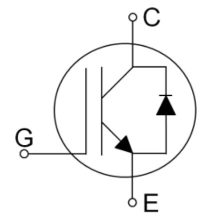
TGAN80N65F2DS

Field Stop Trench IGBT

Features

- 650V Field Stop Trench Technology
- Low Switching Loss for a Wide Temperature Range
- Positive Temperature Coefficient
- Easy Parallel Operation
- RoHS Compliant
- JEDEC Qualification
- 175℃ Operating Temperature



Applications

UPS, Inverter, Solar, Welder

Device	Package	Marking	Remark
TGAN80N65F2DS	TO-3PN	TGAN80N65F2DS	RoHS

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	650	V
Gate-Emitter Voltage		V_{GES}	±20	V
Transient Gate-Emitter Voltage(t_p ≤ 10μs, D < 0.010)			±30	V
Continuous Collector Current	T_C = 25 ℃	I_C	160	A
	T_C = 100 ℃		80	A
Pulsed Collector Current (Note 1)		I_{CM}	240	A
Diode Continuous Forward Current	T_C = 100 ℃	I_F	80	A
Diode Pulsed Forward Current (Note 2)		I_{FM}	300	A
Power Dissipation	T_C = 25 ℃	P_D	577	W
	T_C = 100 ℃		288	W
Operating Junction Temperature		T_{vj}	-55 ~ 175	℃
Storage Temperature Range		T_{STG}	-55 ~ 150	℃
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300	℃

Notes :

(1) Repetitive rating : Pulse width limited by maximum junction temperature, During production, high current switching capability is 100% verified with the inductive load single-pulse switching test. (Ic=240A)

(2) Repetitive rating : Pulse width limited by maximum junction temperature.

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)	1.0	℃/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	40	℃/W

Electrical Characteristics of the IGBT T_{vj}=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	650	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V	--	--	1	mA
Gate – Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V	--	--	± 250	nA
Integrated Gate Resistance	$R_{G(int)}$	f = 1MHz, Open Collector	--	2.3	--	Ω
ON						
Gate – Emitter Threshold Voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 80mA	4.0	6.0	7.5	V
Collector – Emitter Saturation Voltage	$V_{CE(SAT)}$	V_{GE} = 15V, I_C = 80A, T_{vj} = 25 ℃	--	1.85	2.25	V
		V_{GE} = 15V, I_C = 80A, T_{vj} = 125 ℃	--	2.19	--	V
		V_{GE} = 15V, I_C = 80A, T_{vj} = 175 ℃	--	2.40	--	V
DYNAMIC						
Input Capacitance	C_{IES}	V_{CE} = 30V V_{GE} = 0V f = 1MHz	--	5000	--	pF
Output Capacitance	C_{OES}		--	230	--	pF
Reverse Transfer Capacitance	C_{RES}		--	150	--	pF
Total Gate Charge	Q_g	V_{CC} = 400V, I_C = 80A V_{GE} = 15V	--	216	324	nC
Gate-Emitter Charge	Q_{ge}		--	30	46	nC
Gate-Collector Charge	Q_{gc}		--	106	159	nC
SWITCHING (Note 3)						
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 40A R_G = 5Ω, V_{GE} = 15V Inductive Load, T_{vj} = 25 ℃	--	36	--	ns
Rise Time	t_r		--	69	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	140	--	ns
Fall Time	t_f		--	21	--	ns
Turn-On Switching Loss	E_{ON}		--	1.28	--	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.24	--	mJ
Total Switching Loss	E_{TS}		--	1.52	--	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 80A R_G = 5Ω, V_{GE} = 15V Inductive Load, T_{vj} = 25 ℃	--	57	--	ns
Rise Time	t_r		--	139	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	118	--	ns
Fall Time	t_f		--	65	--	ns
Turn-On Switching Loss	E_{ON}		--	3.05	4.58	mJ
Turn-Off Switching Loss	E_{OFF}		--	1.11	1.67	mJ
Total Switching Loss	E_{TS}		--	4.16	6.24	mJ

Electrical Characteristics of the IGBT T_{vj}=25℃, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
SWITCHING (Note 3)						
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 40A R_G = 5Ω, V_{GE} = 15V Inductive Load, T_{vj} = 175 ℃	--	41	--	ns
Rise Time	t_r		--	63	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	149	--	ns
Fall Time	t_f		--	21	--	ns
Turn-On Switching Loss	E_{ON}		--	1.91	--	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.41	--	mJ
Total Switching Loss	E_{TS}		--	2.32	--	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 80A R_G = 5Ω, V_{GE} = 15V Inductive Load, T_{vj} = 175 ℃	--	47	--	ns
Rise Time	t_r		--	136	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	126	--	ns
Fall Time	t_f		--	62	--	ns
Turn-On Switching Loss	E_{ON}		--	4.94	7.41	mJ
Turn-Off Switching Loss	E_{OFF}		--	1.26	1.89	mJ
Total Switching Loss	E_{TS}		--	6.20	9.30	mJ

Notes：
(3) Not subject to production test – verified by design/characterization

Electrical Characteristics of the DIODE T_{vj}=25℃, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	I_F = 40A, T_{vj} = 25 ℃	--	2.30	--	V
		I_F = 40A, T_{vj} = 125 ℃	--	2.09	--	V
		I_F = 40A, T_{vj} = 175 ℃	--	1.93	--	V
		I_F = 80A, T_{vj} = 25 ℃	--	2.93	--	V
		I_F = 80A, T_{vj} = 125 ℃	--	2.88	--	V
		I_F = 80A, T_{vj} = 175 ℃	--	2.78	--	V
Reverse Recovery Time	t_{rr}	I_F = 40A, di/dt = 200A/µs, T_{vj} = 25 ℃	--	62	--	ns
Reverse Recovery Current	I_{rr}		--	5.2	--	A
Reverse Recovery Charge	Q_{rr}		--	196	--	nC
Reverse Recovery Time	t_{rr}	I_F = 40A, di/dt = 200A/µs, T_{vj} = 175 ℃	--	168	--	ns
Reverse Recovery Current	I_{rr}		--	9.9	--	A
Reverse Recovery Charge	Q_{rr}		--	1102	--	nC
Reverse Recovery Time	t_{rr}	I_F = 80A, di/dt = 200A/µs, T_{vj} = 25 ℃	--	74	--	ns
Reverse Recovery Current	I_{rr}		--	6.0	--	A
Reverse Recovery Charge	Q_{rr}		--	280	--	nC
Reverse Recovery Time	t_{rr}	I_F = 80A, di/dt = 200A/µs, T_{vj} = 175 ℃	--	171	--	ns
Reverse Recovery Current	I_{rr}		--	11.0	--	A
Reverse Recovery Charge	Q_{rr}		--	1218	--	nC

IGBT Characteristics

Fig. 1 IGBT Output Characteristics

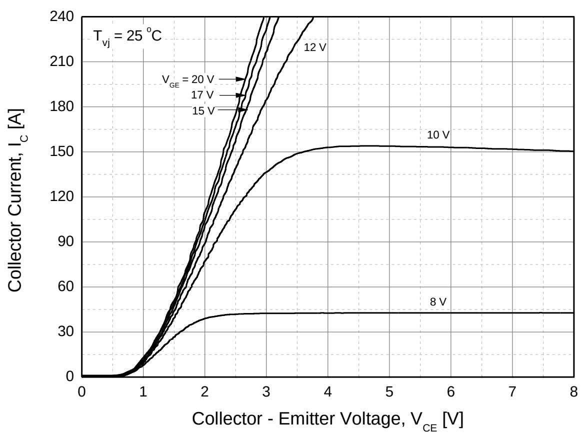


Fig. 2 IGBT Output Characteristics

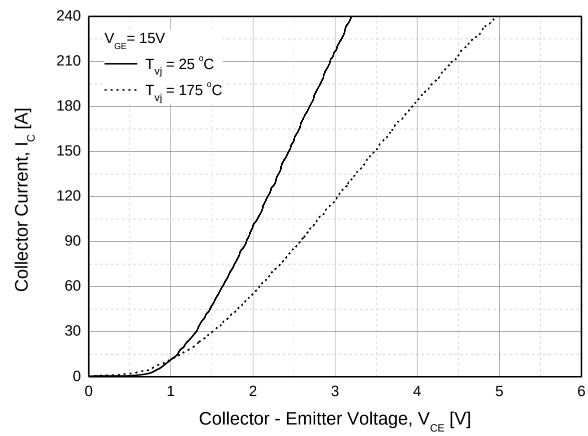


Fig. 3 IGBT Saturation Voltage vs. Junction Temperature

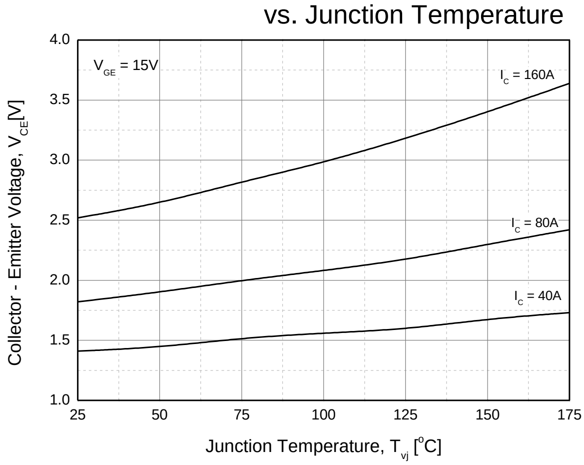


Fig. 4 IGBT Saturation Voltage vs. Gate Bias

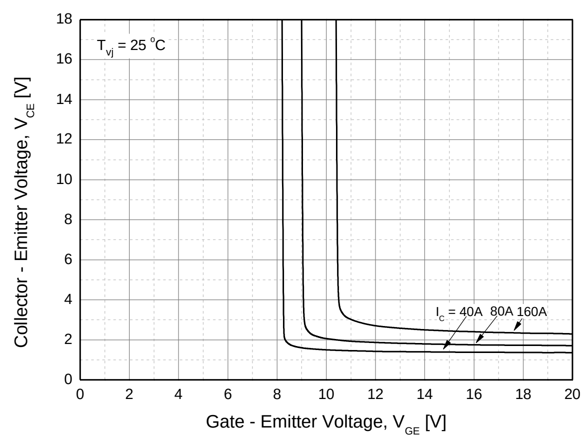


Fig. 5 IGBT Saturation Voltage vs. Gate Bias

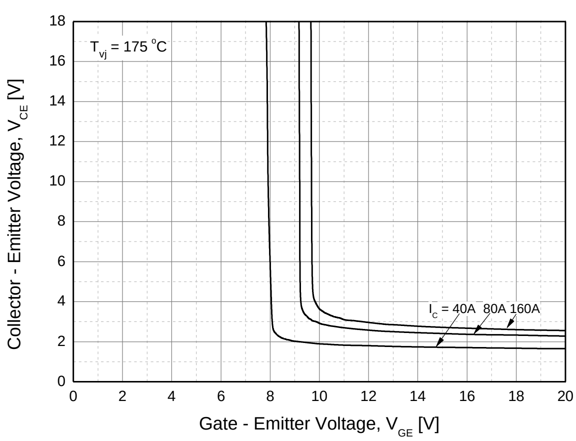
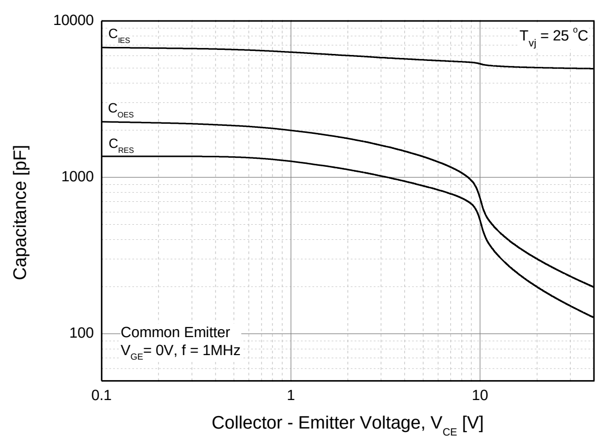


Fig. 6 IGBT Capacitance Characteristics



IGBT Characteristics

Fig. 7 Turn-on Time vs. Gate Resistor

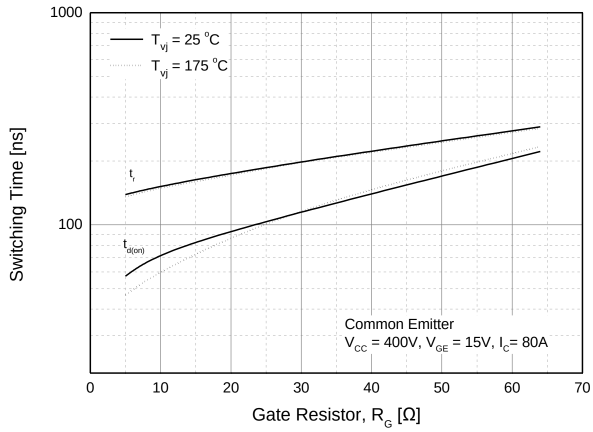


Fig. 8 Turn-off Time vs. Gate Resistor

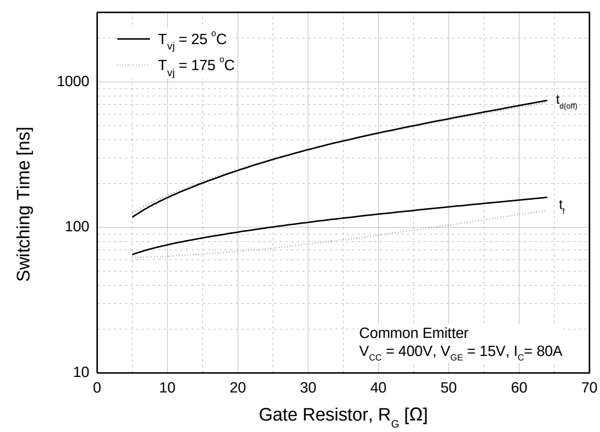


Fig. 9 Switching Loss vs. Gate Resistor

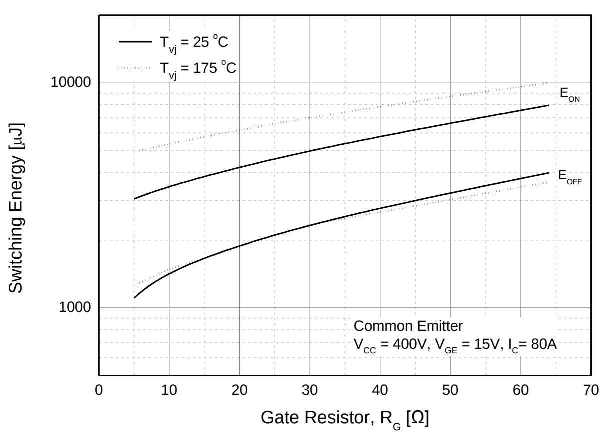


Fig. 10 Turn-on Time vs. Collector Current

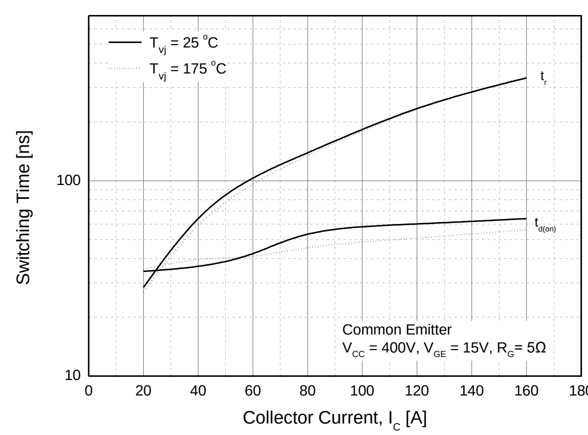


Fig. 11 Turn-off Time vs. Collector Current

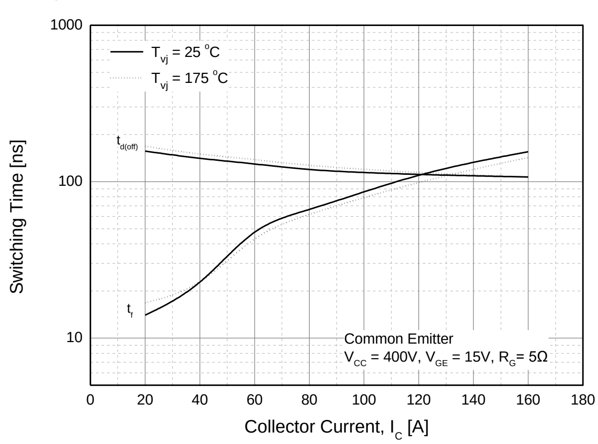
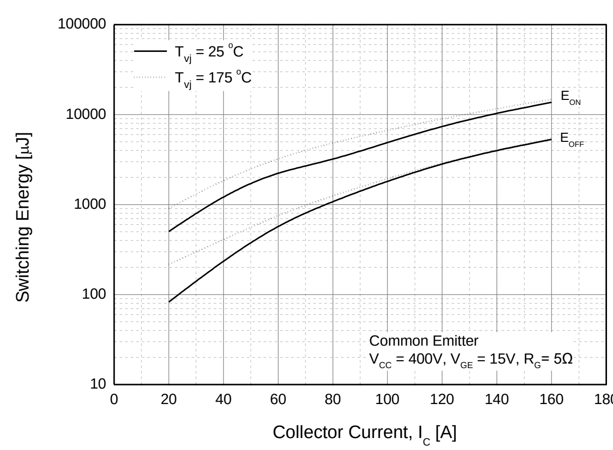


Fig. 12 Switching Loss vs. Collector Current



IGBT Characteristics

Fig. 13 Gate Charge Characteristics

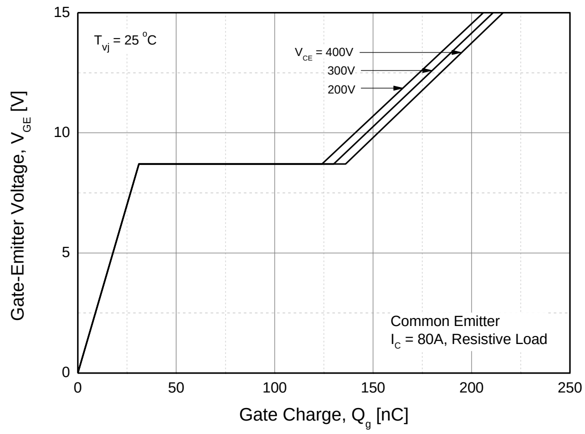


Fig. 14 SOA

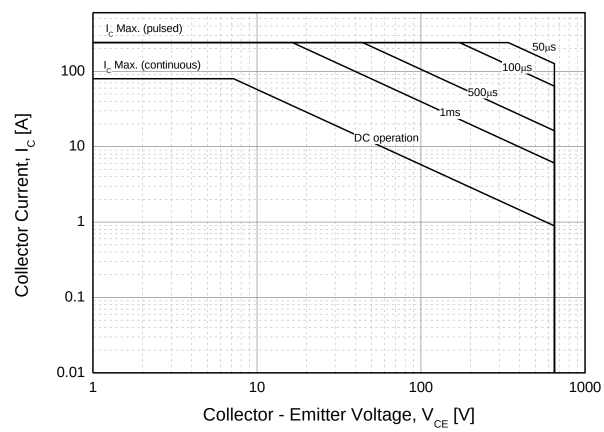


Fig. 15 RBSOA

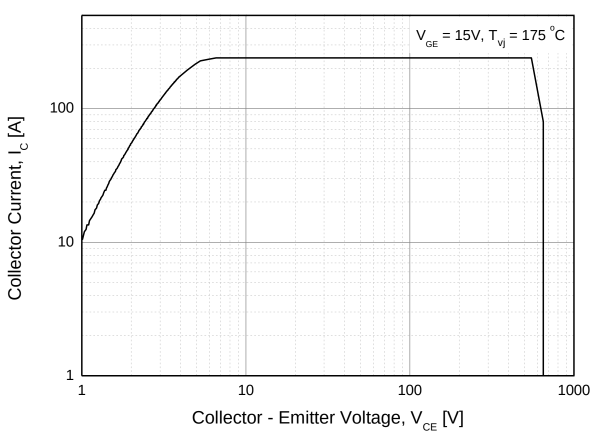


Fig. 16 Transient Thermal Impedance of IGBT

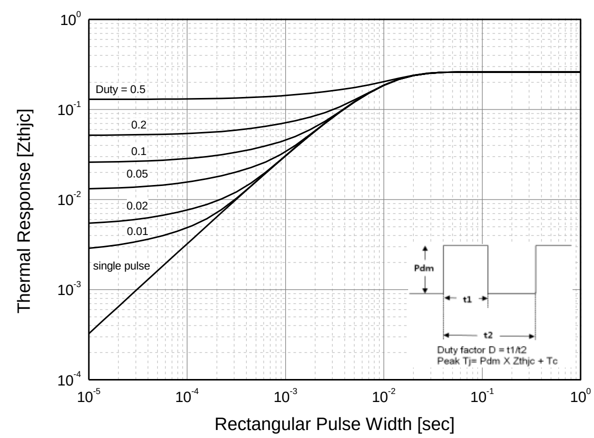
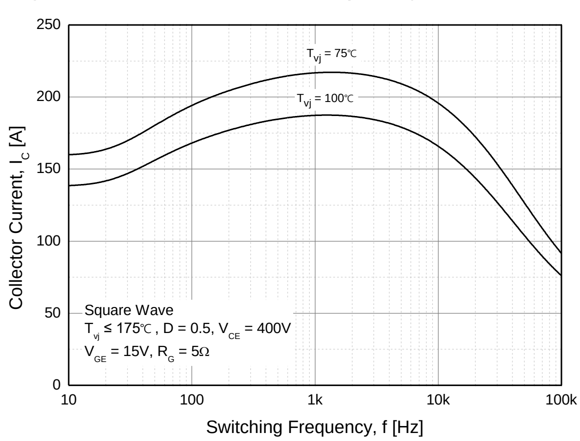


Fig. 17 Load Current vs. Frequency



DIODE Characteristics

Fig. 18 Diode Conduction Characteristics

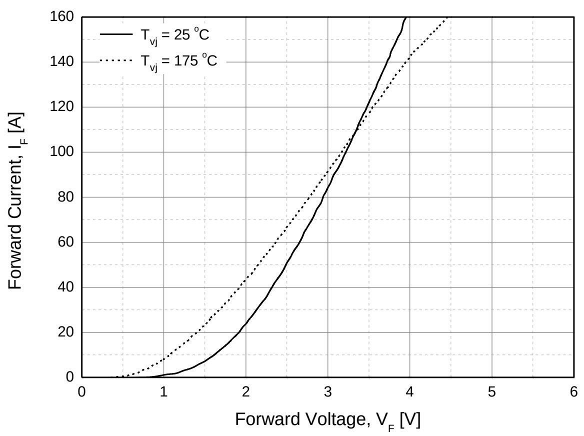


Fig. 19 Reverse Recovery Current vs. Forward Current

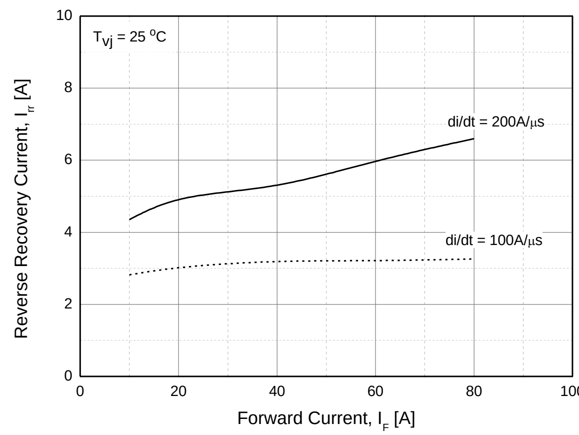


Fig. 20 Reverse Recovery Charge vs. Forward Current

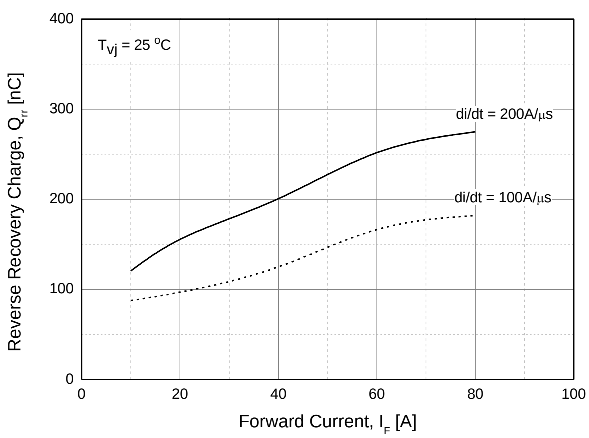
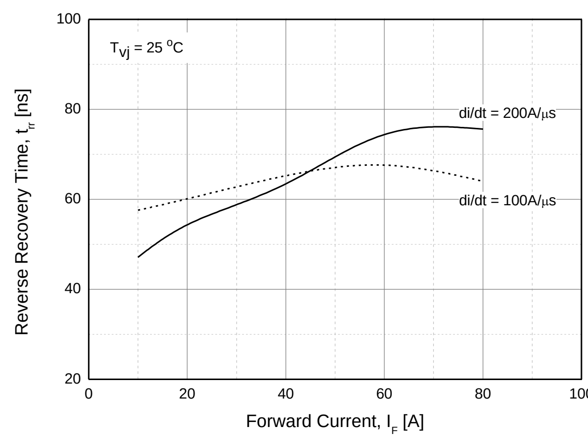
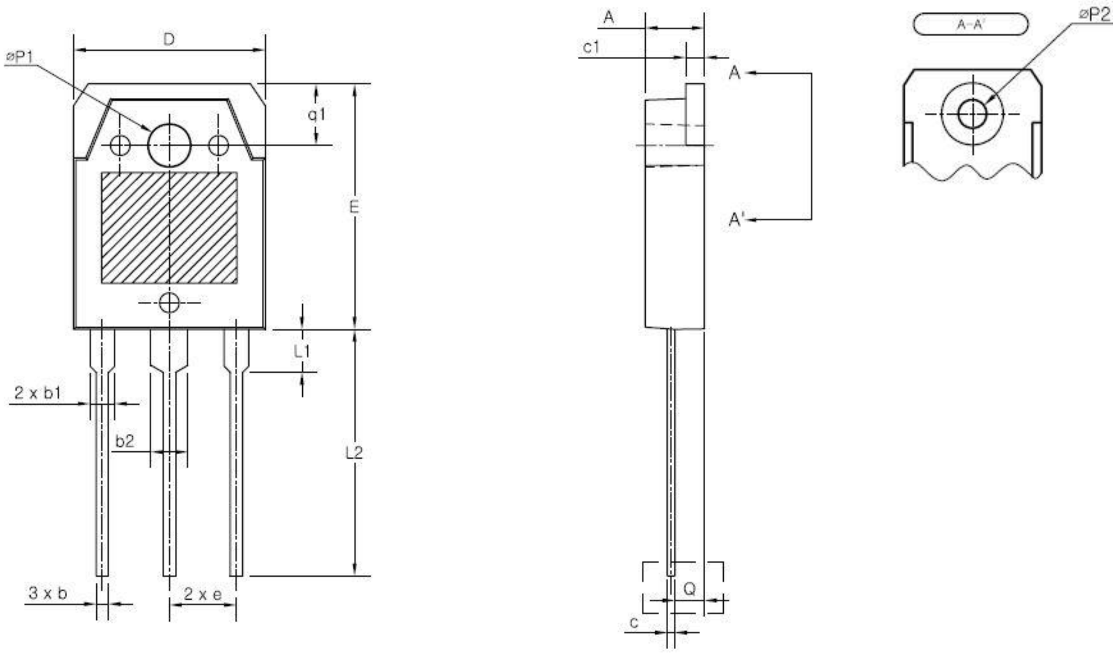


Fig. 21 Reverse Recovery Time vs. Forward Current



TO-3PN MECHANICAL DATA



SYMBOL	MIN	NOM	MAX
A	4.60	4.80	5.00
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
c	0.55	0.60	0.75
c1	1.45	1.50	1.65
D	15.40	15.60	15.80
E	19.70	19.90	20.10
e	5.15	5.45	5.75
L1	3.30	3.50	3.70
L2	19.80	20.00	20.20
⌀P1	3.30	3.40	3.50
⌀P2	(3.20)		
Q	2.20	2.40	2.60
q1	4.80	5.00	5.20

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