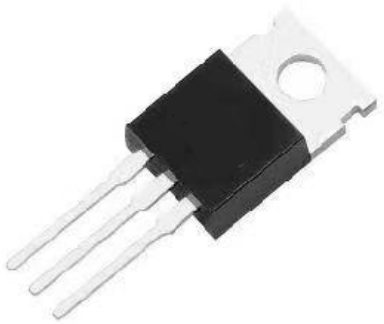
TPGP15N65LN

IGBT Discrete with Anti-Parallel Diode

General Description

Topdiode TPGP15N65LN 15A 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.

Package TO-220-3



Features

High Breakdown Voltage up to 650V for Improved Reliability

Trench Field Stop Technology

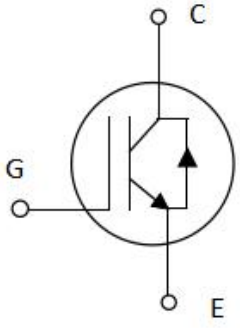
High Ruggedness, Temperature Stable

Low switching losses

Easy Parallel Switching Capability due to Positive Temperature Coefficient in V_{CEsat}

Maximum junction temperature 175℃

Equivalent Schematic



Applications

Uninterruptible Power Supply

Inverter

Converter with High Switching Frequency

Summary

Symbol	Value
V_{CE}	650V
I_C	15A
$V_{CE(SAT)}$ $I_{C=15A}$	1.65V

Maximum Ratings (T_C = 25℃ 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℃	30	A
		T_C=100℃	15	A
I_F	Diode Forward Current, Limited by T_{jmax}	T_C=25℃	30	A
		T_C=100℃	15	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		30	A
I_{CM}	Pulse Collector Current, V_{GE} =15V, t_p Limited by T_{jmax}		60	A
T_{SC}	Short Circuit Withstand Time,V_{GE}=15V,V_{CE} ≤ 400V		5	us
P_{tot}	Power Dissipation , T_j=25°C		130	W
T_j	Operating Junction Temperature		-40 to +175	℃
T_S	Storage Temperature		-55 to +150	℃
-	Soldering Temperature, Wave Soldering 1.6mm (0.063in.) from Case for 10s		260	℃

Thermal Characteristics

Symbol	Description	Max	Unit
R_{thJC}	IGBT Thermal Resistance, Junction - Case	1.15	K/W
R_{thJC}	Diode Thermal Resistance, Junction - Case	1.9	K/W
R_{thJA}	Thermal Resistance, Junction - Ambient	60	K/W

Electrical Characteristics (Tj= 25℃ 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=1mA		650			V
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}=V_{CE}, I_C=250uA		4.1	5.0	5.7	V
$V_{(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=10A	T_j=25℃		1.65		V
			T_j=125℃		1.95		
			T_j=150℃		2.05		
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = 650V, V_{GE} = 0V	T_j=25℃			250	μA
			T_j=150℃			250	
I_{GES}	Gate-Emitter Leakage Current	V_{CE} = 0V, V_{GE} = ±20V				200	nA
Dynamic							
C_{ies}	Input Capacitance	V_{CE} =25V, V_{GE} = 0V, f=1MHz			0.99		nF
C_{res}	Reverse Transfer Capacitance				0.03		
Q_G	Gate Charge	V_{CC} = 480V, I_C = 15A, V_{GE} = 15V			52		nC
I_{SC}	Short Circuit Collector Current	V_{CC} = 400V, tsc ≤ 5us, V_{GE} = 15V, $T_{j.start}$=25° C			98		A

Switching Characteristic, Inductive Load

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
Dynamic T_j=25℃						
$t_{d(on)}$	Turn-on Delay Time	V_{CC} =400V, I_C=15.0A, V_{GE}=0.0/15.0V, R_g=12Ω		15		ns
t_r	Rise Time			25		ns
$t_{d(off)}$	Turn-off Delay Time			60		ns
t_f	Fall Time			46		ns
E_{on}	Turn-on Energy			0.75		mJ
E_{off}	Turn-off Energy			0.1		mJ
Dynamic T_j=125℃						
$t_{d(on)}$	Turn-on Delay Time	V_{CC} =400V, I_C=15.0A,		24		ns

t_r	Rise Time	V_{GE}=0.0/15.0V, R_g=12Ω		30		ns
$t_{d(off)}$	Turn-off Delay Time			90		ns
t_f	Fall Time			54		ns
E_{on}	Turn-on Energy			1.10		mJ
E_{off}	Turn-off Energy			0.15		mJ
Dynamic T_j=150℃						
$t_{d(on)}$	Turn-on Delay Time	V_{CC} =400V, I_C=15.0A, V_{GE}=0.0/15.0V, R_g=12Ω		26		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-off Delay Time			95		ns
t_f	Fall Time			58		ns
E_{on}	Turn-on Energy			1.25		mJ
E_{off}	Turn-off Energy			0.18		mJ

Electrical Characteristics of the DIODE（T_j= 25℃ unless otherwise specified）

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
V_{FM}	Diode Forward Voltage	I_F = 15A,T_j=25℃		1.7		V
		I_F = 15A,T_j=125℃		1.65		
		I_F = 15A,T_j=150℃		1.65		
I_{rr}	Reverse Recovery Current	I_F= 15A, V_R = 400V, di/dt= -150A/μs, T_j=25℃		12		A
Q_{rr}	Reverse Recovery Charge			0.5		uC
Erec	Reverse Recovery Energy			0.06		mj
I_{rr}	Reverse Recovery Current	I_F= 15A, V_R = 400V, di/dt= -150A/μs, T_j=125℃		15		A
Q_{rr}	Reverse Recovery Charge			0.9		uC
Erec	Reverse Recovery Energy			0.12		mj
I_{rr}	Reverse Recovery Current	I_F= 15A, V_R = 400V, di/dt= -150A/μs, T_j=150℃		16		A
Q_{rr}	Reverse Recovery Charge			1.2		uC
Erec	Reverse Recovery Energy			0.15		mj

Typical Performance

Fig. 1 FBSOA characteristics

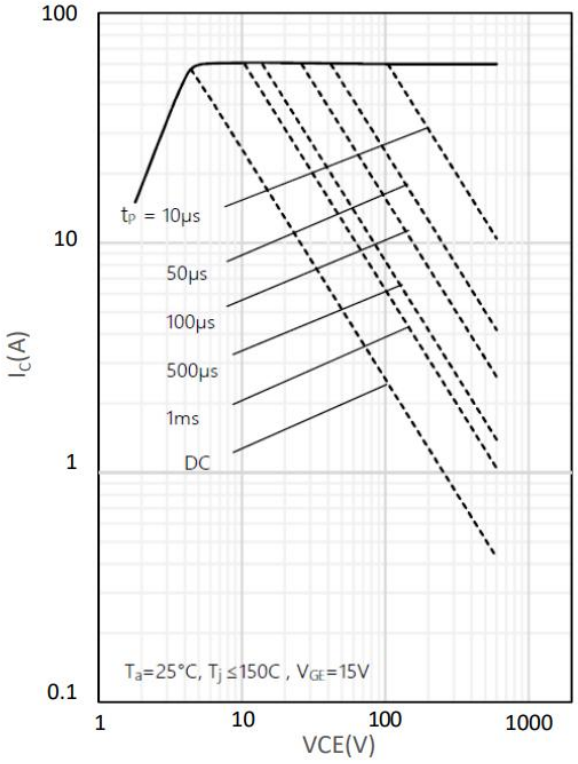


Fig. 2 Load Current vs. Frequency

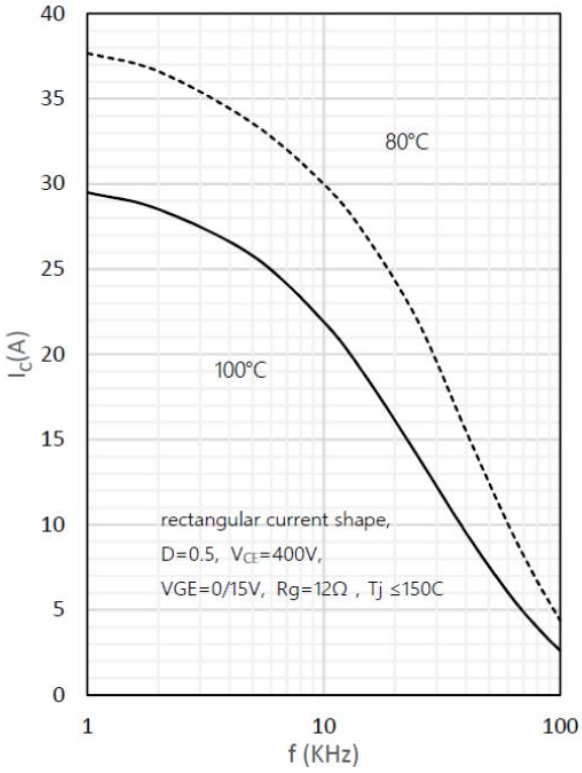


Fig. 3 Output characteristics

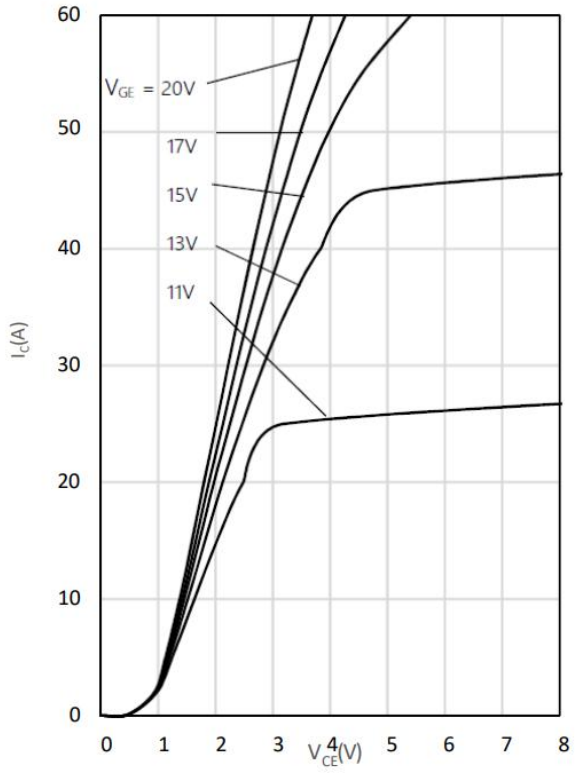
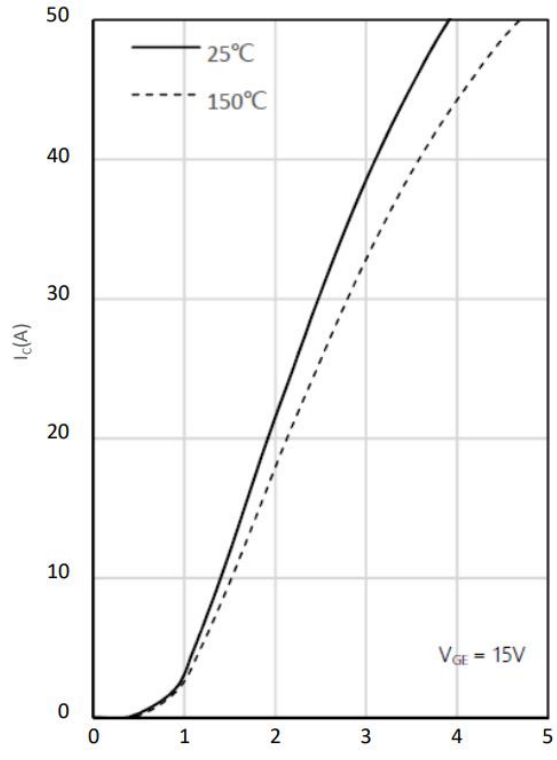


Fig. 4 Saturation voltage characteristics



Typical Performance

Fig. 5 Switching times vs. gate resistor

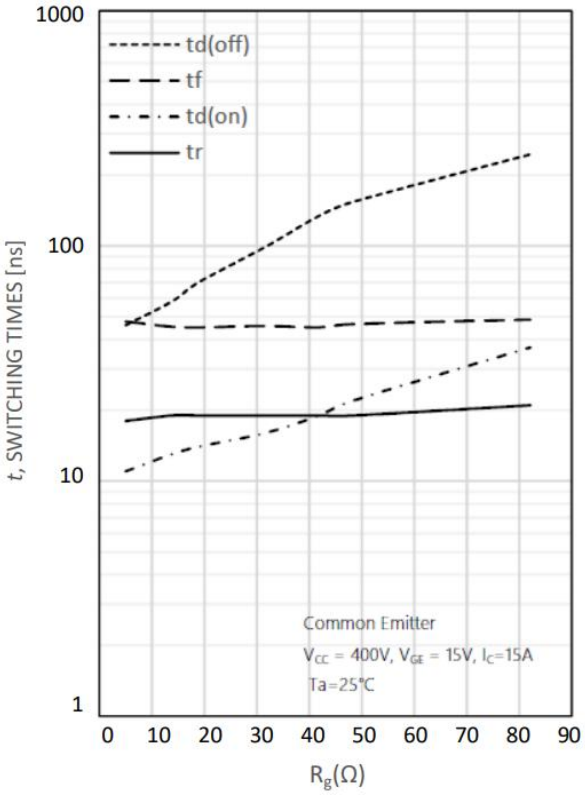


Fig. 6 Switching times vs. collector current

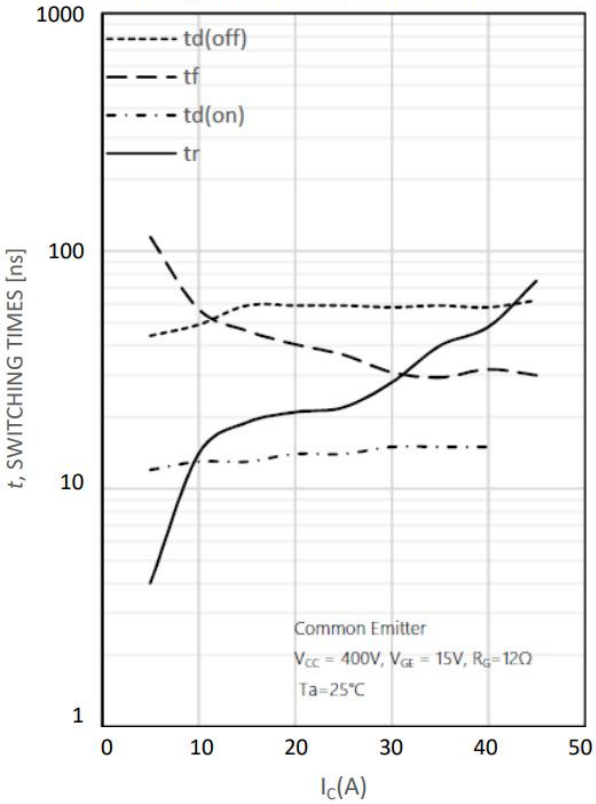


Fig. 7 Switching loss vs. gate resistor

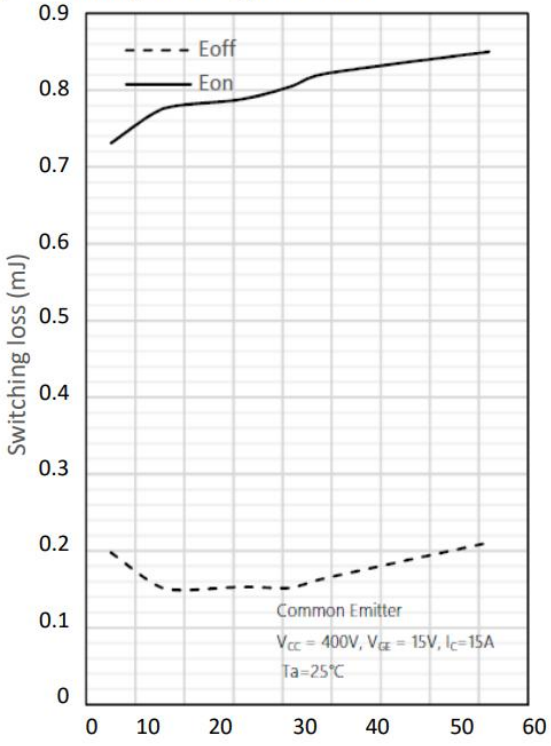
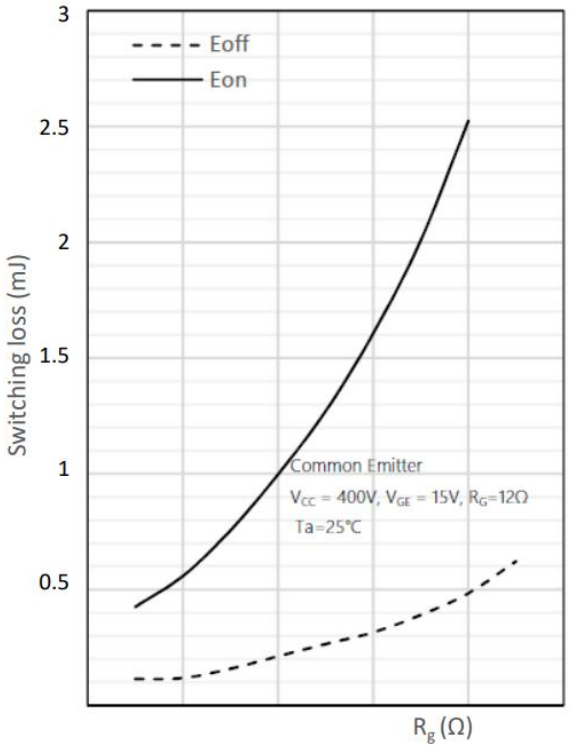


Fig. 8 Switching loss vs. collector current



Typical Performance

Fig. 9 Gate charge characteristics

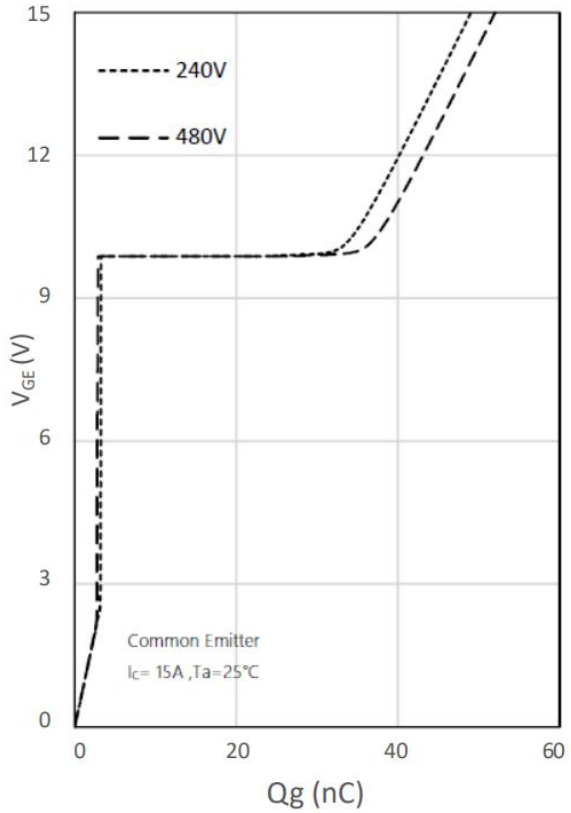
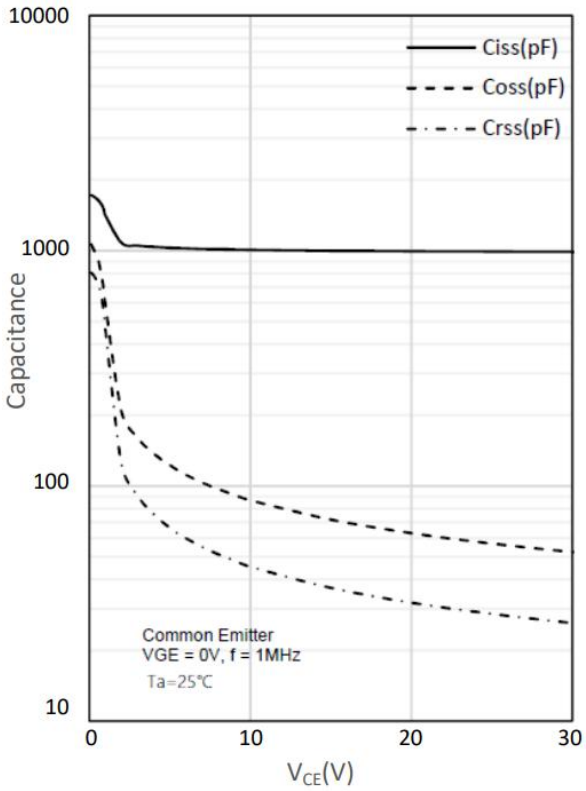
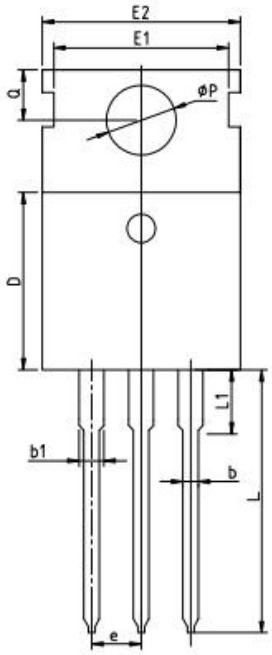


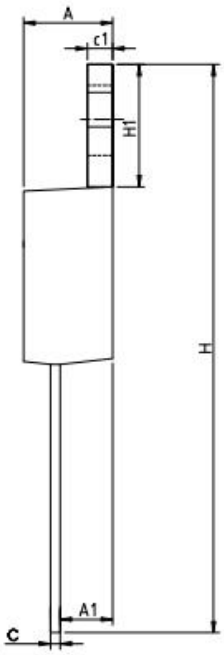
Fig. 10 Capacitance characteristics

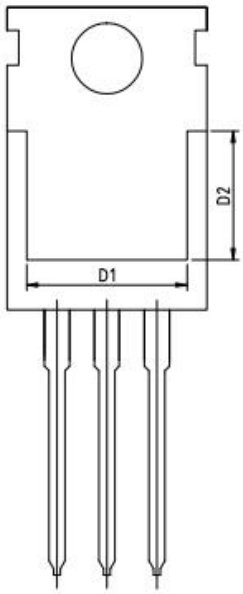


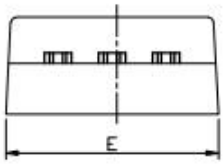
Package Dimensions

TO-220CB-3L

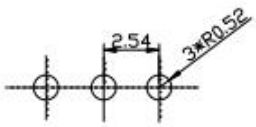








RECOMMENDED LAND PATTERN



	MIN	NOM	MAX
A	4.40	4.60	4.80
A1	2.25	2.40	2.55
b	0.72	0.82	0.92
b1	1.12	1.27	1.42
c	0.40	0.50	0.60
c1	1.20	1.30	1.40
D	8.80	9.10	9.40
D1	7.75	7.95	8.15
D2	6.55	6.75	6.95
e		2.54BSC	
E	9.65	10.00	10.35
E1		8.70	
E2	9.70	10.00	10.30
H	28.70	29.20	29.70
H1	6.25	6.50	6.85
L	13.20	13.50	13.80
L1	2.80	3.10	3.40
Q	2.60	2.80	3.00
ØP	3.45	3.60	3.75

UNIT:mm