

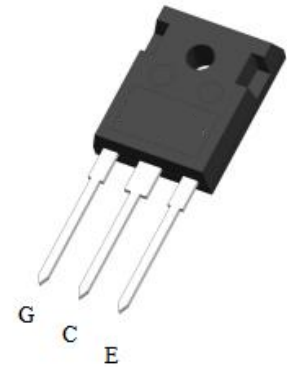
TPGW40N65LN

IGBT Discrete with Anti-Parallel Diode

Package TO-247-3

General Description

Topdiode TPGW40N65LN 40A, 650V IGBT Discrete provides ultra-low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



Features

High Breakdown Voltage up to 650V for Improved Reliability

Trench Field Stop Technology

High Ruggedness, Temperature Stable

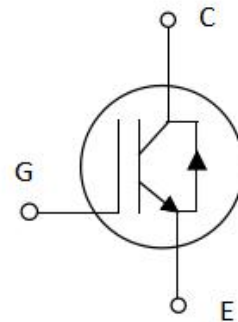
Low switching losses

Easy Parallel Switching Capability due to Positive

Temperature Coefficient in V_{CEsat}

Maximum junction temperature 175°C

Equivalent Schematic



Applications

Uninterruptible Power Supply

Inverter

Converter with High Switching Frequency

Summary

Symbol	Value
V_{CE}	650V
I_C	40A
$V_{CE(sat)}$ $I_C=40A$	1.55V

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

Symbol	Description		Value	Unit
V _{CE}	Collector-Emitter Breakdown Voltage		650	V
I _C	DC Collector Current, Limited by T _{jmax}	T _C =25°C	80	A
		T _C =100°C	40	A
I _F	Diode Forward Current, Limited by T _{jmax}	T _C =25°C	80	A
		T _C =100°C	40	A
V _{GE}	Continuous Gate-Emitter voltage		±20	V
V _{GE}	Transient Gate-Emitter voltage		±30	V
I _{CRM}	Repetitive peak collector current, t _p = 1ms		80	A
I _{CM}	Pulse Collector Current, V _{GE} =15V, t _p Limited by T _{jmax}		160	A
P _{tot}	Power Dissipation , T _j =25°C		187	W
T _j	Operating Junction Temperature		-40 to +175	°C
T _s	Storage Temperature		-55 to +150	°C
-	Soldering Temperature, Wave Soldering 1.6mm (0.063in.) from Case for 10s		260	°C

Thermal Characteristics

Symbol	Description	Max	Unit
R_{thJC}	IGBT Thermal Resistance, Junction - Case	0.8	K/W
R_{thJC}	Diode Thermal Resistance, Junction - Case	1.05	K/W
R_{thJA}	Thermal Resistance, Junction - Ambient	40	K/W

Electrical Characteristics (T_j= 25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
Static						
BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} =0V , I _C =250uA	650			V
		V _{GE} =0V , I _C =0.75mA	650			V
V _{GE(th)}	Gate Threshold Voltage	V _{GE} =V _{CE} , I _C =0.75mA	4.0	5.3	6.5	V
V _(sat)	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C =40A	T _j =25°C	1.55	1.95	V
			T _j =125°C	1.75		
			T _j =150°C	1.85		
I _{CES}	Zero Gate Voltage Collector Current	V _{CE} = 650V, V _{GE} = 0V	T _j =25°C		200	μA
			T _j =150°C		4000	
I _{GES}	Gate-Emitter Leakage Current	V _{CE} = 0V, V _{GE} = ±20V			100	nA
Dynamic						
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} = 0V, f=1MHz		2220		pF
C _{res}	Reverse Transfer Capacitance			38		
Q _G	Gate Charge	V _{CC} = 300V, I _C = 40A, V _{GE} = 15V		205		nC

Switching Characteristic, Inductive Load

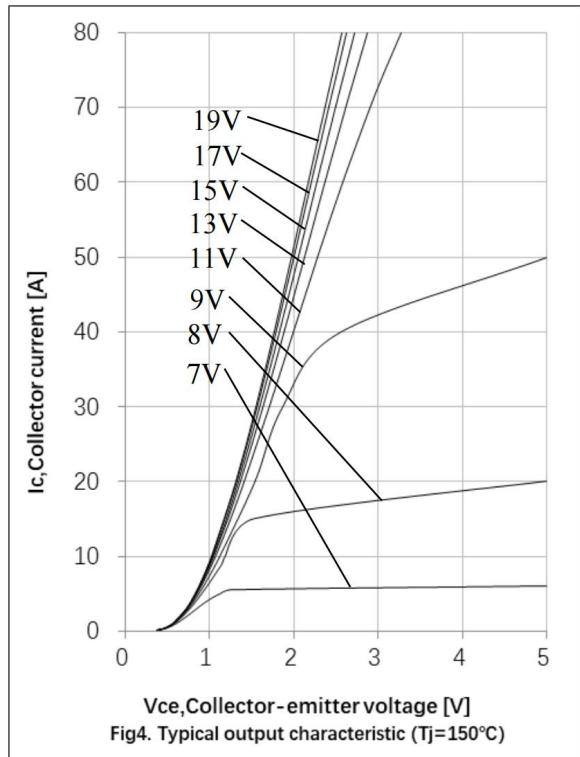
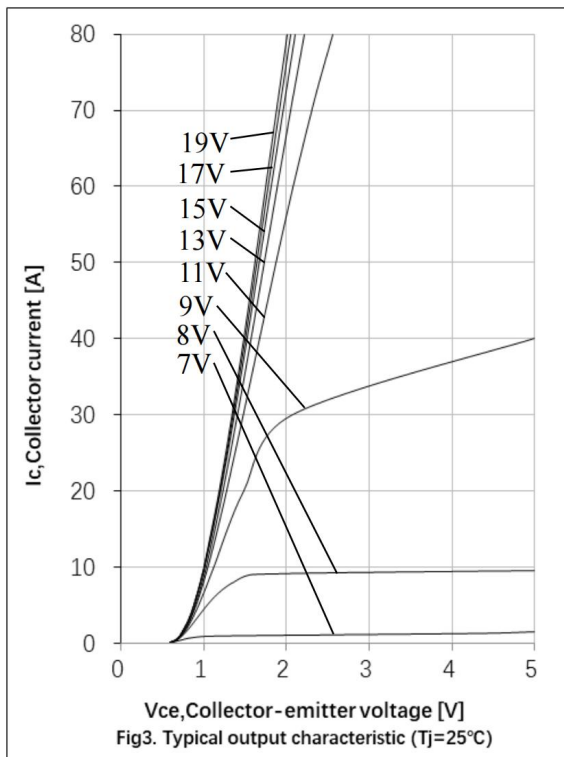
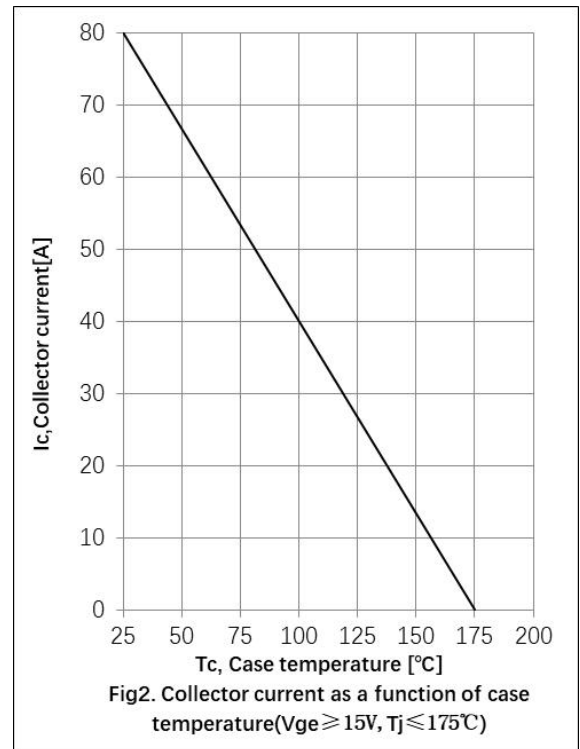
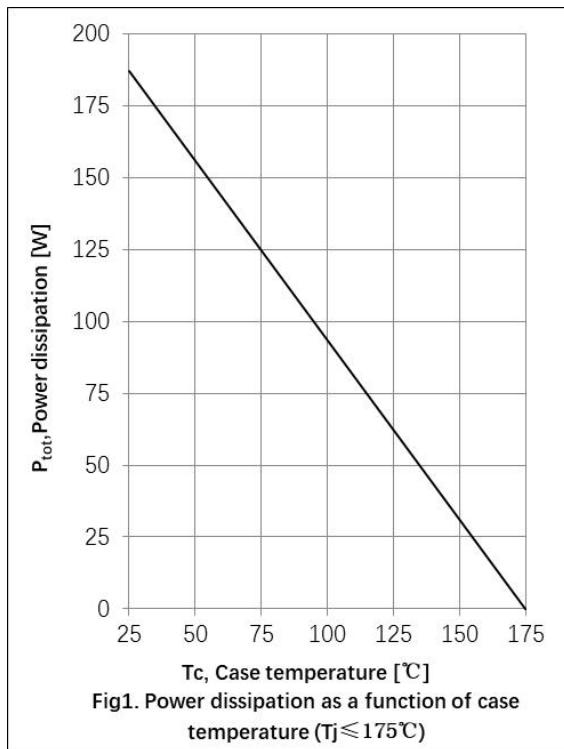
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
Dynamic T _j =25°C						
t _{d(on)}	Turn-on Delay Time	V _{CC} =300V, I _C =40.0A, V _{GE} =-5.0/15.0V, R _g =20Ω		18		ns
t _r	Rise Time			64		ns
t _{d(off)}	Turn-off Delay Time			134		ns
t _f	Fall Time			46		ns
E _{on}	Turn-on Energy			1.28		mJ
E _{off}	Turn-off Energy			0.44		mJ
Dynamic T _j =125°C						
t _{d(on)}	Turn-on Delay Time	V _{CC} =300V, I _C =40.0A, V _{GE} =-5.0/15.0V, R _g =20Ω		18		ns
t _r	Rise Time			65		ns

t _{d(off)}	Turn-off Delay Time			136		ns
t _f	Fall Time			76		ns
E _{on}	Turn-on Energy			1.29		mJ
E _{off}	Turn-off Energy			0.58		mJ
Dynamic T _j =150°C						
t _{d(on)}	Turn-on Delay Time	V _{CC} =300V, I _C =40.0A, V _{GE} =-5.0/15.0V, R _g =20Ω		18		ns
t _r	Rise Time			58		ns
t _{d(off)}	Turn-off Delay Time			141		ns
t _f	Fall Time			91		ns
E _{on}	Turn-on Energy			1.31		mJ
E _{off}	Turn-off Energy			0.62		mJ

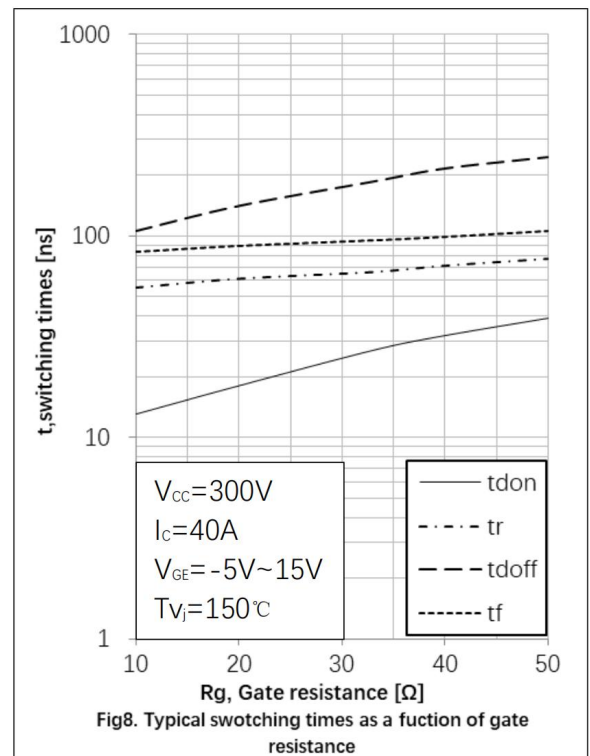
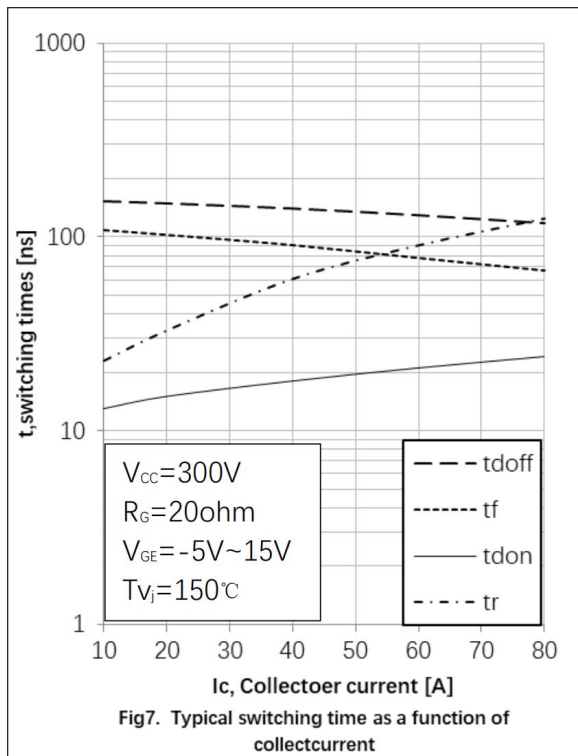
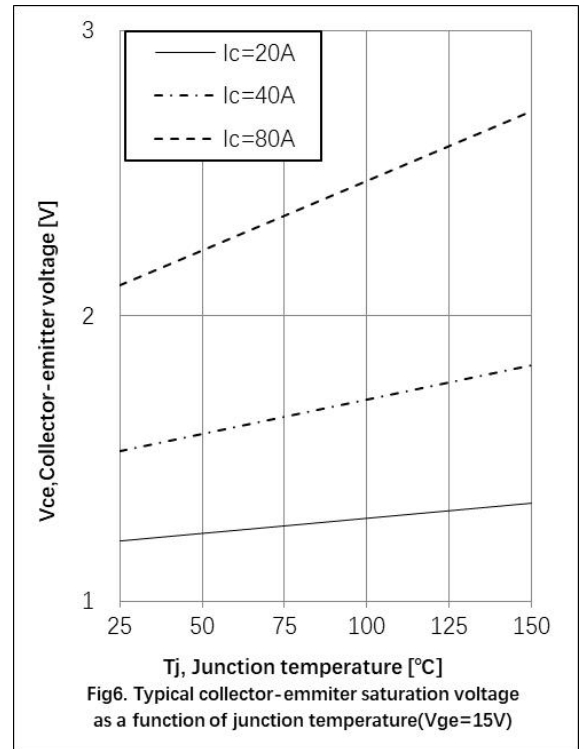
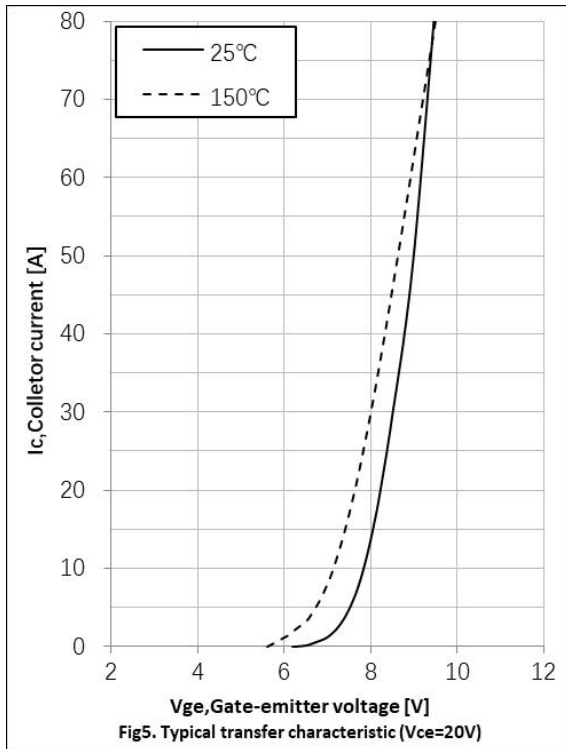
Electrical Characteristics of the DIODE ($T_j=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
V_{FM}	Diode Forward Voltage	$I_F=40\text{A}, T_j=25^{\circ}\text{C}$		2.1	3.0	V
		$I_F=40\text{A}, T_j=125^{\circ}\text{C}$		1.85		
		$I_F=40\text{A}, T_j=150^{\circ}\text{C}$		1.75		
T_{rr}	Reverse Recovery Time	$I_F=40\text{A},$ $V_R=300\text{V},$ $di/dt=-400\text{A}/\mu\text{s},$ $T_j=25^{\circ}\text{C}$		66		ns
I_{rr}	Reverse Recovery Current			5		A
Q_{rr}	Reverse Recovery Charge			276		nC
E_{rec}	Reverse Recovery Energy			0.04		mJ
T_{rr}	Reverse Recovery Time	$I_F=40\text{A},$ $V_R=300\text{V},$ $di/dt=-400\text{A}/\mu\text{s},$ $T_j=125^{\circ}\text{C}$		153		ns
I_{rr}	Reverse Recovery Current			7		A
Q_{rr}	Reverse Recovery Charge			781		nC
E_{rec}	Reverse Recovery Energy			0.09		mJ
T_{rr}	Reverse Recovery Time	$I_F=40\text{A},$ $V_R=300\text{V},$ $di/dt=-400\text{A}/\mu\text{s},$ $T_j=150^{\circ}\text{C}$		194		ns
I_{rr}	Reverse Recovery Current			9		A
Q_{rr}	Reverse Recovery Charge			958		nC
E_{rec}	Reverse Recovery Energy			0.12		mJ

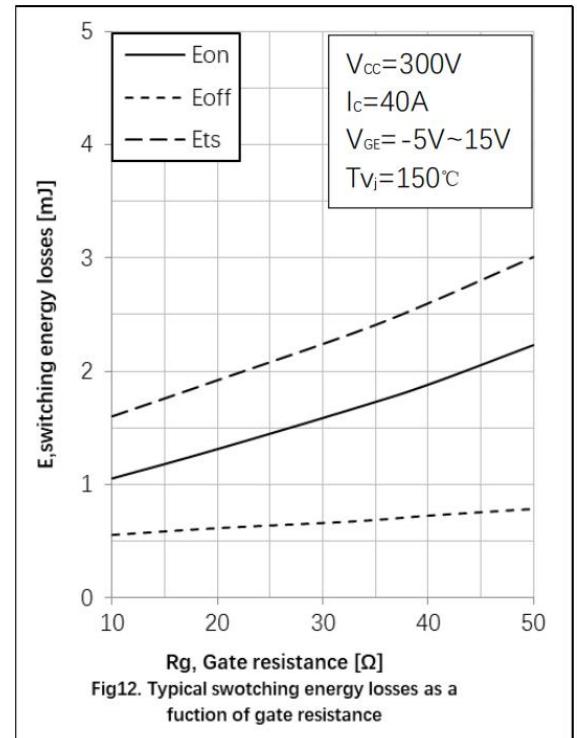
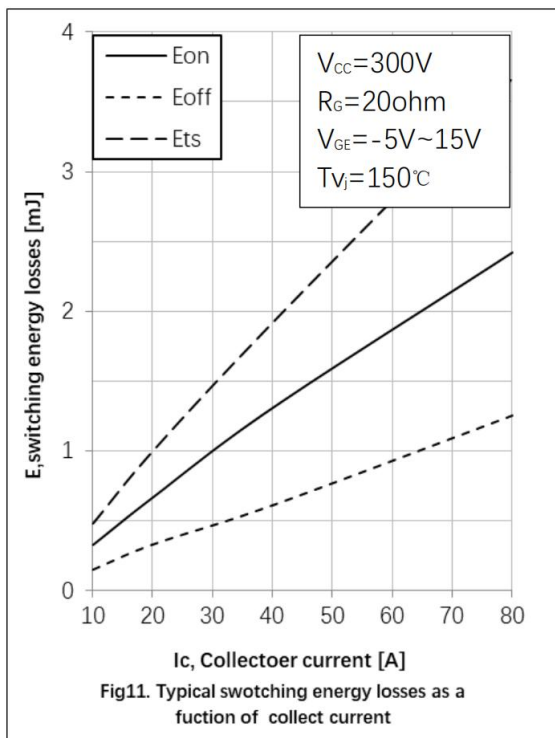
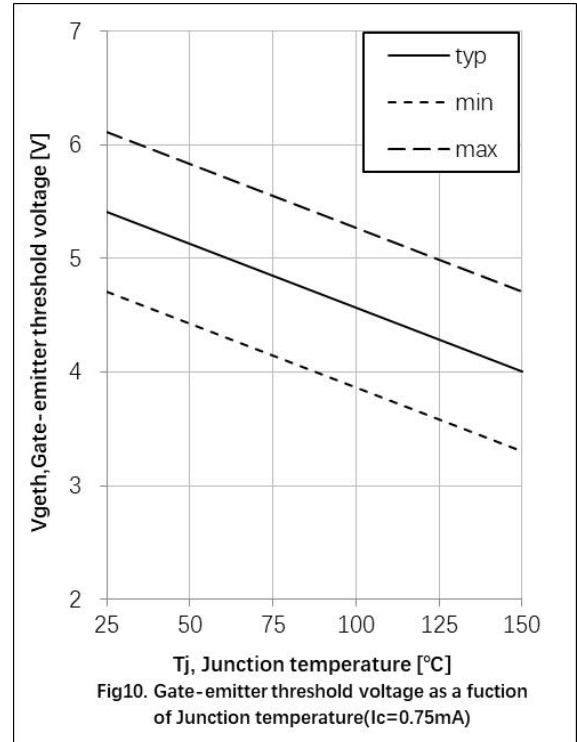
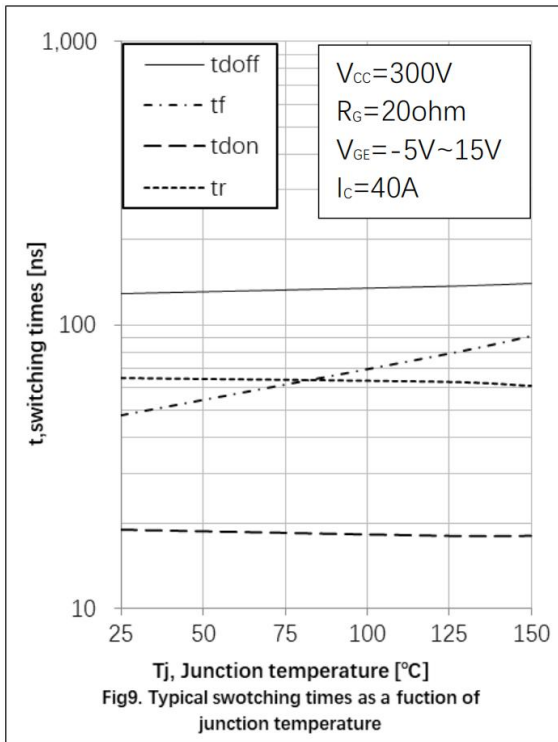
Typical Performance



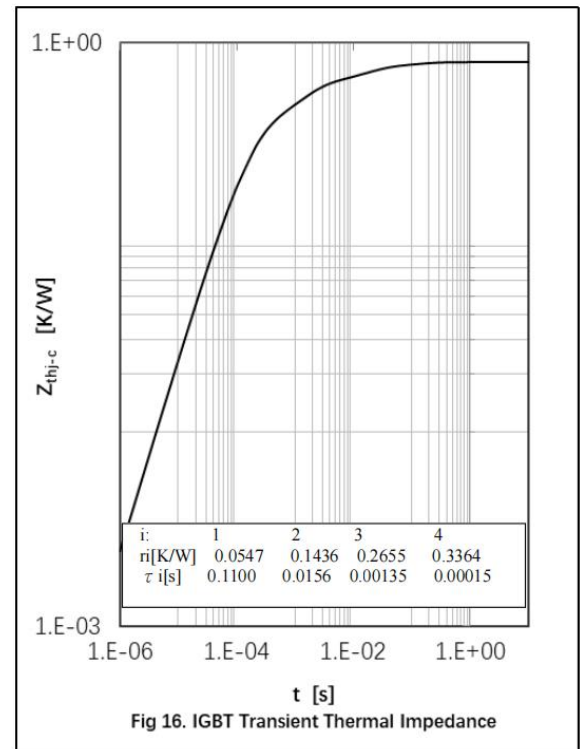
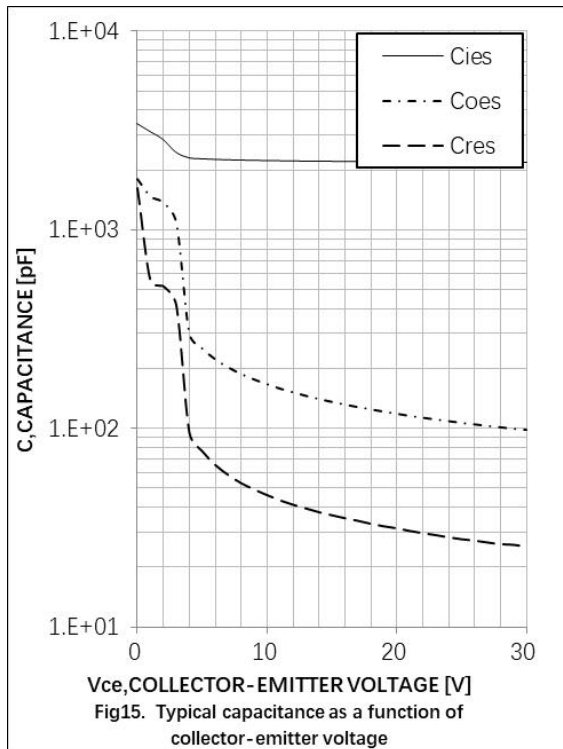
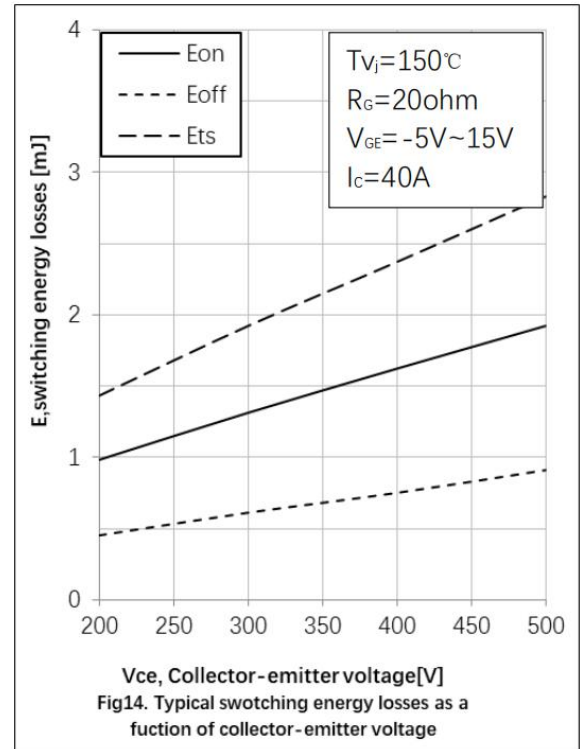
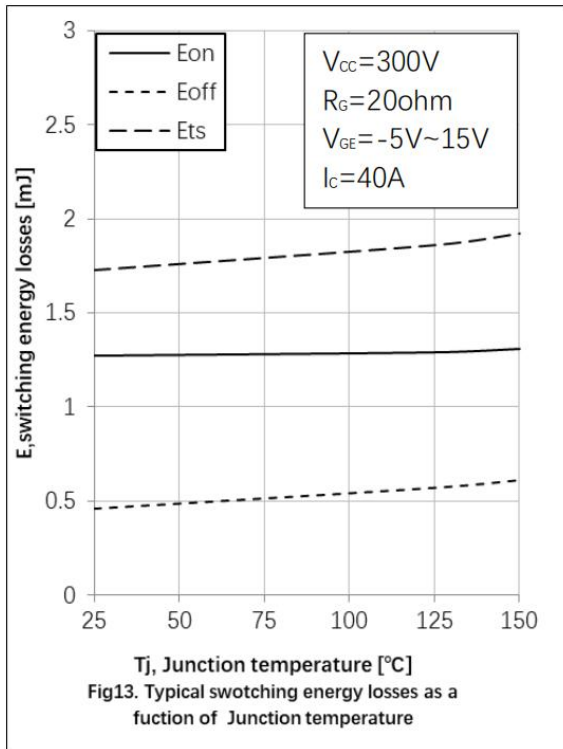
Typical Performance



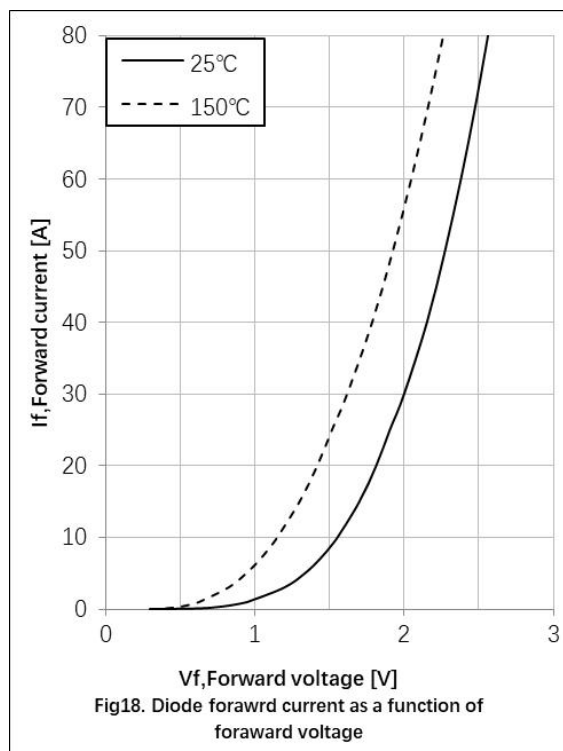
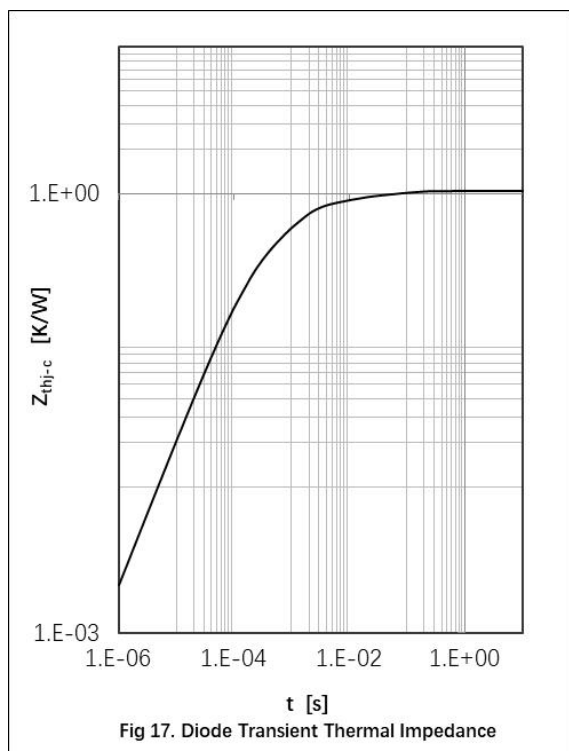
Typical Performance



Typical Performance

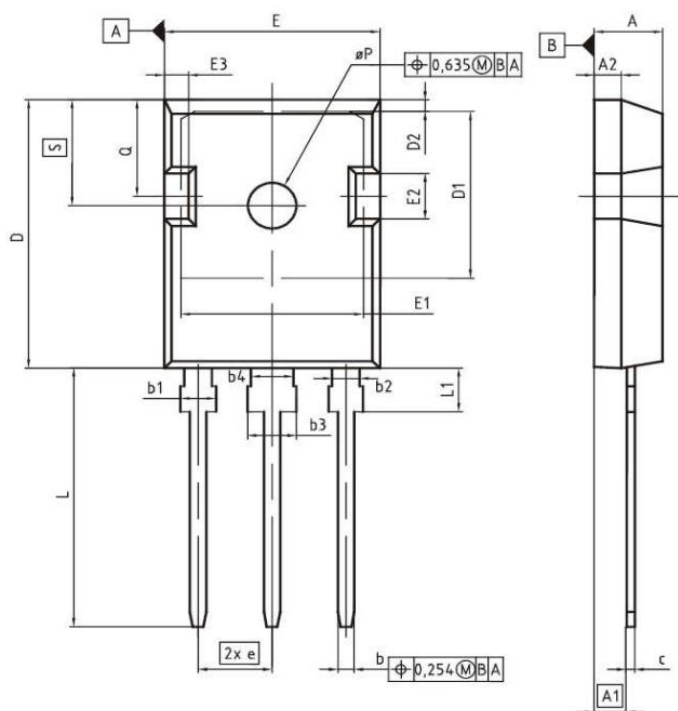


Typical Performance



Package Dimensions

TO-247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44(BSC)		0.214(BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
ΦP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

UNIT:mm