

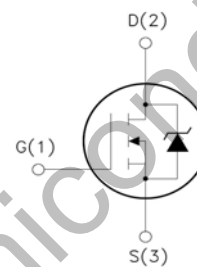
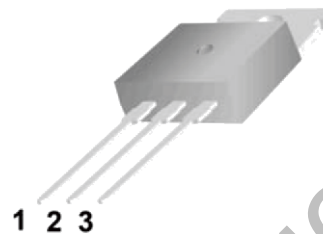


## WGP4N65SE

## Features:

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

TO-220



- 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
$V_{GSS}$	Gate - Source 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
Off Characteristics						
$BV_{DSS}$	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	
On Characteristics						
$V_{GS(TH)}$	Gate 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	$\Omega$
Dynamic Characteristics						
$C_{iss}$	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	-	
Switching Characteristics						
$T_d(on)$	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	$V_{DS}=520V, V_{GS}=10V, I_D=4A$ (Note 3,4)	-	14.3		nC
$Q_{gs}$	Gate-Source Charge		-	2.8	-	
$Q_{gd}$	Gate-Drain Charge		-	4.5	-	
Drain-Source Diode Characteristics and Maximum Ratings						
$I_S$	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	$I_S=4A, V_{GS}=0V, diF/dt=100A/\mu s$ (Note 3)	-	393	-	nS
$Q_{rr}$	Reverse Recovery Charge		-	1.5	-	$\mu C$

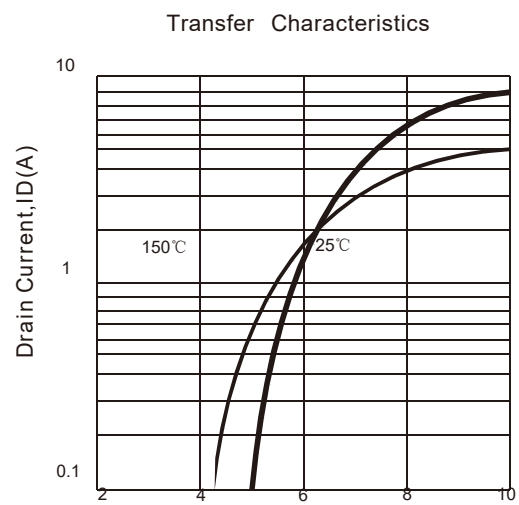
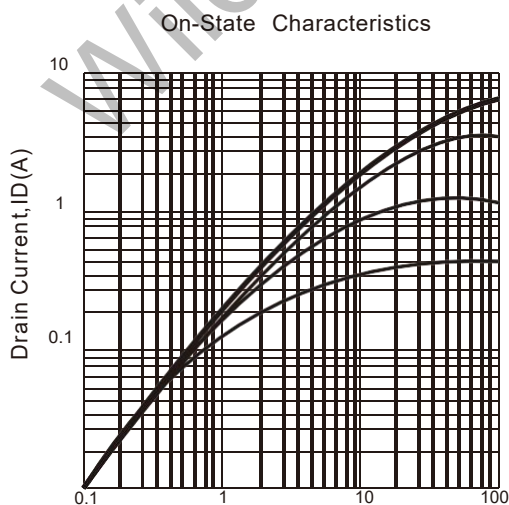
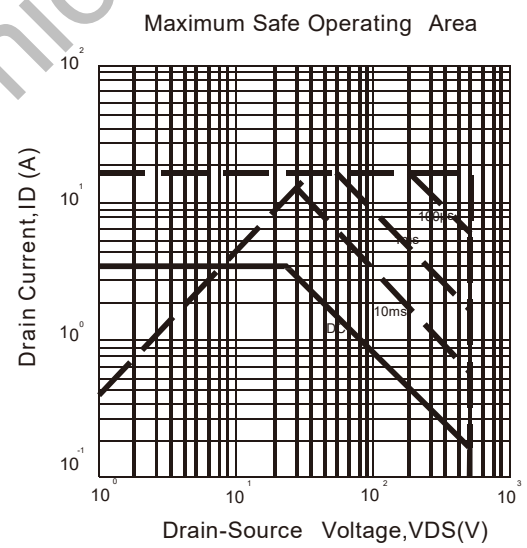
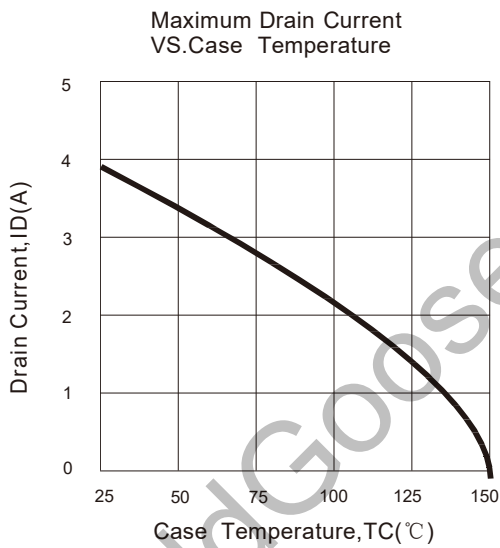
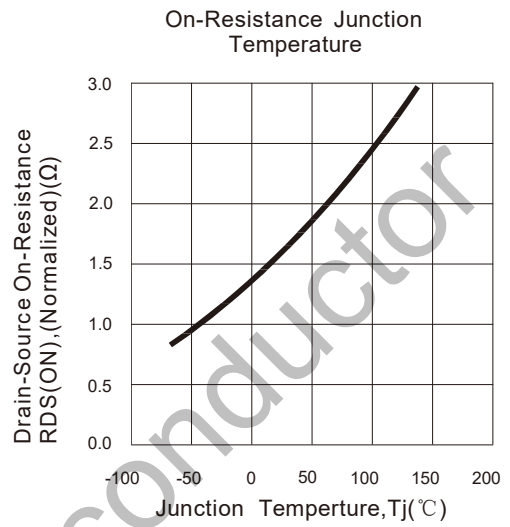
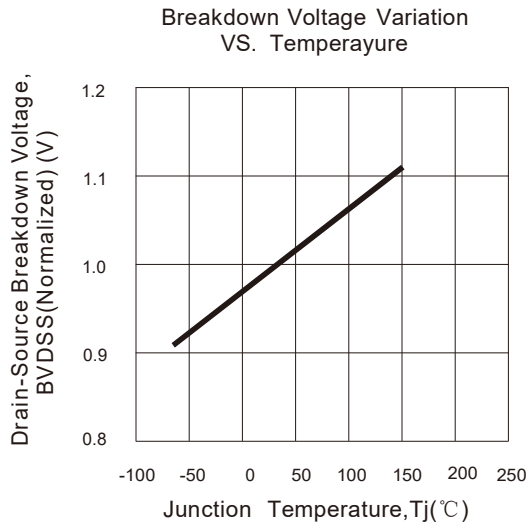
Notes : 1, L=0.5mH, IAS= 4A, VDD=50V, RG=25 $\Omega$ , Starting T<sub>J</sub> =25°C

2, Repetitive Rating : Pulse width limited by maximum junction temperature

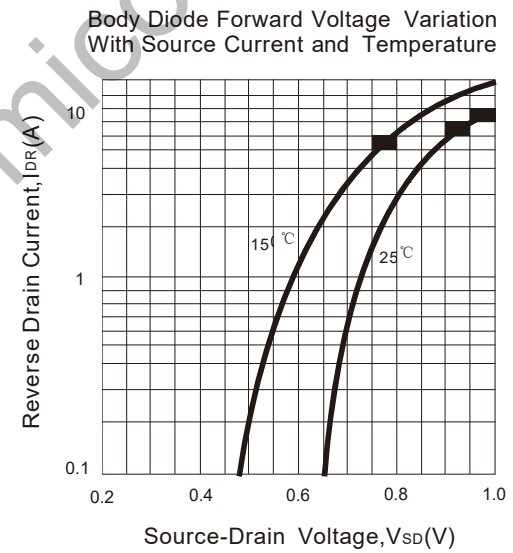
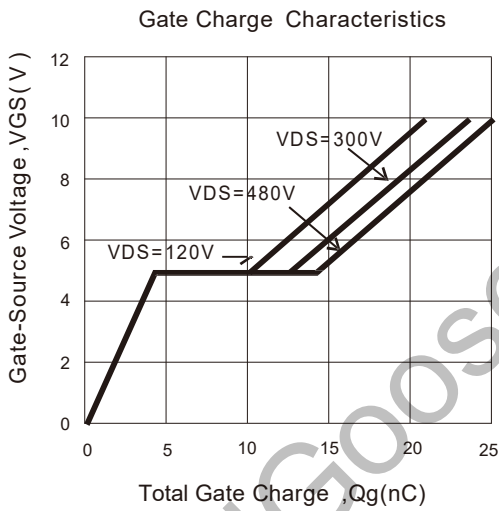
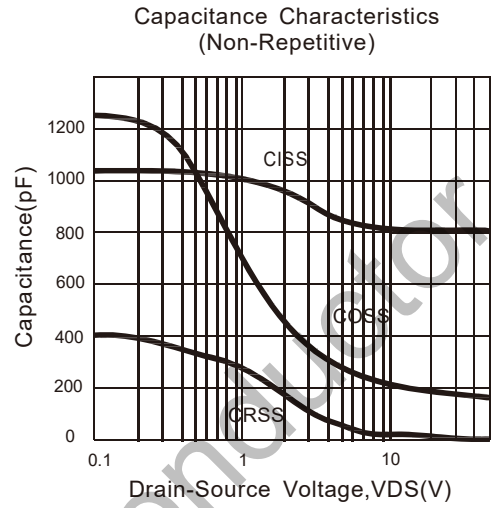
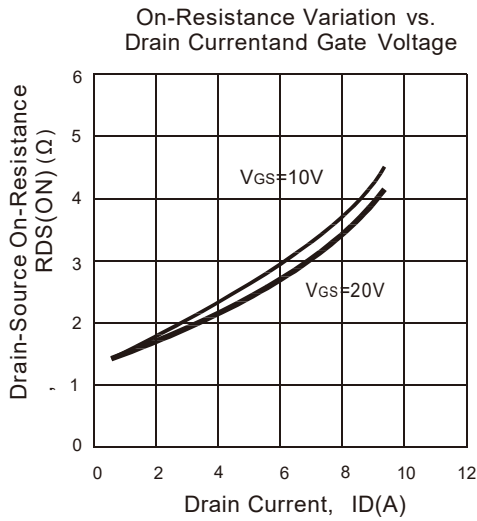
3, Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$

4, Essentially Independent of Operating Temperature

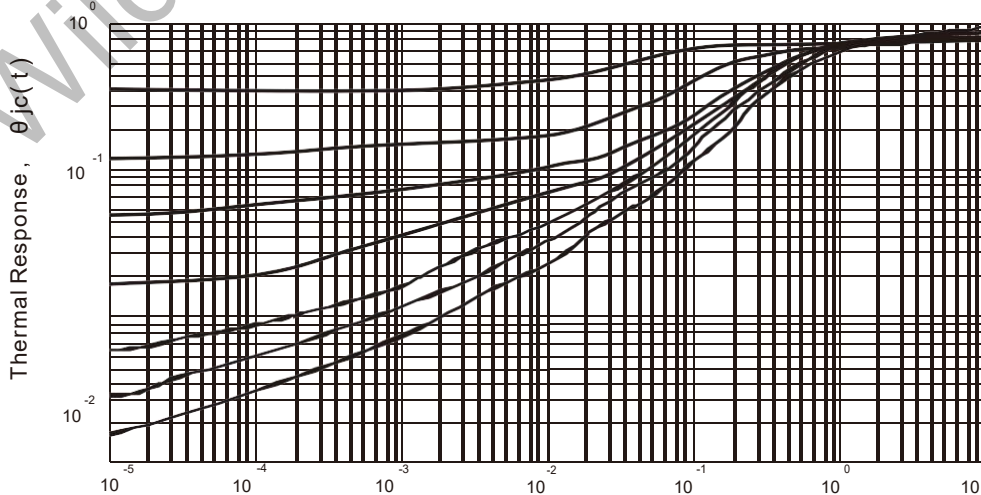
Typical Characteristics



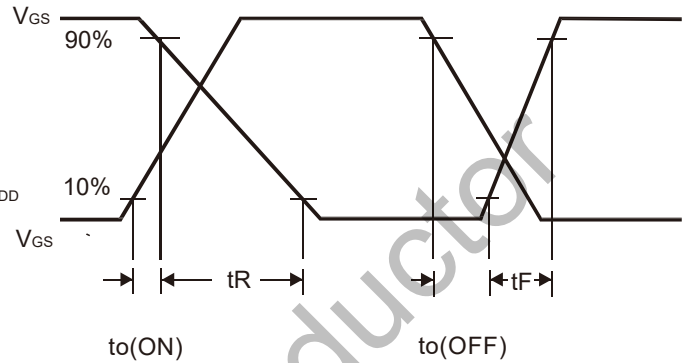
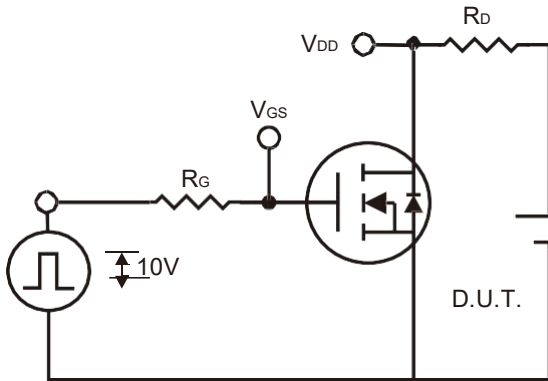
Typical Characteristics (Continued)



Transient Thermal Response Curve

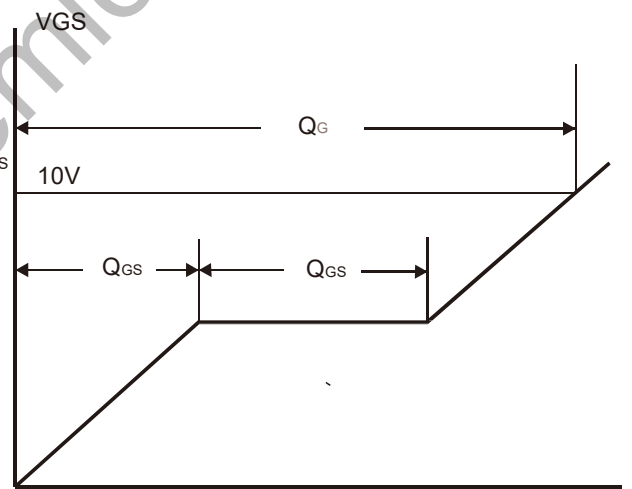
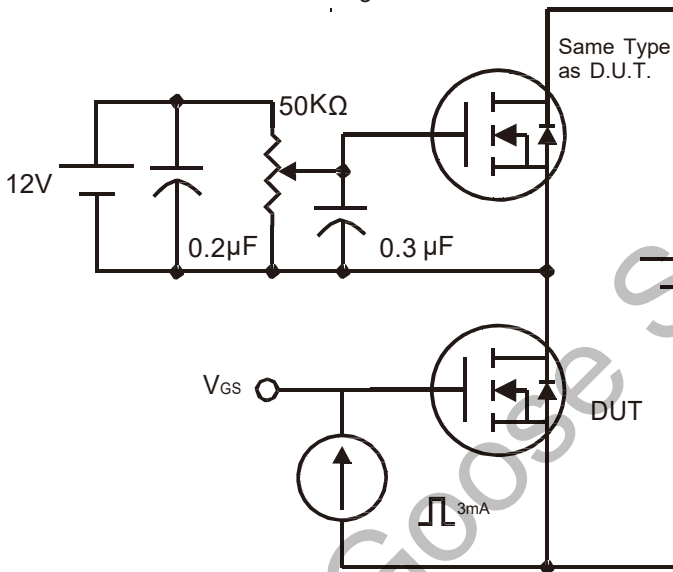


Gate Charge Test Circuit & Waveform



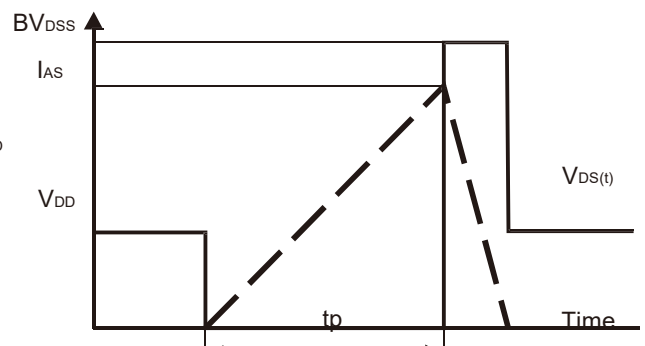
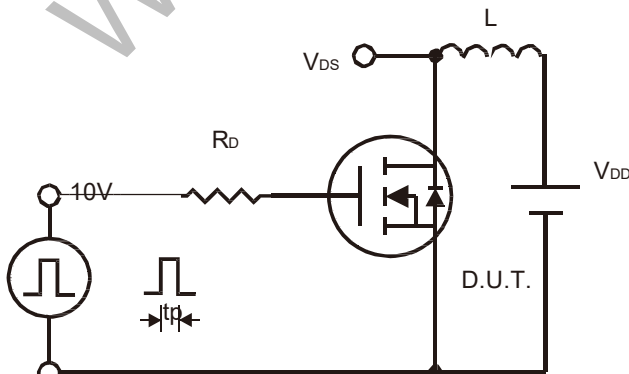
Switching Test Circuit

Switching Waveforms



Gate Charge Test Circuit

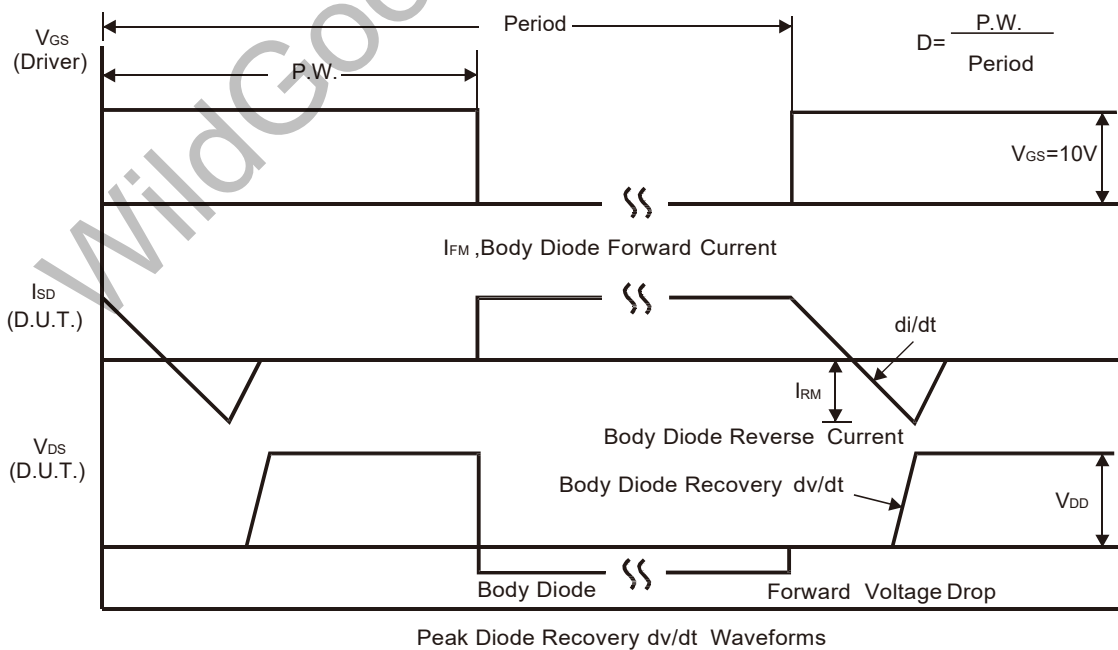
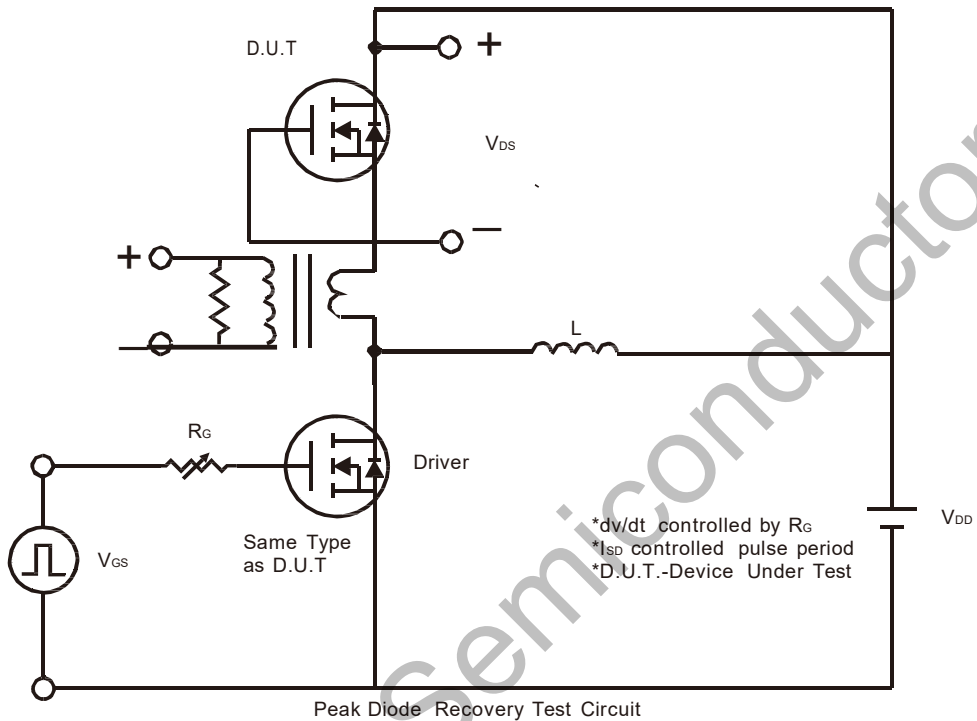
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

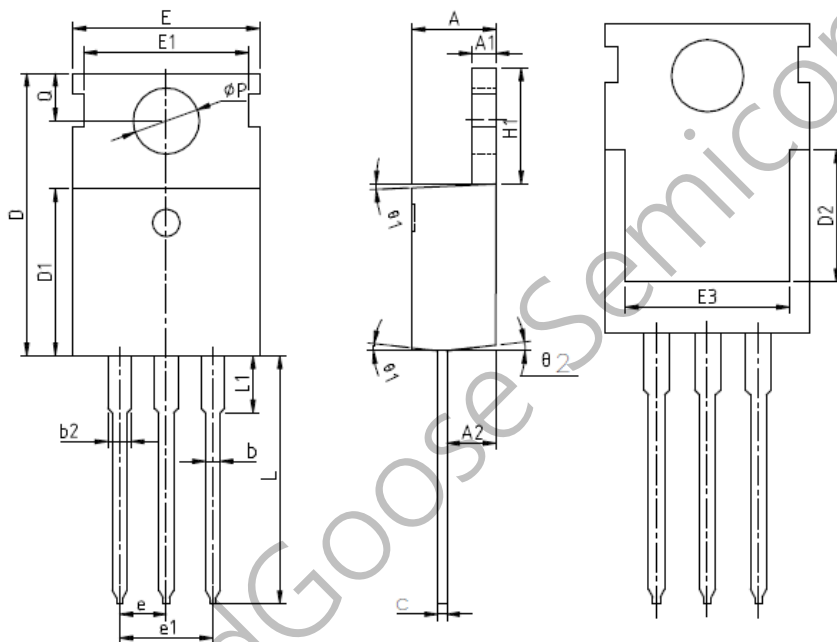
Unclamped Inductive Switching Waveforms

Peak Diode Recovery dv/dt Test Circuit & Waveform



Package Dimension

TO-220



SYMBOL	MIN	NOM	MAX
A	4.27	4.57	4.87
A1	1.15	1.30	1.45
A2	2.10	2.40	2.70
b	0.70	0.80	1.00
b2	1.17	1.27	1.50
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.70	6.70	7.00
E	9.70	10.00	10.30
E1	-	8.70	-
E2	9.65	10.00	10.35
E3	7.00	8.00	8.40
e	2.54 BSC		
e1	5.08 BSC		
H1	6.00	6.50	6.85
L	12.75	13.50	13.90
L1	-	3.10	3.40
ΦP	3.45	3.60	3.75
Q	2.60	2.80	3.00
θ 1	4°	7°	10°
θ 2	0°	3°	6°

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