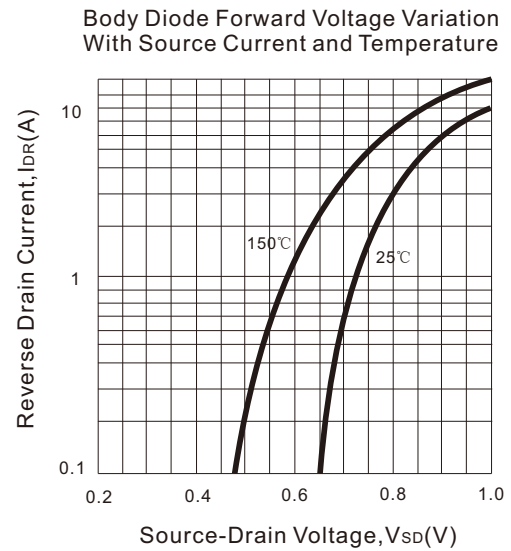
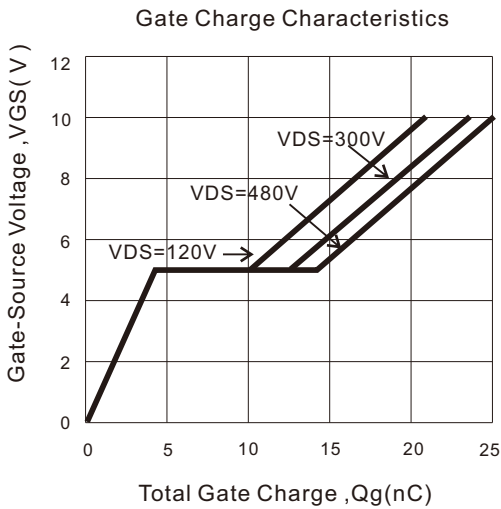
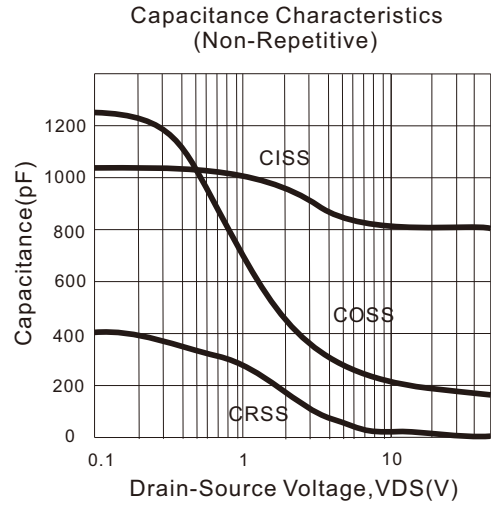
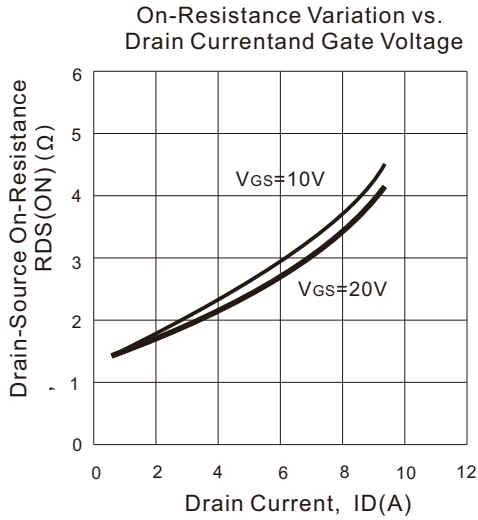
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu A, V_{GS}=0$	650	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu A$ , Reference to 25°C	-	0.67	-	V/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	-	-	10	$\mu A$
		$V_{DS}=520V, T_J=125^\circ C$	-	-	100	
$I_{GSSF}$	Gate-body leakage Current, Forward	$V_{GS}=+30V, V_{DS}=0V$	-	-	100	nA
$I_{GSSR}$	Gate-body leakage Current, Reverse	$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	
<b>On Characteristics</b>						
$V_{GS(TH)}$	Date Threshold Voltage	$I_D=250\mu A, V_{DS}=V_{GS}$	2	-	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$I_D=2.0A, V_{GS}=10V$	-	-	2.5	$\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$	-	560	-	pF
$C_{oss}$	Output Capacitance		-	48	-	
$C_{rss}$	Reverse Transfer Capacitance		-	5.4	-	
<b>Switching Characteristics</b>						
$T_d(on)$	Turn-On Delay Time	$V_{DD}=325V, I_D=4A, R_G=25\Omega$ (Note 3,4)	-	25	-	nS
$T_r$	Turn-On Rise Time		-	45	-	
$T_d(off)$	Turn-Off Delay Time		-	25	-	
$T_f$	Turn-Off Rise Time		-	35	-	
$Q_g$	Total Gate Charge	$V_{DS}=520V, V_{GS}=10V, I_D=4A$ (Note3,4)	-	14.3	-	nC
$Q_{gs}$	Gate-Source Charge		-	2.8	-	
$Q_{gd}$	Gate-Drain Charge		-	4.5	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Max. Diode Forward Current	-	-	-	4	A
$I_{SM}$	Max. Pulsed Forward Current	-	-	-	16	
$V_{SD}$	Diode Forward Voltage	$I_D=4A$	-	-	1.4	V
$T_{rr}$	Reverse Recovery Time	$I_S=4A, V_{GS}=0V, diF/dt=100A/\mu s$ (Note3)	-	393	-	nS
$Q_{rr}$	Reverse Recovery Charge		-	1.5	-	$\mu C$

- Notes : 1, L=0.5mH, IAS= 4A, VDD=50V, RG=25 $\Omega$ , Starting T<sub>J</sub> =25°C  
 2, Repetitive Rating : Pulse width limited by maximum junction temperature  
 3, Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$   
 4, Essentially Independent of Operating Temperature

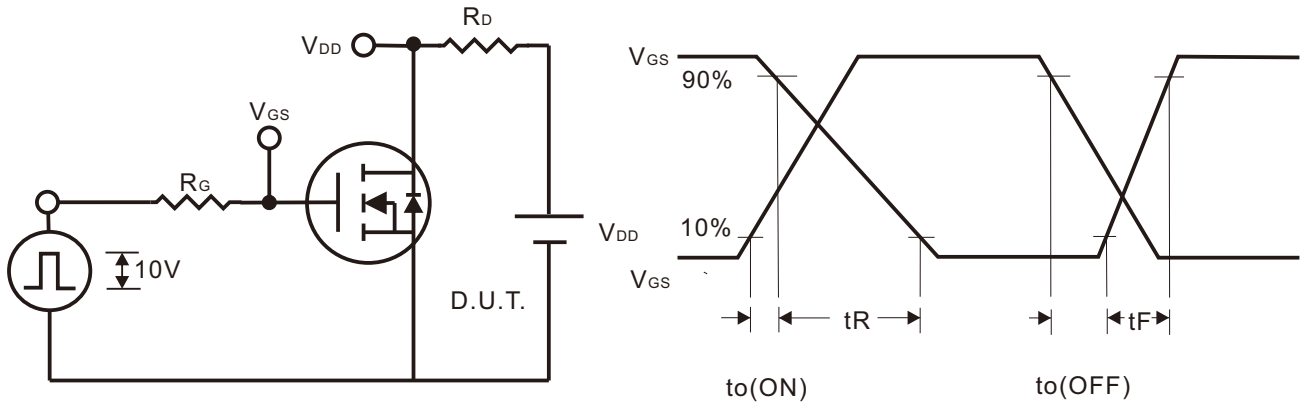
Typical Characteristics



Typical Characteristics (Continued)

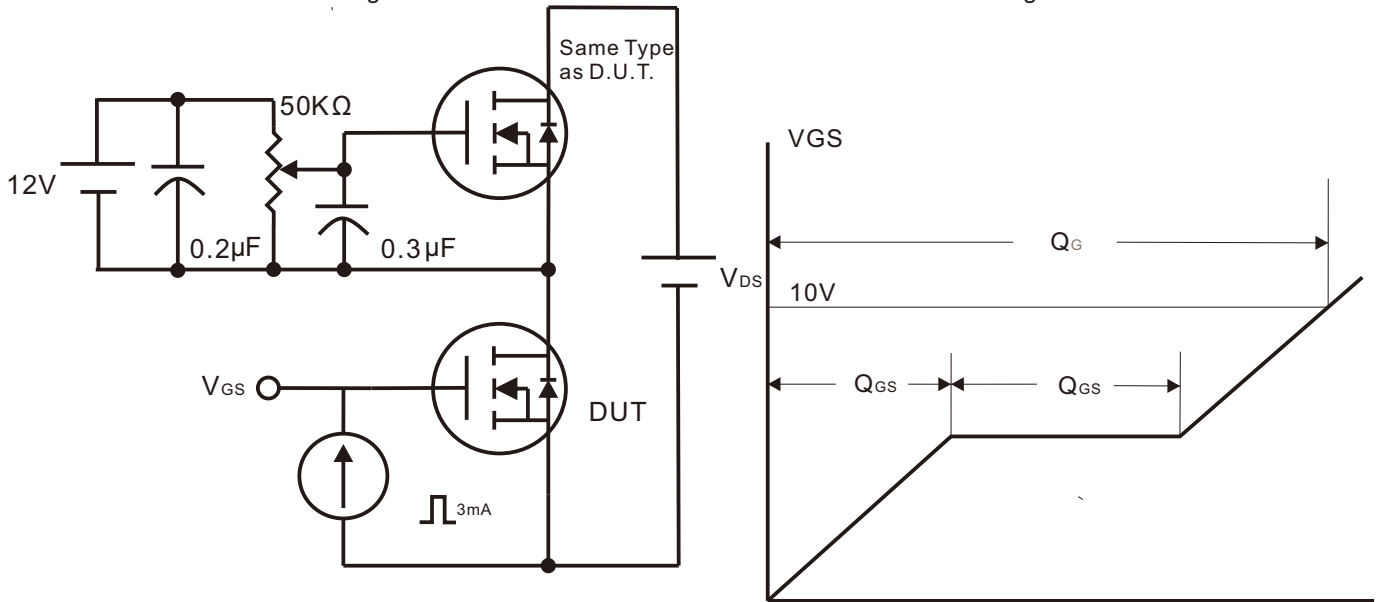


Gate Charge Test Circuit & Waveform



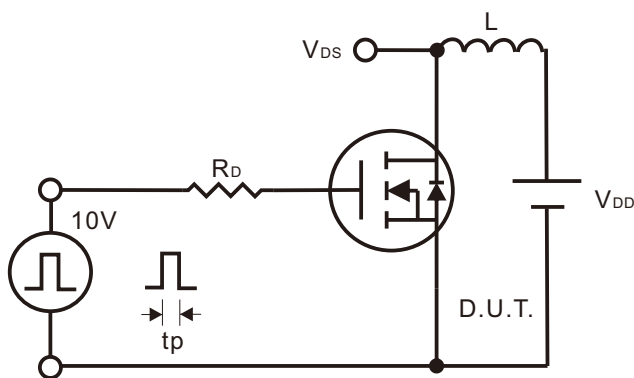
Switching Test Circuit

Switching Waveforms

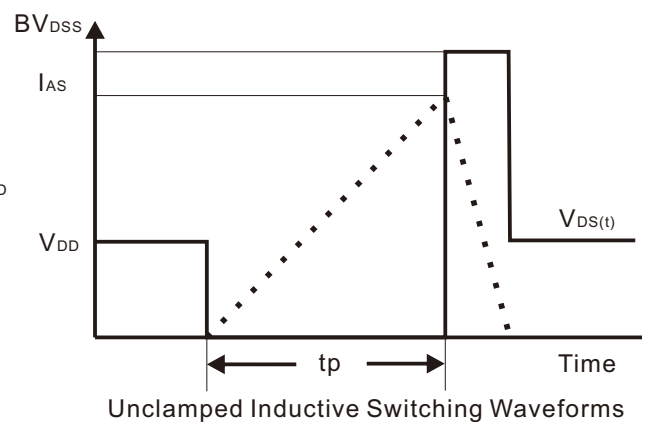


Gate Charge Test Circuit

Gate Charge Waveform

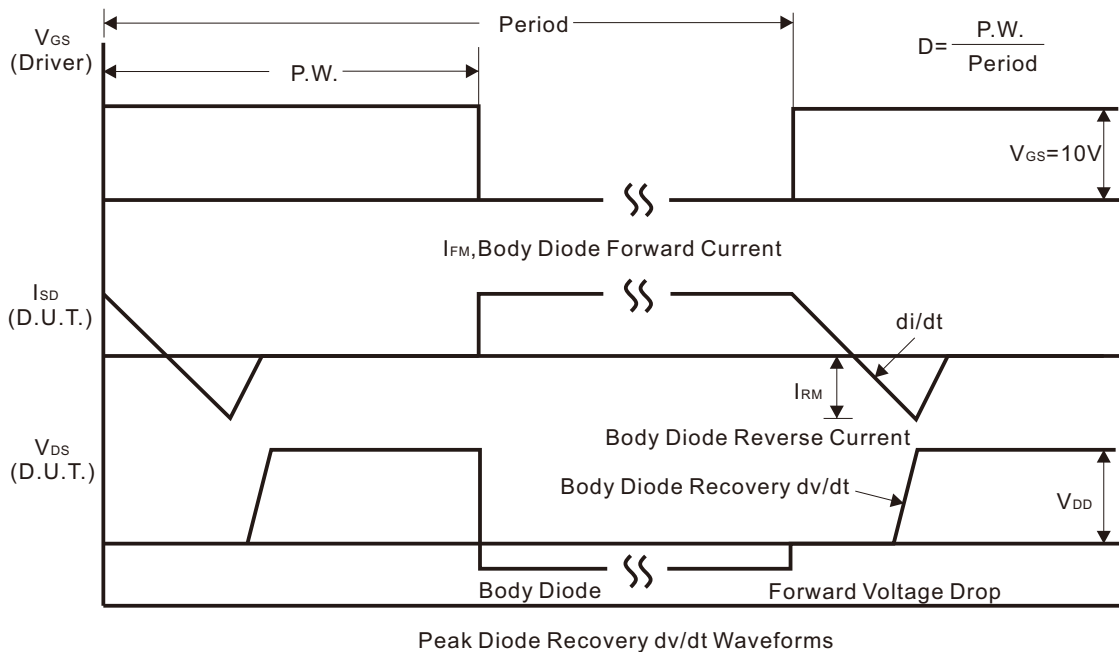
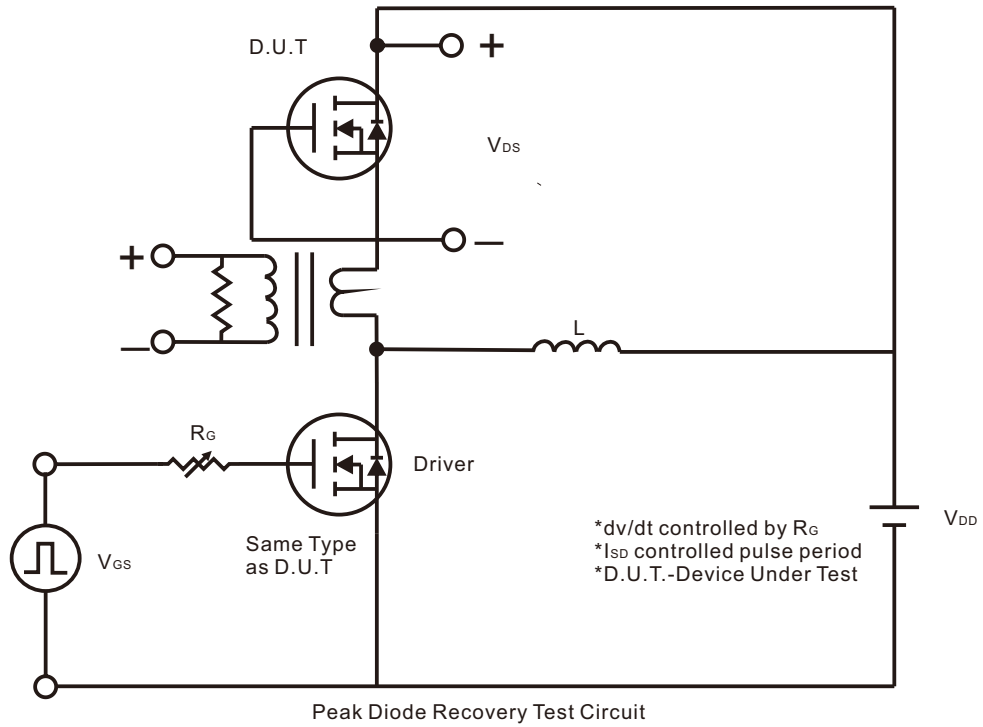


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

Peak Diode Recovery  $dv/dt$  Test Circuit & Waveform



Package Dimension

TO-220F

Unit: mm

