

WPCT65N640-HAF

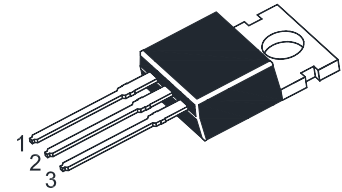
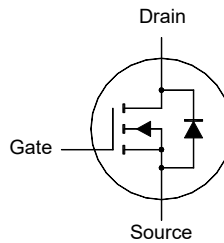
N-Channel Enhancement Mode MOSFET

Features

- Low $R_{DS(on)}$
- Low Gate Charge
- Halogen and Antimony Free(HAF), RoHS compliant

Application

- DC-DC converters
- Lighting



1.Gate 2.Drain 3.Source
TO-220FB Plastic Package

Key Parameters

Parameter	Value	Unit
BV_{DSS}	650	V
$R_{DS(ON) Max}$	0.64 @ $V_{GS} = 10 V$	Ω
$V_{GS(th) typ}$	3	V
$Q_g typ$	10 @ $V_{GS} = 10 V$	nC

Absolute Maximum Ratings(at $T_a = 25^\circ C$ unless otherwise specified)

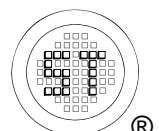
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 30	V
Drain Current	I_D	4.8 3	A
		$T_c = 25^\circ C$ $T_c = 100^\circ C$	
Peak Drain Current, Pulsed ¹⁾	I_{DM}	20	A
Avalanche Current	I_{AS}	2.1	A
Single Pulse Avalanche Energy ²⁾	E_{AS}	174	mJ
Power Dissipation	P_D	39.6	W
		$T_c = 25^\circ C$	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.1	$^\circ C/W$
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	53	$^\circ C/W$

¹⁾ Pulse Test: Pulse Width $\leq 100 \mu s$, Duty Cycle $\leq 2\%$, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ C$.

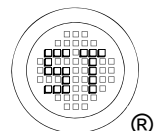
²⁾ Limited by $T_{J(MAX)}$, starting $T_J = 25^\circ C$, $L = 79 mH$, $R_g = 25 \Omega$, $I_D = 2.1 A$, $V_{GS} = 10 V$.



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Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $I_D = 250 \mu\text{A}$	BV_{DSS}	650	-	-	V
Drain-Source Leakage Current at $V_{DS} = 520 \text{ V}$	I_{DSS}	-	-	1	μA
Gate Leakage Current at $V_{GS} = \pm 24 \text{ V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	$V_{GS(th)}$	2	-	4	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}$	$R_{DS(on)}$	-	0.56	0.64	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 5 \text{ V}, I_D = 3.5 \text{ A}$	g_{FS}	-	4.2	-	S
Gate Resistance at $V_{GS} = 0 \text{ V}, V_{DS} = 0 \text{ V}, f = 1 \text{ MHz}$	R_g	-	5.8	-	Ω
Input Capacitance at $V_{GS} = 0 \text{ V}, V_{DS} = 300 \text{ V}, f = 1 \text{ MHz}$	C_{iss}	-	399	-	pF
Output Capacitance at $V_{GS} = 0 \text{ V}, V_{DS} = 300 \text{ V}, f = 1 \text{ MHz}$	C_{oss}	-	25	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0 \text{ V}, V_{DS} = 300 \text{ V}, f = 1 \text{ MHz}$	C_{rss}	-	4.9	-	pF
Gate charge total at $V_{DS} = 325 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}$	Q_g	-	10	-	nC
Gate to Source Charge at $V_{DS} = 325 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}$	Q_{gs}	-	2.7	-	nC
Gate to Drain Charge at $V_{DS} = 325 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}$	Q_{gd}	-	3.6	-	nC
Turn-On Delay Time at $V_{DS} = 323 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}, R_G = 24 \Omega$	$t_{d(on)}$	-	22	-	ns
Turn-On Rise Time at $V_{DS} = 323 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}, R_G = 24 \Omega$	t_r	-	14	-	ns
Turn-Off Delay Time at $V_{DS} = 323 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}, R_G = 24 \Omega$	$t_{d(off)}$	-	17	-	ns
Turn-Off Fall Time at $V_{DS} = 323 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}, R_G = 24 \Omega$	t_f	-	51	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 1 \text{ A}, V_{GS} = 0 \text{ V}$	V_{SD}	-	-	1.4	V
Body-Diode Continuous Current	I_S	-	-	4.8	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	20	A
Body Diode Reverse Recovery Time at $I_S = 3.5 \text{ A}, di/dt = 100 \text{ A} / \mu\text{s}$	t_{rr}	-	275	-	ns
Body Diode Reverse Recovery Charge at $I_S = 3.5 \text{ A}, di/dt = 100 \text{ A} / \mu\text{s}$	Q_{rr}	-	1.5	-	μC



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Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

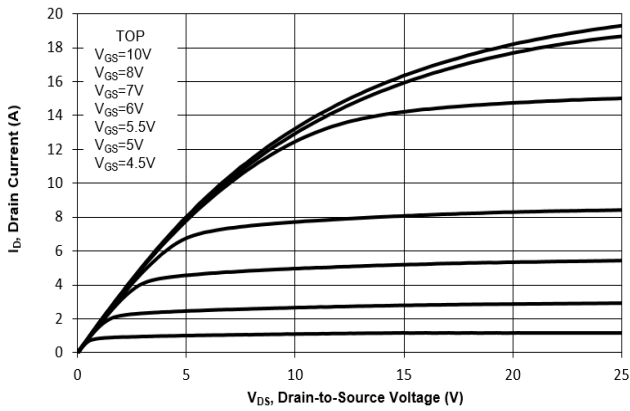


Fig. 2 Typical Transfer Characteristics

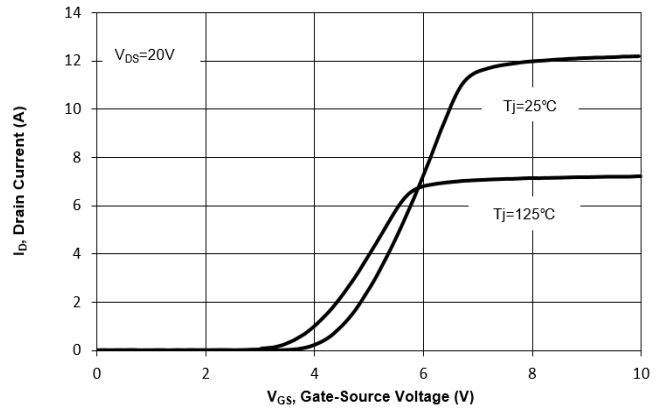


Fig. 3 On-Resistance vs. Drain Current

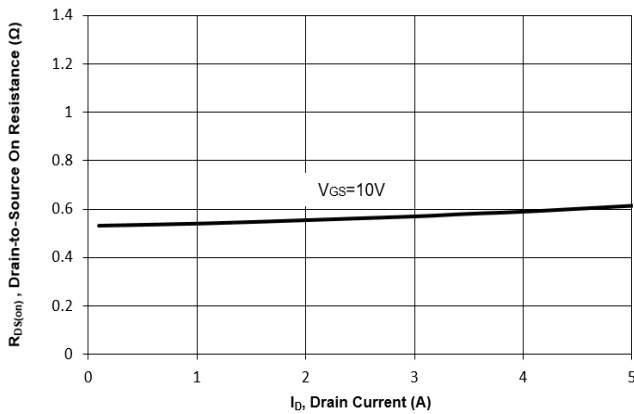


Fig. 4 On-Resistance vs. Gate Voltage

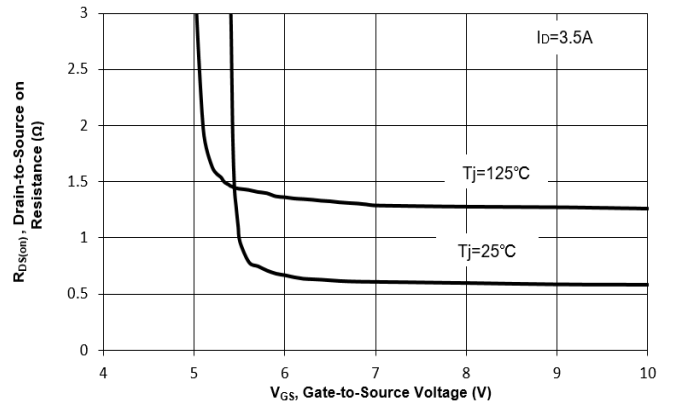


Fig. 5 On-Resistance vs. T_j

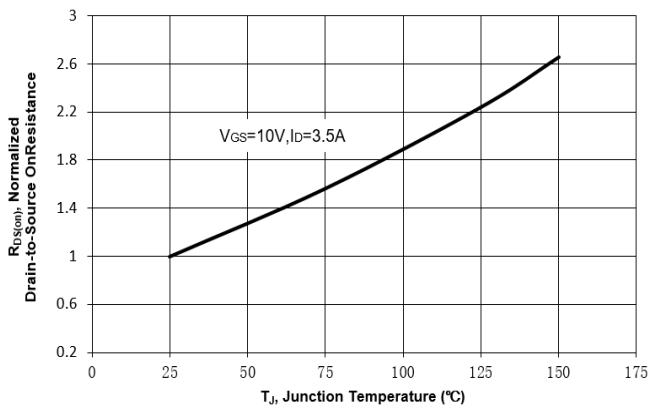
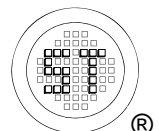
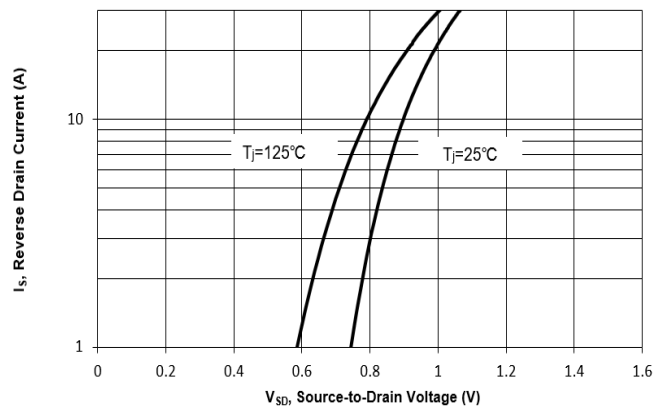


Fig. 6 Typical Body-Diode Forward Characteristics



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Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

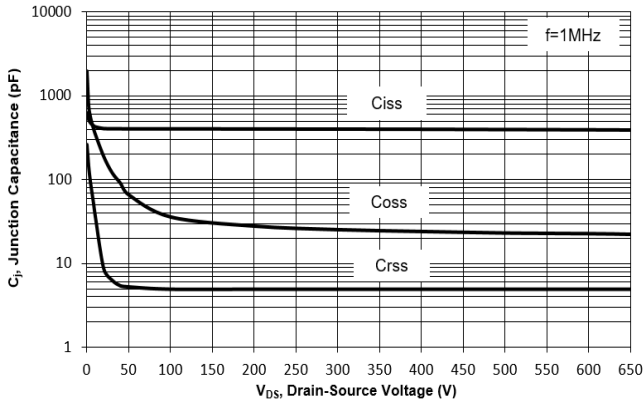


Fig. 8 Drain-Source Leakage Current vs. Tj

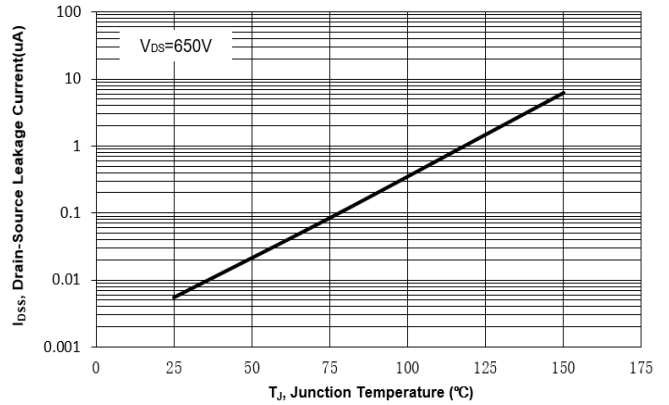


Fig. 9 V(BR)DSS vs. Junction Temperature

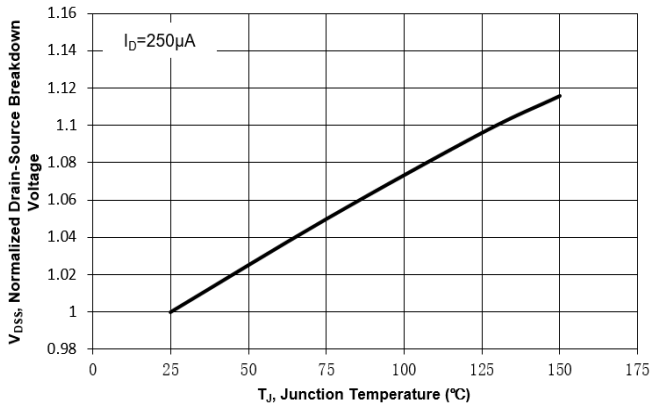


Fig. 10 Gate Threshold Variation vs. Tj

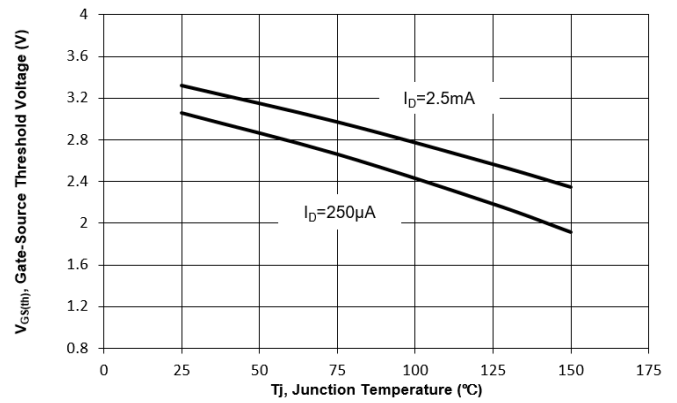


Fig. 11 Gate Charge

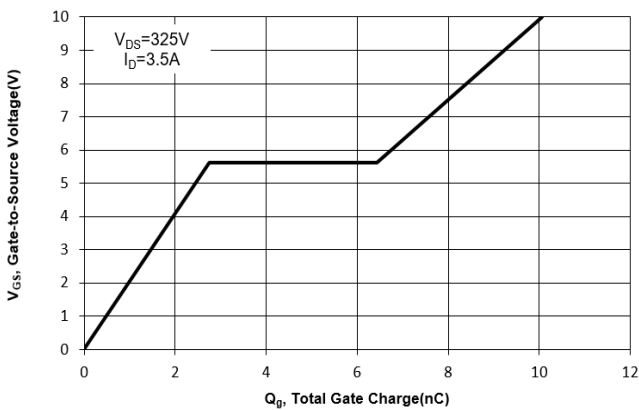
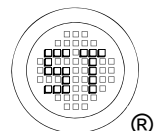
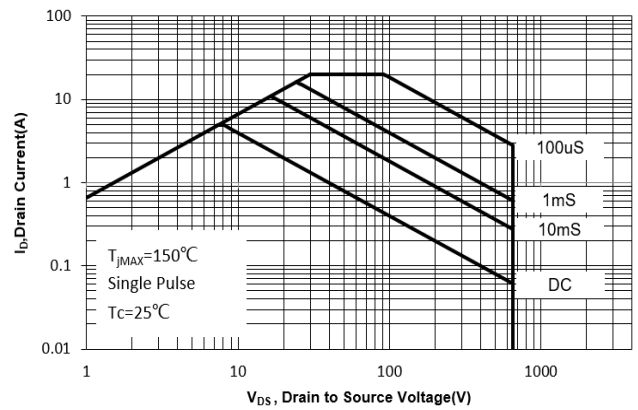


Fig. 12 Safe Operation Area



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Electrical Characteristics Curves

Fig.13 Normalized Maximum Transient Thermal Impedance($Z_{\theta JC}$)

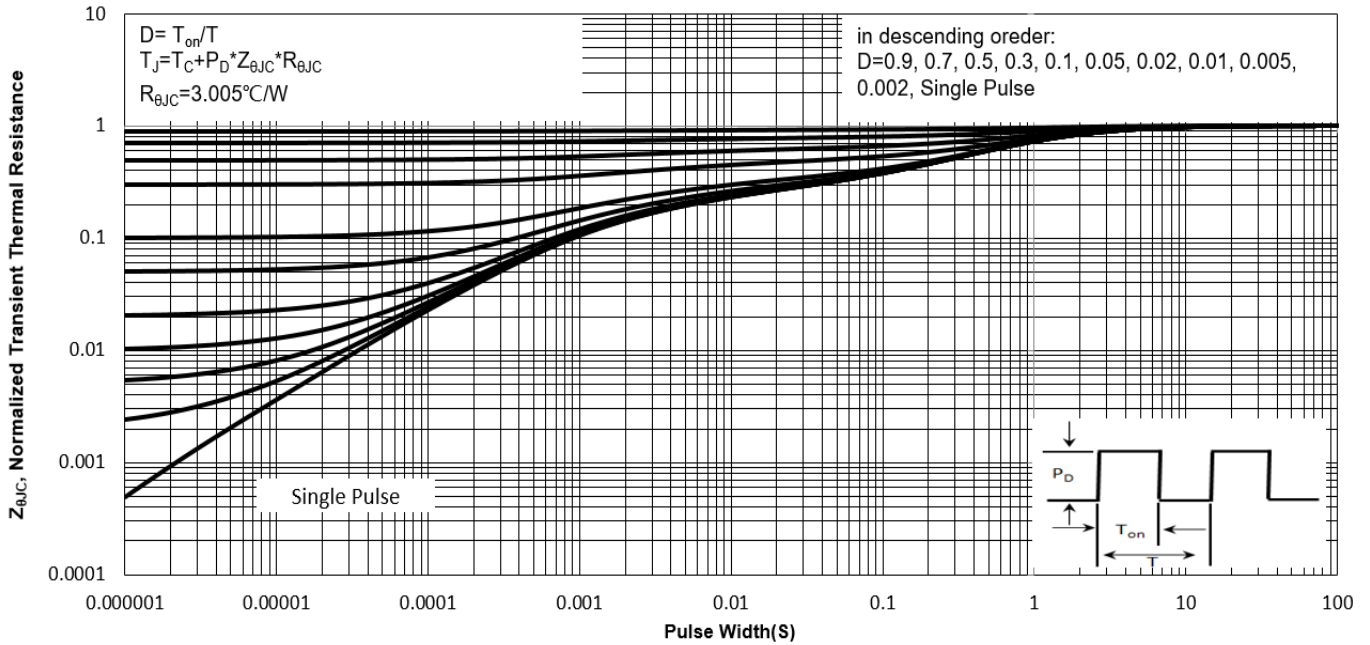
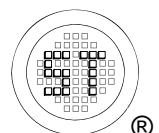
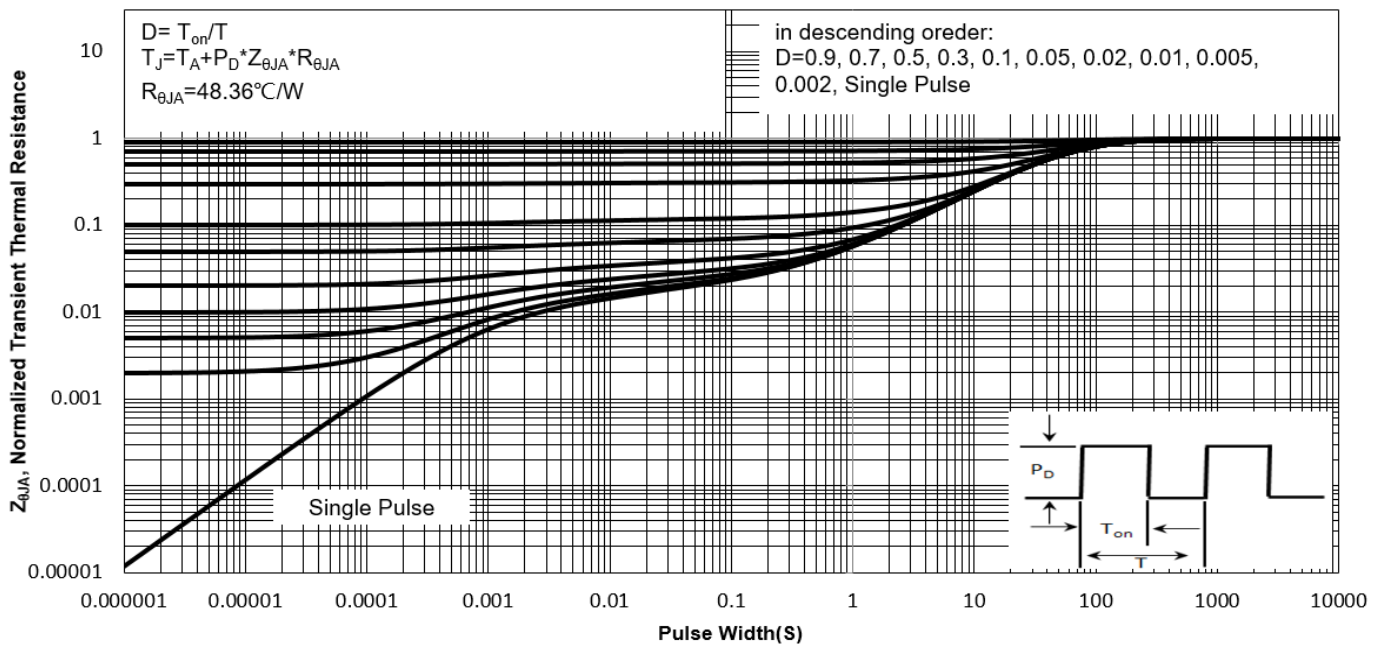


Fig.14 Normalized Maximum Transient Thermal Impedance($Z_{\theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

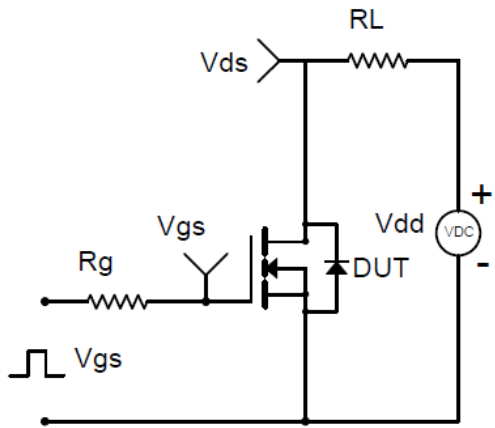


Fig.1-2 Switching Waveform

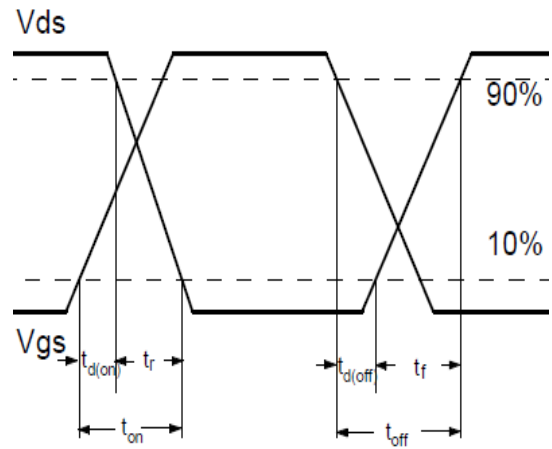


Fig.2-1 Gate charge test circuit

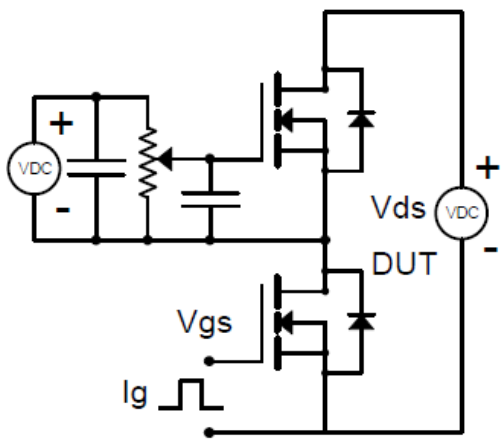


Fig.2-2 Gate charge waveform

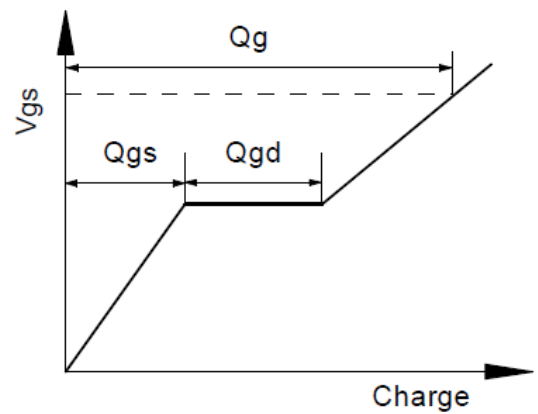


Fig.3-1 Avalanche test circuit

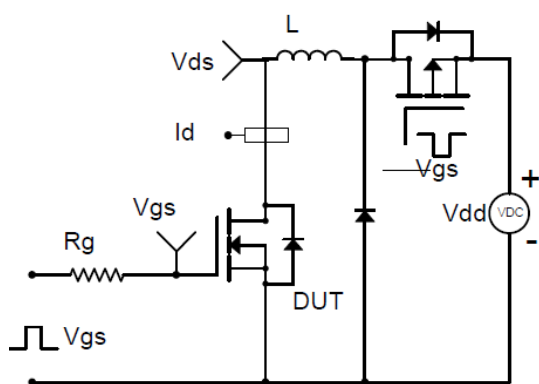
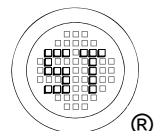
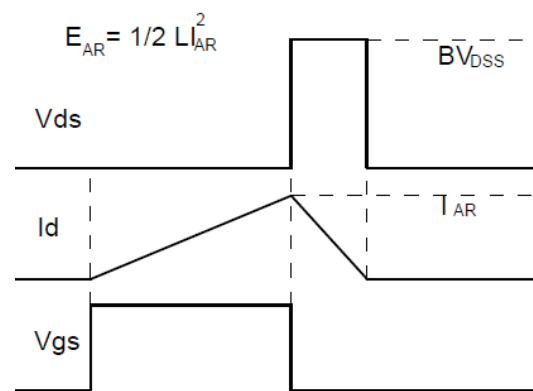


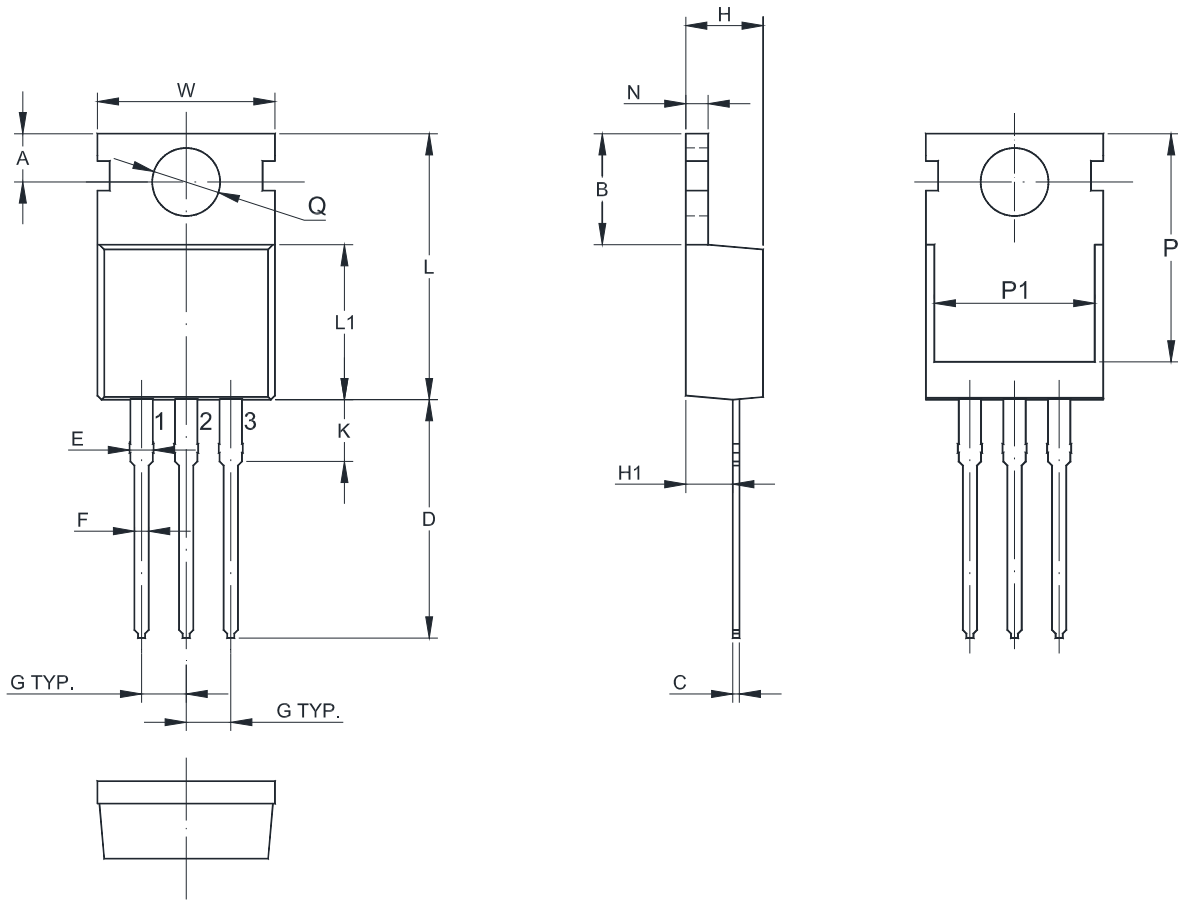
Fig.3-2 Avalanche waveform



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Package Outline Dimensions (Units: mm)

TO-220FB



UNIT	A	B	C	D	E	F	G	W	H	H1	K	L	L1	N
mm	2.9	6.8	0.7	15	1.5	0.9	2.54	10.2	4.7	2.5	3.1	16.8	9.4	1.4
	2.7	6.4	0.3	11	1.1	0.7	TYP.	9.8	4.3	2.2	2.7	14.8	9.0	1.2

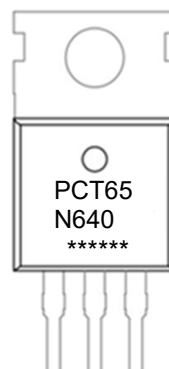
UNIT	P	P1	Q
mm	13.3	8.2	3.7
	12.7	7.6	3.5

Marking information

" PCT65N640 " = Part No.

" ***** " = Date Code Marking

Font type: Arial



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