

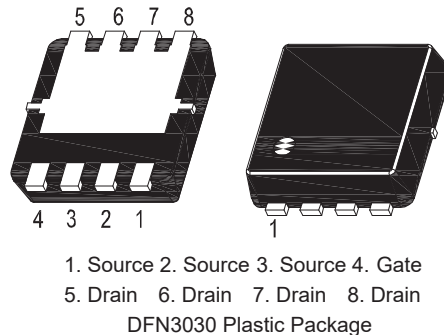
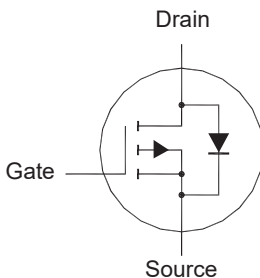
P-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package
- Low Gate-Source Threshold Voltage
- Halogen and Antimony Free(HAF), RoHS compliant

Applications

- Motor Drive
- Synchronous Rectification in DC/DC and AC/DC Converters



Key Parameters

Parameter	Value	Unit
$-BV_{DS}$	40	V
$R_{DS(ON)}$ Max	19 @ $-V_{GS} = 10$ V	m Ω
	29 @ $-V_{GS} = 4.5$ V	
$-V_{GS(th)}$ typ	1.5	V
Q_g typ	42 @ $-V_{GS} = 10$ V	nC

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current	$-I_D$	30	A
		19	
Peak Drain Current, Pulsed ¹⁾	$-I_{DM}$	120	A
Single-Pulse Avalanche Current	$-I_{AS}$	29	A
Single-Pulse Avalanche Energy ²⁾	E_{AS}	42	mJ
Power Dissipation	P_D	30	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	5	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient ³⁾	$R_{\theta JA}$	50	$^\circ\text{C/W}$

¹⁾ Pulse Test: Pulse Width ≤ 100 μs , Duty Cycle $\leq 2\%$, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 175^\circ\text{C}$.

²⁾ Limited by $T_{J(MAX)}$, starting $T_J = 25^\circ\text{C}$, $L = 0.1$ mH, $R_g = 25$ Ω , $-I_{AS} = 29$ 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.

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

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $-I_D = 250\ \mu\text{A}$	$-BV_{DS}$	40	-	-	V
Drain-Source Leakage Current at $-V_{DS} = 32\ \text{V}$	$-I_{DSS}$	-	-	1	μA
Gate Leakage Current at $V_{GS} = \pm 20\ \text{V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $-I_D = 250\ \mu\text{A}$	$-V_{GS(th)}$	1.2	-	2.5	V
Drain-Source On-State Resistance at $-V_{GS} = 10\ \text{V}$, $-I_D = 10\ \text{A}$ at $-V_{GS} = 4.5\ \text{V}$, $-I_D = 8\ \text{A}$	$R_{DS(on)}$	- -	15 -	19 29	m Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS} = 5\ \text{V}$, $-I_D = 5\ \text{A}$	g_{fs}	-	15	-	S
Gate resistance at $V_{DS} = 0\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	R_g	-	5.1	-	Ω
Input Capacitance at $-V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}	-	2573	-	pF
Output Capacitance at $-V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}	-	174	-	pF
Reverse Transfer Capacitance at $-V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}	-	111	-	pF
Total Gate Charge at $-V_{GS} = 10\ \text{V}$, $-V_{DS} = 20\ \text{V}$, $-I_D = 10\ \text{A}$ at $-V_{GS} = 4.5\ \text{V}$, $-V_{DS} = 20\ \text{V}$, $-I_D = 10\ \text{A}$	Q_g	- -	42 19	- -	nC
Gate-Source Charge at $-V_{GS} = 10\ \text{V}$, $-V_{DS} = 20\ \text{V}$, $-I_D = 10\ \text{A}$	Q_{gs}	-	8.5	-	nC
Gate-Drain Charge at $-V_{GS} = 10\ \text{V}$, $-V_{DS} = 20\ \text{V}$, $-I_D = 10\ \text{A}$	Q_{gd}	-	5.5	-	nC
Turn-On Delay Time at $-V_{DD} = 20\ \text{V}$, $-V_{GS} = 10\ \text{V}$, $-I_D = 10\ \text{A}$, $R_g = 3.3\ \Omega$	$t_{d(on)}$	-	14	-	ns
Turn-On Rise Time at $-V_{DD} = 20\ \text{V}$, $-V_{GS} = 10\ \text{V}$, $-I_D = 10\ \text{A}$, $R_g = 3.3\ \Omega$	t_r	-	26	-	ns
Turn-Off Delay Time at $-V_{DD} = 20\ \text{V}$, $-V_{GS} = 10\ \text{V}$, $-I_D = 10\ \text{A}$, $R_g = 3.3\ \Omega$	$t_{d(off)}$	-	27	-	ns
Turn-Off Fall Time at $-V_{DD} = 20\ \text{V}$, $-V_{GS} = 10\ \text{V}$, $-I_D = 10\ \text{A}$, $R_g = 3.3\ \Omega$	t_f	-	5	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $-I_S = 1\ \text{A}$, $V_{GS} = 0\ \text{V}$	$-V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	30	A
Body-Diode Continuous Current, Pulsed	$-I_{SM}$	-	-	120	A
Body Diode Reverse Recovery Time at $-I_S = 10\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$	t_{rr}	-	14.4	-	ns
Body Diode Reverse Recovery Charge at $-I_S = 10\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$	Q_{rr}	-	9.4	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

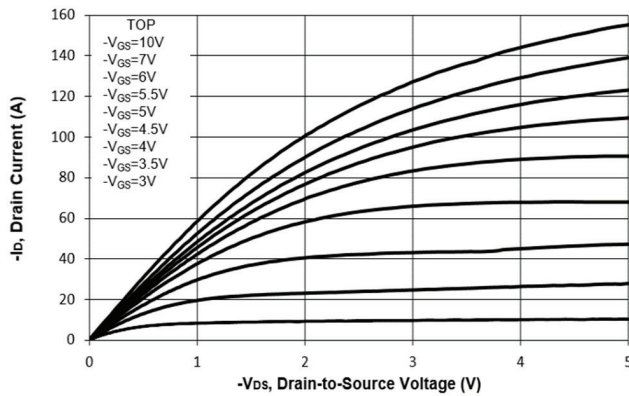


Fig. 2 Typical Transfer Characteristics

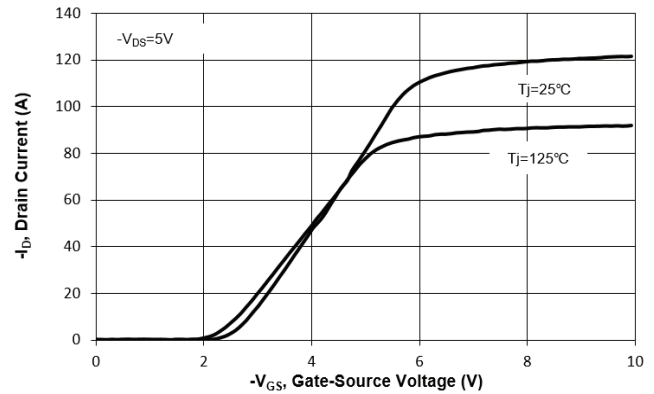


Fig. 3 on-Resistance vs Drain Current

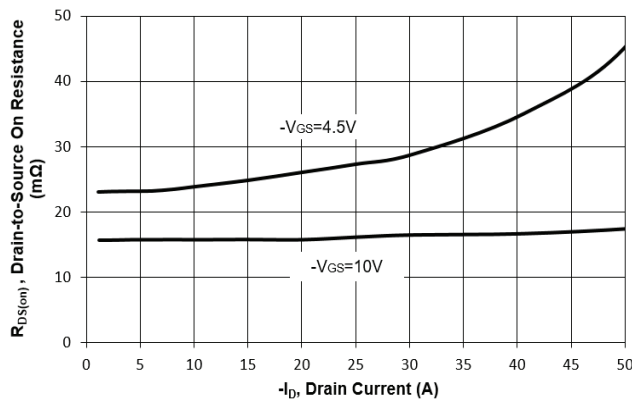


Fig. 4 on-Resistance vs. Gate to Source Voltage

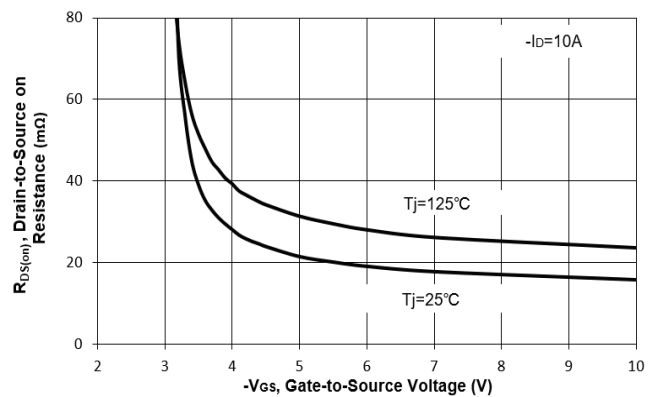


Fig. 5 on-Resistance vs. Tj

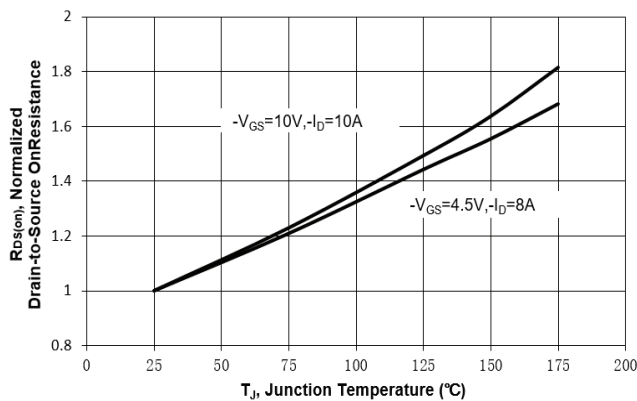
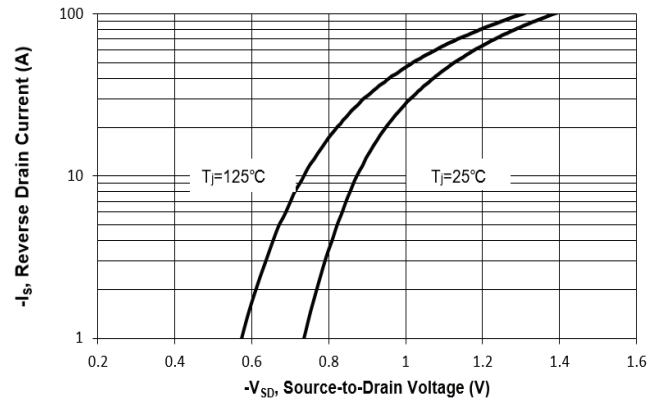


Fig. 6 Typical Body Diode Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

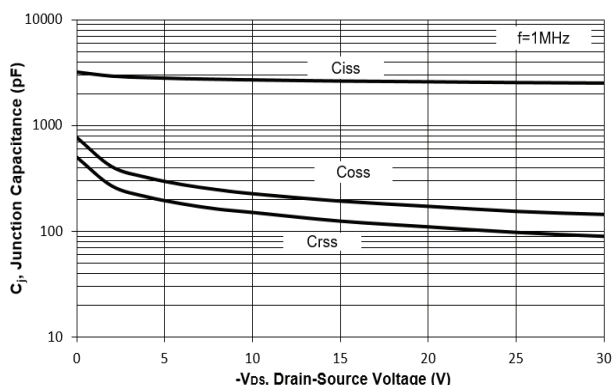


Fig. 8 Drain-Source Leakage Current vs. T_J

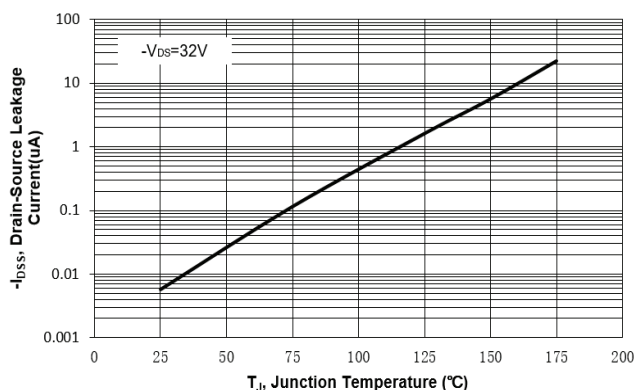


Fig. 9 V_{(BR)DSS} vs. Junction Temperature

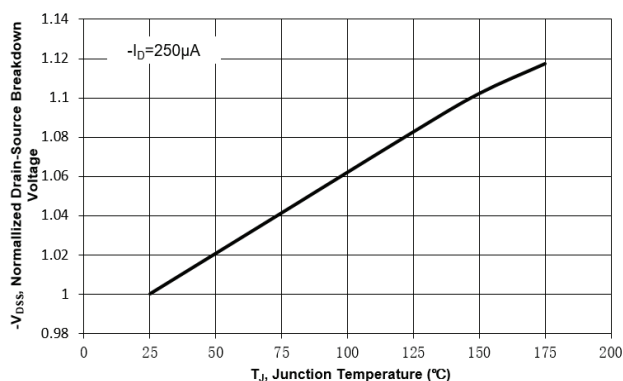


Fig. 10 Gate Threshold Variation vs. T_J

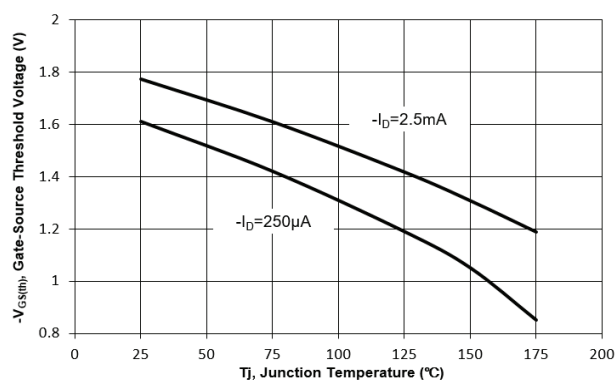


Fig. 11 Gate Charge

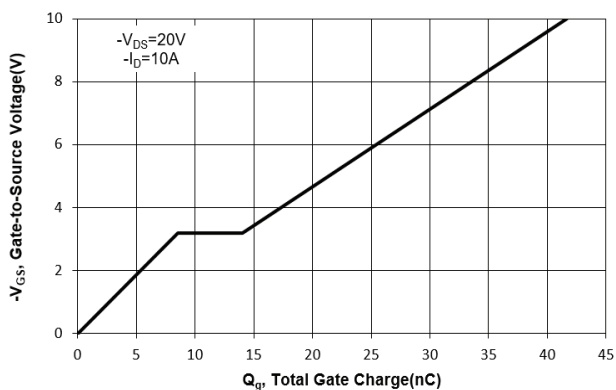
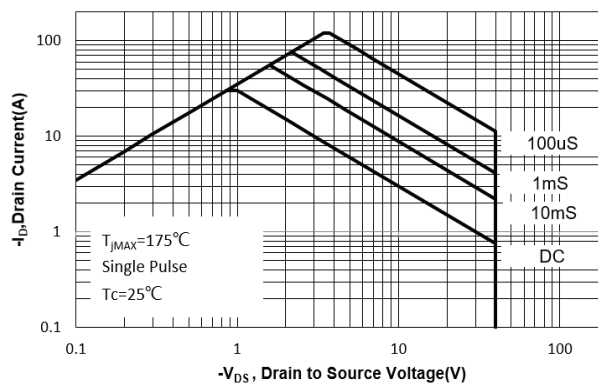
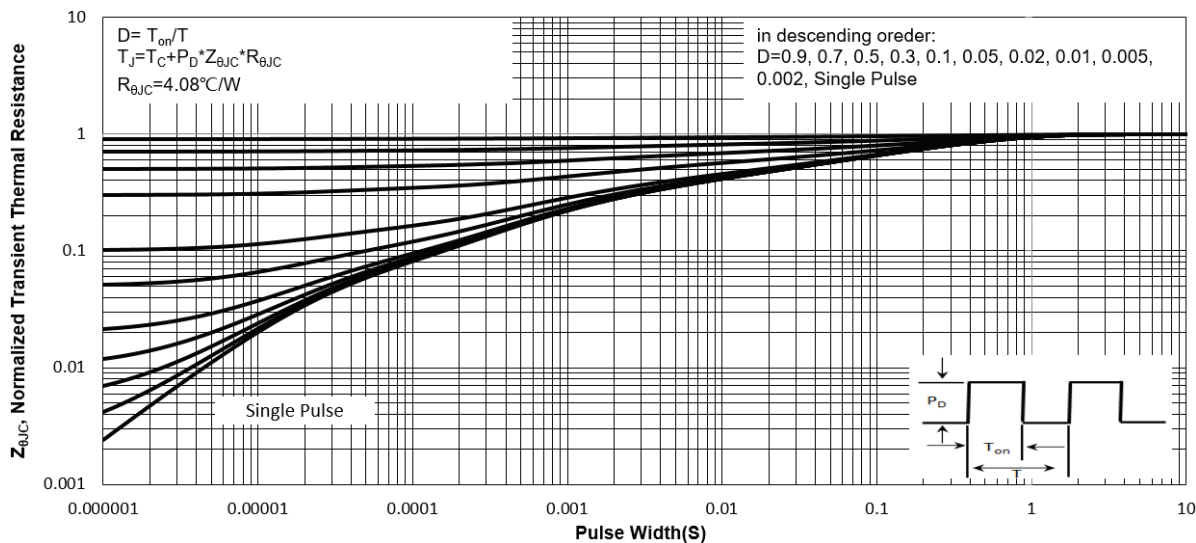
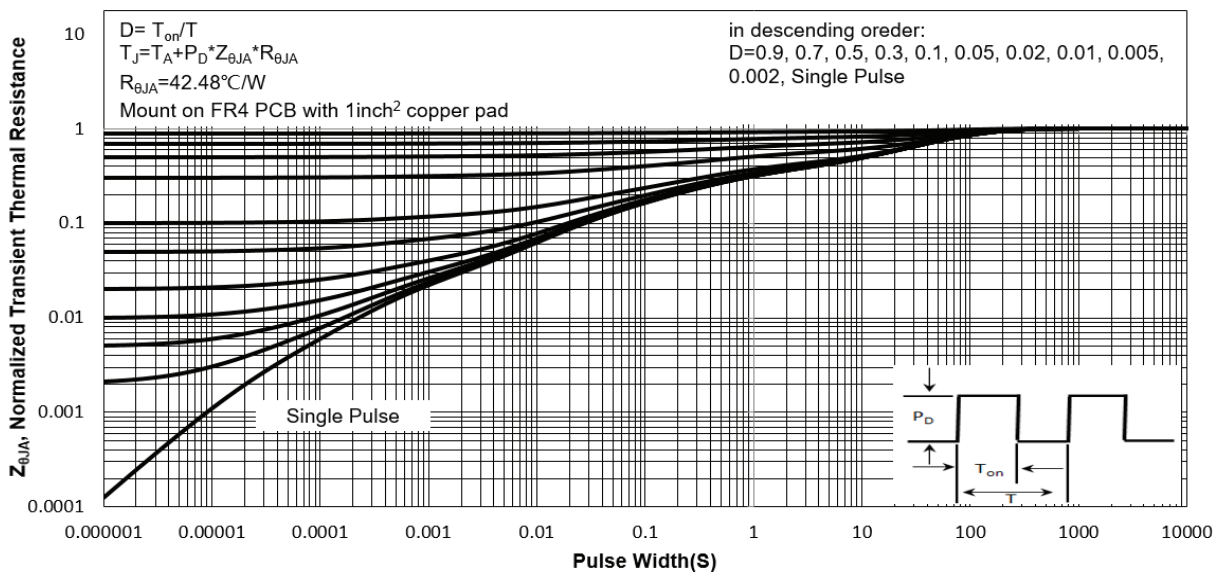


Fig. 12 Safe Operation Area



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

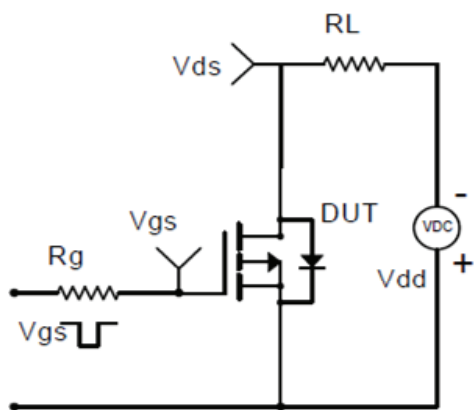


Fig.1-2 Switching Waveform

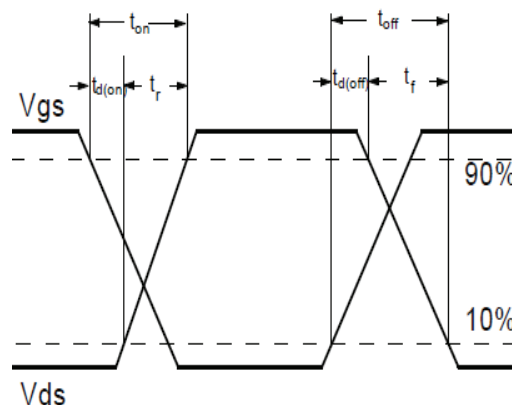


Fig.2-1 Gate charge test circuit

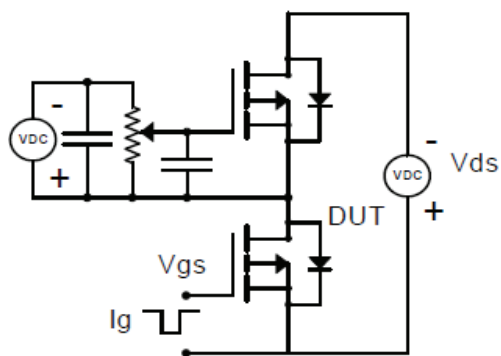


Fig.2-2 Gate charge waveform

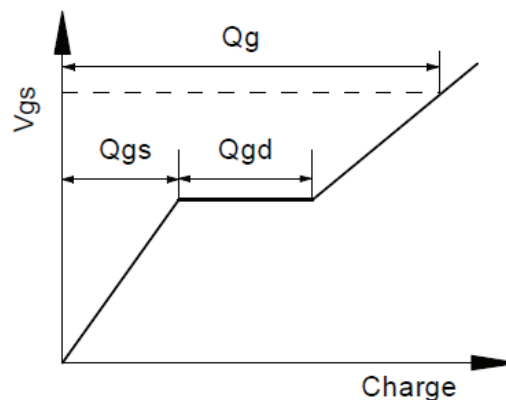


Fig.3-1 Avalanche test circuit

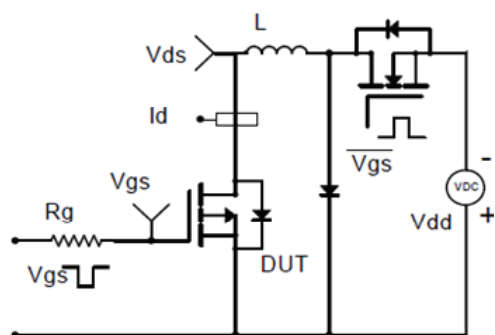
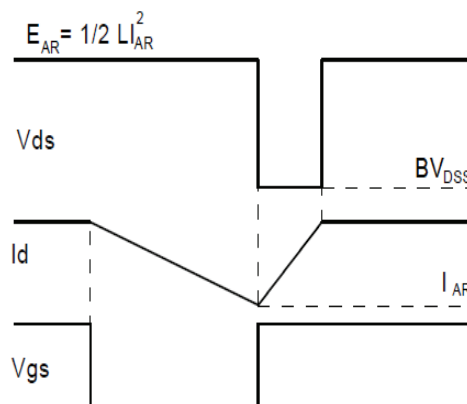
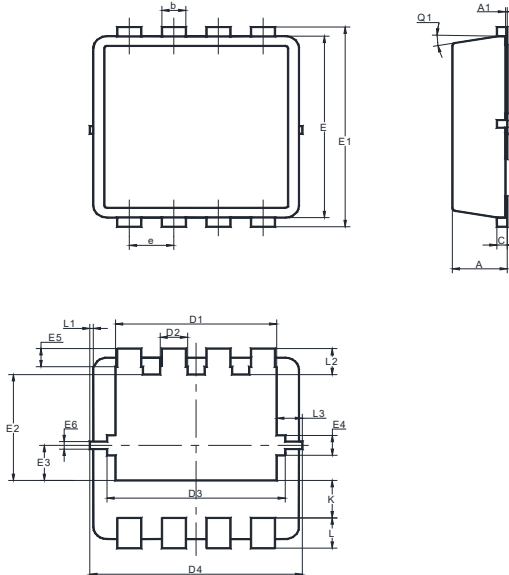


Fig.3-2 Avalanche waveform



Package Outline Dimensions (Units: mm)

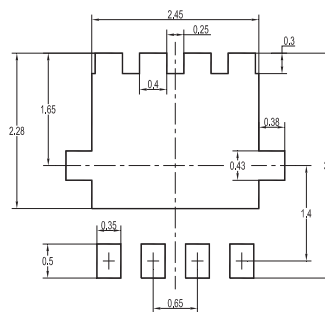
DFN3030



UNIT	A	A1	b	c	D1	D2	D3	D4	E	E1	E2	E3	E4
mm	0.9	0.05	0.35	0.25	2.6	0.5	2.7	3.2	3.1	3.3	1.85	0.68	0.43
	0.7	0	0.24	0.1	2.4	0.3	2.5	3	2.9	3.1	1.65	0.48	0.23

UNIT	E5	E6	e	K	L	L1	L2	L3	θ1
mm	0.4	0.25	0.7	0.72	0.5	0.1	0.53	0.475	12°
	0.2	0.15	0.6	0.52	0.3	0	0.33	0.275	0°

Recommended Soldering Footprint



Packing information

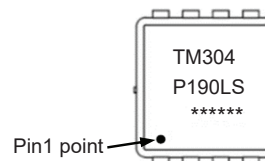
Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN3030	12	8 ± 0.1	0.315 ± 0.004	330	13	5,000

Marking information

" TM304P190LS " = Part No.

" ***** " = Date Code Marking

Font type: Arial



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