

PWG40N65YD

IGBT 650V, 1.45V, 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
- Short Circuit withstand time-8 μ s
- Qualified according to JEDEC criteria



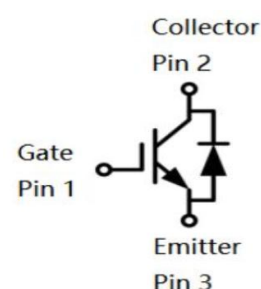
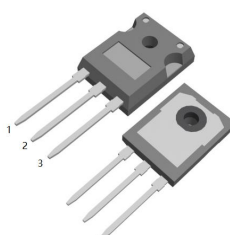
Applications

- Solar Inverter, UPS, Welder, Telecom, ESS

Product Summary

V_{CE}	650V
$V_{CE(sat)}$	1.45V
I_C	40A

TO-247-3L



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWG40N65YD	PWG40N65YD	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
Short circuit withstand time $V_{GE}=15\text{V}, V_{CC}\leq 400\text{V}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{s}$, $T_{vj}\leq 175^{\circ}\text{C}$	t_{SC}	8	μs
Power dissipation $T_C=25^{\circ}\text{C}$	P_{tot}	326	W
Operating junction and storage temperature	T_{vj}, T_{stg}	$-55\ldots+175$	$^{\circ}\text{C}$
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}	-	-	0.46	°C/W	-
Thermal resistance, junction-case.(Diode)	R_{thJC}	-	-	0.78	°C/W	-
Thermal resistance, junction-ambient	R_{thJA}	-	-	50	°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	$V_{CE(sat)}$	-	1.45 1.71	1.85 -	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}	-	2178	-	pF	$V_{GE}=0V, V_{CE}=25V,$ $f=1MHz$
Output capacitance	C_{oes}	-	100	-		
Reverse transfer capacitance	C_{res}	-	25	-		
Gate total charge	Q_G	-	104	-	nC	$V_{CE}=520V, I_C=40A$ $V_{GE}=15V$
Gate-collector charge	Q_{gc}	-	51	-		
Gate-emitter charge	Q_{ge}	-	24	-		
Short circuit collector	I_{SC}	-	250.0	-	A	$V_{GE}=15.0V, V_{CC}\leq 400V, t_{SC}\leq 8\mu s, 1000$ short circuits, Times between short circuits: $\geq 1.0s, T_{vj}\leq 175^{\circ}\text{C}$

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)}	-	36	-	ns	I _C =40A, V _{CE} =400V, V _{GE} =15V, R _G =10Ω, T _{vj} =25°C, Inductive load
Rise time	t _r	-	49	-		
Turn-off delay time	t _{d(off)}	-	134	-		
Fall time	t _f	-	52	-		
Turn-on energy	E _{on}	-	1.25	-	mJ	
Turn-off energy	E _{off}	-	0.84	-		
Total switching energy	E _{ts}	-	2.09	-		

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)}	-	60	-	ns	I _C =40A, V _{CC} =400V, V _{GE} =15V, R _G =10Ω, T _{vj} =175°C, Inductive load
Rise time	t _r	-	81	-		
Turn-off delay time	t _{d(off)}	-	200	-		
Fall time	t _f	-	73	-		
Turn-on energy	E _{on}	-	2.06	-	mJ	
Turn-off energy	E _{off}	-	1.87	-		
Total switching energy	E _{ts}	-	3.93	-		

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

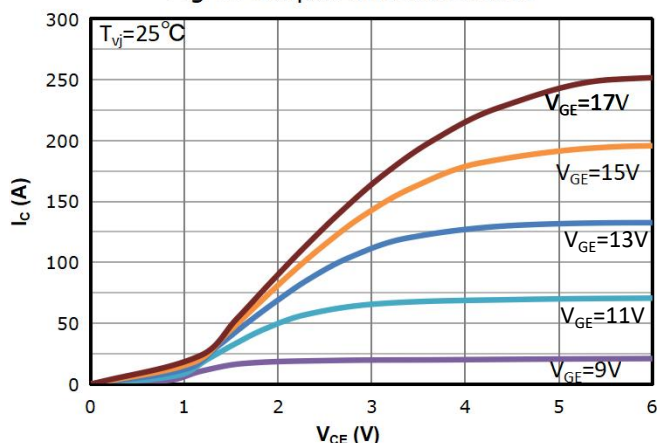


Fig 2: Output Characteristics

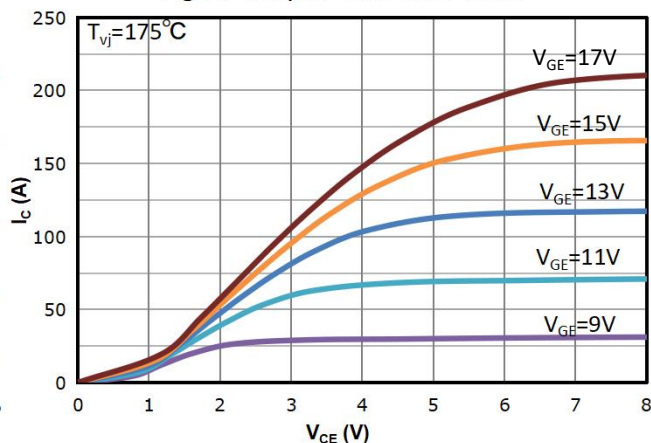


Fig 3: Transfer Characteristics

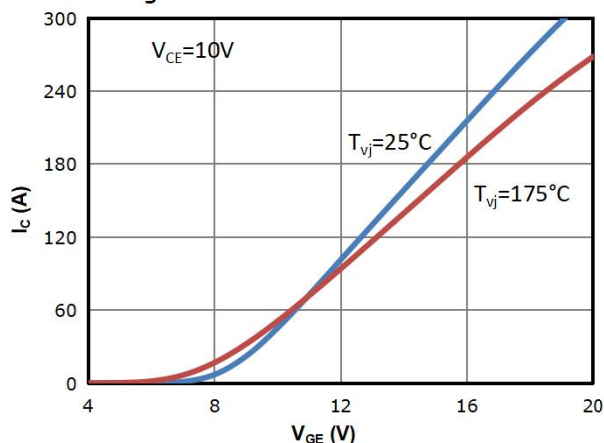


Fig 4: Typical Saturation Voltage Characteristic

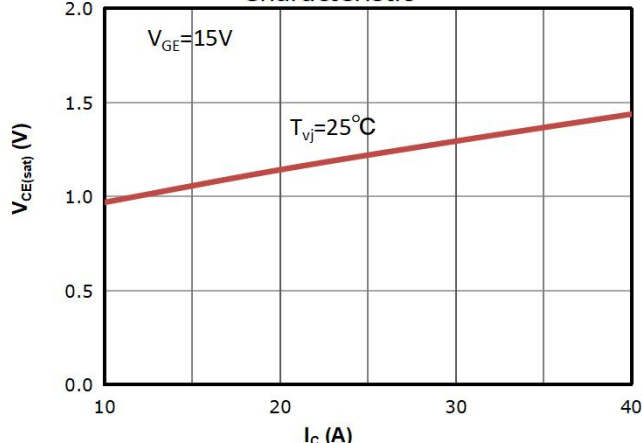


Fig 5: $V_{CE(sat)}$ vs. Gate Voltage

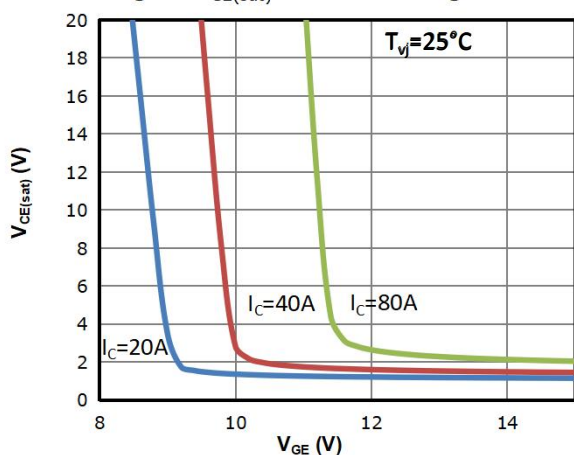


Fig 6: $V_{CE(sat)}$ vs. Temperature

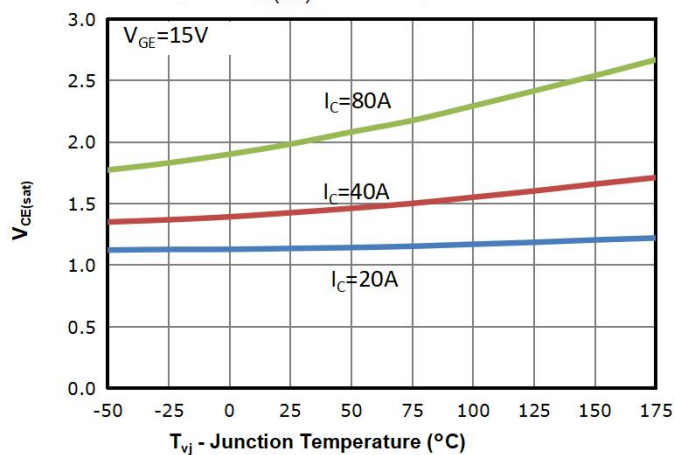


Fig 7: $V_{GE(th)}$ vs. Temperature

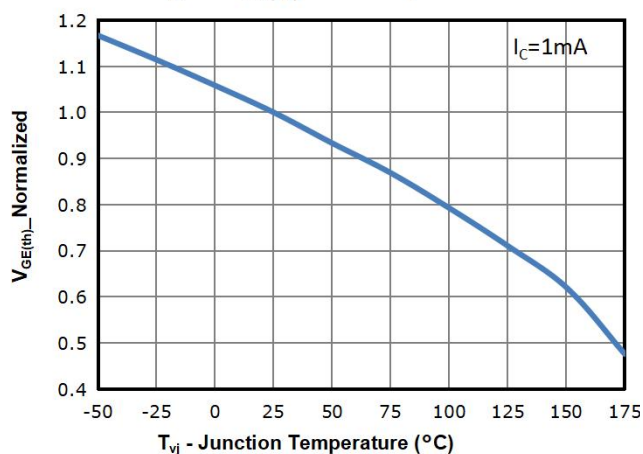


Fig 8: BV_{ces} vs. Temperature

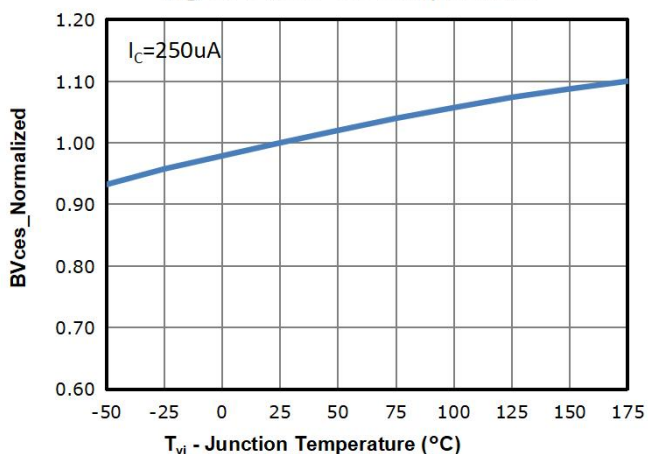


Fig 9: Forward characteristic

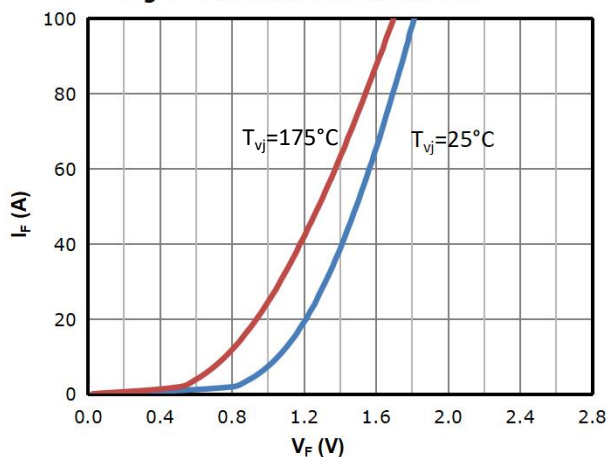


Fig 10: V_F vs. Temperature

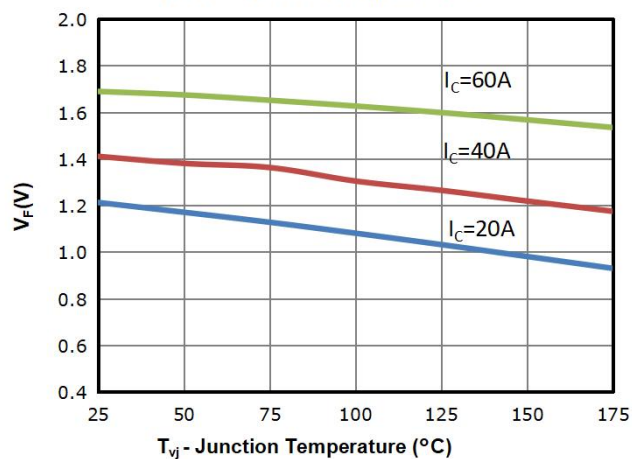


Fig 11: Capacitance Characteristics

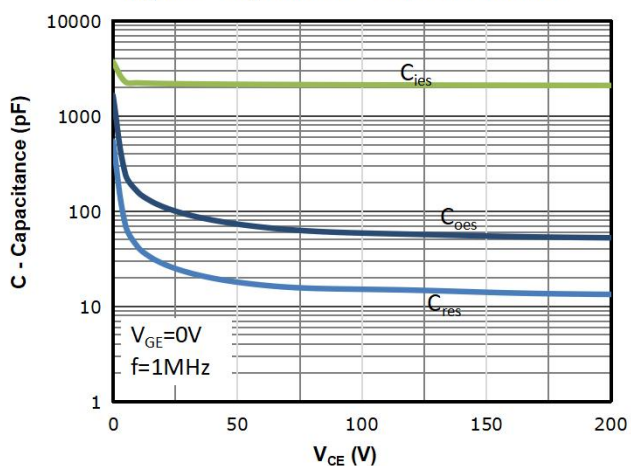


Fig 12: Gate Charge Characteristics

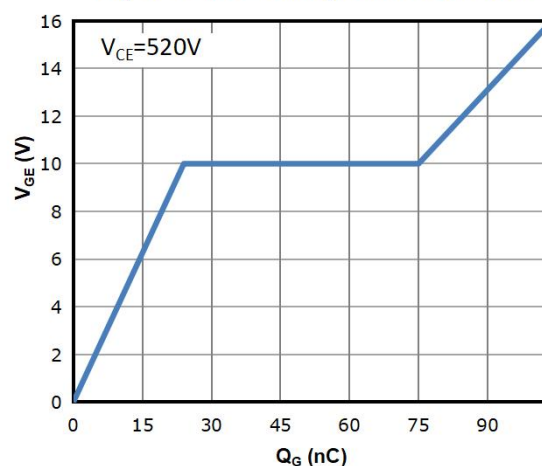


Fig 13: Typical Switching Time vs. R_G

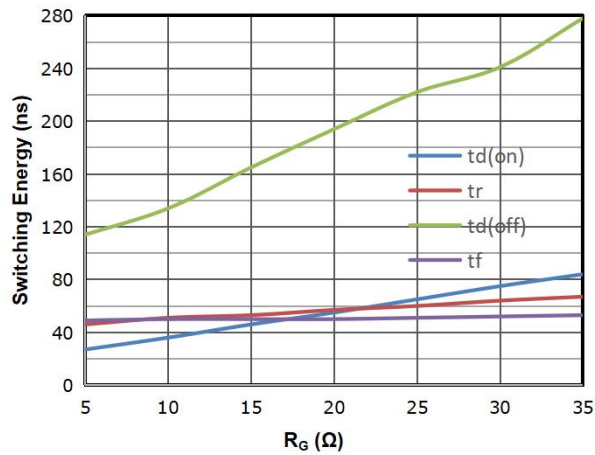


Fig 14: Typical Switching Energy vs. R_G

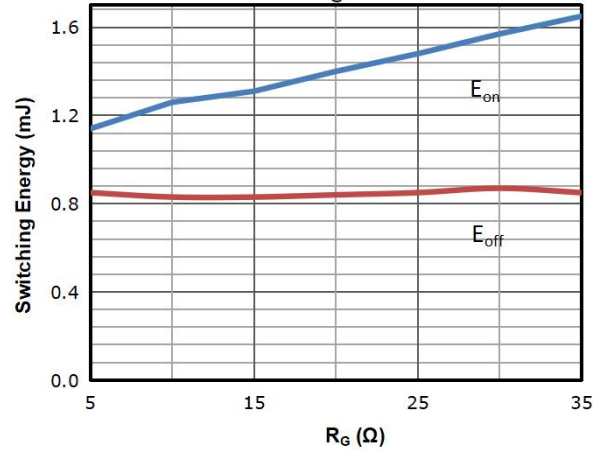


Fig 15: IGBT Max. Transient Thermal Impedance

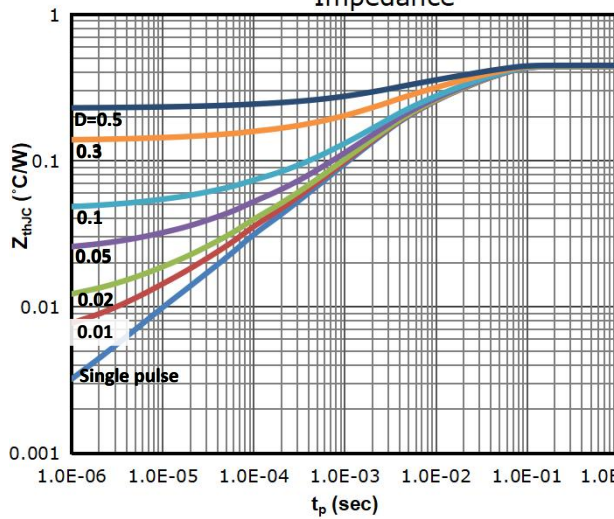


Fig 16: Diode Max. Transient Thermal Impedance

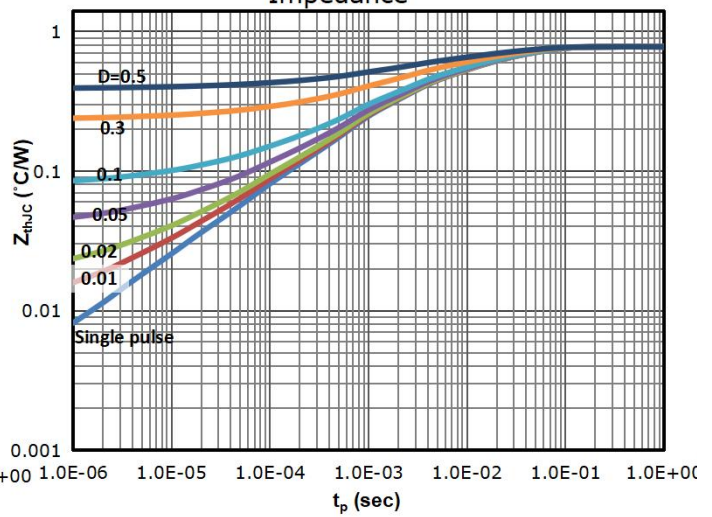
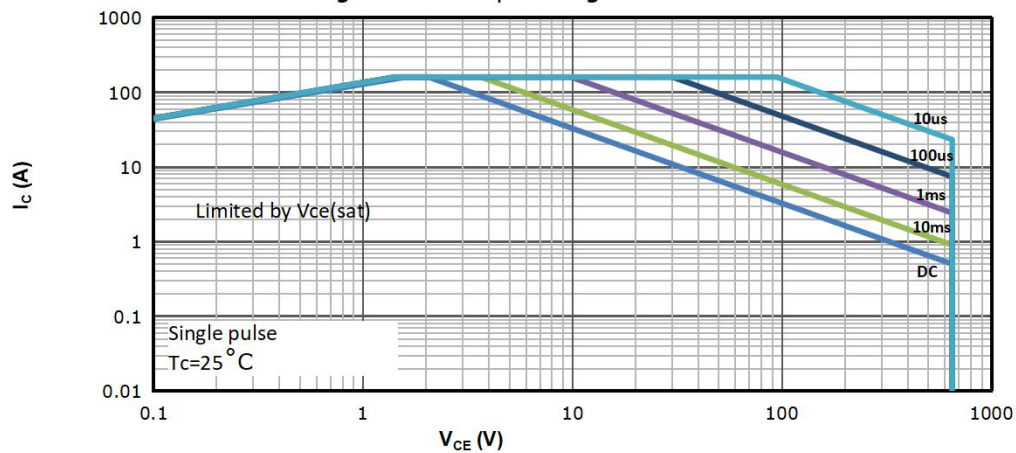
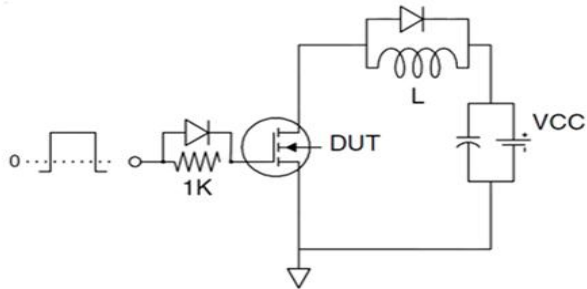


Fig 17: Safe Operating Area

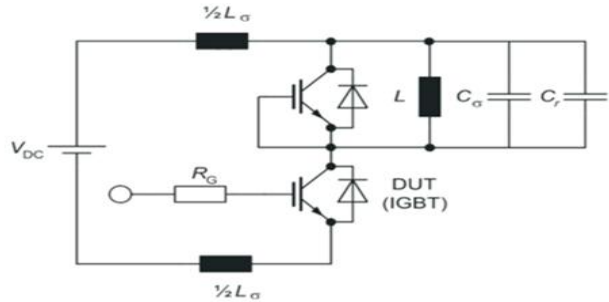


Test Circuit

1) Gate Charge Test Circuit

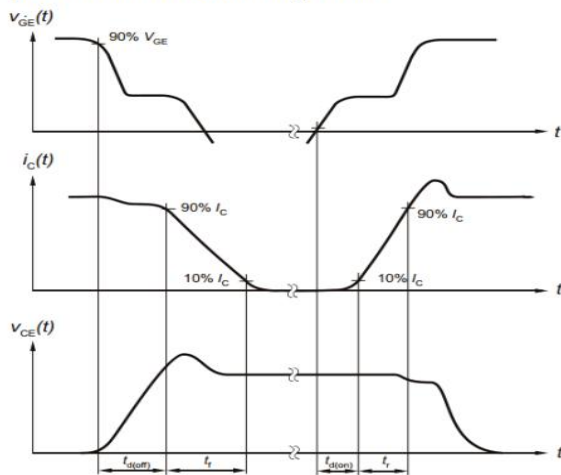


2) Switch Time Test Circuit

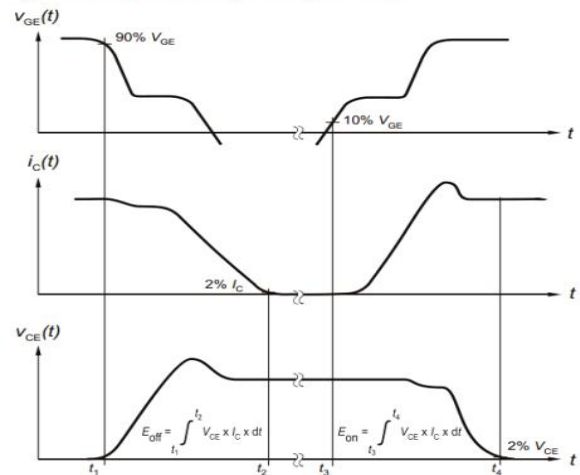


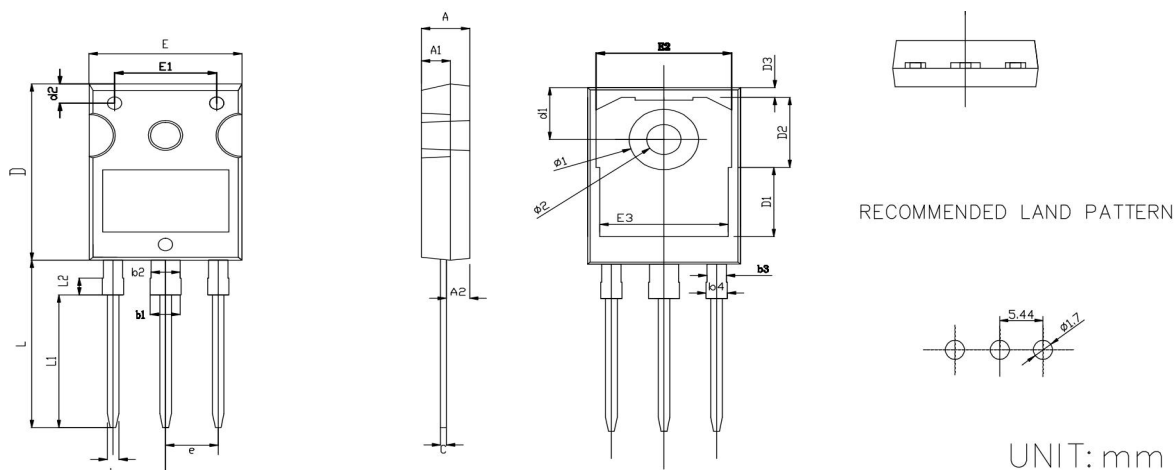
Switching characteristics

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

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