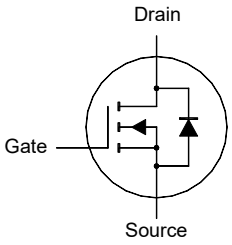
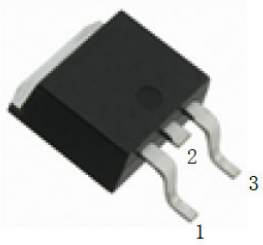
WPR65N640-HAF

N-Channel Enhancement Mode MOSFET

Features

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





1.Gate 2.Drain 3.Source

TO-252 Plastic Package

Application

- DC-DC converters
- Lighting

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℃ unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	± 30	V
Drain Current	T_c = 25℃ T_c = 100℃	I_D	6.4 4	A
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	T_c = 25℃	P_D	61.4	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2	℃/W
Thermal Resistance from Junction to Ambient [3]	$R_{\theta JA}$	35	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 150°C.

[2] Limited by $T_{J(MAX)}$, starting T_J = 25 °C, L = 79 mH, R_g = 25 Ω, I_{AS} = 2.1 A, V_{GS} = 10 V.

[3] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Dated: 15/08/2023 Rev: 03

Characteristics at T_a = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at I_D = 250 µA	BV_{DSS}	650	-	-	V
Drain-Source Leakage Current at V_{DS} = 520 V	I_{DSS}	-	-	1	µA
Gate Leakage Current at V_{GS} = ± 24 V	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, I_D = 250 µA	$V_{GS(th)}$	2	-	4	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 3.5 A	$R_{DS(on)}$	-	0.55	0.64	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 5 V, I_D = 3.5 A	g_{FS}	-	4.2	-	S
Gate Resistance at V_{GS} = 0 V, V_{DS} = 0 V, f = 1 MHz	R_g	-	5.8	-	Ω
Input Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{iss}	-	399	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{oss}	-	25	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{rss}	-	4.9	-	pF
Gate charge total at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A	Q_g	-	10	-	nC
Gate to Source Charge at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A	Q_{gs}	-	2.7	-	nC
Gate to Drain Charge at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A	Q_{gd}	-	3.6	-	nC
Turn-On Delay Time at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A, R_G = 24 Ω	$t_{d(on)}$	-	22	-	ns
Turn-On Rise Time at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A, R_G = 24 Ω	t_r	-	14	-	ns
Turn-Off Delay Time at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A, R_G = 24 Ω	$t_{d(off)}$	-	17	-	ns
Turn-Off Fall Time at V_{DS} = 325 V, V_{GS} = 10 V, I_D = 3.5 A, R_G = 24 Ω	t_f	-	51	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at I_S = 1 A, V_{GS} = 0 V	V_{SD}	-	-	1.4	V
Body-Diode Continuous Current	I_S	-	-	6.4	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	20	A
Body Diode Reverse Recovery Time at I_S = 3.5 A, di/dt = 100 A / µs	t_{rr}	-	275	-	ns
Body Diode Reverse Recovery Charge at I_S = 3.5 A, di/dt = 100 A / µs	Q_{rr}	-	1.5	-	µC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

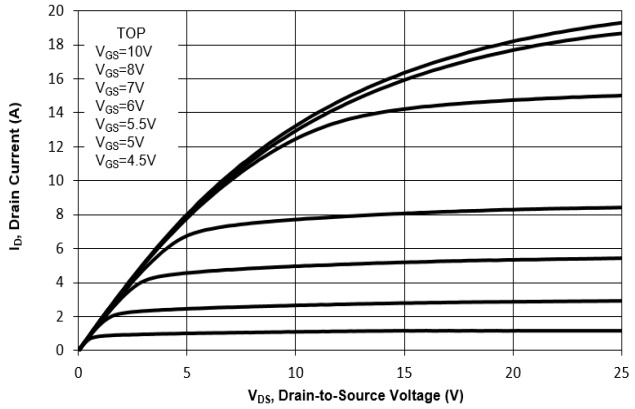


Fig. 2 Typical Transfer Characteristics

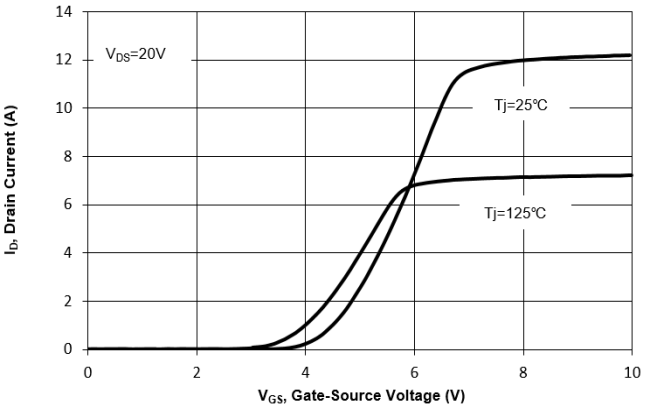


Fig. 3 On-Resistance vs. Drain Current

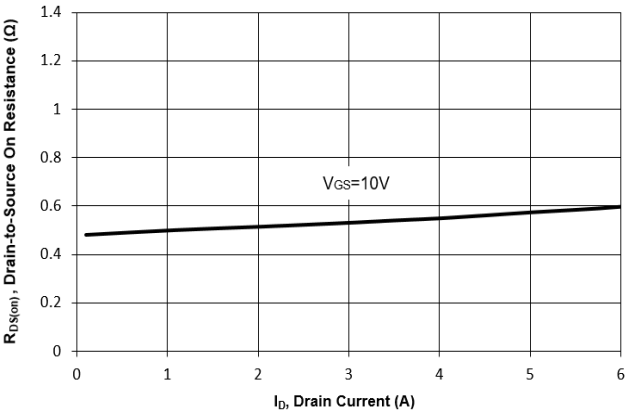


Fig. 4 On-Resistance vs. Gate to Source Voltage

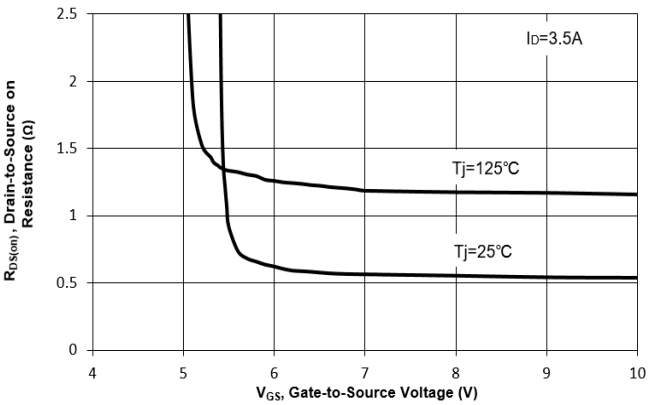


Fig. 5 On-Resistance vs.T_j

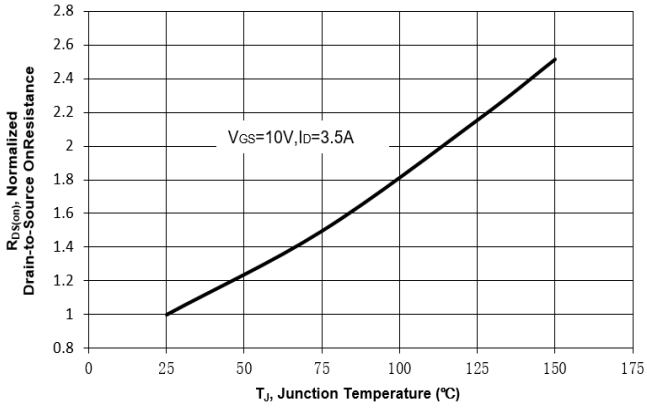
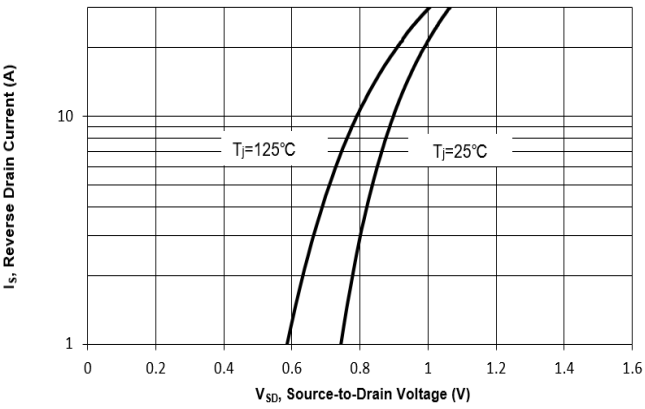


Fig. 6 Typical Body-Diode Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

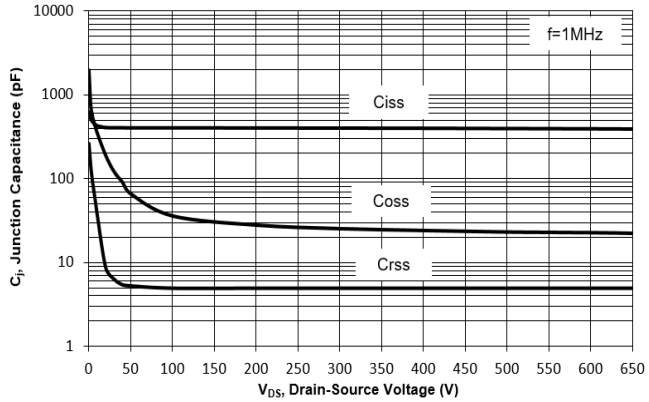


Fig. 8 Drain-Source Leakage Current vs. T_j

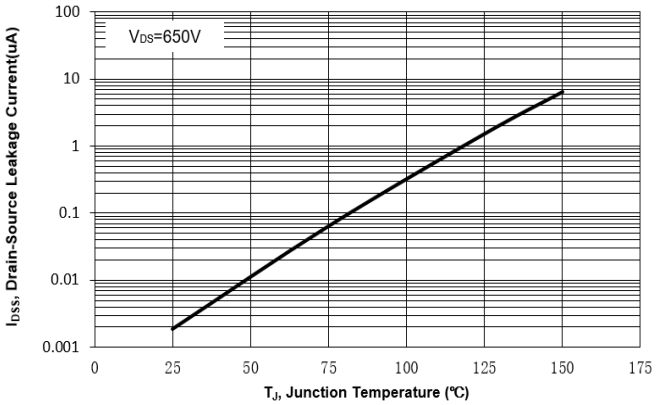


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

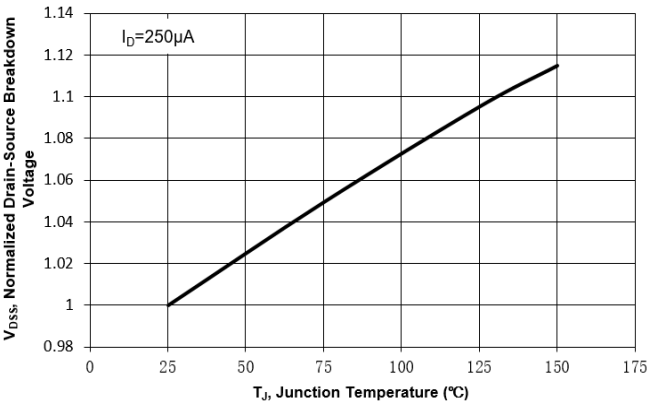


Fig. 10 Gate Threshold Variation vs. T_j

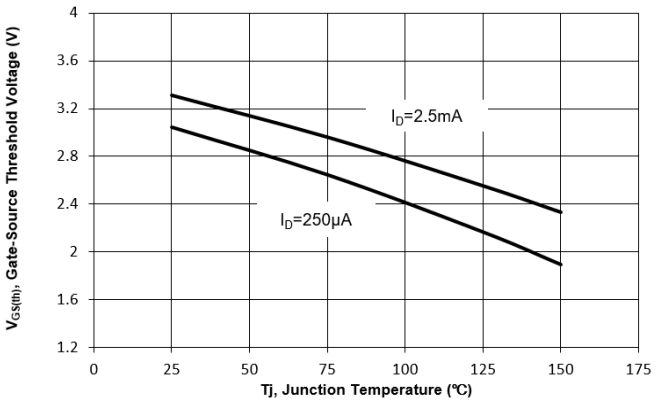


Fig. 11 Gate Charge

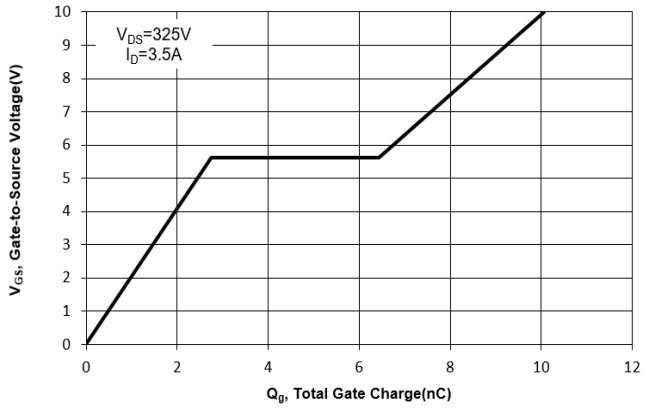
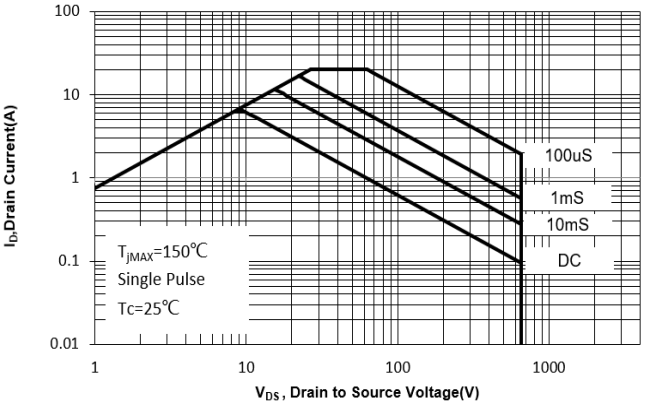


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

Fig.13 Normalized Maximum Transient Thermal Impedance($z_{\Theta JC}$)

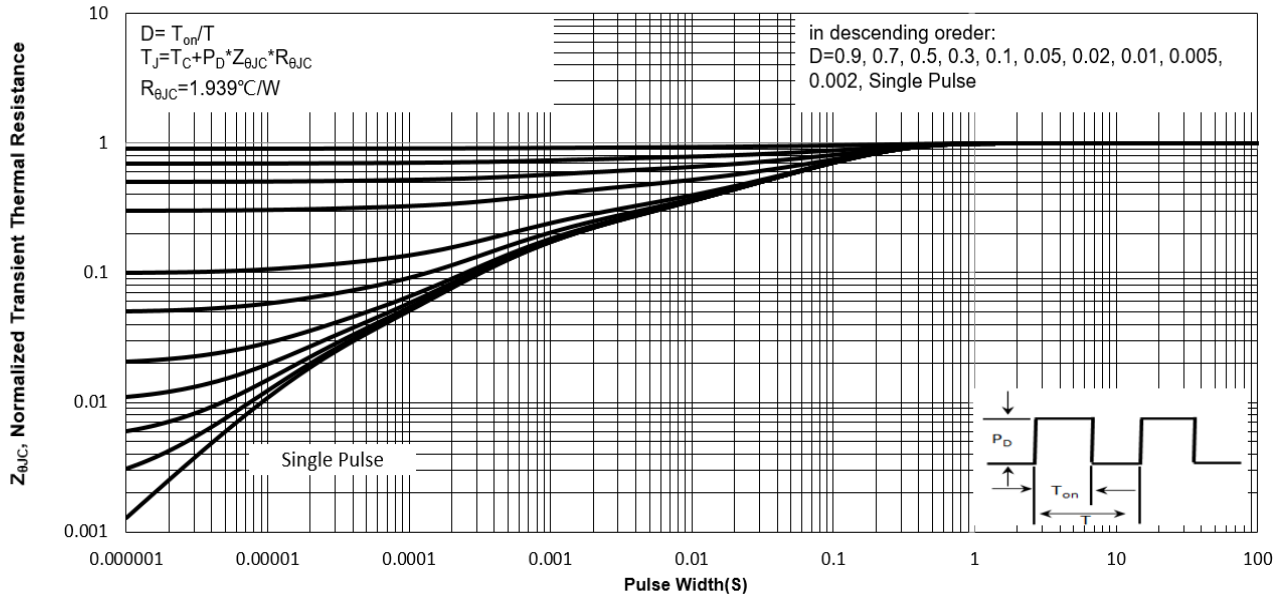
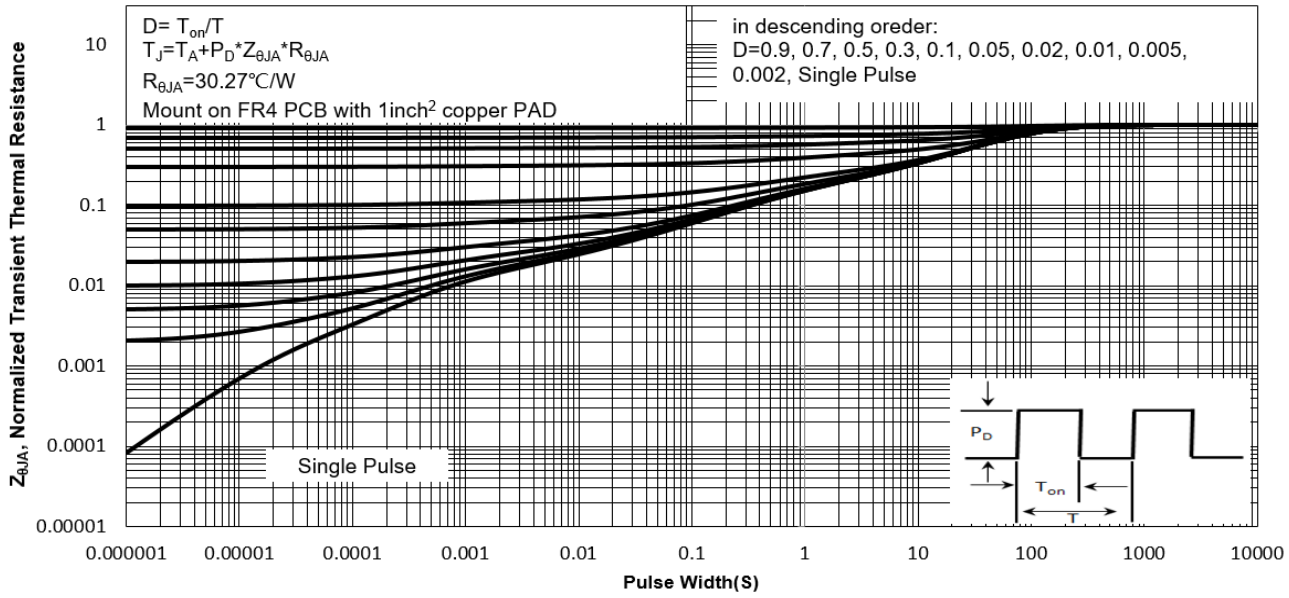


Fig.14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

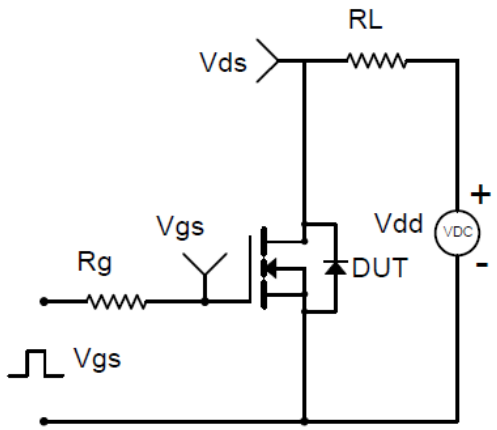


Fig.1-2 Switching Waveform

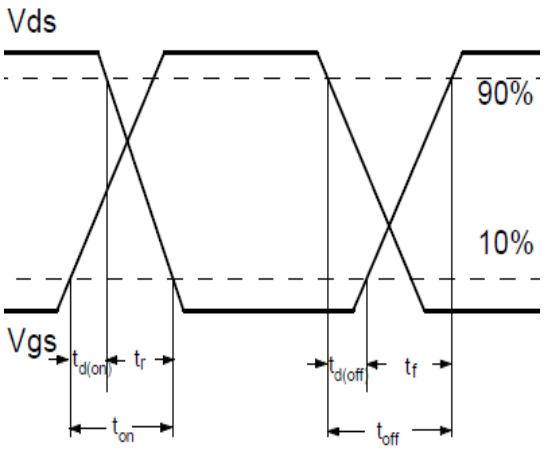


Fig.2-1 Gate charge test circuit

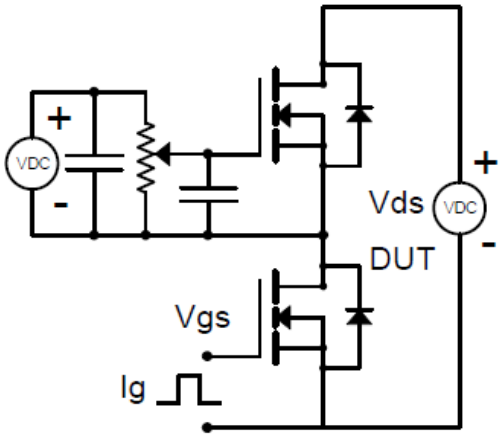


Fig.2-2 Gate charge waveform

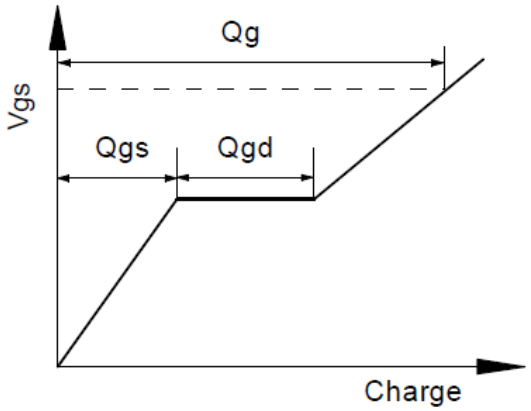


Fig.3-1 Avalanche test circuit

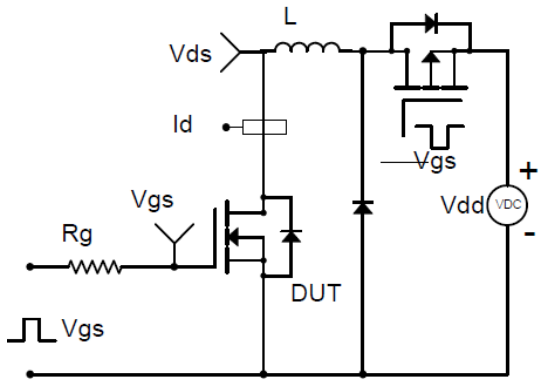
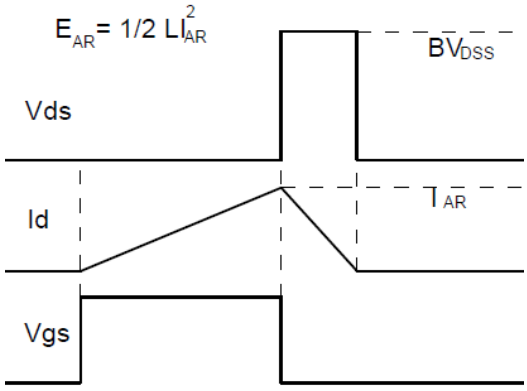
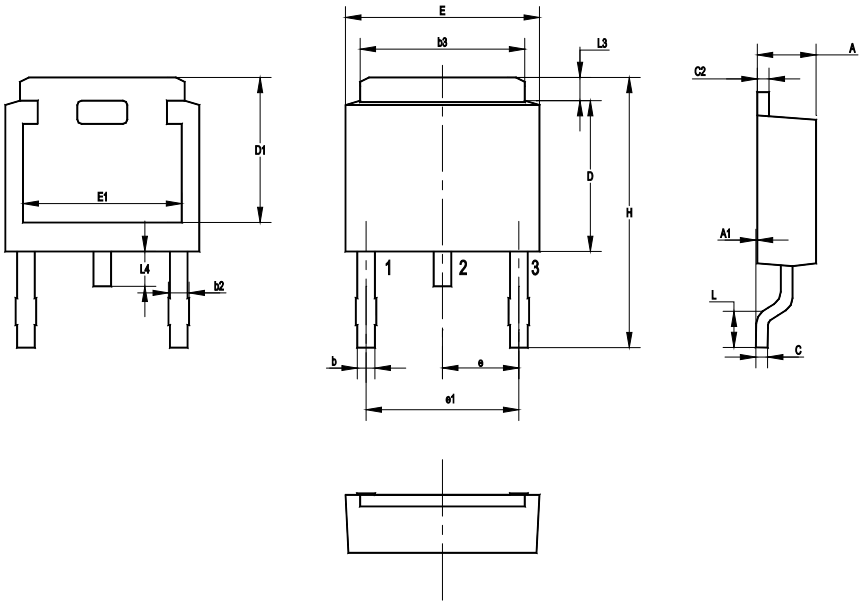


Fig.3-2 Avalanche waveform

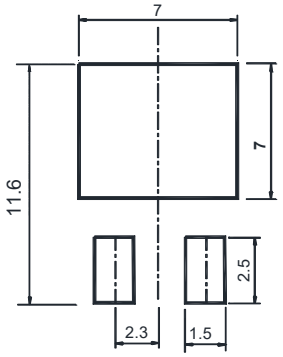


Package Outline (Dimensions in mm) TO-252



UNIT	A	A1	b	b2	b3	C	C2	D	D1	E	E1	e	e1	H	L	L3	L4
mm	2.5	0.15	1.0	1.15	5.5	0.65	0.65	6.2	5.4	6.7	5.0	2.30	4.60	10.7	1.78	1.20	1.10
	2.1	0	0.5	0.65	4.9	0.4	0.4	5.6	5.0	6.1	4.6	TYP.	TYP.	9	1.40	0.85	0.51

Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
TO-252	16	8 ± 0.1	0.315 ± 0.004	330	13	2,500

Marking information

" PR65N640 " = Part No.

" ****** " = Date Code Marking

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