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تخصص، تنوع و کیفیت

۰۲۱۶۶۷۰۳۶۵۲



تهران، پاساژ امجد، طبقه اول، واحد ۱۶



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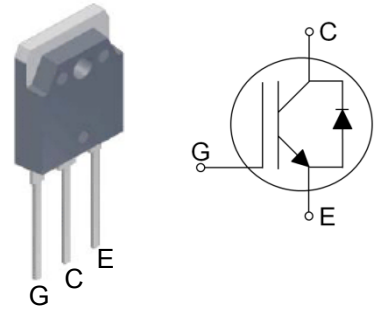


Features

- 600V Field Stop Trench Technology
- High Speed Switching
- Low Conduction Loss
- Positive Temperature Coefficient
- Easy Parallel Operation
- RoHS Compliant
- JEDEC Qualification

Applications

UPS, Welder, Inverter, Solar



Device	Package	Marking	Remark
TGAN40N60FD	TO-3PN	TGAN40N60FD	RoHS

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	± 20	V
Continuous Collector Current	$T_C = 25\text{ }^{\circ}\text{C}$	I_C	80	A
	$T_C = 100\text{ }^{\circ}\text{C}$		40	A
Pulsed Collector Current (Note 1)		I_{CM}	120	A
Diode Continuous Forward Current	$T_C = 100\text{ }^{\circ}\text{C}$	I_F	20	A
Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	P_D	231	W
	$T_C = 100\text{ }^{\circ}\text{C}$		93	W
Operating Junction Temperature		T_J	-55 ~ 150	$^{\circ}\text{C}$
Storage Temperature Range		T_{STG}	-55 ~ 150	$^{\circ}\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300	$^{\circ}\text{C}$

Notes :

(1) 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)	0.54	$^{\circ}\text{C/W}$
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$ (DIODE)	1.12	$^{\circ}\text{C/W}$
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$

Electrical Characteristics of the IGBT $T_C=25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF						
Collector – Emitter Breakdown Voltage	BV _{CES}	V _{GE} = 0V, I _C = 1mA	600	--	--	V
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} = 600V, V _{GE} = 0V	--	--	1	mA
Gate – Emitter Leakage Current	I _{GES}	V _{CE} = 0V, V _{GE} = ± 20V	--	--	± 250	nA
ON						
Gate – Emitter Threshold Voltage	V _{GE(TH)}	V _{GE} = V _{CE} , I _C = 40mA	4.5	6.0	7.5	V
Collector – Emitter Saturation Voltage	V _{CE(SAT)}	V _{GE} = 15V, I _C = 40A, T _C = 25 °C	--	1.8	2.3	V
		V _{GE} = 15V, I _C = 40A, T _C = 150 °C	--	2.2	--	V
DYNAMIC						
Input Capacitance	C _{IES}	V _{CE} = 30V, V _{GE} = 0V f = 1MHz	--	2720	--	pF
Output Capacitance	C _{OES}		--	125	--	pF
Reverse Transfer Capacitance	C _{RES}		--	75	--	pF
SWITCHING (Note 2)						
Turn-On Delay Time	t _{d(on)}	V _{CC} = 400V, I _C = 40A R _G = 5Ω, V _{GE} = 15V Inductive Load, T _C = 25 °C	--	35	--	ns
Rise Time	t _r		--	75	--	ns
Turn-Off Delay Time	t _{d(off)}		--	85	--	ns
Fall Time	t _f		--	55	82	ns
Turn-On Switching Loss	E _{ON}		--	1.46	2.19	mJ
Turn-Off Switching Loss	E _{OFF}		--	0.54	0.81	mJ
Total Switching Loss	E _{TS}		--	2	3	mJ
Turn-On Delay Time	t _{d(on)}	V _{CC} = 400V, I _C = 40A R _G = 5Ω, V _{GE} = 15V Inductive Load, T _C = 150 °C	--	35	--	ns
Rise Time	t _r		--	75	--	ns
Turn-Off Delay Time	t _{d(off)}		--	90	--	ns
Fall Time	t _f		--	70	--	ns
Turn-On Switching Loss	E _{ON}		--	1.65	2.47	mJ
Turn-Off Switching Loss	E _{OFF}		--	0.85	1.27	mJ
Total Switching Loss	E _{TS}		--	2.5	3.74	mJ
Total Gate Charge	Q _g	V _{CC} = 400V, I _C = 40A V _{GE} = 15V	--	115	173	nC
Gate-Emitter Charge	Q _{ge}		--	18	27	nC
Gate-Collector Charge	Q _{gc}		--	56	84	nC

Notes :

(2) Not subject to production test – verified by design/characterization

Electrical Characteristics of the DIODE $T_C=25^{\circ}\text{C}$, unless otherwise noted

Parameter	Symbol	Test condition		Min.	Typ.	Max.	Unit
Diode Forward Voltage	V _{FM}	I _F = 20A	T _C = 25 °C	--	1.8	--	V
			T _C = 150 °C	--	1.6	--	
Reverse Recovery Time	t _{rr}	I _F = 20A, di/dt = 200A/μs	T _C = 25 °C	--	60	--	ns
			T _C = 150 °C	--	250	--	
Reverse Recovery Current	I _{rr}		T _C = 25 °C	--	5.3	--	A
			T _C = 150 °C	--	11.8	--	
Reverse Recovery Charge	Q _{rr}		T _C = 25 °C	--	160	--	nC
			T _C = 150 °C	--	1475	--	

IGBT Characteristics

Fig. 1 Output characteristics

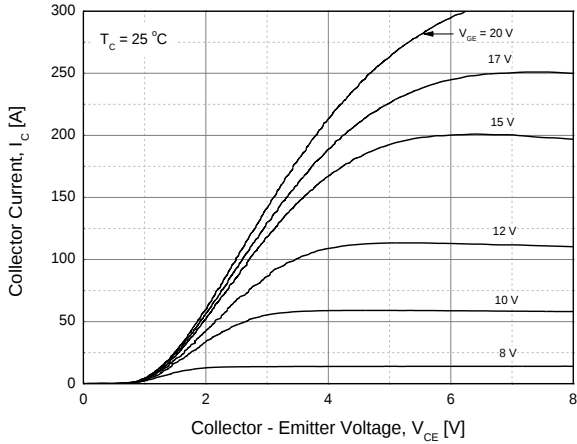


Fig. 2 Saturation voltage characteristics

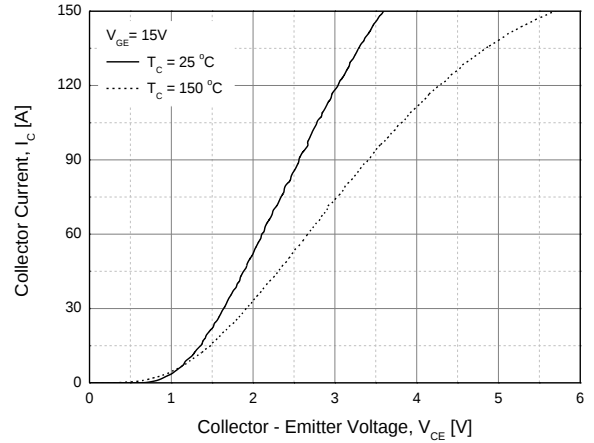


Fig. 3 Saturation voltage vs. collector current

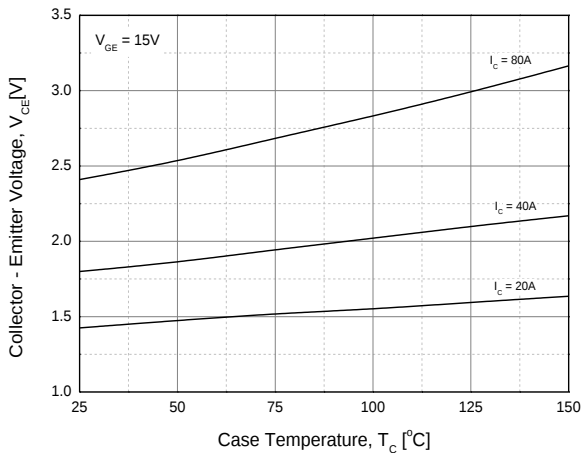


Fig. 4 Saturation voltage vs. gate bias

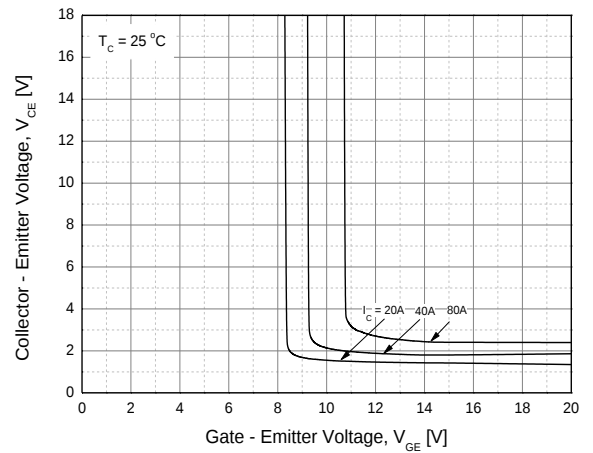


Fig. 5 Saturation voltage vs. gate bias

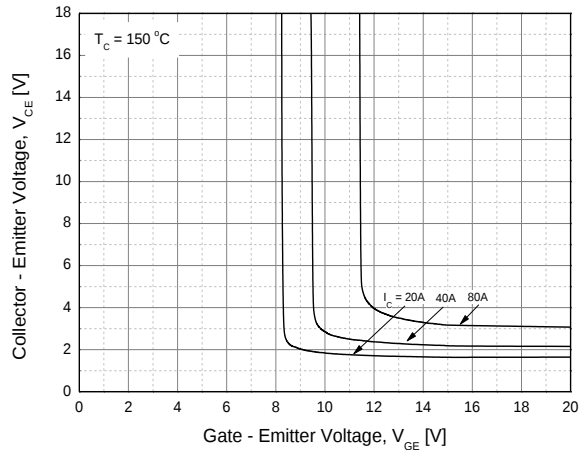
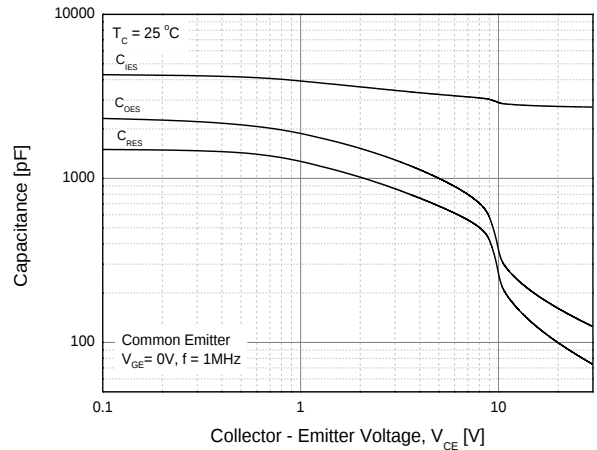


Fig. 6 Capacitance characteristics



IGBT Characteristics

Fig. 7 Turn-on time vs. gate resistor

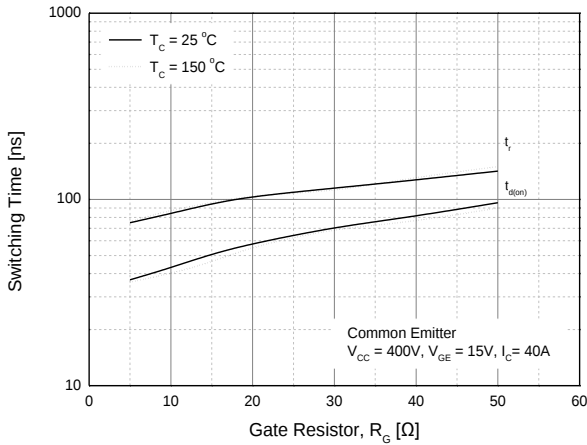


Fig. 8 Turn-off time vs. gate resistor

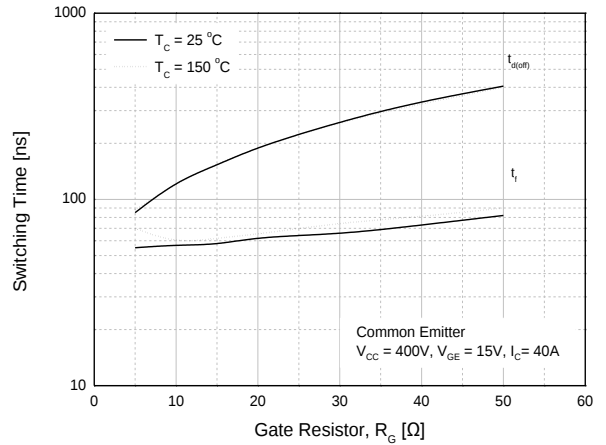


Fig. 9 Switching loss vs. gate resistor

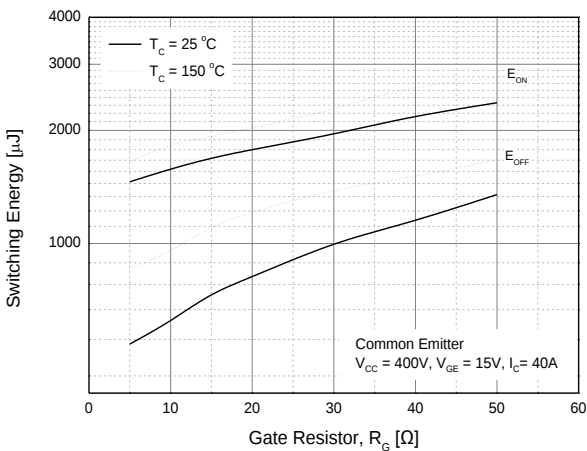


Fig. 10 Turn-on time vs. collector current

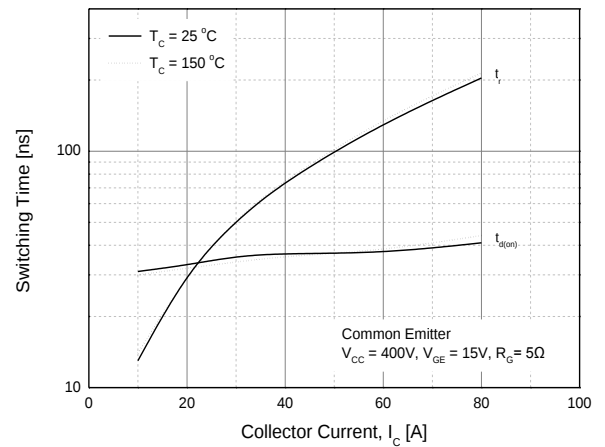


Fig. 11 Turn-off time vs. collector current

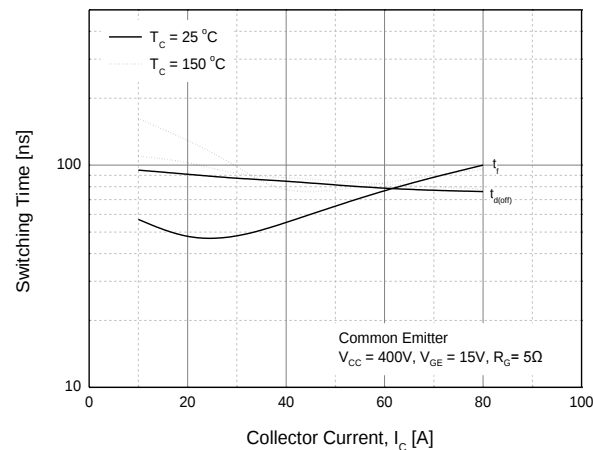
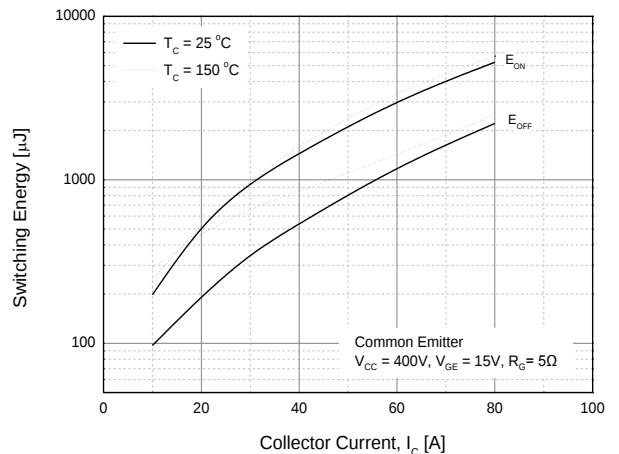


Fig. 12 Switching loss vs. collector current



IGBT Characteristics

Fig. 13 Gate charge characteristics

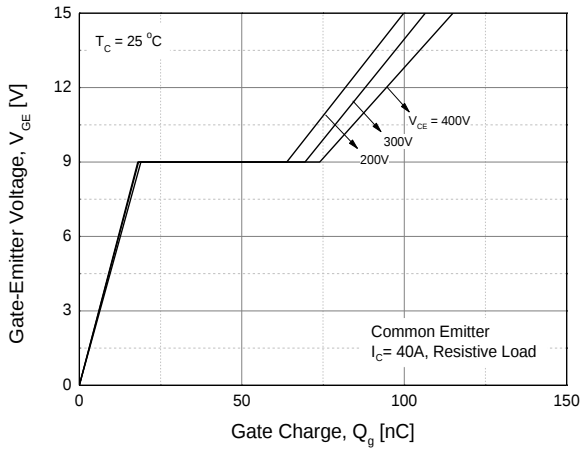


Fig. 14 SOA

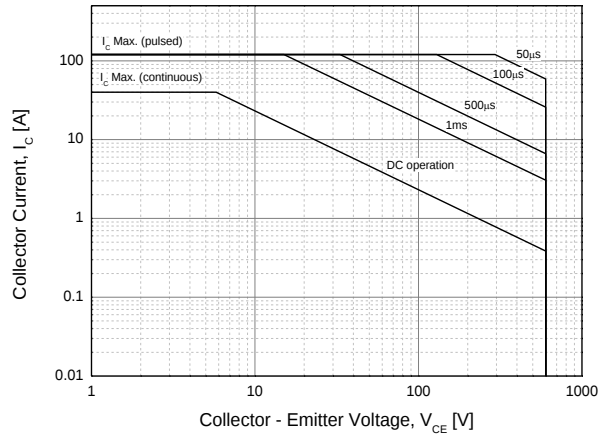


Fig. 15 RBSOA

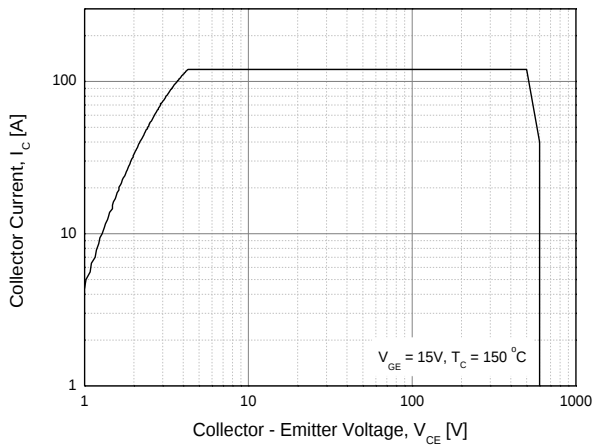


Fig. 16 Transient thermal impedance of IGBT

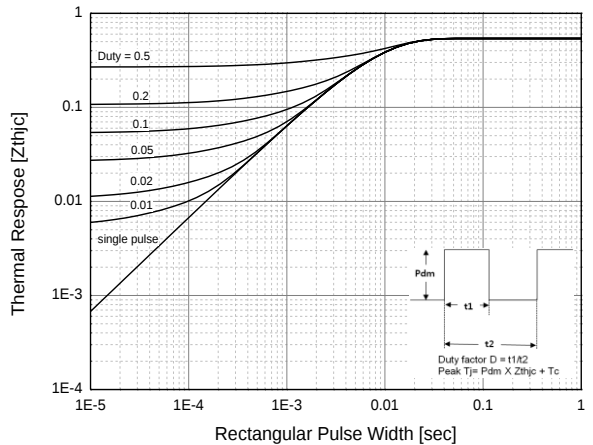
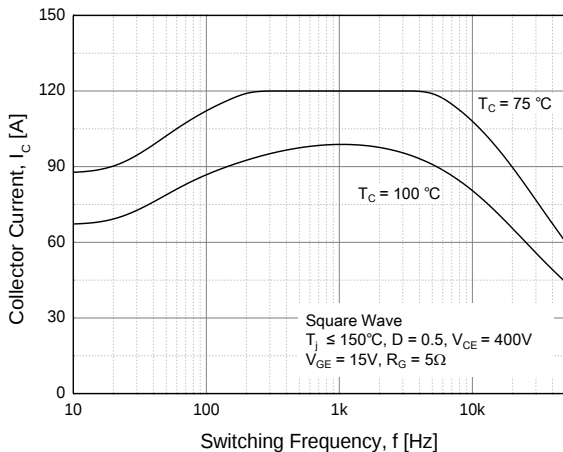


Fig. 17 Load Current vs. Frequency



Diode Characteristics

Fig. 18 Conduction characteristics

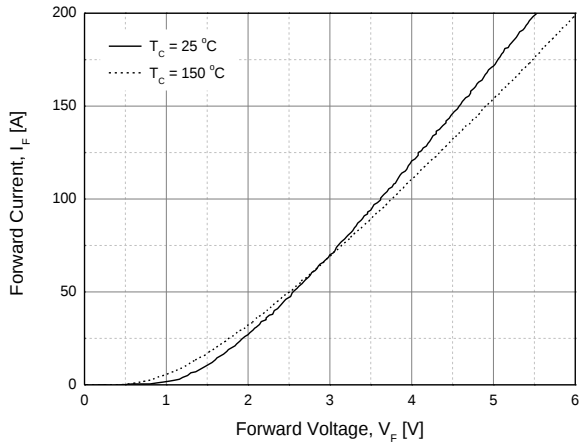


Fig. 19 Reverse recovery current vs. forward current

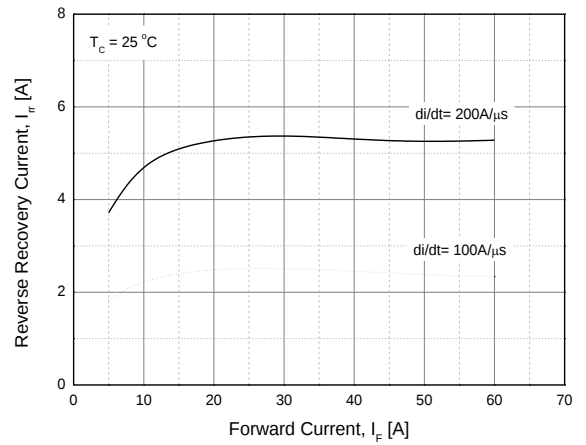


Fig. 20 Reverse recovery charge vs. forward current

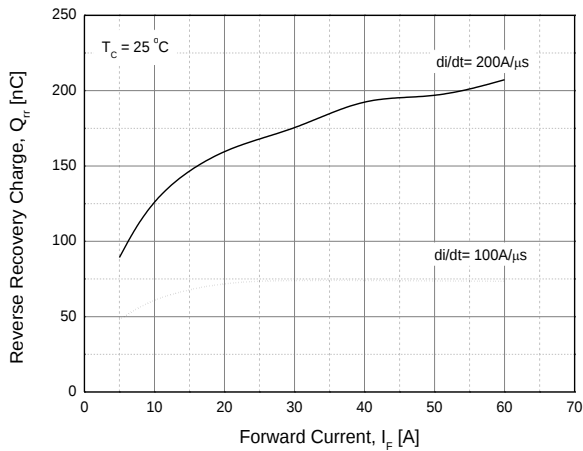
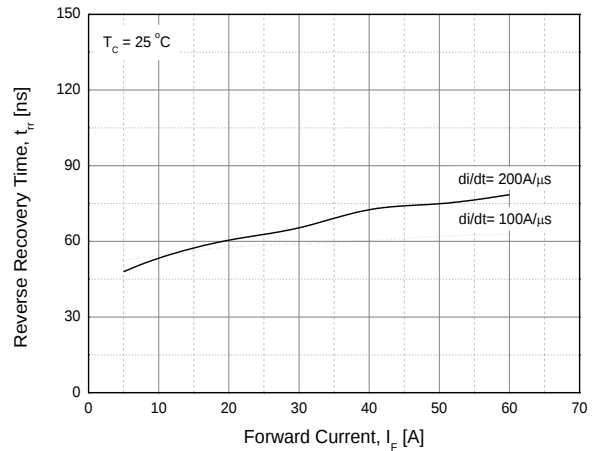
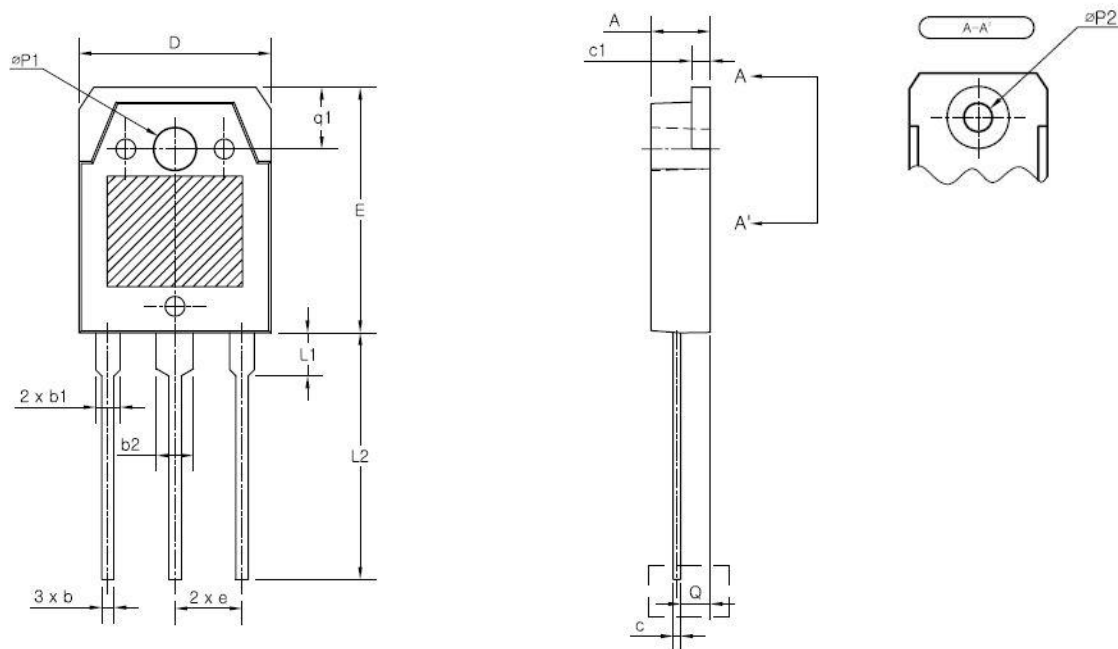


Fig. 21 Reverse recovery time vs. forward current



TO-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
øP1	3.30	3.40	3.50
øP2	(3.20)		
Q	2.20	2.40	2.60
q1	4.80	5.00	5.20

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