

Features

- Enhancement mode transistor-Normally off power switch
- No reverse-recovery charge
- Low gate charge, low output charge
- Ultra high switching frequency
- Qualified according to JEDEC for target applications

Applications

- AC-DC converters
- DC-DC converters
- Fast battery charging
- High density power conversion
- High efficiency power conversion

Benefits

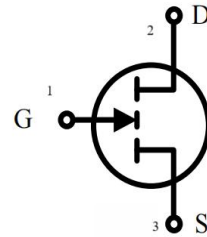
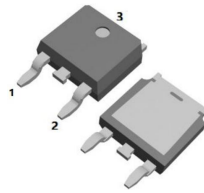
- Enable very high conversion efficiencies
- Supports high operating frequency
- Enables ultrahigh power density designs
- Improved safety & reliability due to cooler operation temperature



Product Summary

V_{DS}	700V
$R_{DS(on)@6V\ typ}$	129m Ω
I_D	11.5A

TO-252-2L



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWEG190N70G	EG190N70G	TO-252-2L	Tape&Reel	13 inches	16mm	2500pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage ($T_J = -55^\circ\text{C}$ to 150°C)	V_{DSS}	700	V
Drain to source voltage transient ¹	$V_{(TR)DSS}$	800	
Drain to source voltage, pulsed ² $T_J = 25^\circ\text{C}$; total time < 10 h $T_J = 125^\circ\text{C}$; total time < 1 h	$V_{DSS,pulse}$	750	V
Continuous current, drain source	I_D	11.5	A
Pulsed current, drain source ³ $V_{GS} = 6V$; $T_{PULSE} = 10\ \mu\text{s}$; $TC = 25^\circ\text{C}$; $V_{GS} = 6V$; $T_{PULSE} = 10\ \mu\text{s}$; $TC = 125^\circ\text{C}$;	$I_{D,pulse}$	20.5 11.5	A
Gate source voltage, continuous ⁴ $T_J = -55^\circ\text{C}$ to 150°C	V_{GS}	-1.4~7	V
Gate source voltage, pulsed	$V_{GS,pulse}$	-20~10	V
Power dissipation	P_{tot}	81	W
Operating temperature	T_J	-55~150	$^\circ\text{C}$
Storage temperature	T_{stg}		
Maximum reflow soldering temperature	T_{sold}	260	$^\circ\text{C}$

1. $V_{DS, transient}$ is intended for non-repetitive events, $t_{PULSE} < 200\ \mu\text{s}$.

2. $V_{DS, pulse}$ is intended for repetitive pulse, $t_{PULSE} < 100\ \text{ns}$.

3. Limit was extracted from characterization test, not measured during production.

4. The minimum V_{GS} is clamped by ESD protection circuit, as shown in Figure 10.

Thermal Resistance

Parameter	Symbol	Limit value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – ambient	R_{thJA}	-	54	-	°C/W	-
Thermal resistance, junction - case	R_{thJC}	-	1.48	-	°C/W	-

Electrical Characteristic (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static characteristics

Gate threshold voltage	$V_{GS(th)}$	1.2 -	1.38 1.38	2.5 -	V	$I_D = 11.1\text{mA}, V_{DS} = V_{GS}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$
Drain-to-source leakage current	I_{DSS}	- -	0.45 6	20 -	μA	$V_{DS} = 700\text{V}, V_{GS} = 0\text{V}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	60	-	μA	$V_{GS} = 6\text{V}, V_{DS} = 0\text{V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	129	190	m Ω	$V_{GS} = 6\text{V}, I_D = 3.9\text{A}, T_j = 25^\circ\text{C}$
		-	246	-	m Ω	$V_{GS} = 6\text{V}, I_D = 3.9\text{A}, T_j = 125^\circ\text{C}$
Gate resistance	R_G	-	2.2	-	Ω	$f = 1\text{MHz}; \text{open drain}$

Dynamic characteristics

Input Capacitance	C_{iss}	-	90	-	pF	$V_{GS} = 0\text{V}, V_{DS} = 400\text{V},$ $f = 100\text{KHz}$
Output Capacitance	C_{oss}	-	33	-		
Reverse Transfer Capacitance	C_{rss}	-	0.9	-		
Effective output capacitance, energy related ¹	$C_{o(er)}$	-	43	-		$V_{GS} = 0\text{V}, V_{DS} = 0\text{V} \sim 400\text{V},$
Effective output capacitance, time related ²	$C_{o(tr)}$	-	60	-		
Output charge	Q_{oss}	-	24.5	-	nC	
Turn-on delay time	$t_{d(on)}$	-	1.4	-	ns	$V_{GS} = 6\text{V}, V_{DS} = 400\text{V},$ $R_{G_on(ext)} = 10\Omega, I_D = 8\text{A},$ $R_{G_off(ext)} = 2\Omega, L = 318\mu\text{H},$ See Figure 22
Rise time	t_r	-	4	-		
Turn-off delay time	$t_{d(off)}$	-	1.7	-		
Fall time	t_f	-	4	-		

1. $C_{o(er)}$ is the fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400 V.

2. $C_{o(tr)}$ is the fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400 V.

Gate charge characteristics

Gate Total Charge	Q_G	-	2.8	-	nC	$V_{DS}=400V, I_D=3.9A$ $V_{GS}=0V-6V$
Gate-Source charge	Q_{GS}	-	0.25	-		
Gate-Drain charge	Q_{GD}	-	1.1	-		
Gate Plateau Voltage	V_{Plat}	-	2.2	-	V	$V_{DS}=400V, I_D=3.9A$

Reverse Device Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	2.6	-	V	$V_{GS}=0V, I_S=3.9A$
Pulsed current, reverse	$I_{S,pulse}$	-	-	20.5	A	$V_{GS}=6V, t_{PULSE}=10\mu s$
Reverse recovery charge	Q_{rr}	-	0	-	nC	$I_S=3.9A, V_{DS}=400V$
Reverse recovery time	t_{RR}	-	0	-	ns	
Peak reverse recovery current	I_{rrm}	-	0	-	A	

Typical Performance Characteristics

Fig 1: Typ. Output Characteristics

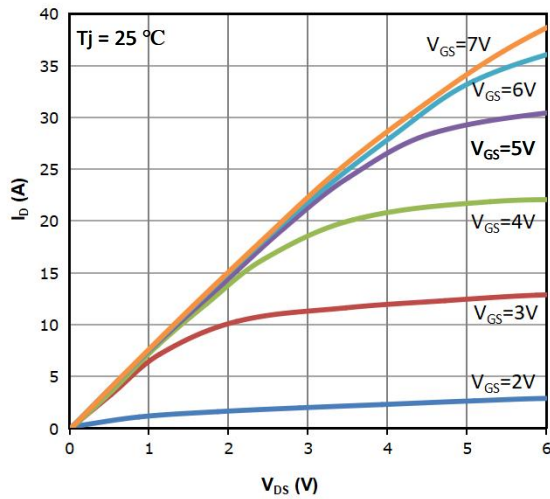


Fig 2: Typ. Output Characteristics

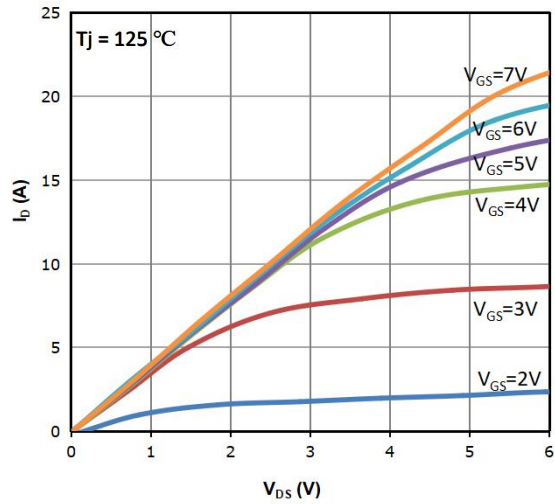


Fig 3:
Typ. Drain-source on-state resistance

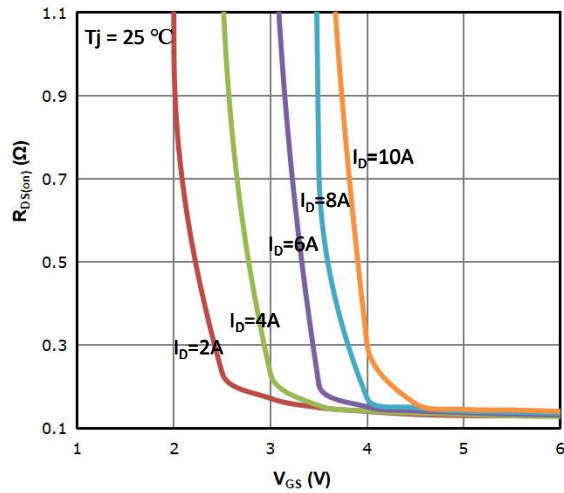


Fig 4:
Typ. Drain-source on-state resistance

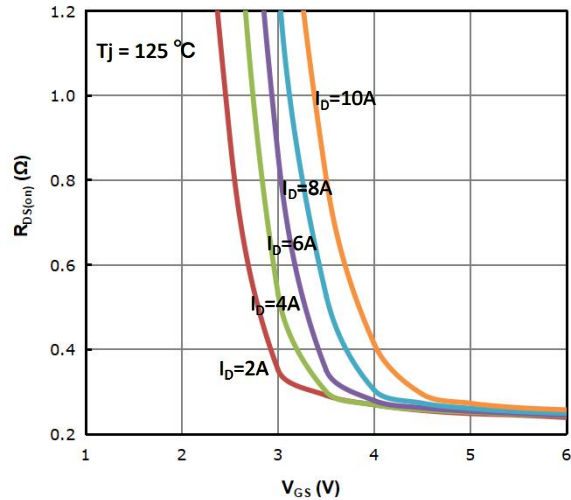


Fig 5:
Typ.channel reverse characteristics

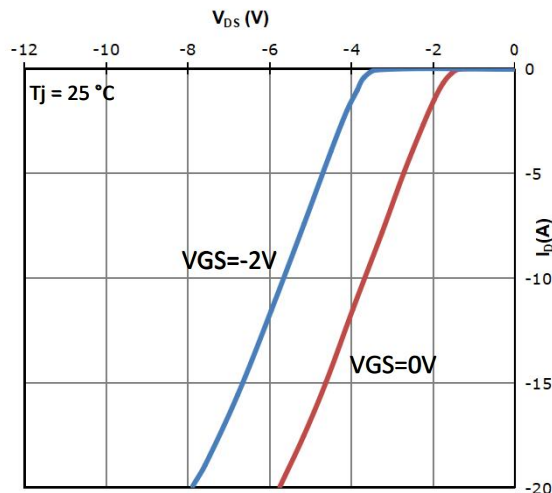


Fig 6:
Typ.channel reverse characteristics

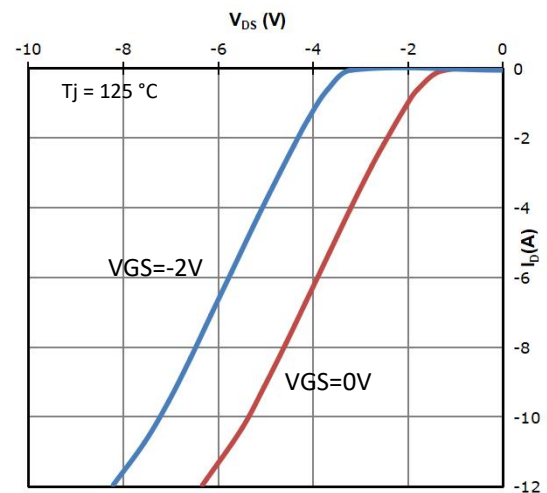


Fig 7:
Typ. channel reverse characteristics

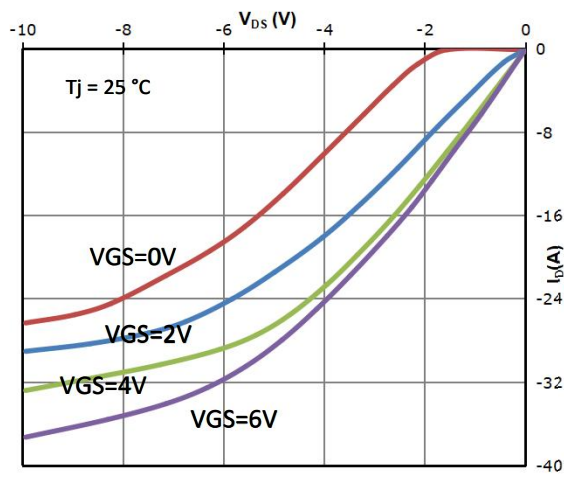


Fig 8:
Typ. channel reverse characteristics

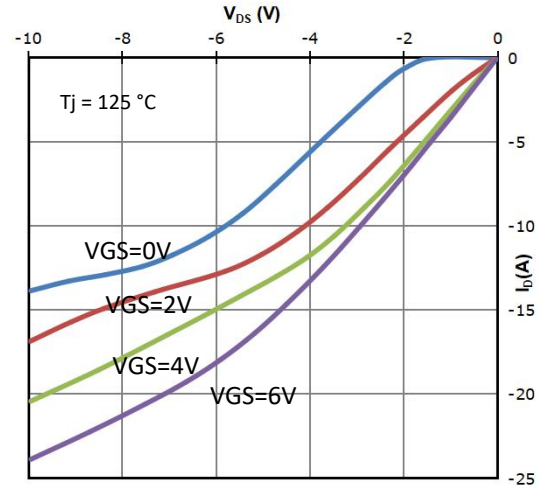


Fig 9: Typ. Transfer Characteristics

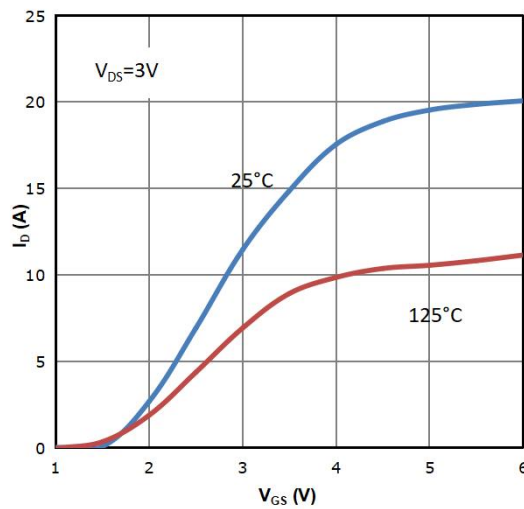


Fig 10: Typ. Gate-to-Source leakage

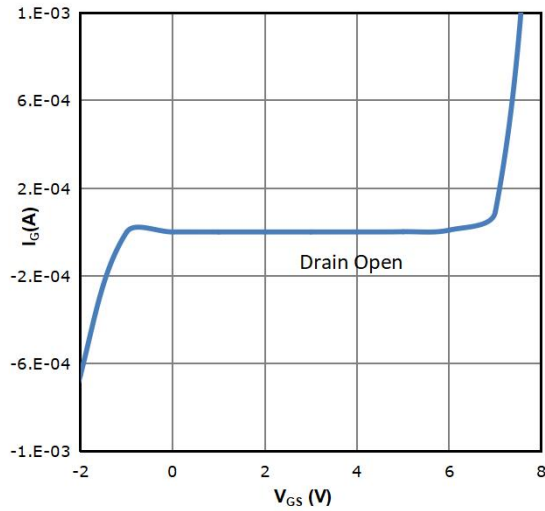


Fig 11: Drain-source leakage characteristics

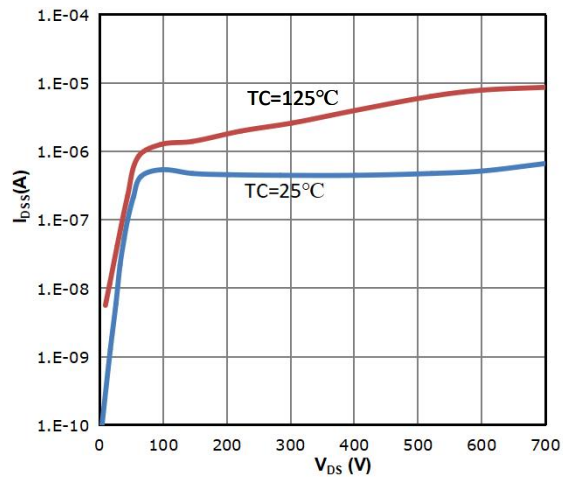


Fig 12: Vgs(th) vs. Temperature

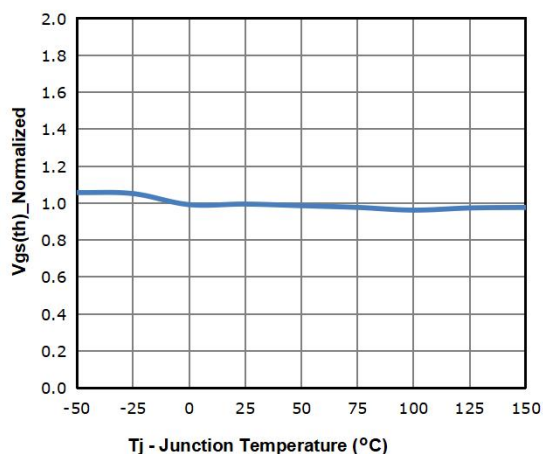


Fig 13: Rds(on) vs. Temperature

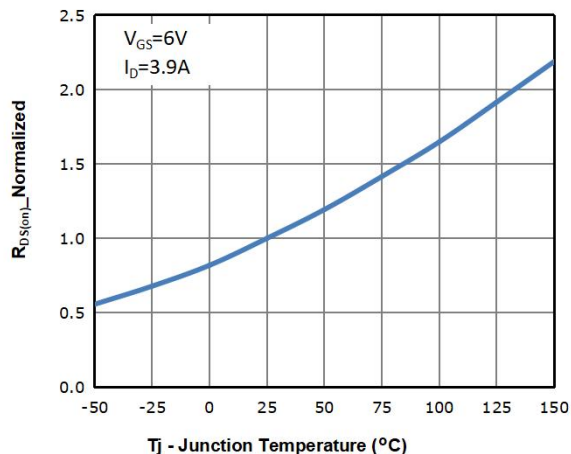


Fig 14: Power Dissipation

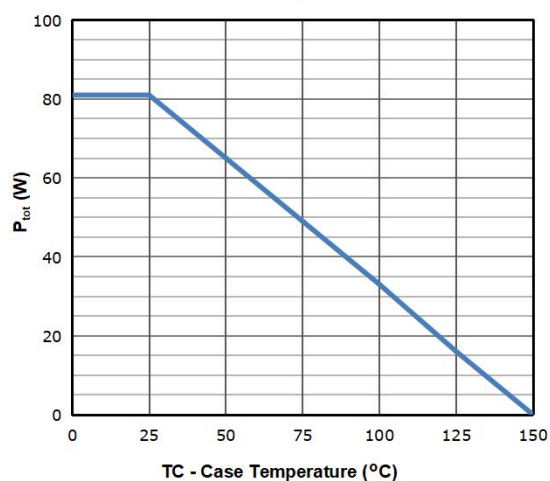


Fig 15: Max. Transient Thermal Impedance

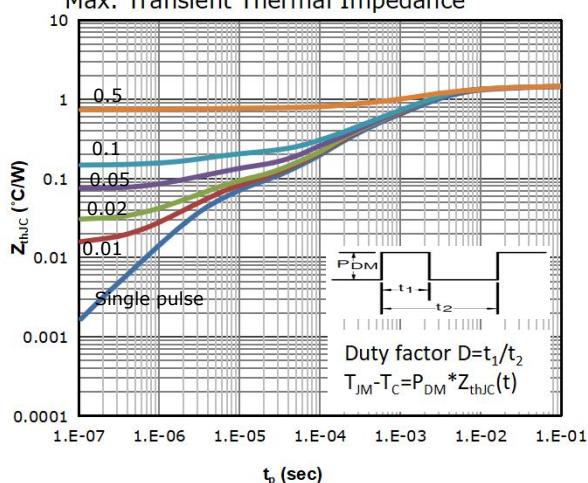


Fig 16: Safe Operating Area

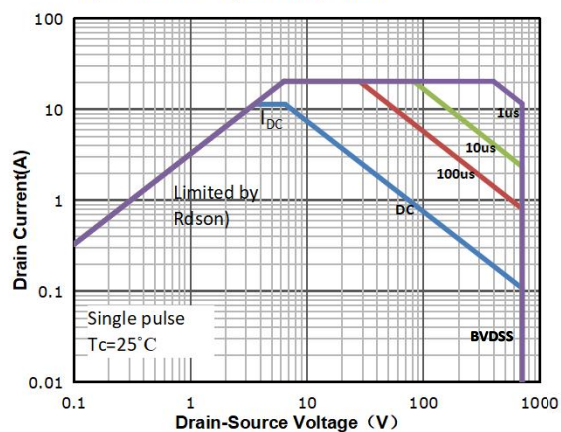


Fig 17: Safe Operating Area

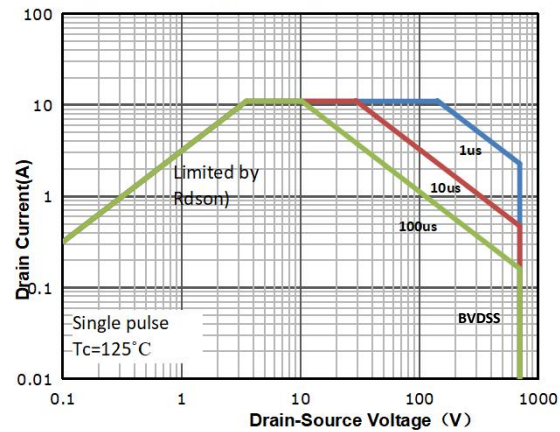


Fig 18: Gate Charge Characteristics

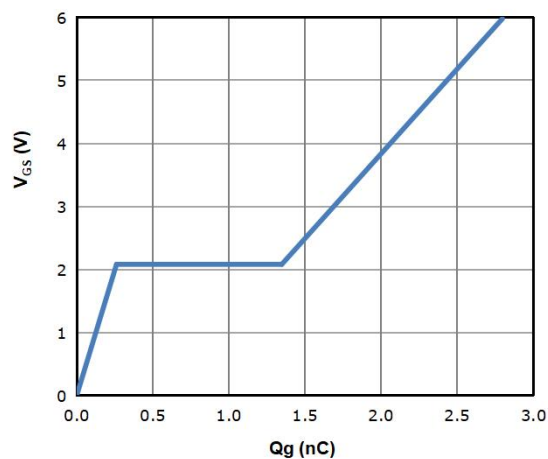


Fig 19: Capacitance Characteristics

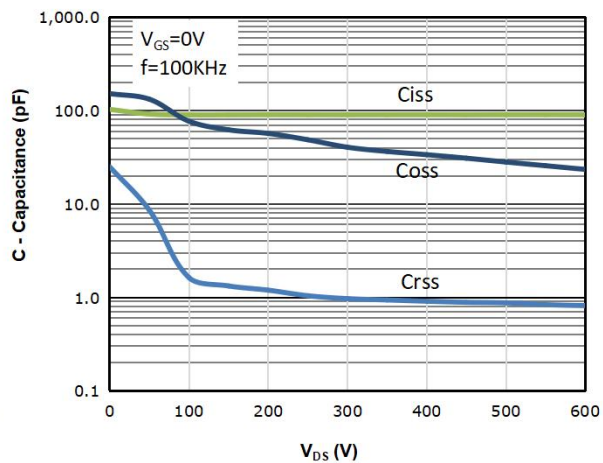


Fig 20: Typ. output charge

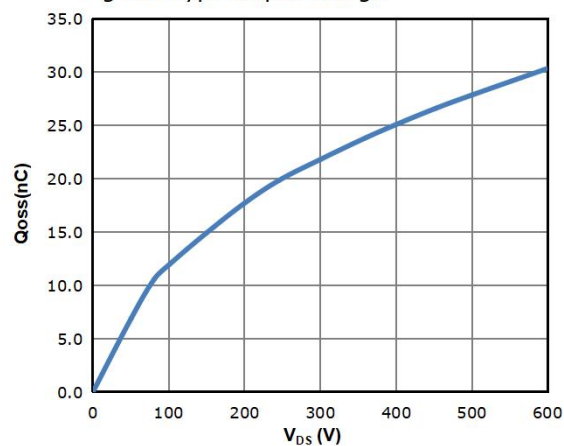
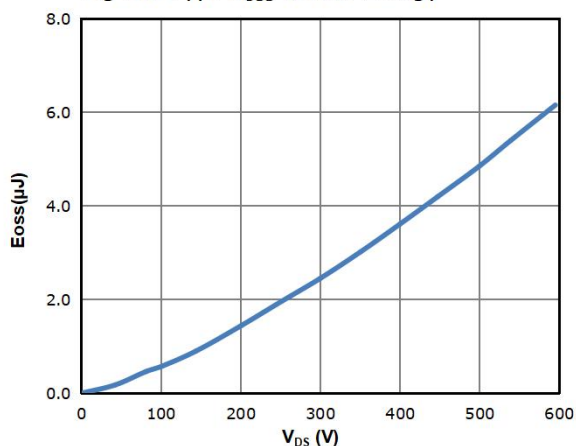
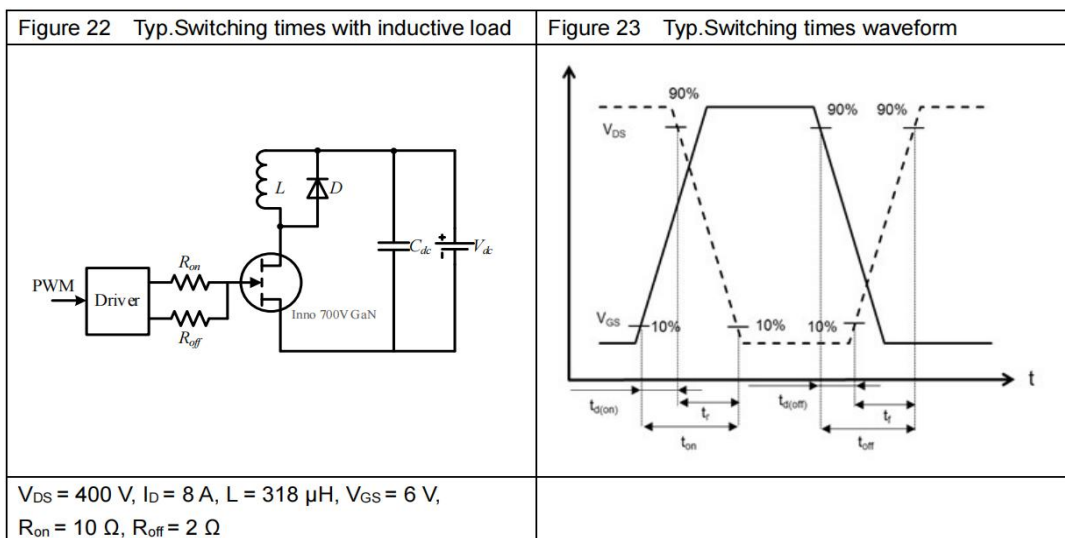


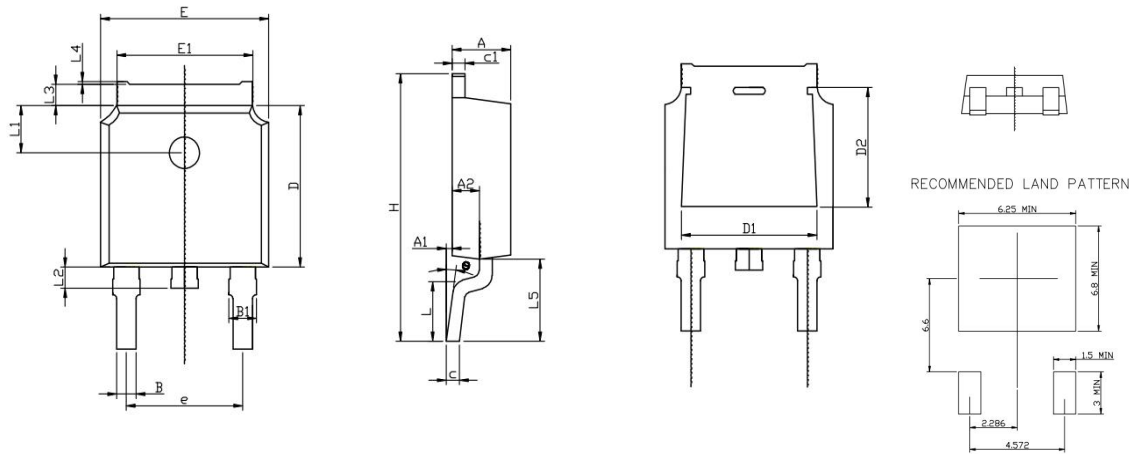
Fig 21: Typ. Coss stored Energy



Test Circuit & Waveform



Package Outline: TO-252-2L



UNIT: mm

SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.15	2.45	0.085	0.096
A1	0.05	0.20	0.002	0.008
A2	0.91	1.22	0.036	0.048
B	0.66	0.86	0.026	0.034
B1	0.93	1.23	0.037	0.048
C	0.40	0.60	0.016	0.024
C1	0.40	0.60	0.016	0.024
D	5.95	6.25	0.234	0.246
D1	4.80		0.189	
D2	3.80		0.150	
E	6.45	6.75	0.254	0.266
E1	5.12	5.52	0.202	0.217
L	1.65		0.065	
L1	1.58	1.98	0.062	0.078
L2	0.60	1.00	0.024	0.039
L3	0.70	1.00	0.028	0.039
L4	0.00	0.20	0.000	0.008
L5	2.80	3.40	0.110	0.134
H	9.80	10.40	0.386	0.409
θ	0.00	8.00	0.000	0.315
e	4.57		0.180	

Disclaimer

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