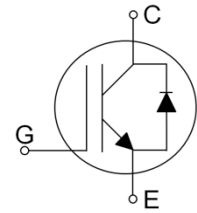


1200V Field Stop Trench Technology
 High Speed Switching
 Low Conduction Loss
 Positive Temperature Coefficient
 Easy parallel Operation
 RoHS compliant
 JEDEC Qualification



Applications :

Induction Heating, Soft switching application, UPS, Welder, Inverter

Device	Package	Marking	Remark
TGL40N120FD	TO-264	TGL40N120FD	RoHS

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit	
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	20	V	
Continuous Collector Current	I_c	$T_C = 25$	80	A
		$T_C = 100$	40	A
Pulsed Collector Current (Note 1)	I_{CM}	120	A	
Diode Continuous Forward Current	$T_C = 100$	I_F	40	A
Diode Maximum Forward Current	I_{FM}	120	A	
Power Dissipation	P_D	$T_C = 25$	480	W
		$T_C = 100$	192	W
Operating Junction Temperature	T_J	-55 ~ 150		
Storage Temperature Range	T_{STG}	-55 ~ 150		
Maximum lead temperature for soldering purposes, □	T_L	300		

Thermal Characteristics

Parameter	Symbol	Value	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$ (IGBT)	0.26	/W
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$ (DIODE)	0.95	/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	25	/W

Electrical Characteristics of the IGBT $T_C=25$, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF						
Collector Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0V, I_C = 1mA$	1200	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 1200V, V_{GE} = 0V$	--	--	1	mA
Gate Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	--	--	± 250	nA
ON						
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	$V_{GE} = V_{CE}, I_C = 40mA$	4.5	6.5	8.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15V, I_C = 40A, T_C = 25^\circ C$	--	2.0	2.6	V
		$V_{GE} = 15V, I_C = 40A, T_C = 125^\circ C$	--	2.45	--	V
DYNAMIC						
Input Capacitance	C_{IES}	$V_{CE} = 30V,$ $V_{GE} = 0V$ $f = 1MHz$	--	5150	--	pF
Output Capacitance	C_{OES}		--	150	--	pF
Reverse Transfer Capacitance	C_{RES}		--	100	--	pF
SWITCHING (Note 2)						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600V, I_C = 40A$ $R_G = 5\ \Omega, V_{GE} = 15V$ Inductive Load, $T_C = 25^\circ C$	--	55	--	ns
Rise Time	t_r		--	80	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	200	--	ns
Fall Time	t_f		--	55	110	ns
Turn-On Switching Loss	E_{ON}		--	5.3	8.0	mJ
Turn-Off Switching Loss	E_{OFF}		--	1.1	1.6	mJ
Total Switching Loss	E_{TS}		--	6.4	9.6	mJ
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600V, I_C = 40A$ $R_G = 5\ \Omega, V_{GE} = 15V$ Inductive Load, $T_C = 125^\circ C$	--	45	--	ns
Rise Time	t_r		--	75	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	210	--	ns
Fall Time	t_f		--	115	--	ns
Turn-On Switching Loss	E_{ON}		--	5.6	8.4	mJ
Turn-Off Switching Loss	E_{OFF}		--	2.2	3.3	mJ
Total Switching Loss	E_{TS}		--	7.8	11.7	mJ
Total Gate Charge	Q_g	$V_{CC} = 600V, I_C = 40A$ $V_{GE} = 15V$	--	320	480	nC
Gate-Emitter Charge	Q_{ge}		--	40	60	nC
Gate-Collector Charge	Q_{gc}		--	150	225	nC

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Diode Forward Voltage	V_{FM}	$I_F = 40A$	$T_C = 25\text{ }^\circ\text{C}$	--	2.85	--	V
			$T_C = 125\text{ }^\circ\text{C}$	--	2.9	--	
Reverse Recovery Time	t_{rr}	$I_F = 40A,$ $di/dt = 200A/\mu s$	$T_C = 25\text{ }^\circ\text{C}$	--	200	--	ns
			$T_C = 125\text{ }^\circ\text{C}$	--	325	--	
Reverse Recovery Current	I_{rr}		$T_C = 25\text{ }^\circ\text{C}$	--	23	--	A
			$T_C = 125\text{ }^\circ\text{C}$	--	43	--	
Reverse Recovery Charge	Q_{rr}		$T_C = 25\text{ }^\circ\text{C}$	--	2500	--	

IGBT Characteristics

Fig. 1 Output characteristics

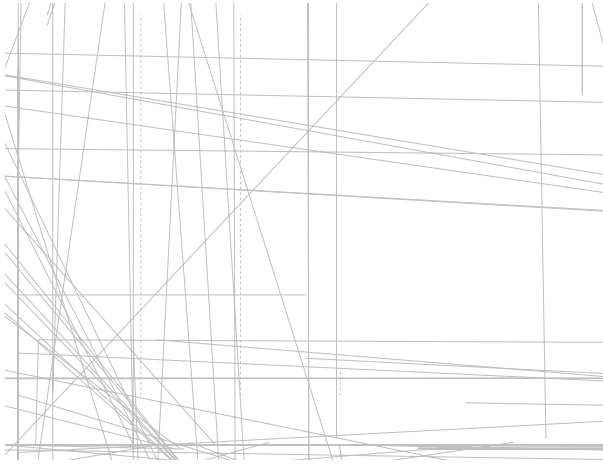


Fig. 2 Saturation voltage characteristics

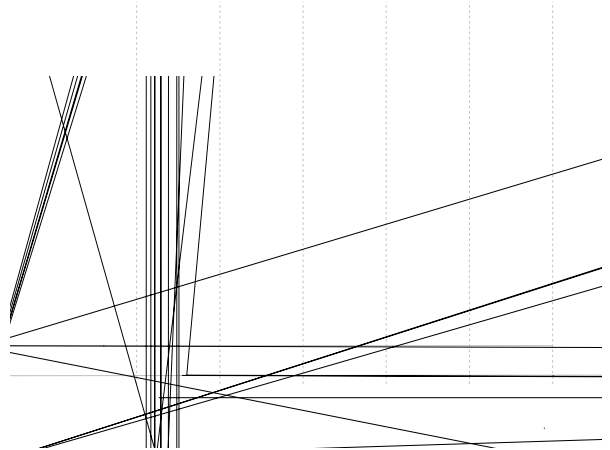


Fig. 3 Saturation voltage vs. collector current

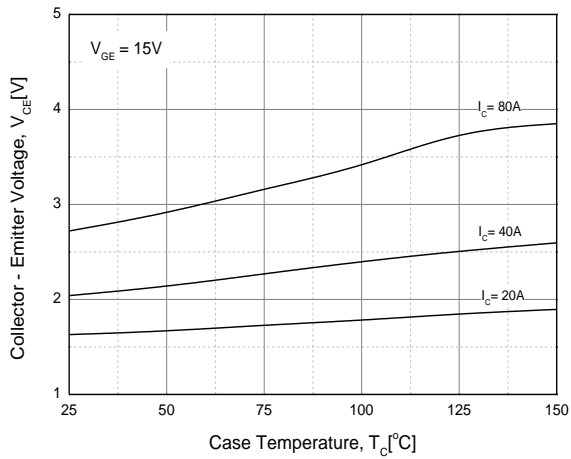


Fig. 4 Saturation voltage vs. gate bias

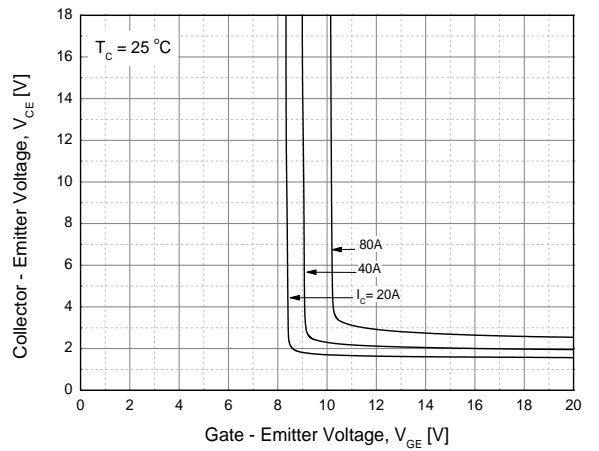


Fig. 5 Saturation voltage vs. gate bias

Fig. 6 Capacitance characteristics

IGBT Characteristics

Fig. 7 Turn-on time vs. gate resistor

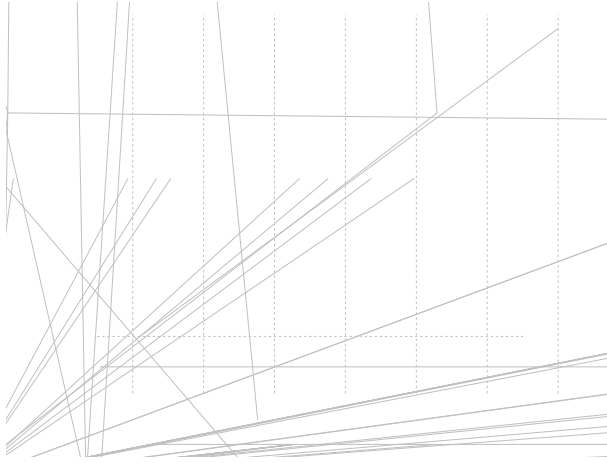


Fig. 8 Turn-off time vs. gate resistor

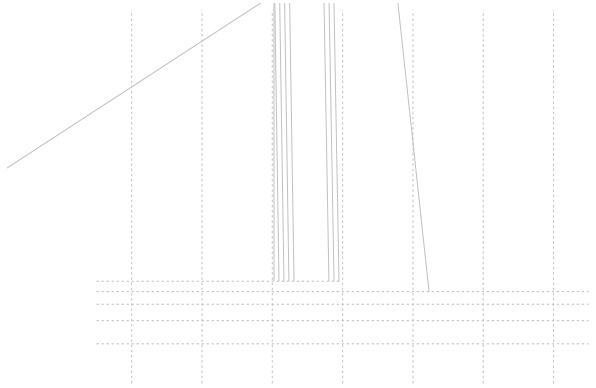


Fig. 9 Switching loss vs. gate resistor

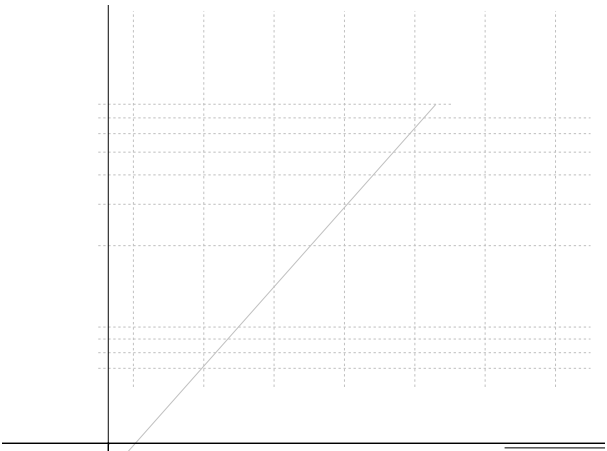


Fig. 10 Turn-on time vs. collector current

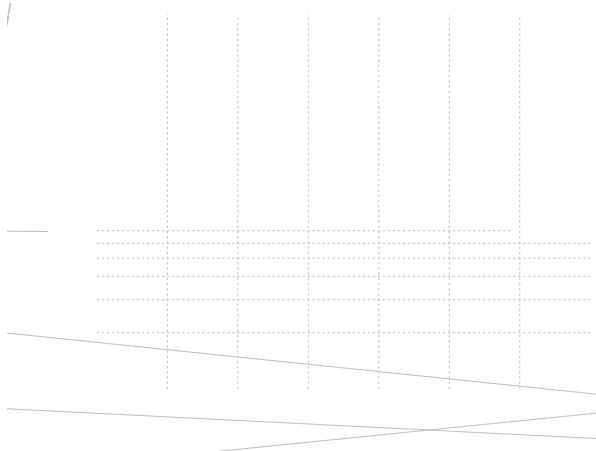


Fig. 11 Turn-off time vs. collector current

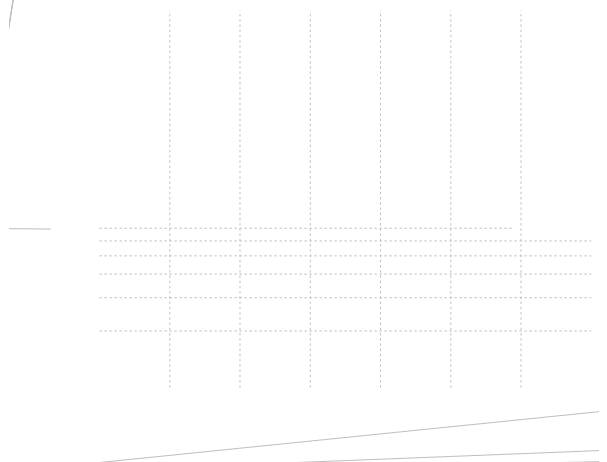
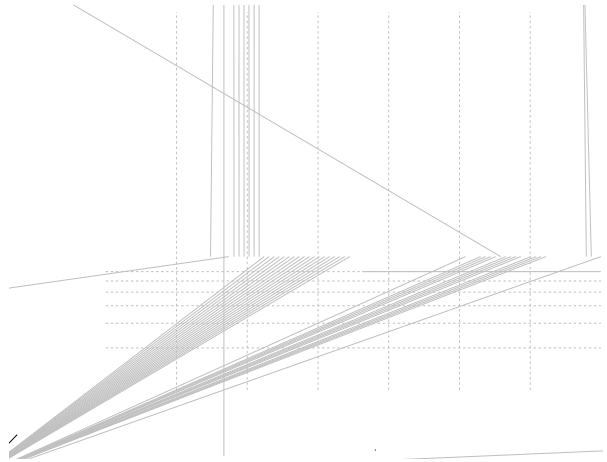


Fig. 12 Switching loss vs. collector current



IGBT Characteristics

Fig. 13 Gate charge characteristics

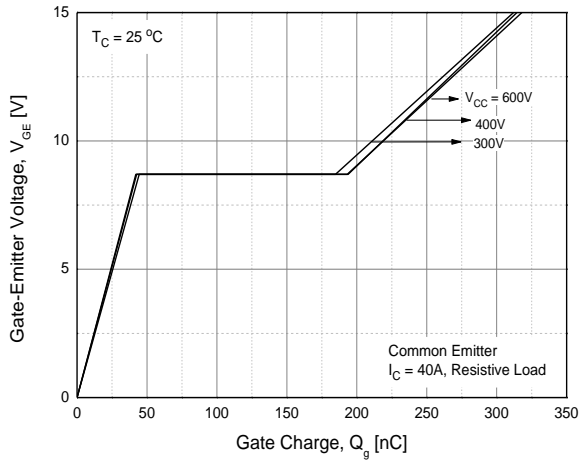


Fig. 14 SOA

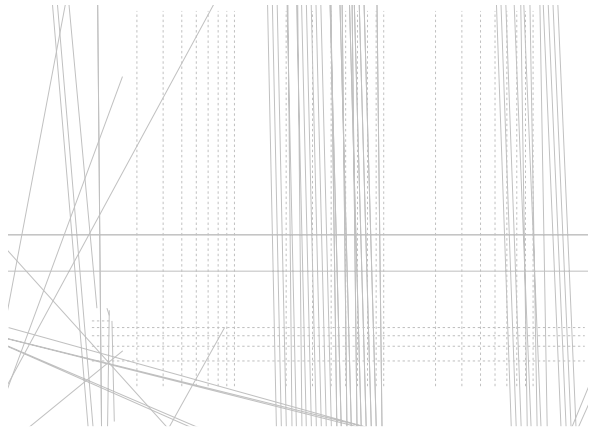


Fig. 15 RBSOA

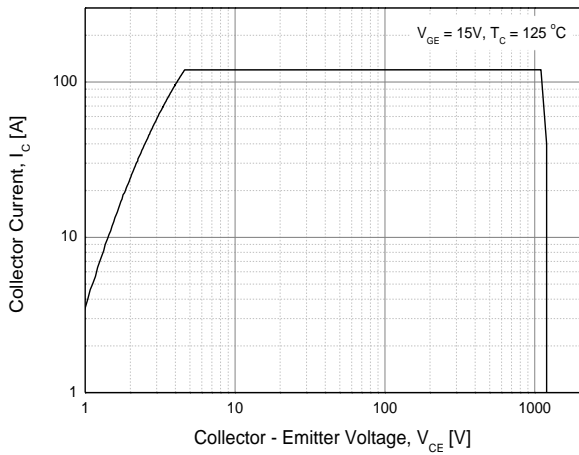


Fig. 16 Transient thermal impedance of IGBT

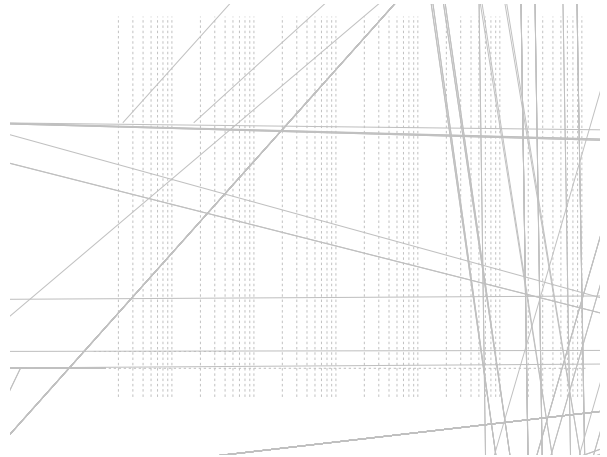
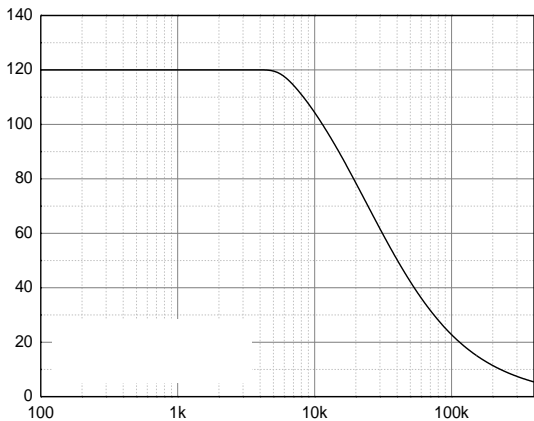


Fig. 17 Load Current vs. Frequency



Diode Characteristics

Fig. 18 Conduction characteristics

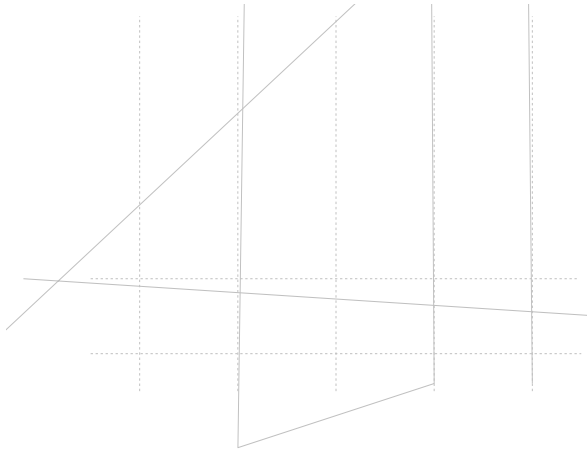


Fig. 19 Reverse recovery current vs. forward current

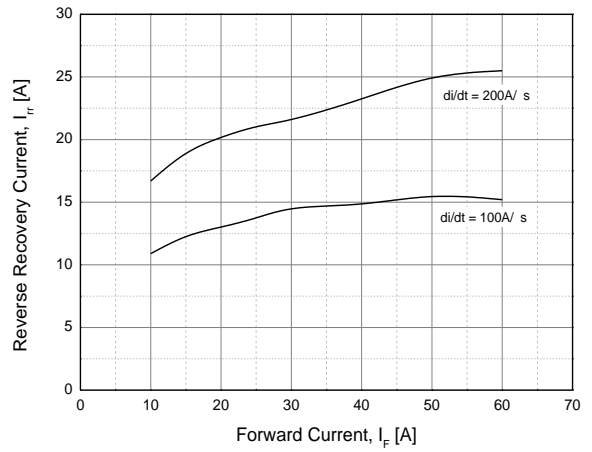
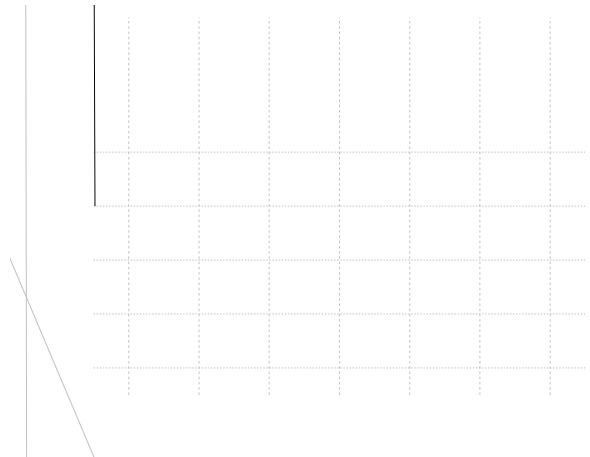


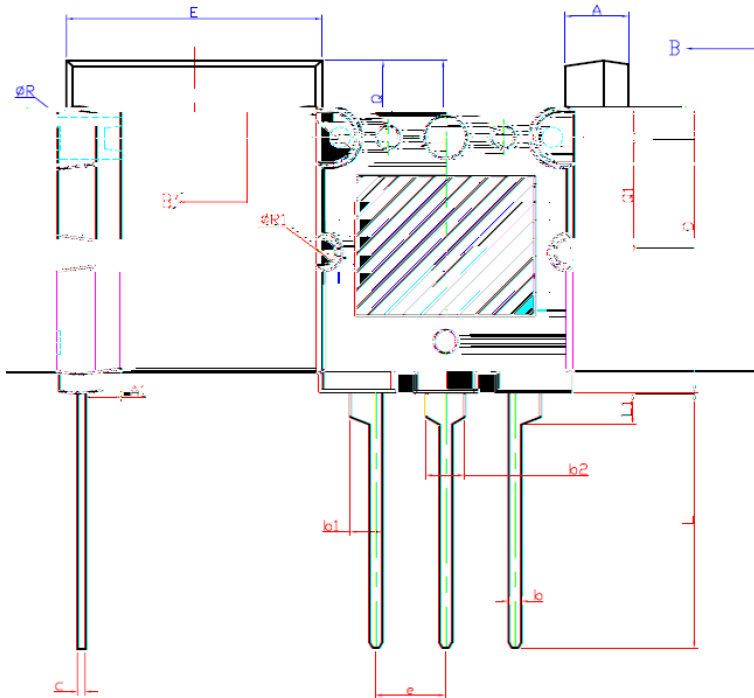
Fig. 20 Reverse recovery charge vs. forward current



Fig. 21 Reverse recovery time vs. forward current



TO-264 MECHANICAL DATA



SYMBOL	MIN	NDM	MAX
A	4.80	5.00	5.20
A1	2.50	2.80	3.10
b	0.90	1.00	1.25
b1	2.30	2.50	2.70
b2	2.80	3.00	3.20
c	0.10	0.15	0.20
c1	0.10	0.15	0.20
c2	0.10	0.15	0.20
c3	0.10	0.15	0.20
c4	0.10	0.15	0.20
c5	0.10	0.15	0.20
c6	0.10	0.15	0.20
c7	0.10	0.15	0.20
c8	0.10	0.15	0.20
c9	0.10	0.15	0.20
c10	0.10	0.15	0.20
c11	0.10	0.15	0.20
c12	0.10	0.15	0.20
c13	0.10	0.15	0.20
c14	0.10	0.15	0.20
c15	0.10	0.15	0.20
c16	0.10	0.15	0.20
c17	0.10	0.15	0.20
c18	0.10	0.15	0.20
c19	0.10	0.15	0.20
c20	0.10	0.15	0.20
c21	0.10	0.15	0.20
c22	0.10	0.15	0.20
c23	0.10	0.15	0.20
c24	0.10	0.15	0.20
c25	0.10	0.15	0.20
c26	0.10	0.15	0.20
c27	0.10	0.15	0.20
c28	0.10	0.15	0.20
c29	0.10	0.15	0.20
c30	0.10	0.15	0.20
c31	0.10	0.15	0.20
c32	0.10	0.15	0.20
c33	0.10	0.15	0.20
c34	0.10	0.15	0.20
c35	0.10	0.15	0.20
c36	0.10	0.15	0.20
c37	0.10	0.15	0.20
c38	0.10	0.15	0.20
c39	0.10	0.15	0.20
c40	0.10	0.15	0.20
c41	0.10	0.15	0.20
c42	0.10	0.15	0.20
c43	0.10	0.15	0.20
c44	0.10	0.15	0.20
c45	0.10	0.15	0.20
c46	0.10	0.15	0.20
c47	0.10	0.15	0.20
c48	0.10	0.15	0.20
c49	0.10	0.15	0.20
c50	0.10	0.15	0.20
c51	0.10	0.15	0.20
c52	0.10	0.15	0.20
c53	0.10	0.15	0.20
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c55	0.10	0.15	0.20
c56	0.10	0.15	0.20
c57	0.10	0.15	0.20
c58	0.10	0.15	0.20
c59	0.10	0.15	0.20
c60	0.10	0.15	0.20
c61	0.10	0.15	0.20
c62	0.10	0.15	0.20
c63	0.10	0.15	0.20
c64	0.10	0.15	0.20
c65	0.10	0.15	0.20
c66	0.10	0.15	0.20
c67	0.10	0.15	0.20
c68	0.10	0.15	0.20
c69	0.10	0.15	0.20
c70	0.10	0.15	0.20
c71	0.10	0.15	0.20
c72	0.10	0.15	0.20
c73	0.10	0.15	0.20
c74	0.10	0.15	0.20
c75	0.10	0.15	0.20
c76	0.10	0.15	0.20
c77	0.10	0.15	0.20
c78	0.10	0.15	0.20
c79	0.10	0.15	0.20
c80	0.10	0.15	0.20
c81	0.10	0.15	0.20
c82	0.10	0.15	0.20
c83	0.10	0.15	0.20
c84	0.10	0.15	0.20
c85	0.10	0.15	0.20
c86	0.10	0.15	0.20
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c95	0.10	0.15	0.20
c96	0.10	0.15	0.20
c97	0.10	0.15	0.20
c98	0.10	0.15	0.20
c99	0.10	0.15	0.20
c100	0.10	0.15	0.20

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