



重庆平伟实业股份有限公司

LH40N65PW1

IGBT

1. Description

LH40N65PW1 is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low gate charge Q_g and optimized switching performance. The IGBT is suitable device for welding, UPS, and high switching frequency applications.

KEY CHARACTERISTICS

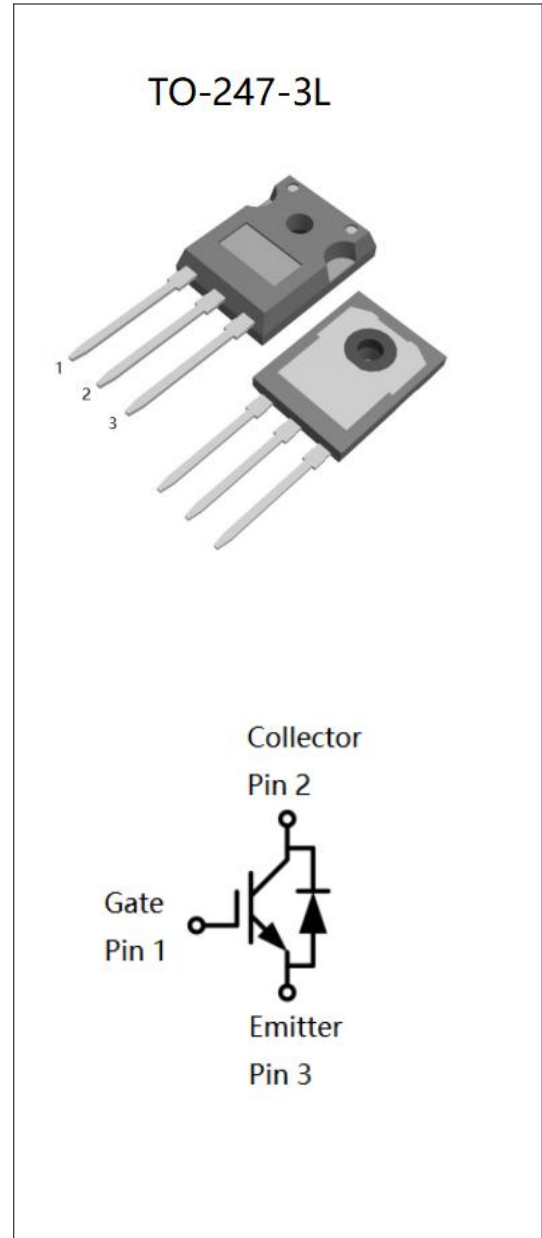
Parameter	Value	Unit
V_{CES}	650	V
I_C	40	A
$V_{CE(sat)}$.typ	1.42	V
P_D ($T_C = 25^\circ C$)	298	W

FEATURES

- Fast Switching
- Positive temperature coefficient
- Fast recovery anti-parallel diode
- RoHS product

APPLICATIONS

- Welding converters
- UPS
- Air condition
- Photovoltaic Inverter



ORDERING INFORMATION

Ordering Codes	Package	Packing	Qty
LH40N65PW1	TO-247-3L	Tube	30pcs



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2 . ABSOLUTE RATINGS

at $T_c = 25^{\circ}\text{C}$, unless otherwise specified

Symbol	Parameter	Values	Units
V_{CES}	Collector- Emitter Voltage	650	V
I_c	Collector Current @ $T_c = 25^{\circ}\text{C}$	80	A
	Collector Current @ $T_c = 100^{\circ}\text{C}$	40	A
I_{CM}	Pulsed Collector Current , t_p limited by T_{Jmax}	160	A
I_F	Diode Continuous Forward Current @ $T_c = 25^{\circ}\text{C}$	80	A
	Diode Continuous Forward Current @ $T_c = 100^{\circ}\text{C}$	40	A
I_{FM}	Diode Maximum Forward Current, limited by T_{Jmax}	160	A
V_{GES}	Gate- Emitter Voltage	± 30	V
t_{SC}	Short circuit withstand time $V_{GE} = 15\text{V}$, $V_{CC} \leq 400\text{V}$, Allowed number of short circuits < 1000 , Times between short circuits: $\geq 1.0\text{s}$, $T_J \leq 175^{\circ}\text{C}$	6.0	us
P_D	Power Dissipation @ $T_c = 25^{\circ}\text{C}$	298	W
T_{Jmax} , T_{stg}	Operating Junction and Storage Temperature Range	$175, -55$ to 175	$^{\circ}\text{C}$
T_L	Maximum Temperature for Soldering	260	$^{\circ}\text{C}$

3 . Thermal characteristics

Symbol	Parameter	RATINGS	Units
$R_{\theta JC}$	Junction- to- Case (IGBT)	0.5	$^{\circ}\text{C/W}$
$R_{\theta JC}$	Junction- to- Case (Diode)	0.8	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Junction- to- Ambient	40	$^{\circ}\text{C/W}$

4 . Electrical Characteristics

at $T_c = 25^{\circ}\text{C}$, unless otherwise specified

Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min .	Typ .	Max .	
V_{CES}	Collector- Emitter Breakdown Voltage	$V_{GE} = 0\text{V}$, $I_c = 250\mu\text{A}$	650	..	..	V
$V_{CE(sat)}$	Collector- Emitter Saturation Voltage	$V_{GE} = 15\text{V}$, $I_c = 50\text{A}$ $T_J = 25^{\circ}\text{C}$	..	1.42	1.8	V
		$T_J = 125^{\circ}\text{C}$	..	1.62	..	
		$T_J = 175^{\circ}\text{C}$	..	1.72	..	



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$V_{GE(TH)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 1mA$	4.5	5.4	6.5	V
V_F	Diode Forward Voltage	$I_F = 20A$ $T_J = 25^\circ C$ $T_J = 125^\circ C$ $T_J = 150^\circ C$	..	1.51 1.03 0.98	..	V
V_F	Diode Forward Voltage	$I_F = 40A$ $T_J = 25^\circ C$ $T_J = 125^\circ C$ $T_J = 150^\circ C$	..	1.77 1.53 1.45	..	V
I_{CES}	Collector- Emitter Leakage Current	$V_{CE} = 650V,$ $V_{GE} = 0V$	..	..	4	μA
$I_{GES(F)}$	Gate- Emitter Leakage Current	$V_{GE} = +30V$	..	..	200	nA
$I_{GES(R)}$	Gate- Emitter Reverse Leakage	$V_{GE} = -30V$	..	..	-200	nA
Pulse width $t_p \leq 300\mu s, 6 \leq 2\%$						

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min .	Typ .	Max .	
C_{iss}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1 .0MHz$	..	2260	..	pF
C_{oss}	Output Capacitance		..	171	..	
C_{rss}	Reverse Transfer Capacitance		..	28	..	
Q_G	Gate charge	$V_{CC} = 520V$ $I_{CE} = 40A$ $V_{GE} = 15V$	..	158	..	nC
Q_{GC}	Gate- collector charge		..	57	..	
Q_{GE}	Gate- emitter charge		..	21	..	
$I_{C(SC)}$	Short circuit collector current Max . 1000 short circuits , Times between short circuits: $\geq 1 .0s$	$V_{GE} = 15 .0V, V_{CC} \leq 400V,$ $t_{SC} \leq 5\mu s, T_J \leq 175^\circ C$		250		A

Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min .	Typ .	Max .	
$t_{d(on)}$	Turn- on Delay Time	$I_C = 40A$ $V_{CE} = 400V$ $V_{GE} = 15V$ $R_G = 10\Omega$	..	13	..	ns
t_r	Rise Time		..	72	..	
$t_{d(off)}$	Turn- Off Delay Time		..	121	..	



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t_f	Fall Time	$T_J = 25^\circ\text{C}$ Inductive Load	..	53	..	mJ
E_{on}	Turn- On Switching Loss		..	0.90	..	
E_{off}	Turn- Off Switching Loss		..	1.31	..	
E_{ts}	Total Switching Loss		..	2.21	..	

Diode Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min .	Typ .	Max .	
T_{rr}	Reverse Recovery Time	$I_F = 0.5\text{A}, I_R = 1\text{A}, I_{RR} = 0.25\text{A}, T_J = 25^\circ\text{C}$	..	..	50	ns



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5. Characteristics Curves

Figure 1. Forward Bias Safe Operating Area

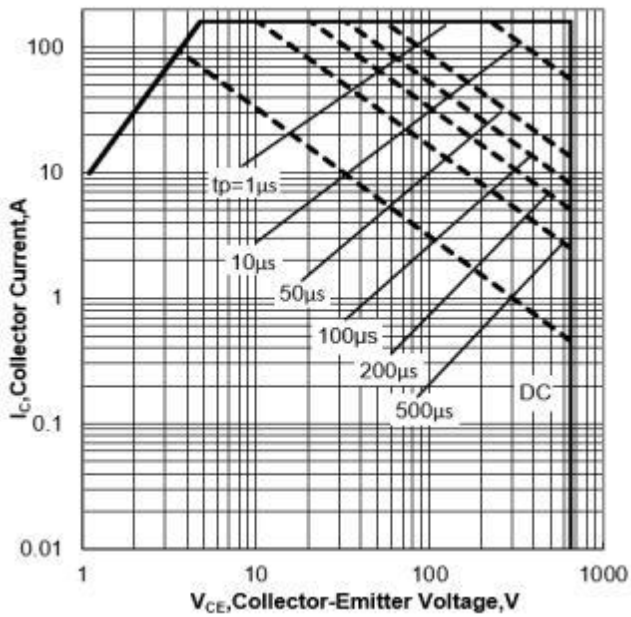


Figure 2. Power Dissipation vs Case Temperature

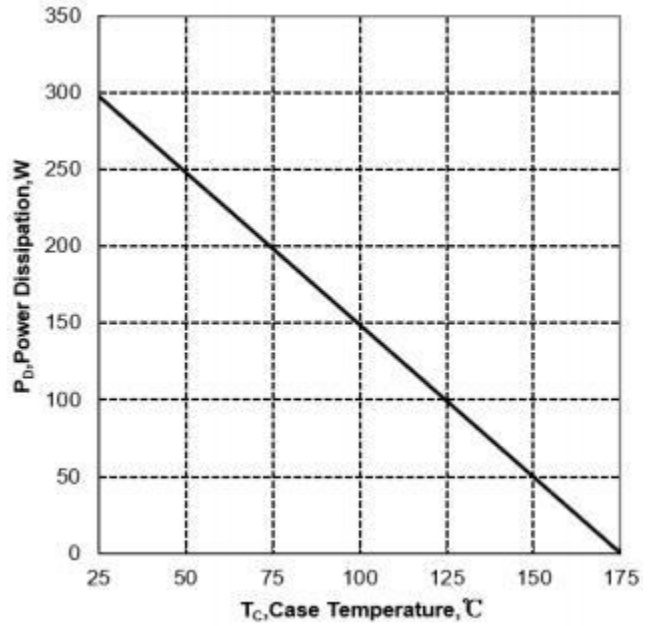


Figure 3. Collector Current vs Case Temperature

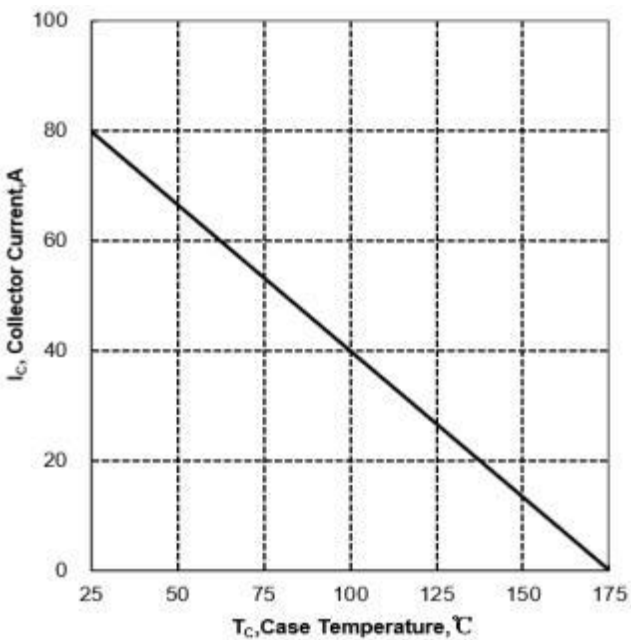
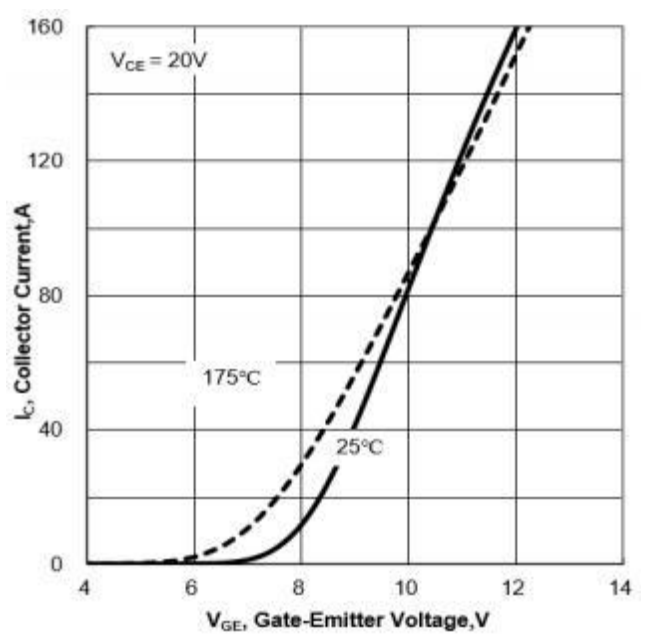


Figure 4. Typical Transfer Characteristics





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Figure 5. Typical Output Characteristics
($T_C = 25^\circ\text{C}$)

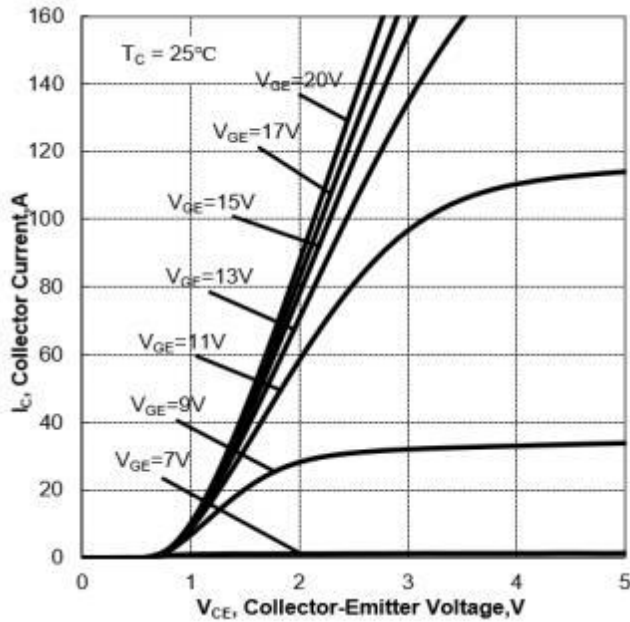


Figure 6. Typical Output Characteristics
($T_C = 175^\circ\text{C}$)

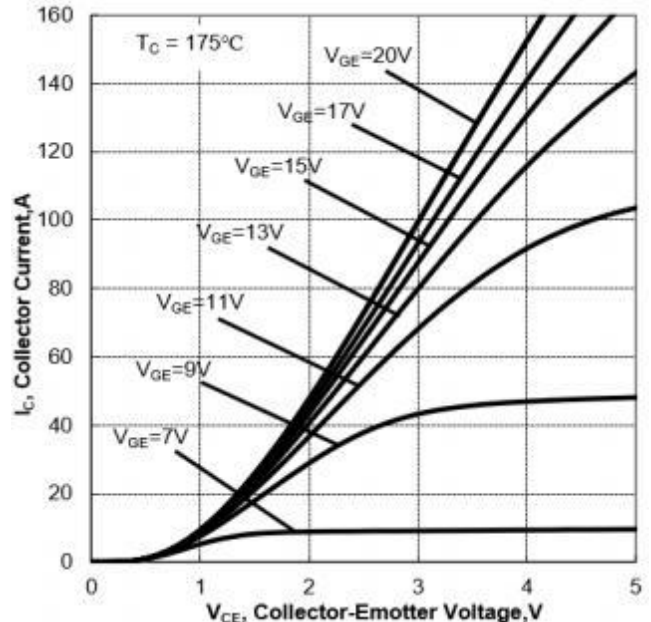


Figure 7. Typical Gate Charge

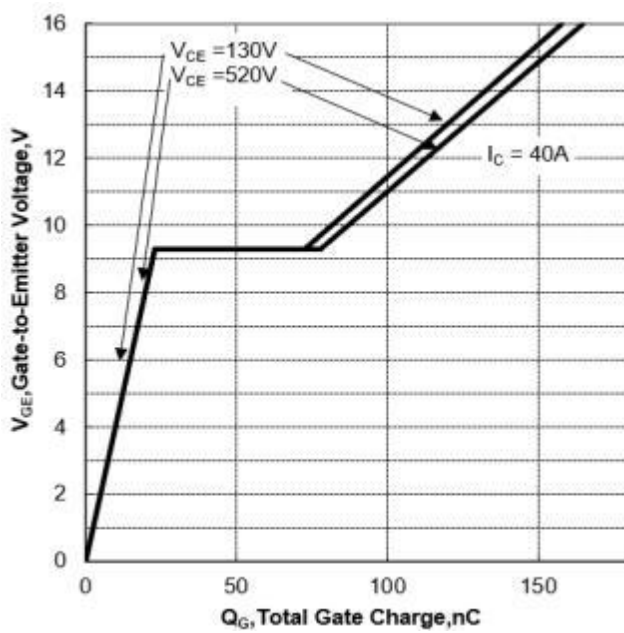
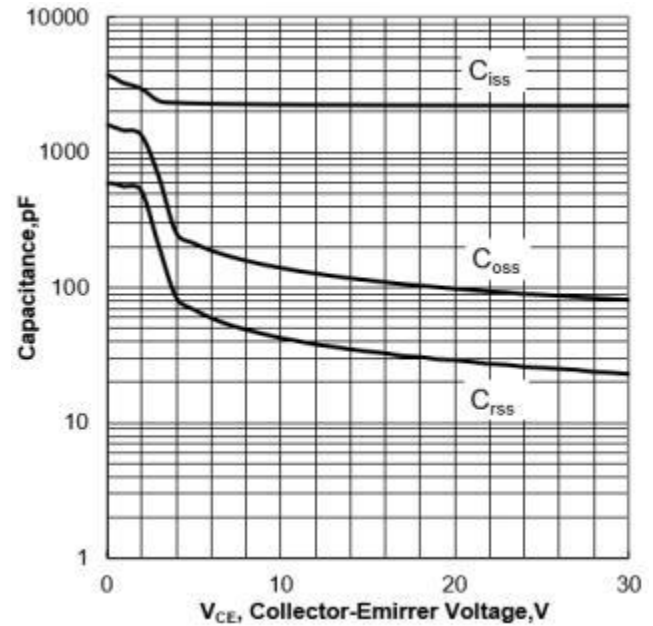


Figure 8. Typical Capacitance vs Collector-Emitter Voltage





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Figure 9. IGBT Transient Thermal Impedance vs Pulse Width(TO247)

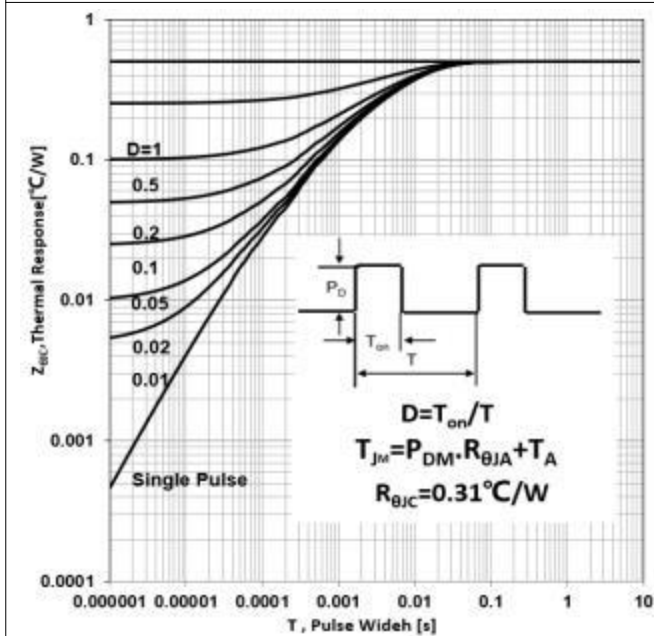
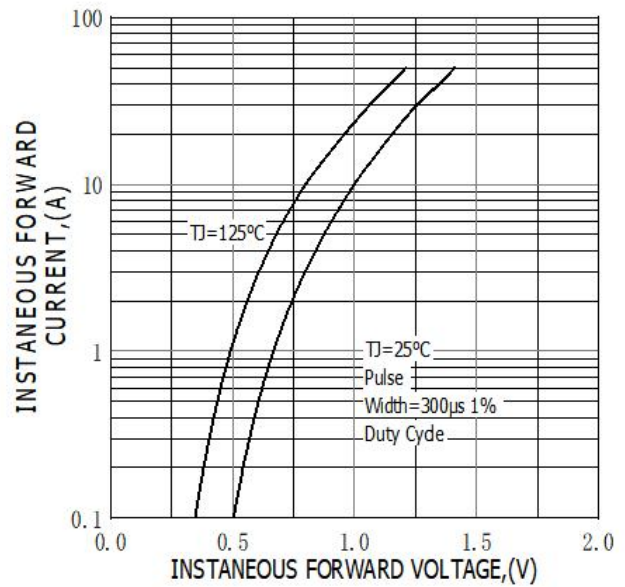


Figure 10. Typical Diode Forward Current vs Forward Voltage





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6. Test Circuit and Waveform

Figure 11. Inductive Switching Test Circuit

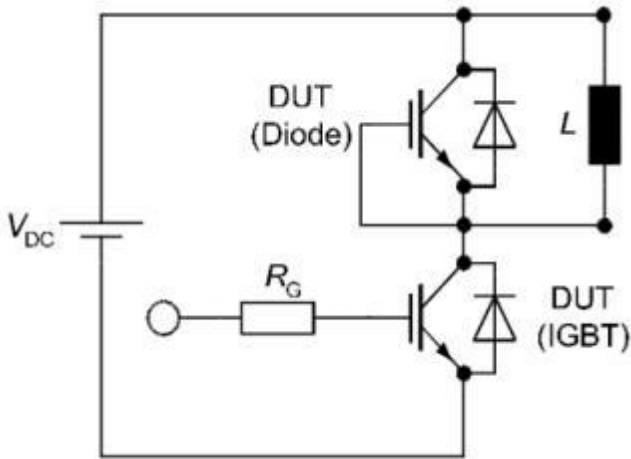


Figure 12. Definition of switching times

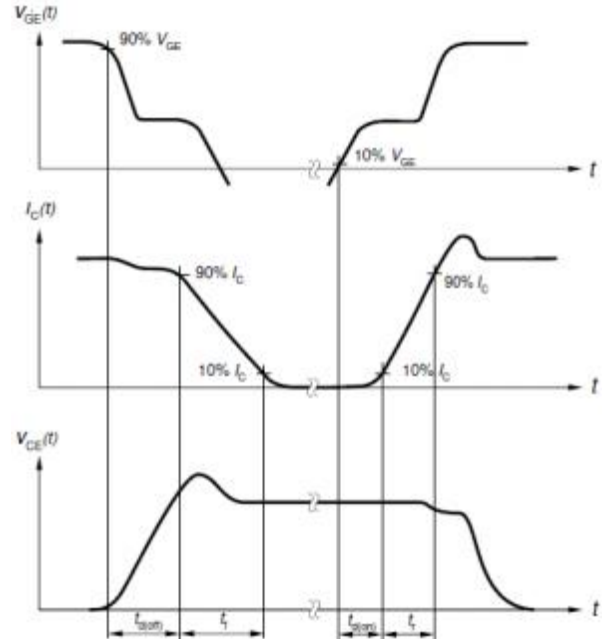


Figure 13. Definition of switching losses

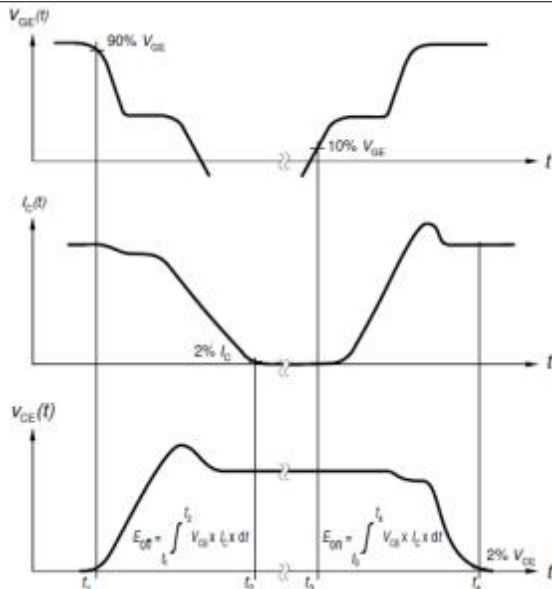
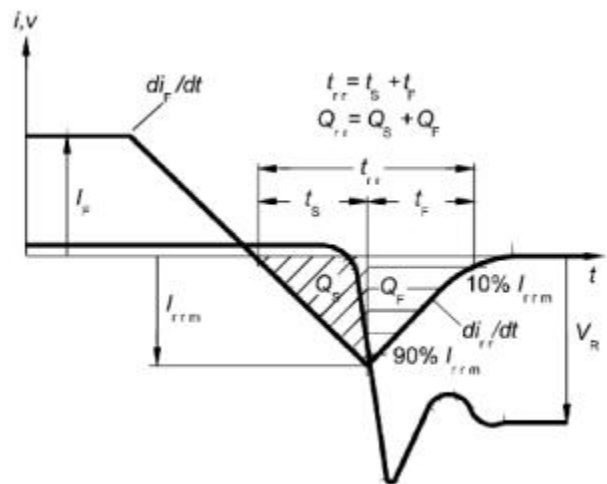


Figure 14. Definition of diode switching characteristics



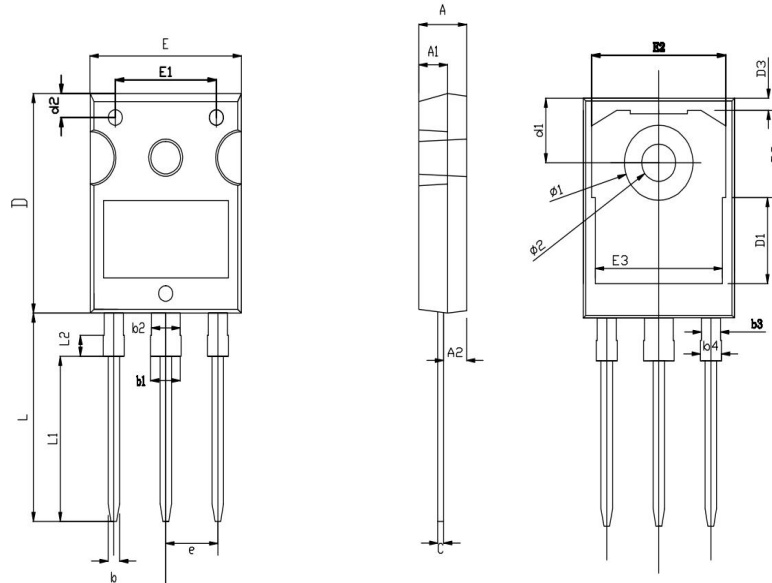


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7. Package Description



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



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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

Revision History

Revision	Date	Major changes
1.0	2023/04/17	Release of Formal Version.