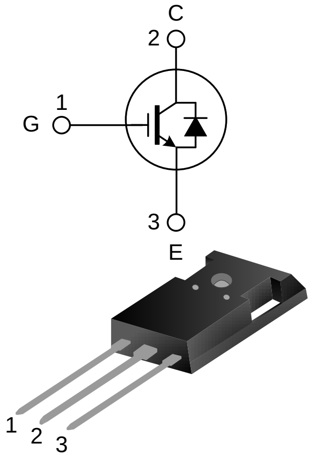
40A, 650V FIELD STOP IGBT

DESCRIPTION

The SGTP40V65FDR1P7 field stop IGBT employs 5th generation Field Stop technology (Field Stop 5), features low conduction loss and switching loss, is applicable to photovoltaic, UPS, SMPS, and PFC fields.

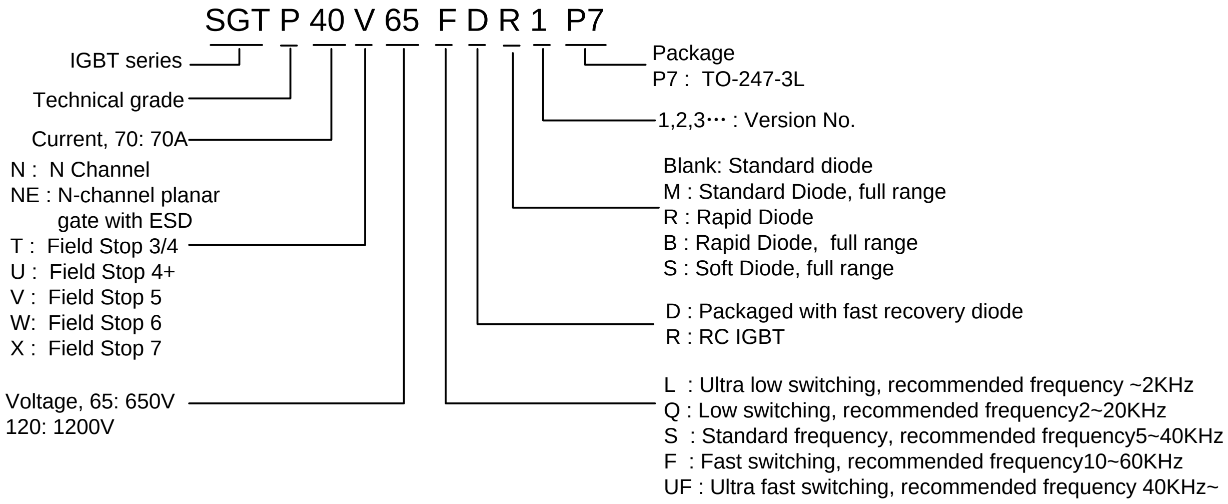


TO-247-3L

FEATURES

- 40A, 650V, $V_{CE(sat)(typ.)}$=1.65V@I_C=40A
- Low conduction loss
- Fast switching
- High input impedance
- T_{Jmax}=175°C

NOMENCLATURE



ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGTP40V65FDR1P7	TO-247-3L	P40V65FDR1	Halogen free	Tube

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, T_C=25°C)

Characteristics		Symbol	Ratings	Unit
Collector to Emitter Voltage		V_{CE}	650	V
Gate to Emitter Voltage		V_{GE}	±20	V
Transient Gate to Emitter Voltage (t_p≤10μs, D<0.010)		V_{GE}	±30	V
Collector Current	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed Collector Current		I_{CM}	120	A
Diode current	T_C=25°C	I_F	40	A
	T_C=100°C		20	A
Power Dissipation (T_C=25°C)		P_D	300	W
Operating Junction Temperature		T_J	-40～+175	°C
Storage Temperature Range		T_{stg}	-55～+150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	--	--	--	0.5	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	--	--	--	1.4	°C/W
Thermal Resistance, Junction to Ambient (IGBT)	$R_{\theta JA}$	--	--	--	40	°C/W
Soldering Temperature (in line)	T_{sold}	15^{+2}_{-0} sec, 1time	--	--	260	°C

ELECTRICAL CHARACTERISTICS OF IGBT (UNLESS OTHERWISE NOTED, T_C=25°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Collector to Emitter Breakdown Voltage	BV_{CE}	V_{GE}=0V, I_C=250μA	650	--	--	V
C-E Leakage Current	I_{CES}	V_{CE}=600V, V_{GE}=0V	--	--	200	μA
G-E Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±400	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250μA, V_{CE}=V_{GE}	3.2	4.5	5.8	V
Collector to Emitter	$V_{CE(sat)}$	I_C=40A, V_{GE}=15V, T_C=25°C	--	1.65	2.1	V
		I_C=40A, V_{GE}=15V, T_C=150°C	--	1.85	--	V
Input Capacitance	C_{ies}	V_{CE}=30V	--	3150	--	pF
Output Capacitance	C_{oes}	V_{GE}=0V	--	63	--	
Reverse Transfer Capacitance	C_{res}	f=1MHz	--	11	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=20A R_g=10Ω V_{GE}=15V Inductive Load	--	22	--	ns
Rise Time	T_r		--	38	--	
Turn-Off Delay Time	$T_{d(off)}$		--	118	--	
Fall Time	T_f		--	60	--	
Turn-On Switching Loss	E_{on}		--	0.8	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.1	--	
Total Switching Loss	E_{st}		--	0.9	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=40A R_g=10Ω V_{GE}=15V Inductive Load	--	28	--	ns
Rise Time	T_r		--	80	--	
Turn-Off Delay Time	$T_{d(off)}$		--	116	--	
Fall Time	T_f		--	98	--	
Turn-On Switching Loss	E_{on}		--	1.9	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.52	--	
Total Switching Loss	E_{st}		--	2.4	--	
Total Gate Charge	Q_g	V_{CE}=400V, I_C=40A, V_{GE}=15V	--	111	--	nC
Gate to Emitter Charge	Q_{ge}		--	29	--	
Gate to Collector Charge	Q_{gc}		--	25	--	

ELECTRICAL CHARACTERISTICS OF FRD (UNLESS OTHERWISE NOTED, T_C=25°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	I_F=20A, T_C=25°C	--	1.5	2	V
		I_F=20A, T_C=150°C	--	1.4	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=20A,	--	165	--	ns
Diode Reverse Recovery Charge	Q_{rr}	dI_{ES}/dt=200A/μs	--	223	--	nC
Diode Reverse Recovery Current	Irm	T_C=25°C	--	3.2	--	A

TYPICAL CHARACTERISTICS

Figure 1. Typical Output Characteristics

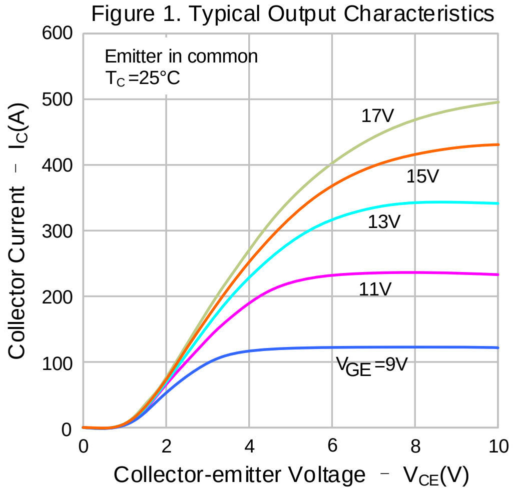


Figure 2. Typical Saturation Voltage Characteristics

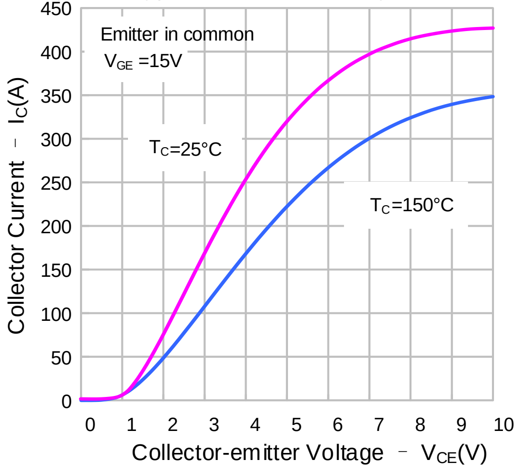


Figure 3. Transmission Characteristics

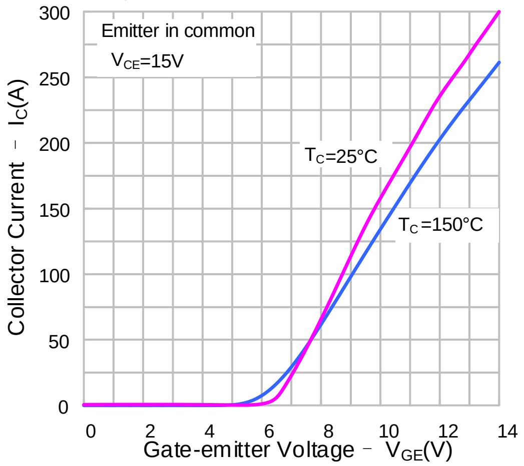


Figure 4. Saturation Voltage vs. V_{GE}

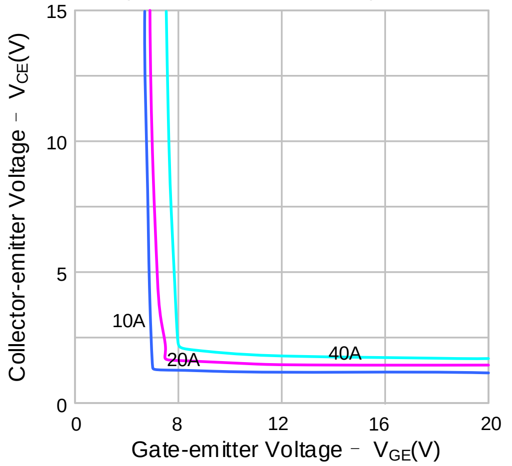


Figure 5. Saturation Voltage vs. V_{GE}

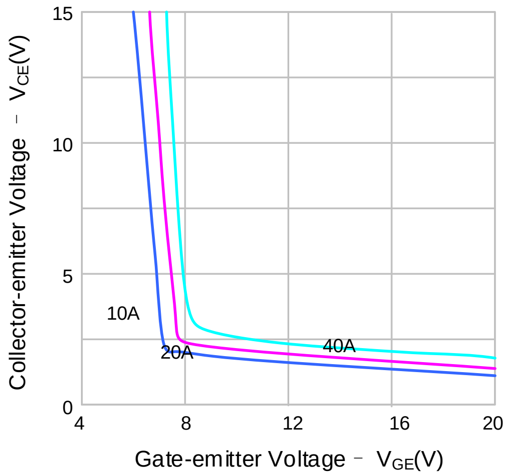
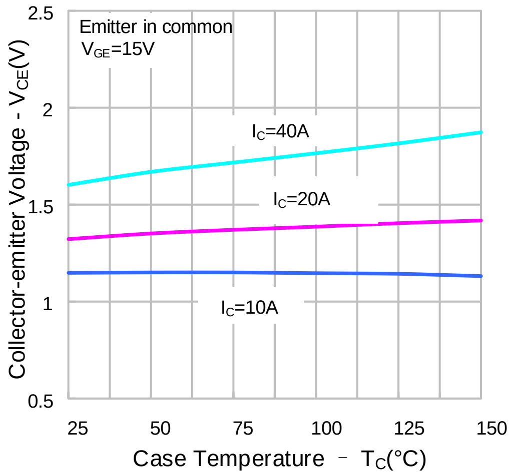


Figure 6. Saturation Voltage vs. Temperature



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Capacitance Characteristics

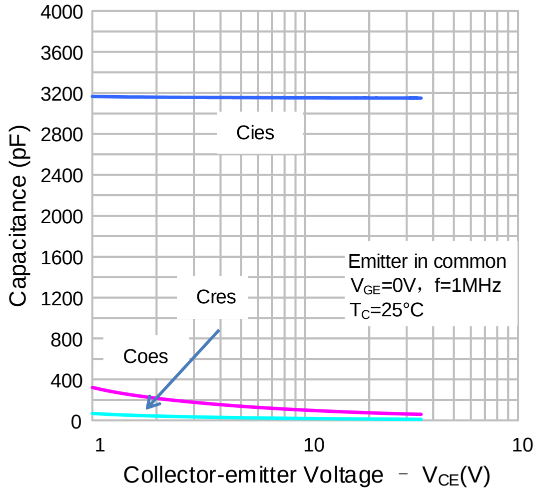


Figure 8. Gate Charge Characteristics

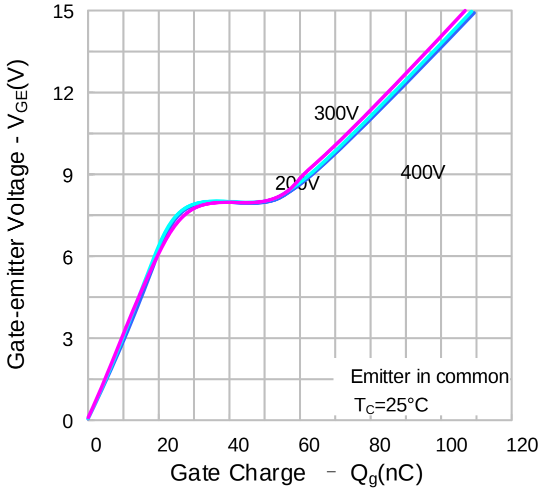


Figure 9. Turn-on Characteristics vs. Gate Resistance

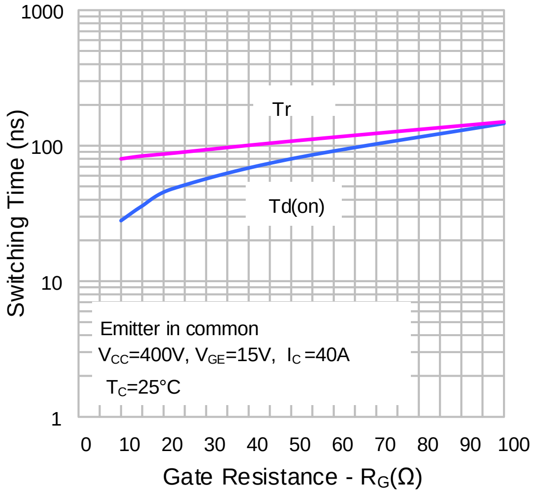


Figure 10. Turn-off Characteristics vs. Gate Resistance

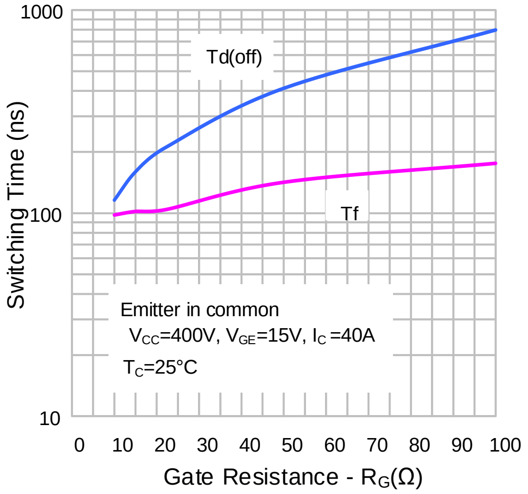


Figure 11. Switching Loss vs. Gate Resistance

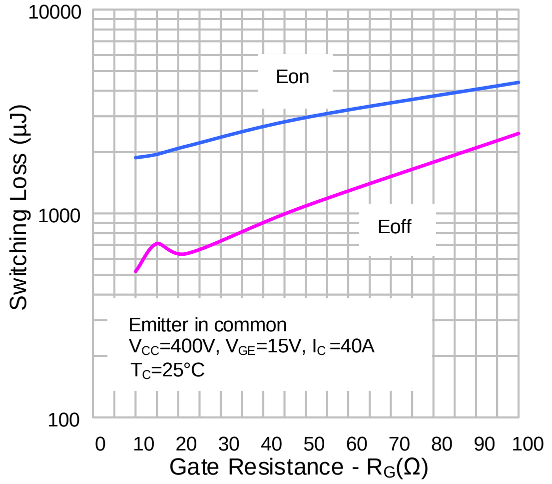
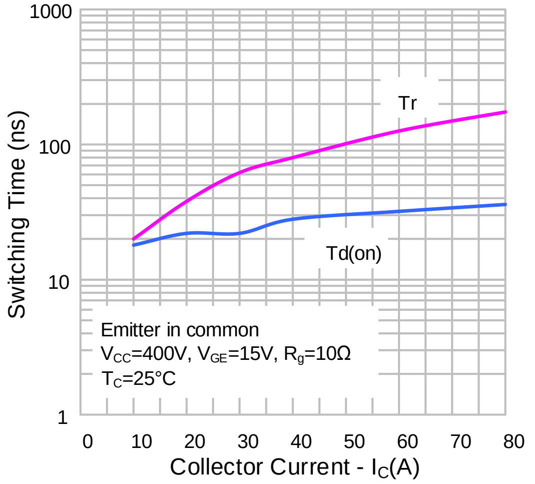


Figure 12. Turn-on Characteristics
vs. Collector Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 13. Turn-off Characteristics vs. Collector Current

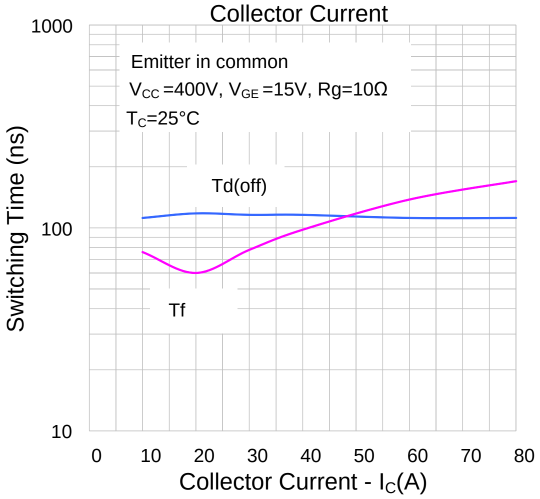


Figure 14. Switching Loss vs. Collector Current

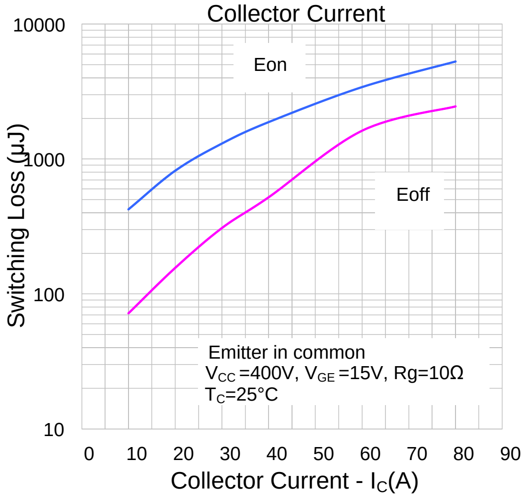


Figure 15. Forward Characteristics

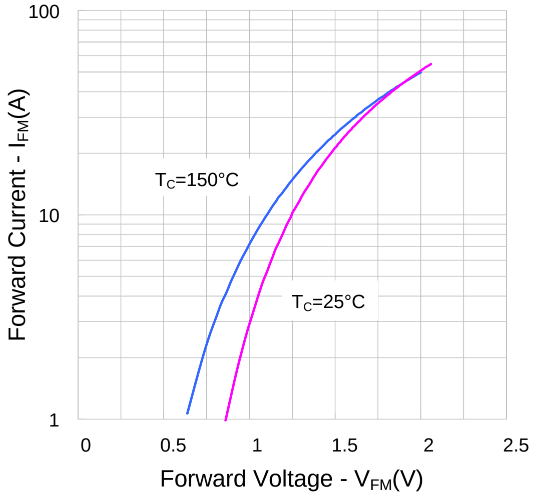


Figure 16. Reverse Recovery Time vs. Forward Current

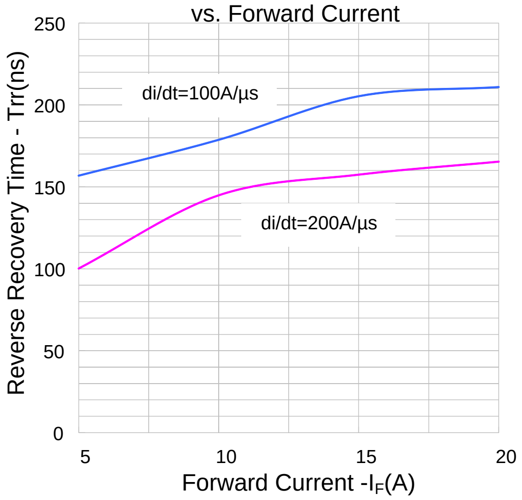


Figure 17. Reverse Recovery Charge vs. Forward Current

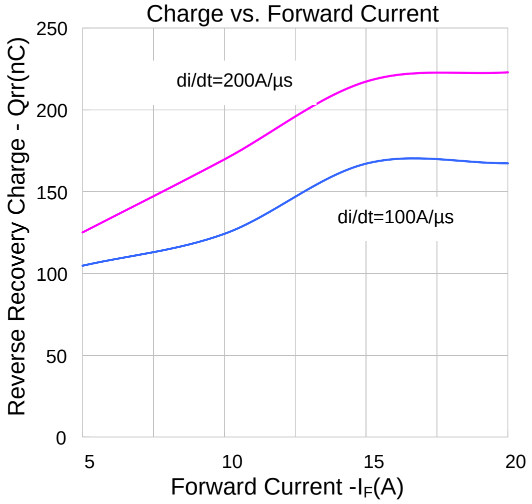
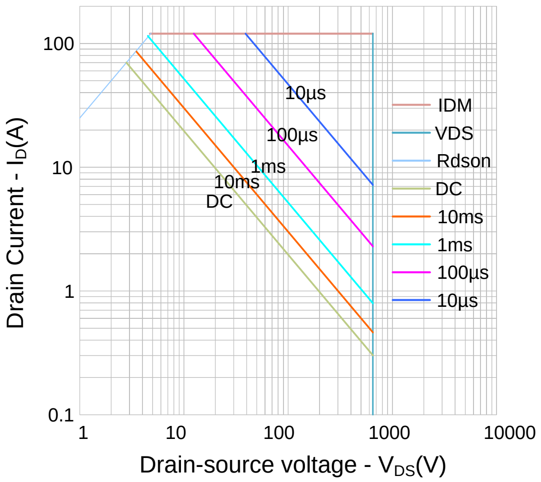


Figure 18. Max. Safe Operating Area (SOA)



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 19. Peak Reverse Recovery Current vs. Forward Current

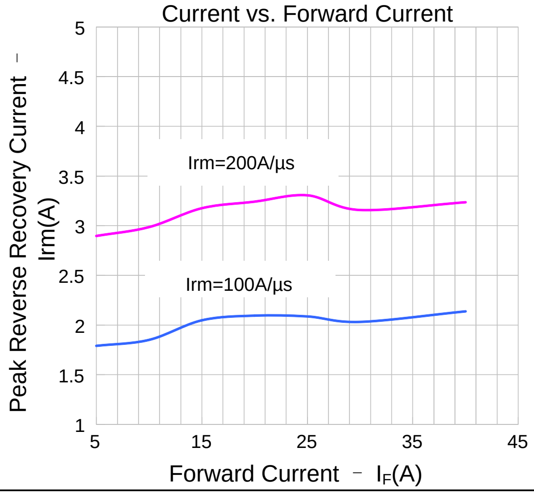
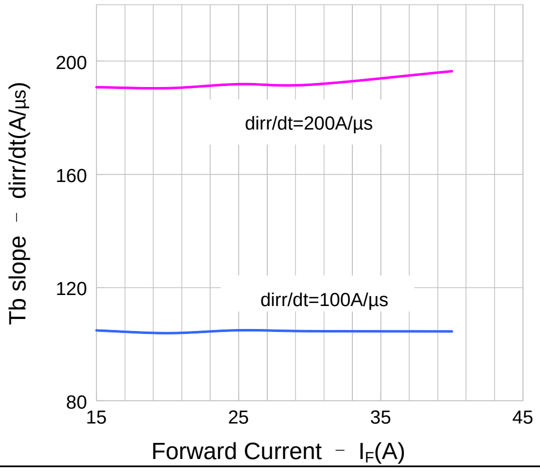
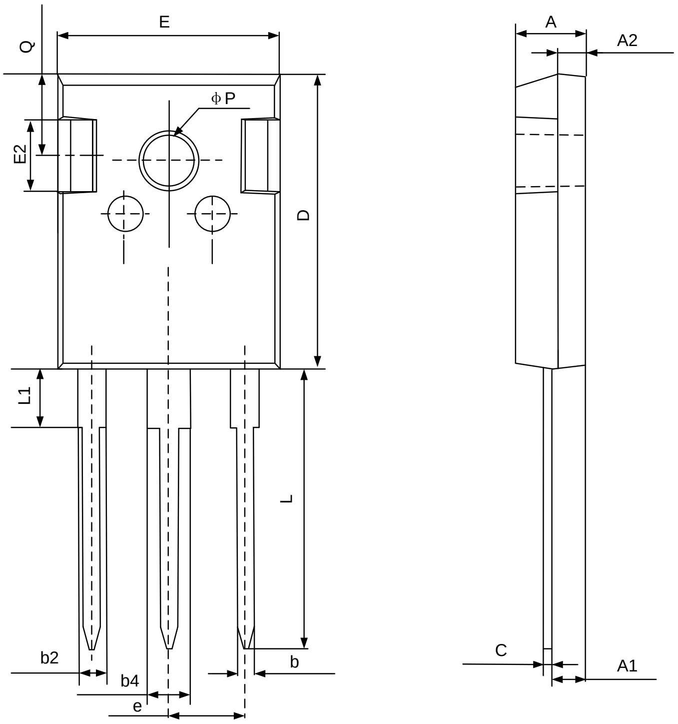


Figure 20. Tb Slope vs. Forward Current



PACKAGE OUTLINE

TO-247-3L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	–	1.36
b2	1.91	–	2.25
b4	2.91	–	3.25
c	0.51	–	0.75
D	20.80	21.00	21.30
E	15.50	15.80	16.10
E2	4.40	5.00	5.20
e	5.44 BSC		
L	19.72	19.92	20.22
L1	–	–	4.30
Q	5.60	5.80	6.00
P	3.40	—	3.80

Important notice:

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2. **Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.**
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Rev.: 1.1

Revision History:

1. Update Hazardous Substance Control
2. Add V_{GE}

Rev.: 1.0

Revision History:

1. First release