

PWGF40N65YD

IGBT 650V, 1.5V, 40A



重庆平伟半导体股份有限公司

Features

- 650V Trench field-stop technology
- Low conduction and switching losses
- Positive temperature coefficient of forward voltage
- Qualified according to JEDEC criteria



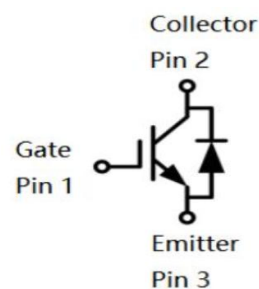
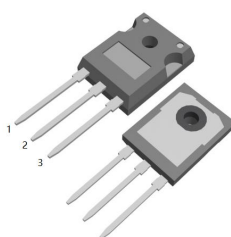
Applications

- Solar Inverter, UPS, Welder, Telecom, ESS

Product Summary

V_{CE}	650V
$V_{CE(sat)}$	1.5V
I_C	40A

TO-247-3L



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWGF40N65YD	PWGF40N65YD	TO-247-3L	Tube	N/A	N/A	30pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	650	V
Collector current $T_C=25^{\circ}\text{C}$ $T_C=100^{\circ}\text{C}$	I_C	80 40	A
Diode forward current $T_C=25^{\circ}\text{C}$ $T_C=100^{\circ}\text{C}$	I_F	80 40	A
Pulsed collector current, t_p limited by T_{vjmax}	$I_{C\ pulse}$	160	A
Gate-emitter voltage	V_{GE}	± 30	V
Power dissipation $T_C=25^{\circ}\text{C}$	P_{tot}	244	W
Operating junction and storage temperature	T_{vj}, T_{stg}	$-55...+175$	$^{\circ}\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	T_{sold}	260	$^{\circ}\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction-case.(IGBT)	R_{thJC}	-	-	0.62	°C/W	-
Thermal resistance, junction-case.(Diode)	R_{thJC}	-	-	0.78	°C/W	-
Thermal resistance, junction-ambient	R_{thJA}	-	-	50.0	°C/W	-

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

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

Static Characteristic

Collector-emitter breakdown voltage	BV_{CES}	650	-	-	V	$V_{GE}=0V, I_C=250\mu A$
Gate threshold voltage	$V_{GE(th)}$	4.5	-	6.5	V	$V_{CE}=V_{GE}, I_C=1mA$
Zero gate voltage collector current	I_{CES}	-	-	4 1000	μA	$V_{CE}=650V, V_{GE}=0V$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$
Gate-emitter leakage current	I_{GES}	-	-	± 200	nA	$V_{GE}=\pm 30V, V_{CE}=0V$
Collector-emitter saturation voltage	$V_{CE(sat)}$	-	1.50 1.88	1.90 -	V	$V_{GE}=15V, I_C=40A$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$

Dynamic Characteristic

Input capacitance	C_{ies}	-	2290	-	pF	$V_{GE}=0V, V_{CE}=25V,$ $f=1MHz$
Output capacitance	C_{oes}	-	162	-		
Reverse transfer capacitance	C_{res}	-	22	-		
Gate total charge	Q_G	-	111	-	nC	$V_{CE}=520V, I_C=40A$ $V_{GE}=15V$
Gate-collector charge	Q_{gc}	-	54	-		
Gate-emitter charge	Q_{ge}	-	23	-		

Switching Characteristic, Inductive Load

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
IGBT Characteristic,at T _{vj} =25°C						
Turn-on delay time	t _{d(on)}	-	32	-	ns	I _C =40A, V _{CE} =400V, V _{GE} =15V, R _G =10Ω, T _{vj} =25°C, Inductive load
Rise time	t _r	-	43	-		
Turn-off delay time	t _{d(off)}	-	116	-		
Fall time	t _f	-	42	-		
Turn-on energy	E _{on}	-	1.10	-	mJ	
Turn-off energy	E _{off}	-	0.49	-		
Total switching energy	E _{ts}	-	1.59	-		

Switching Characteristic, Inductive Load

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
IGBT Characteristic, at T _{vj} =175°C						
Turn-on delay time	t _{d(on)}	-	53	-	ns	I _C =40A, V _{CC} =400V, V _{GE} =15V, R _G =10Ω, T _{vj} =175°C, Inductive load
Rise time	t _r	-	71	-		
Turn-off delay time	t _{d(off)}	-	173	-		
Fall time	t _f	-	59	-		
Turn-on energy	E _{on}	-	1.84	-	mJ	
Turn-off energy	E _{off}	-	1.09	-		
Total switching energy	E _{ts}	-	2.93	-		

ELECTRICAL CHARACTERISTICS OF THE DIODE, at $T_{vj}=25^{\circ}\text{C}$

Diode forward voltage	V_F	-	1.40	1.85	V	$I_F=40\text{A}$
Reverse recovery time	T_{rr}	-	98	120	ns	$I_F=40\text{A},$
Reverse recovery charge	Q_{rr}	-	230	-	nC	$dI_F/dt=200\text{A/us}$

Typical Performance Characteristics

Fig 1: Output Characteristics

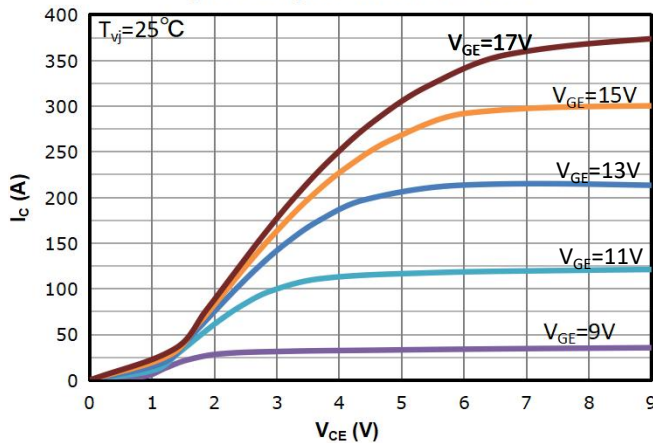


Fig 2: Output Characteristics

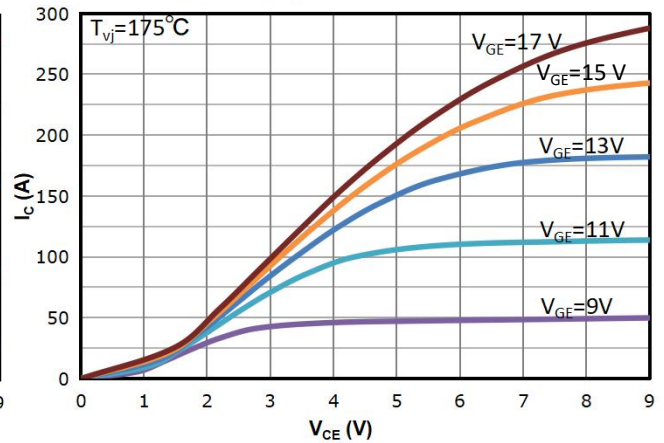


Fig 3: Transfer Characteristics

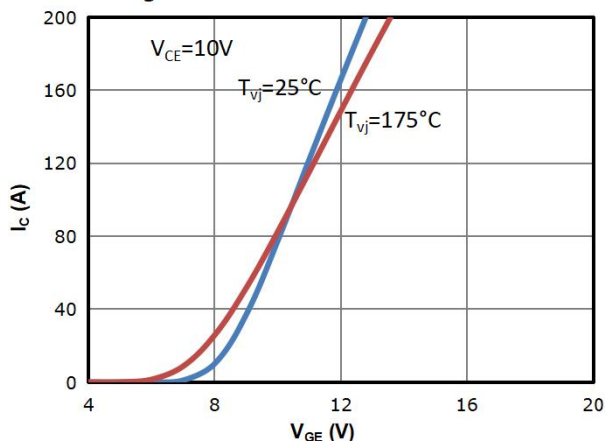


Fig 4: Typical Saturation Voltage Characteristic

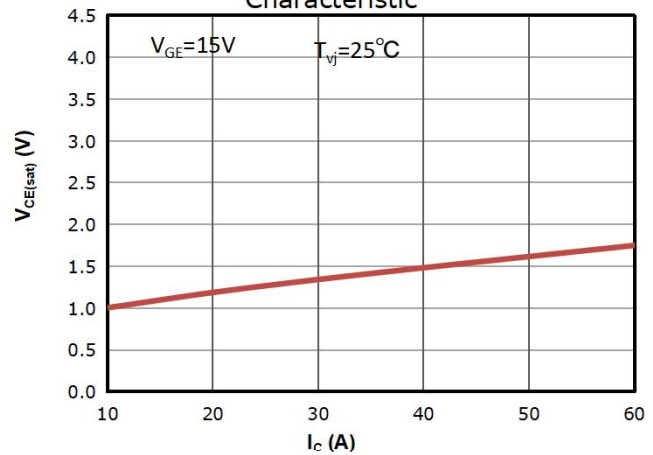


Fig 5: $V_{CE(sat)}$ vs. Gate Voltage

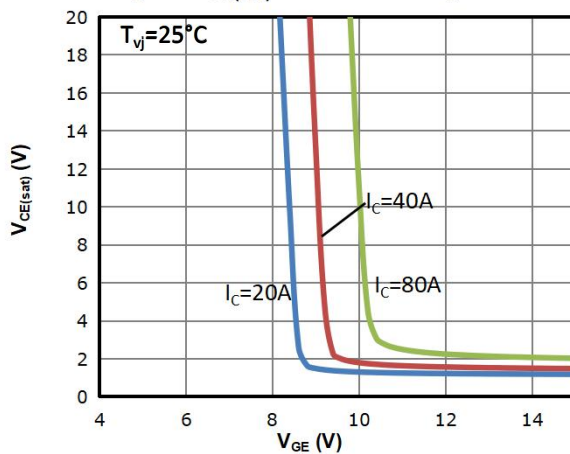


Fig 6: $V_{CE(sat)}$ vs. Temperature

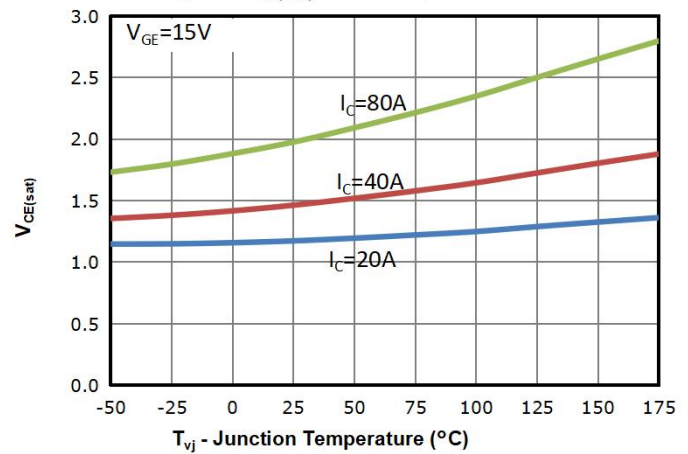


Fig 7: $V_{GE(th)}$ vs. Temperature

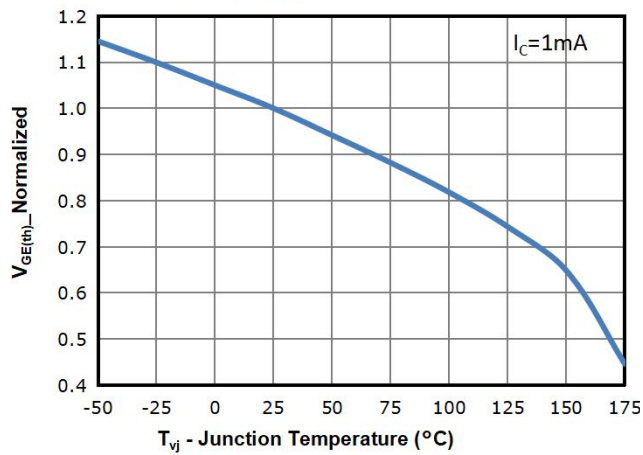


Fig 8: BV_{ces} vs. Temperature

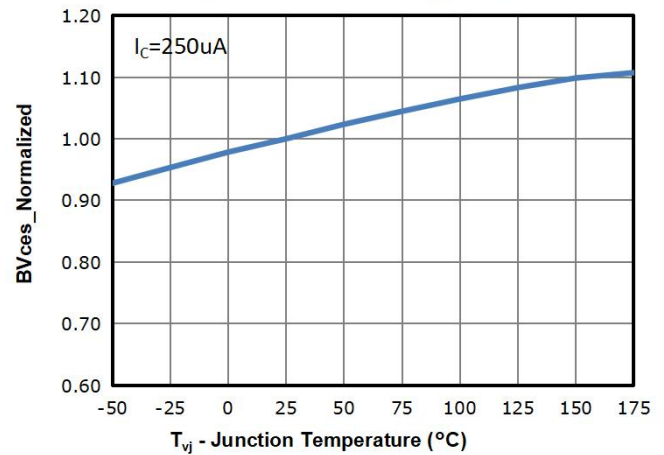


Fig 9: Forward characteristic

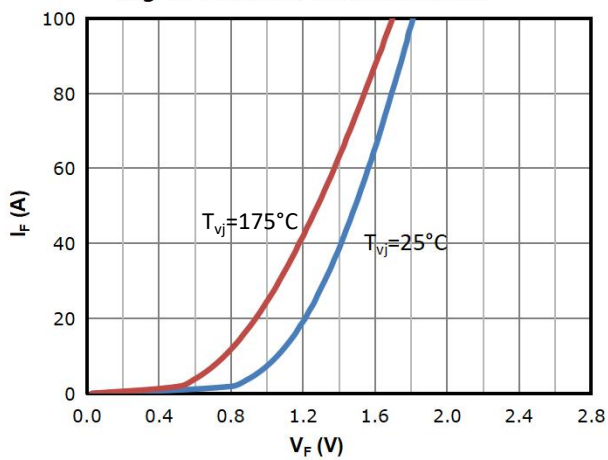


Fig 10: V_F vs. Temperature

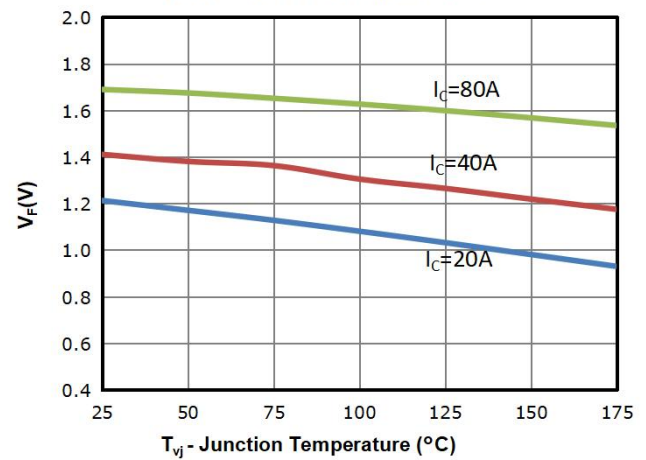


Fig 11: Capacitance Characteristics

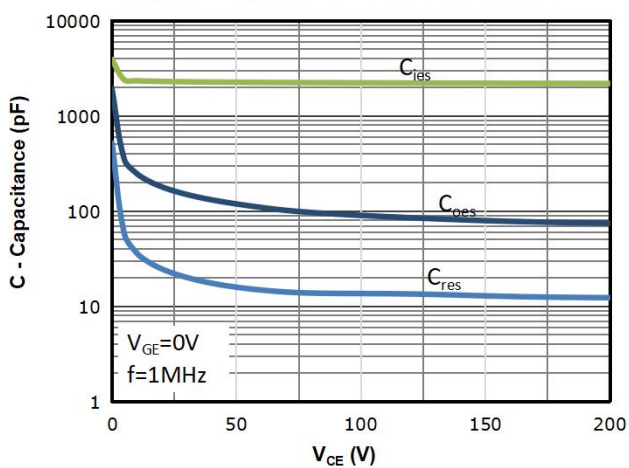


Fig 12: Gate Charge Characteristics

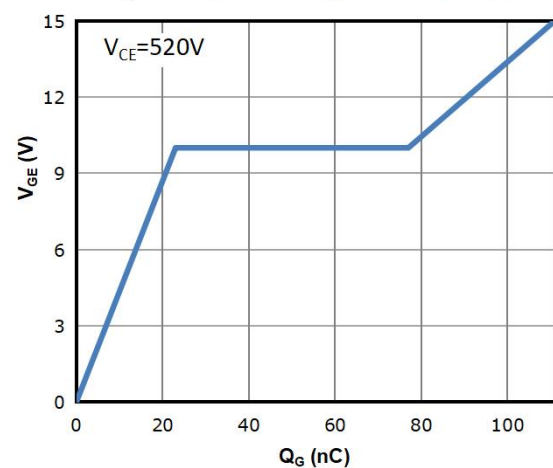


Fig 13: Typical Switching Time vs. R_G

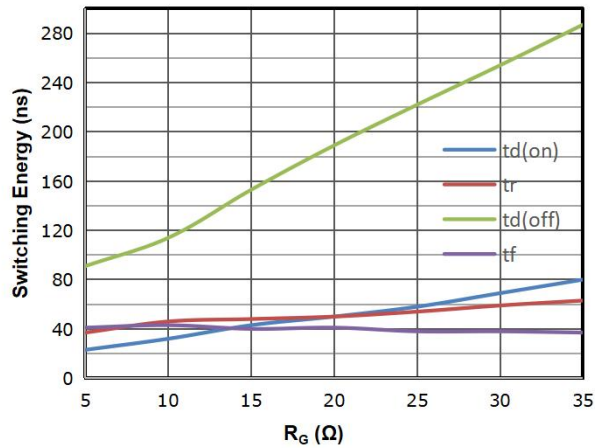


Fig 14: Typical Switching Energy vs. R_G

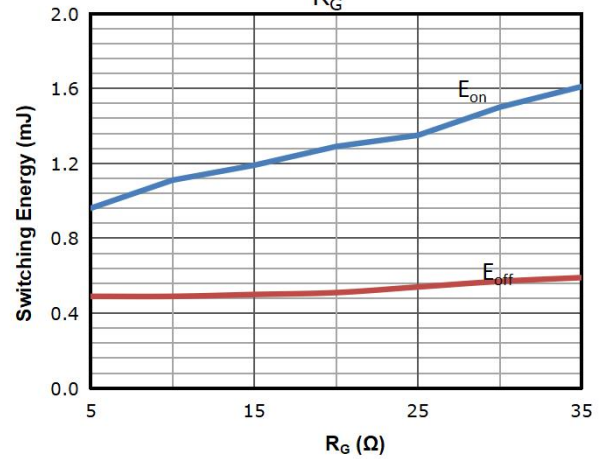


Fig 15: IGBT Max. Transient Thermal Impedance

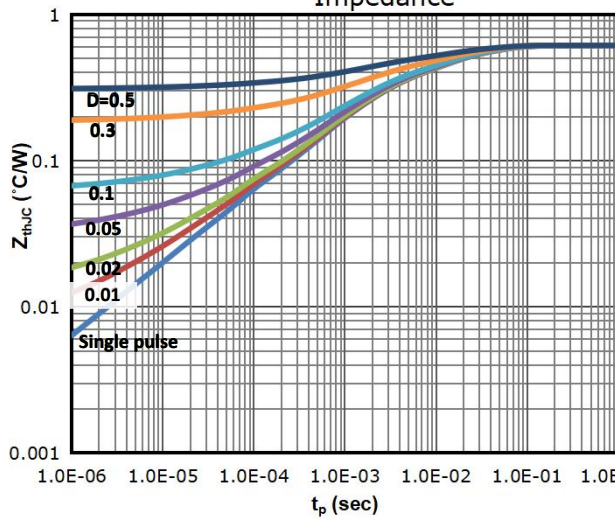


Fig 16: Diode Max. Transient Thermal Impedance

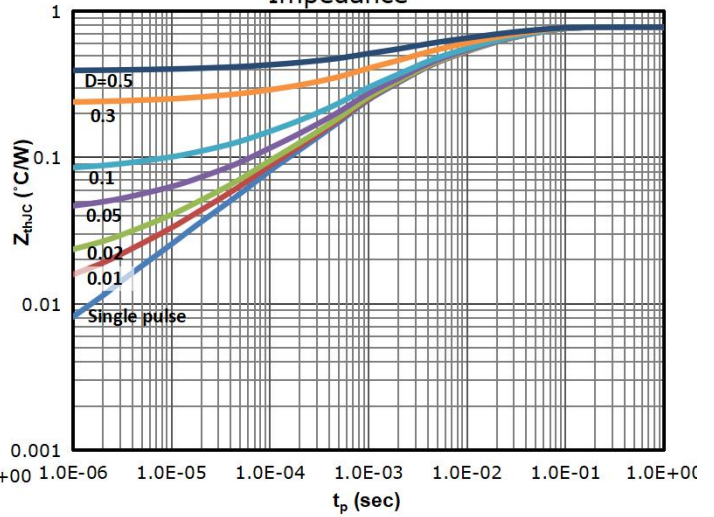
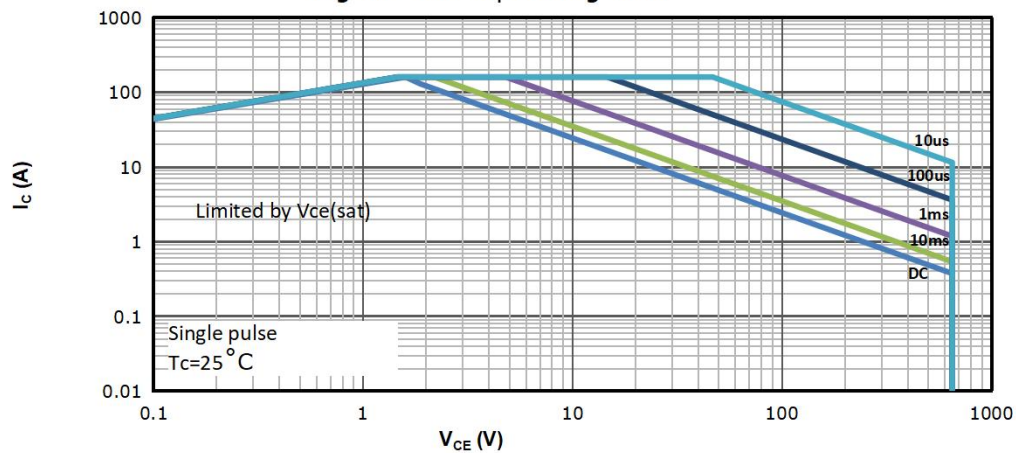
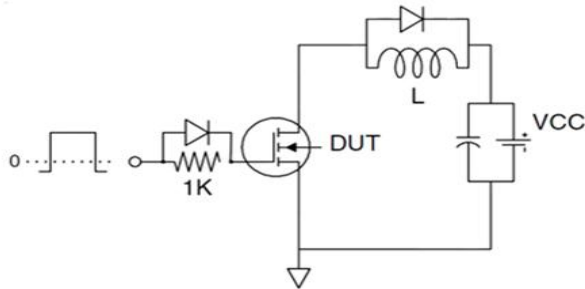


Fig 17: Safe Operating Area

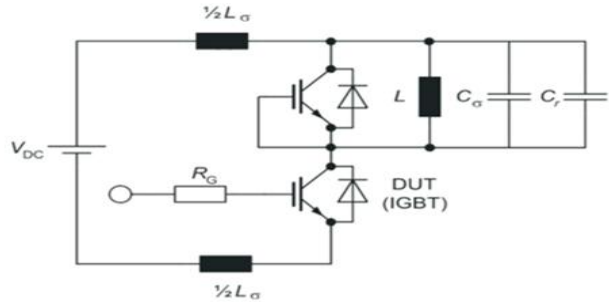


Test Circuit

1) Gate Charge Test Circuit

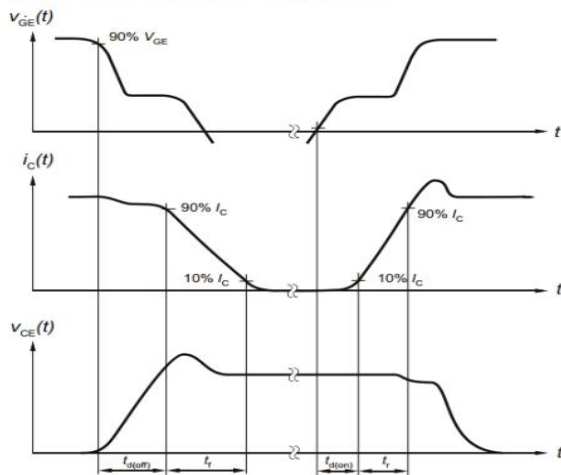


2) Switch Time Test Circuit

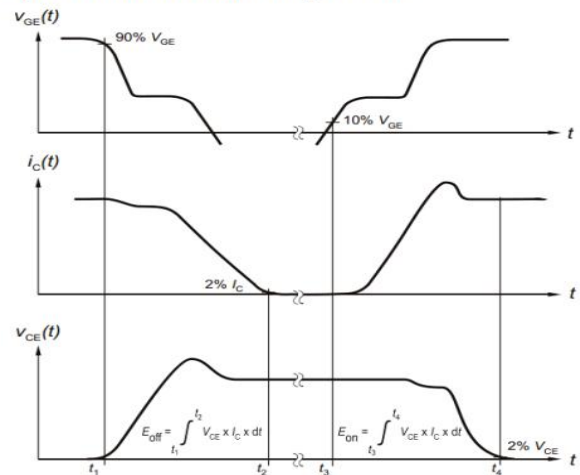


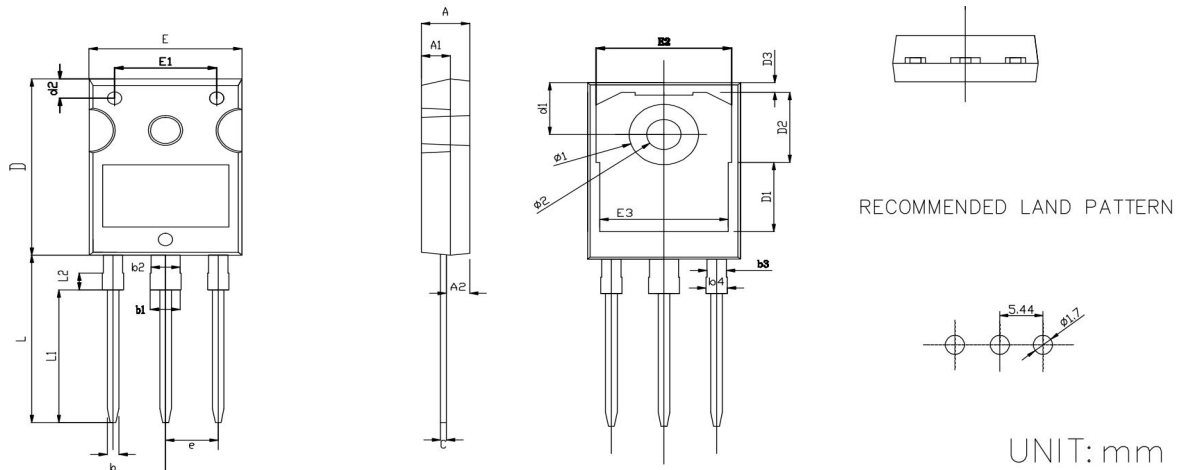
Switching characteristics

1) Definition of switching times



2) Definition of switching losses



Package Outline: TO-247-3L

SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.20	0.189	0.205
A1	2.80	3.20	0.110	0.126
A2	2.26	2.56	0.089	0.101
b	1.10	1.30	0.043	0.051
b1	2.90	3.20	0.114	0.126
b2	2.90	3.10	0.114	0.122
b3	1.90	2.10	0.075	0.083
b4	2.00	2.20	0.079	0.087
c	0.50	0.70	0.020	0.028
D	20.80	21.20	0.819	0.835
D1	8.23		0.324	
D2	8.32		0.328	
D3	1.17		0.046	
d1	6.00	6.30	0.236	0.248
d2	2.20	2.40	0.087	0.094
E	15.60	16.00	0.614	0.630
E1	10.50		0.413	
E2	14.02		0.552	
E3	13.50		0.531	
e	5.34	5.54	0.210	0.218
L	19.72	20.12	0.776	0.792
L1	15.79		0.622	
L2	1.98		0.078	
φ1	7.10	7.30	0.280	0.287
φ2	3.50	3.70	0.138	0.146

Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

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