



RTF03N150D

1500V N-Channel MOSFET

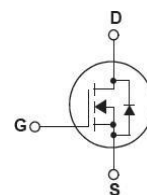
Features

- Fast switching
- Improved dv/dt capability
- 1650V @ $T_J = 150^\circ\text{C}$
- Typ. $R_{DS(on)} = 5.2\Omega$
- Low Gate Charge (typ. $Q_g = 62\text{nC}$)
- 100% avalanche tested

Applications

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)

RTF03N150D



Absolute Maximum Ratings

Symbol	Parameter	RTF03N150D	Unit
V_{DSS}	Drain-Source Voltage	1500	V
I_D	Drain Current -Continuous ($TC = 25^\circ\text{C}$) -Continuous ($TC = 100^\circ\text{C}$)	3.0* 1.9*	A
I_{DM}	Drain Current-Pulsed (Note 1)	10	A
V_{GSS}	Gate-Source voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	310	mJ
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	3.5	A
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
dV_{ds}/dt	Drain Source voltage slope ($V_{ds}=600\text{V}$)	50	V/ns
P_D	Power Dissipation ($TC = 25^\circ\text{C}$)	30	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to $+150$	$^\circ\text{C}$
T_L	Max. Lead Temperature for Soldering Purpose, $1/8''$ from Case for 5 Seconds	300	$^\circ\text{C}$

* Drain current limited by maximum junction temperature. Maximum duty cycle $D=0.75$.

Thermal Characteristics

Symbol	Parameter	RTF03N150D	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.2	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	-	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	80	$^\circ\text{C}/\text{W}$



Electrical Characteristics TC = 25°C unless otherwise noted

RTF03N150D 1500V N-Channel

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA, T _J = 25°C	1500	-	-	V
		V _{GS} = 0V, I _D = 250μA, T _J = 150°C	-	1650	-	V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	-	1.3	-	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 1500V, V _{GS} = 0V	-	-	2	μA
I _{GRTF}	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	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	3.0	4.0	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 1.5A	-	5.2	6.5	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 3A	-	5	-	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	-	1370	-	pF
C _{oss}	Output Capacitance		-	105	-	pF
C _{rss}	Reverse Transfer Capacitance		-	42	-	pF
Q _g	Total Gate Charge	V _{DS} = 400V, I _D = 1.5A V _{GS} = 10V (Note 4)	-	62	-	nC
Q _{gs}	Gate-Source Charge		-	8.5	-	nC
Q _{gd}	Gate-Drain Charge		-	34	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 400V, I _D = 3A R _G = 10Ω, V _{GS} = 12V (Note 4)	-	18	-	ns
t _r	Turn-On Rise Time		-	21	-	ns
t _{d(off)}	Turn-Off Delay Time		-	69	-	ns
t _f	Turn-Off Fall Time		-	49	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	3	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	10	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 3A	-	0.9	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, V _{DS} = 600V I _S = 3A, diF/dt = 100A/μs	-	760	-	ns
Q _{rr}	Reverse Recovery Charge		-	7.5	-	μC
I _{rrm}	Peak Reverse Recovery Current		-	21	-	A

NOTES:

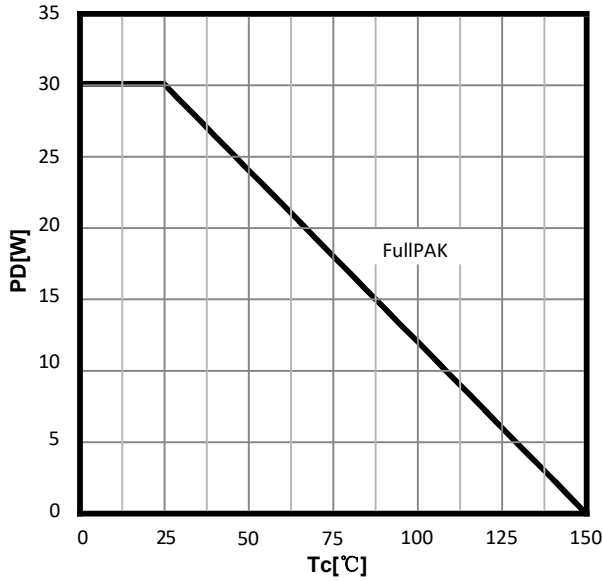
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 3.5A, V_{DD} = 100V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ I_D, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics



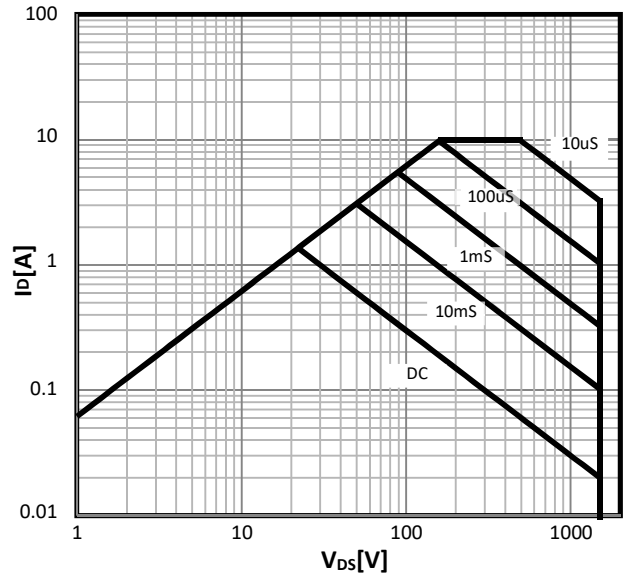
Typical Performance Characteristics

RTF03N150D 1500V N-Channel

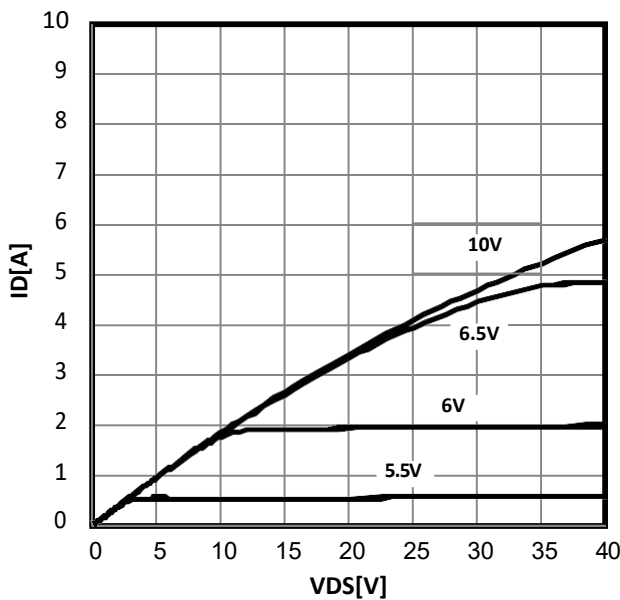
Power dissipation



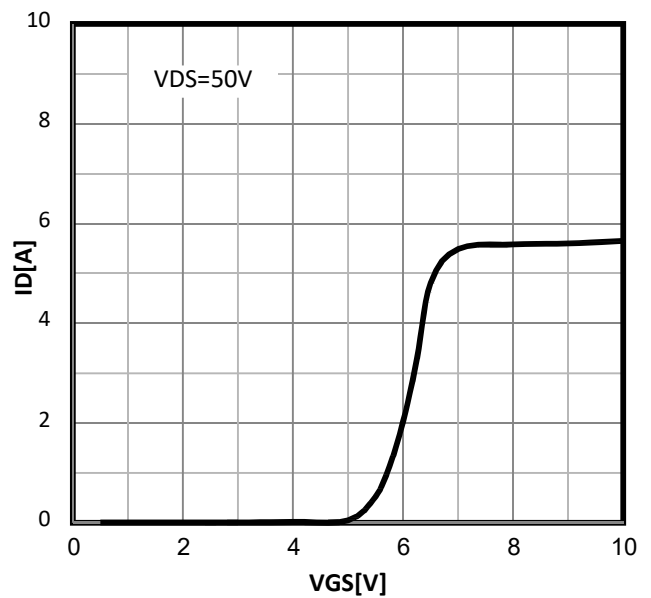
Safe operating area TC=25 °C parameter: tp; TO-220FullPAK



Typ. output characteristics Tj=25 °C parameter: VGS

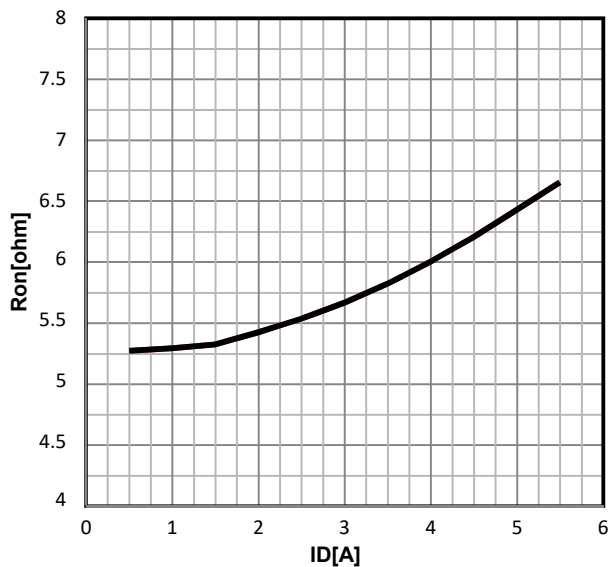


Typ. transfer characteristics Tj=25 °C

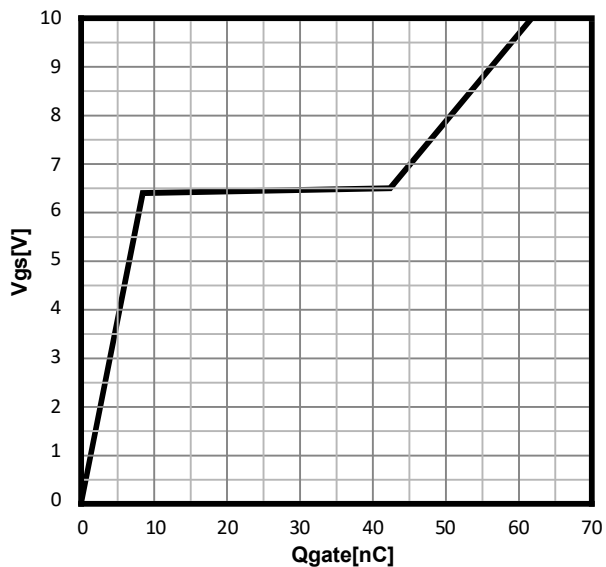


Typical Performance Characteristics

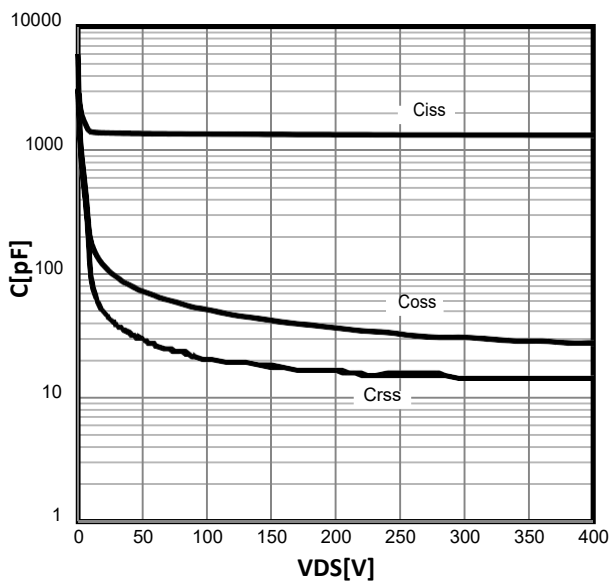
Typ. drain-source on-state resistance
 $V_{GS}=10V$



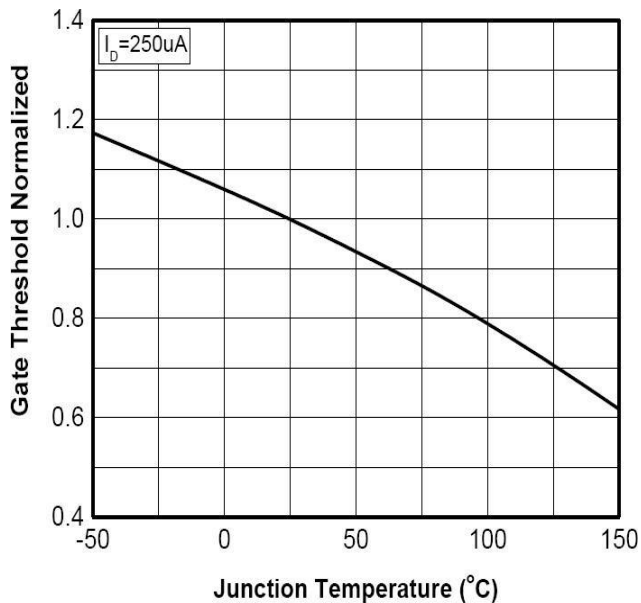
Typ. gate charge characteristics



Typ. capacitances



Normalized $V_{GS(th)}$ characteristics

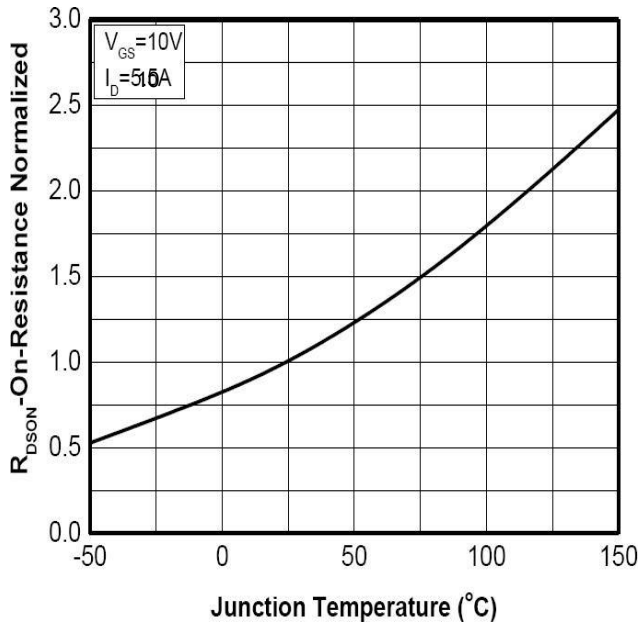




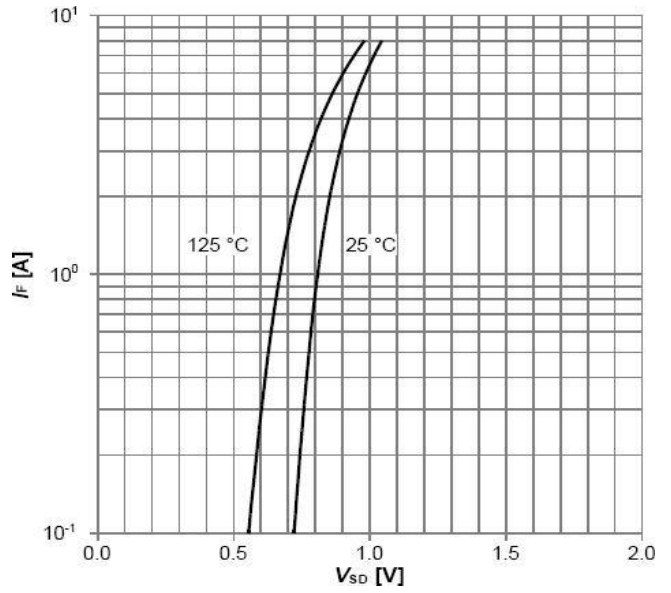
Typical Performance Characteristics

RTF03N150D 1500V N-Channel

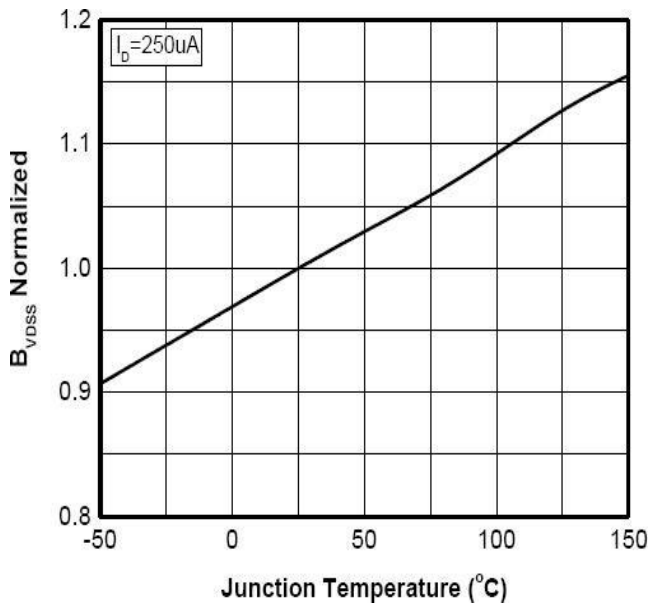
Normalized on-resistance vs temperature



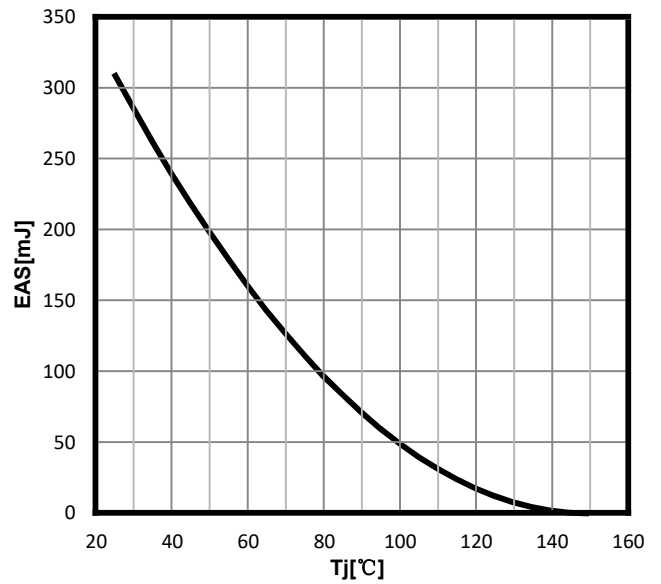
Forward characteristics of reverse diode



Drain-source breakdown voltage



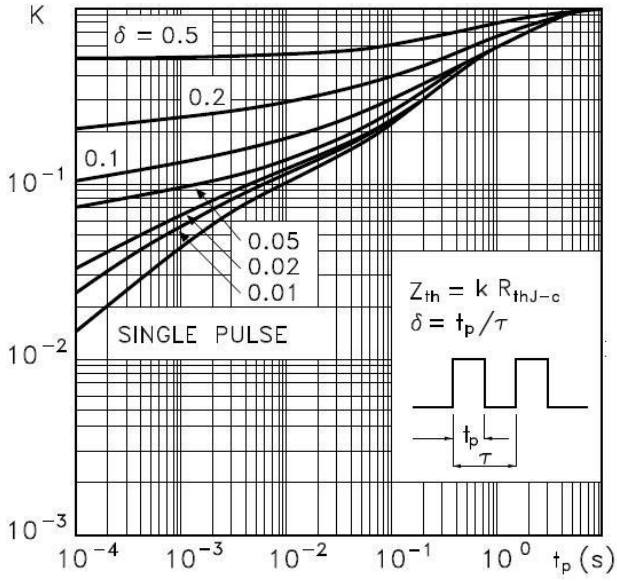
Avalanche energy





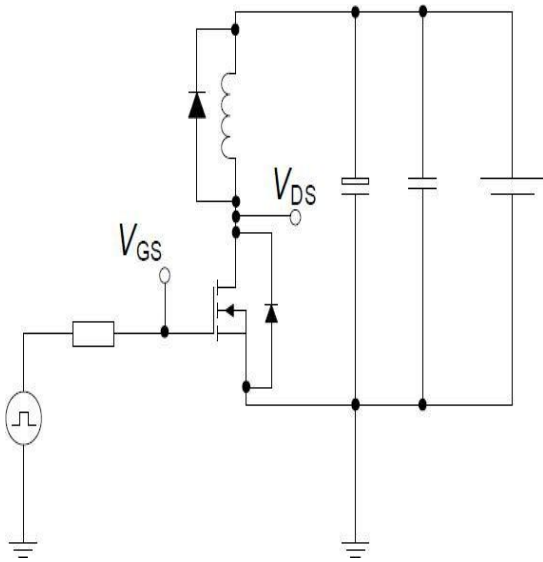
Typical Performance Characteristics

Normalized transient thermal impedance
parameter: $D = t_p / T$; TO-220FullPAK

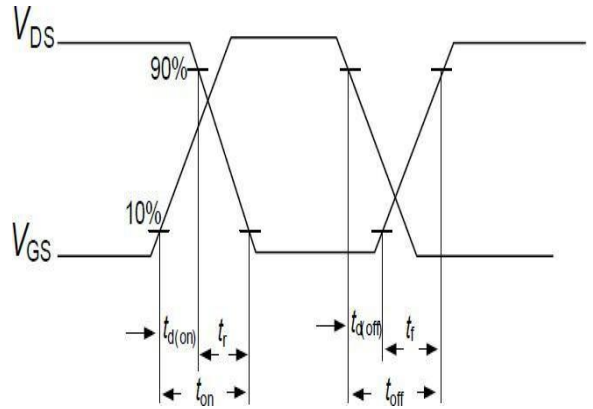


Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

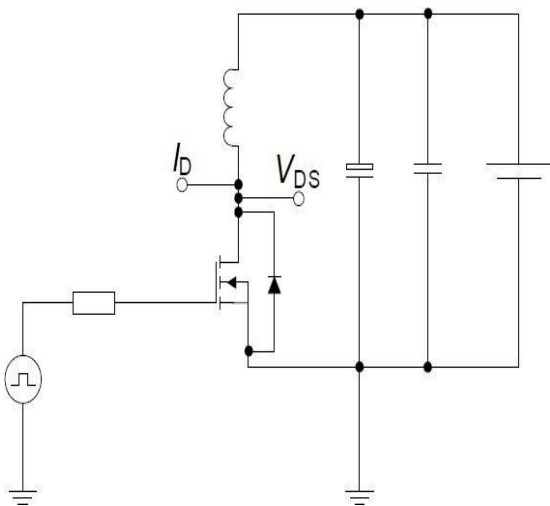


Switching time waveform

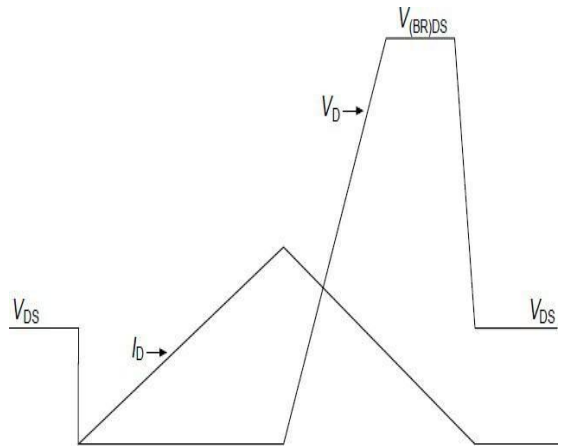


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit



Unclamped inductive waveform

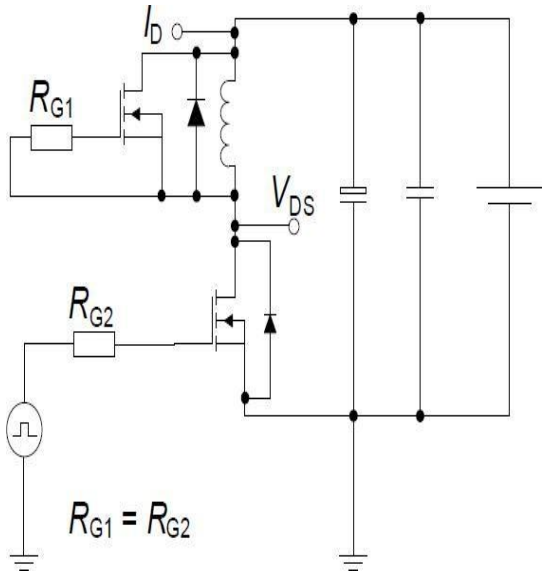




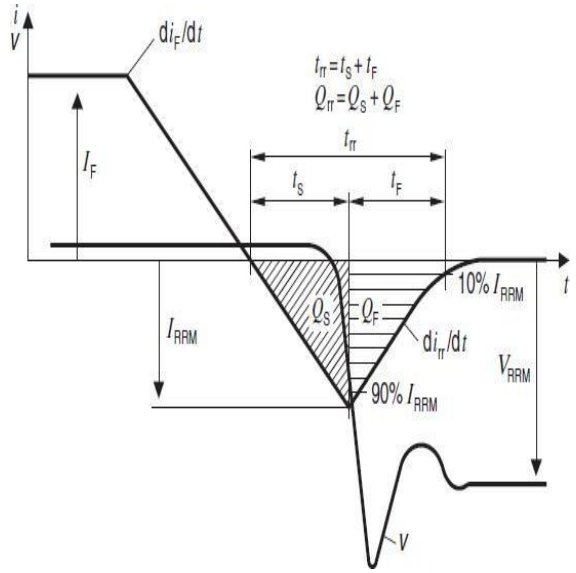
Test circuits

Test circuit and waveform for diode characteristics

Test circuit for diode characteristics



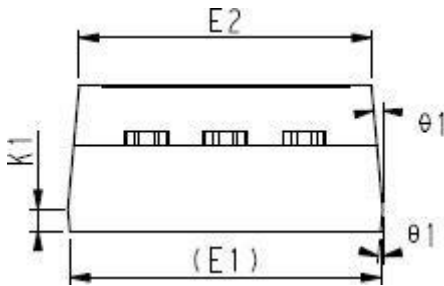
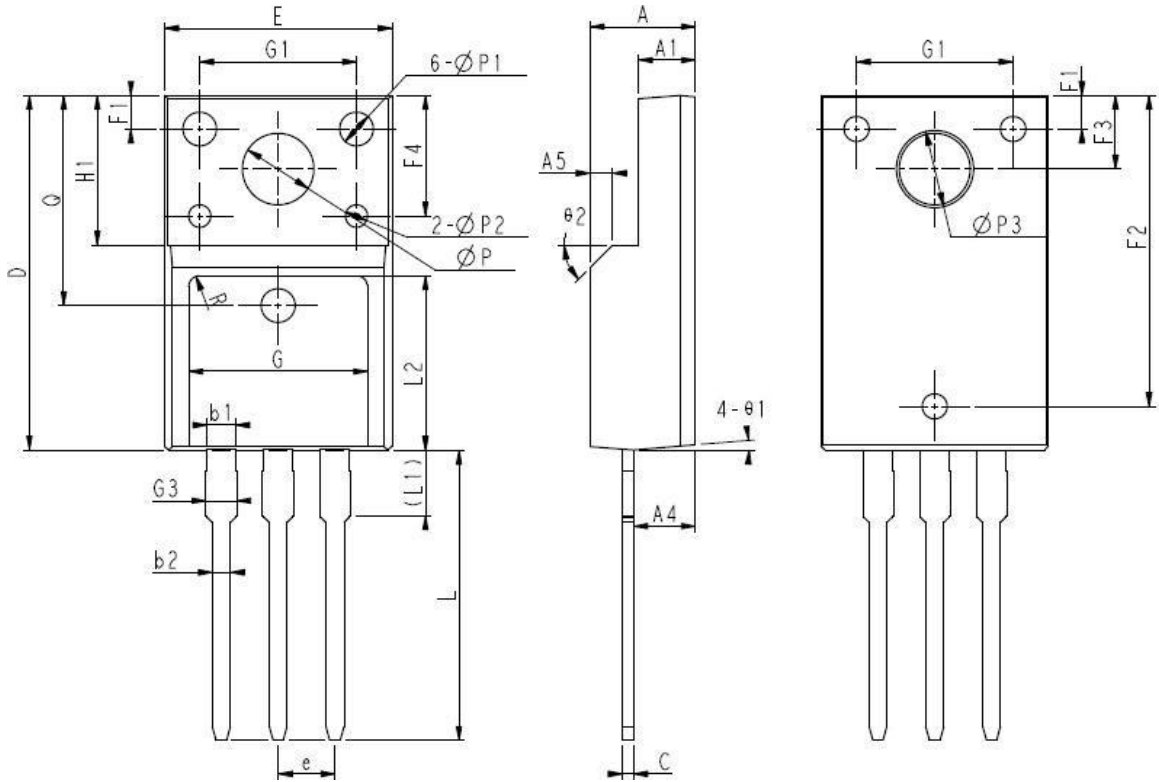
Diode recovery waveform





Package Outline

TO-220 Full PAK



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.16	10.32
E1	9.94	10.04	10.14
E2	9.36	9.46	9.56
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A4	2.66	2.76	2.86
A5	1.00REF		
c	0.45	0.50	0.60
D	15.67	15.87	16.07
Q	9.40REF		
H1	6.70REF		
e	2.54BSC		
Φ P	3.18REF		
L	12.78	12.98	13.18
L1	2.83	2.93	3.03
L2	7.70	7.80	7.90
Φ P1	1.40	1.50	1.60
Φ P2	0.95	1.00	1.05
Φ P3	3.45REF		
θ 1	3°	5°	7°
θ 2	-	45°	-
F1	1.00	1.50	2.00
F2	13.80	13.90	14.00
F3	3.20	3.30	3.40
F4	5.30	5.40	5.50
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
G3	1.25	1.35	1.45
b1	1.23	1.28	1.38
b2	0.75	0.80	0.90
K1	0.65	0.70	0.75
R	0.50REF		

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