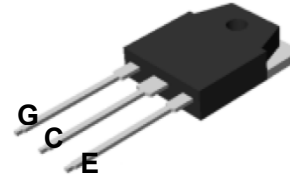
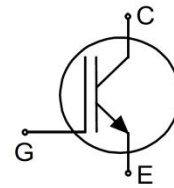


D40R60GP

600V, 40A Field Stop IGBT

Features

- Low $V_{CE(ON)}$ Trench FS IGBT Technology
- Low Switching Losses And Low EMI
- Positive $V_{CE(ON)}$ Temperature Co-Efficient
- Maximum Junction Temperature: $T_J=175^{\circ}\text{C}$
- TO-3PB Package Offers Excellent Thermal Performance
- Pb-free Plating; RoHS Compliant



Description

With advanced IGBT design technology, SPE's 600V Trench gate and Field-stop IGBT offers superior conduction and switching performances. And this technology also enables IGBT to have better Short-Current capability, excellent avalanche characteristics and higher operation temperature. This device is well suited for the switch mode power supply especially in the PFC application.

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-to-Emitter Voltage	600	V
$I_C@T_c=25^{\circ}\text{C}$	Continuous Collector current @ $T_c=25^{\circ}\text{C}$	80	A
$I_C@T_c=100^{\circ}\text{C}$	Continuous Collector current @ $T_c=100^{\circ}\text{C}$	40	A
I_{Cpuls}	Pulsed collector current, $V_{GE}=15\text{V}$	120	A
V_{GES}	Continuous Gate-to-Emitter voltage	± 30	V
$P_D@T_c=25^{\circ}\text{C}$	Maximum Power Dissipation @ $T_c=25^{\circ}\text{C}$	312	W
$P_D@T_c=100^{\circ}\text{C}$	Maximum Power Dissipation @ $T_c=100^{\circ}\text{C}$	156	W
T_J	Operating Junction Temperature Range	$-55 \sim 175$	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	$-55 \sim 175$	$^{\circ}\text{C}$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^{\circ}\text{C}$

Thermal Resistance

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Maximum Junction-to-Case thermal resistance①	0.48	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Maximum Junction-to-Ambient thermal resistance②	40	$^{\circ}\text{C/W}$

① These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming maximum junction temperature of $T_{J(MAX)}=175^{\circ}\text{C}$.

② The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

Electrical Characteristics (T_J= 25°C, Unless Otherwise Specified)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V _{(BR)CES}	IGBT Collector-Emitter Breakdown Voltage	V _{GE} =0V; I _C =250uA	600	-	-	V
V _{CEsat}	Collector-Emitter Saturation Voltage	V _{GE} =15V; I _C =40A	-	1.75	2.3	V
		T _J = 25°C	-	1.95	-	V
		T _J = 125°C				
V _{GE(th)}	Gate-Emitter Threshold voltage	I _C =0.25mA, V _{CE} =V _{GE}	4.0	5.2	6.5	V
I _{CES}	Collector-to-Emitter Leakage Current	V _{CE} =600V, V _{GE} = 0V	-	-	25	uA
I _{GES}	Gate-to-Emitter Forward Leakage Current	V _{CE} =0V; V _{GE} =30V	-	-	200	nA
I _{GESR}	Gate-to-Emitter Reverse leakage Current	V _{CE} =0V; V _{GE} =-30V	-200	-	-	nA

Dynamic Characteristics (T_J= 25°C, Unless Otherwise Specified)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
C _{ies}	IGBT Input Capacitance	V _{CE} =25V; V _{GE} =0V,f=1MHz	-	2150	-	pF
C _{oes}	IGBT Output Capacitance		-	200	-	pF
C _{res}	Reveres Transfer Capacitance		-	65	-	pF
Q _G	Total Gate Charge	V _{CC} =400V; I _C =40A, V _{GE} =15V	-	70	-	nC
Q _{GE}	Gate to Emitter Charge		-	20	-	nC
Q _{GC}	Gate to Collector Charge		-	30	-	nC
T _{d(on)}	Turn-On delay time	T _J =25°C, V _{CC} =400V, I _C =40A, V _{GE} =15V, R _G =10Ω Inductive Load	-	21	-	ns
T _r	Rise time		-	25	-	ns
T _{d(off)}	Turn-Off delay time		-	96	-	ns
t _f	Fall time		-	27	-	ns
E _{on}	Turn-On switch loss		-	0.98	-	mJ
E _{off}	Turn-Off switch loss		-	0.31	-	mJ
E _{total}	Total switch losses		-	1.29	-	mJ
T _{d(on)}	Turn-On delay time		-	25	-	ns
T _r	Rise time		-	27	-	ns
T _{d(off)}	Turn-Off delay time		-	112	-	ns
t _f	Fall time	T _J =125°C, V _{CC} =400V, I _C =40A, V _{GE} =15V, R _G =10Ω Inductive Load	-	32	-	ns
E _{on}	Turn-On switch loss		-	1.15	-	mJ
E _{off}	Turn-Off switch loss		-	0.67	-	mJ
E _{total}	Total switch losses		-	1.82	-	mJ
T _{SC}	Short Circuit Time	T _J =125°, V _{CC} =400V, I _C =40A, R _G =10Ω, V _{GE} =15V	10	-	-	uS

Typical electrical and thermal characteristics

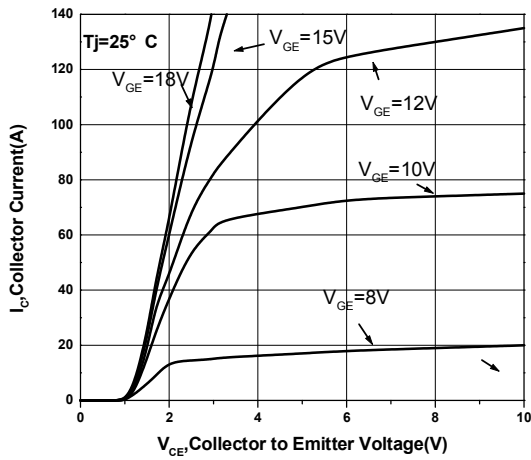


Figure 1: Typical Output Characteristic

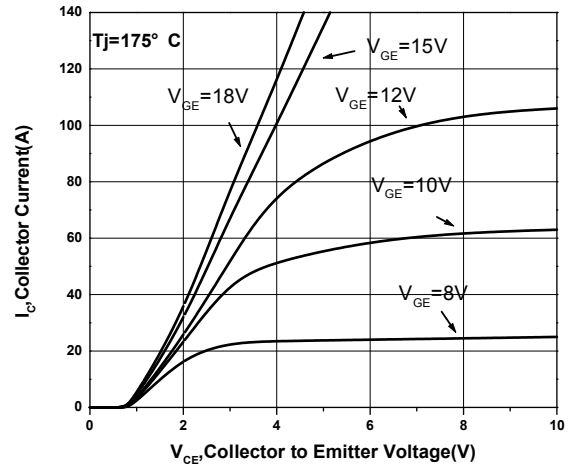


Figure 2: Typical Output Characteristic

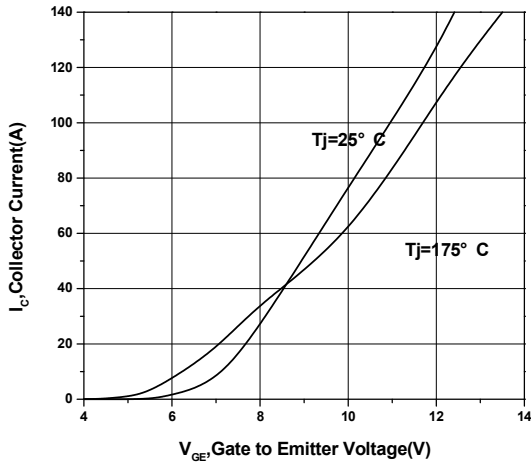


Figure 3: Typical Transfer Characteristics

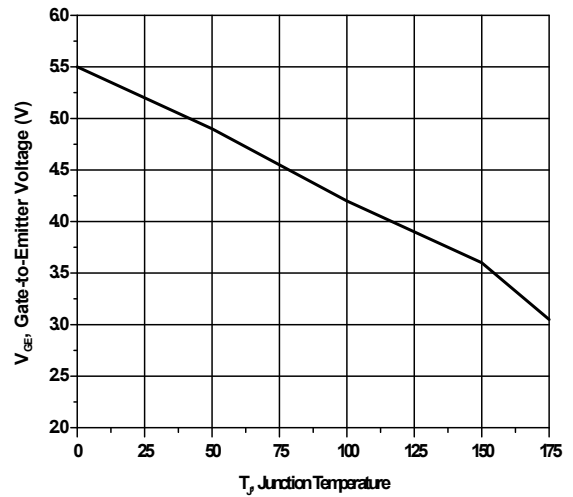


Figure 4: Gate to Emitter threshold Voltage

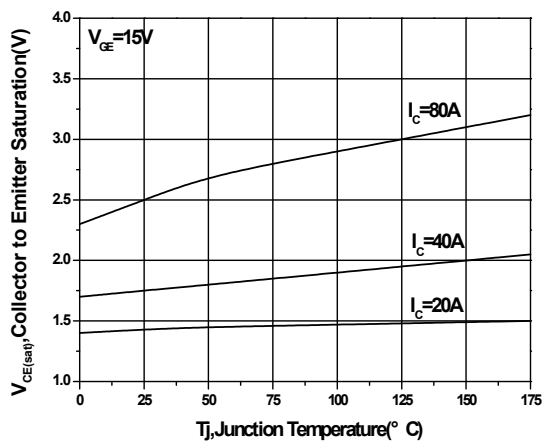


Figure 5: Typical Vce(sat) as a function of Tj

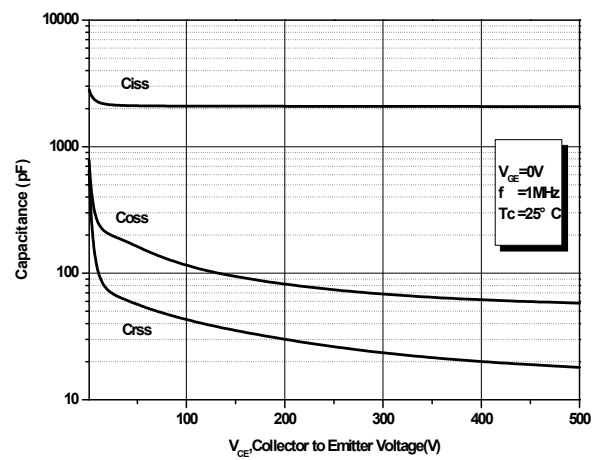


Figure 6: Capacitance vs. Vce

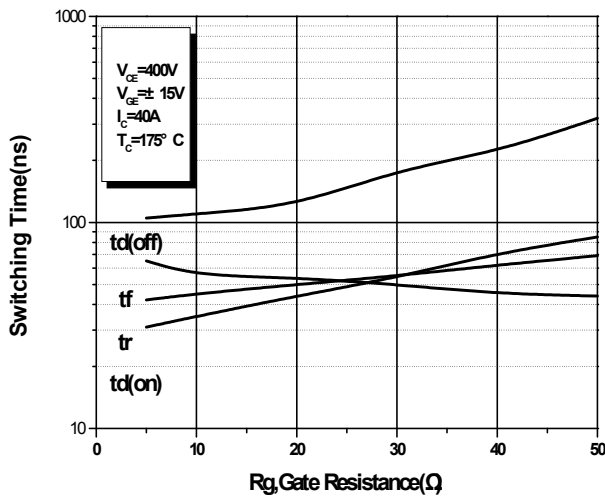


Figure 7: Switching Time Vs R_g

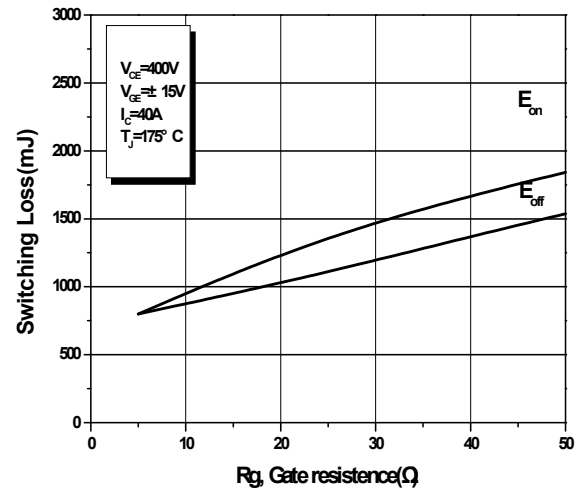


Figure 8: Switching Loss Vs R_g

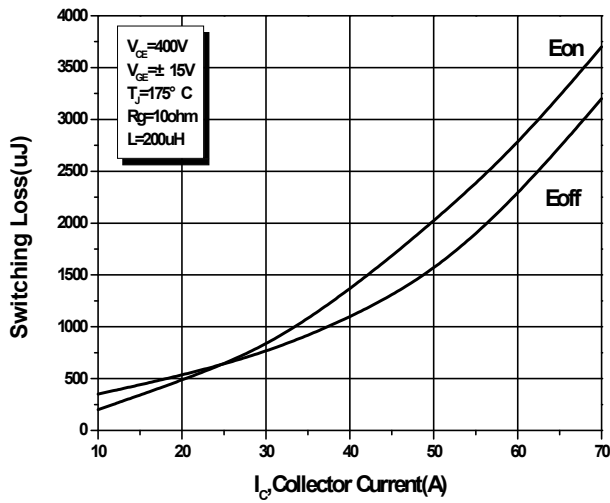


Figure 9: Switching Loss Vs I_C

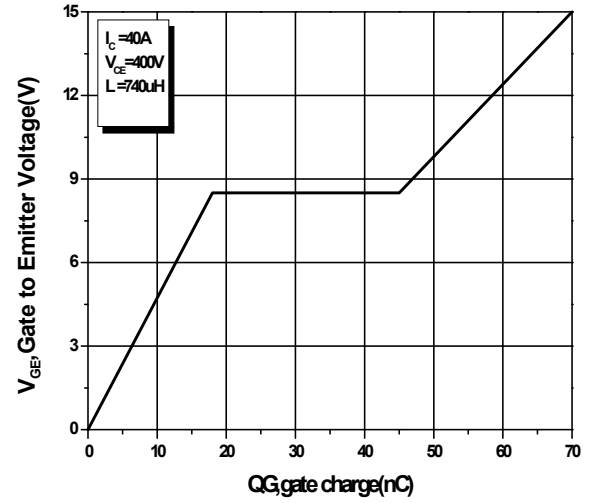


Figure 10: Gate Charge Characteristics

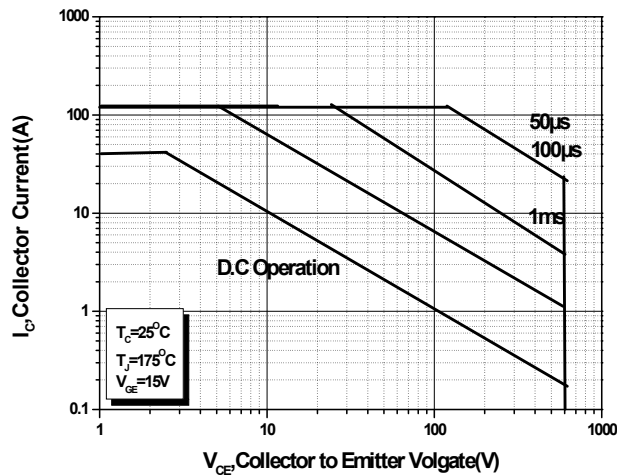


Figure 11: Maximum Forward Biased Safe Operating Area

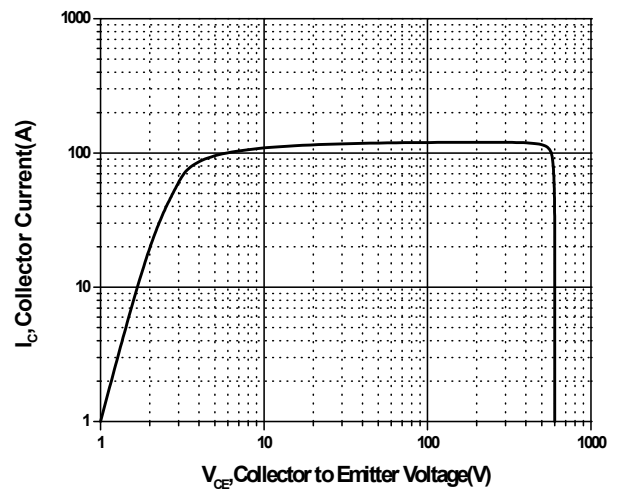


Figure 12: Turn Off Safe Operating Area

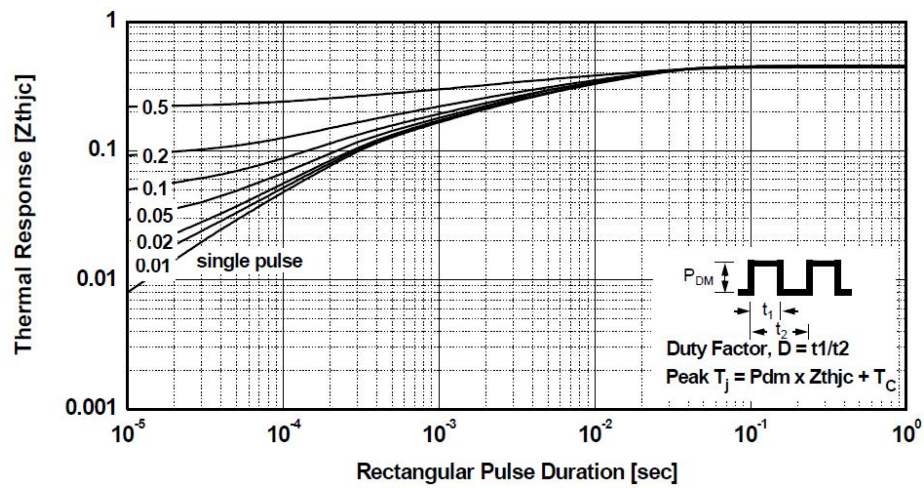
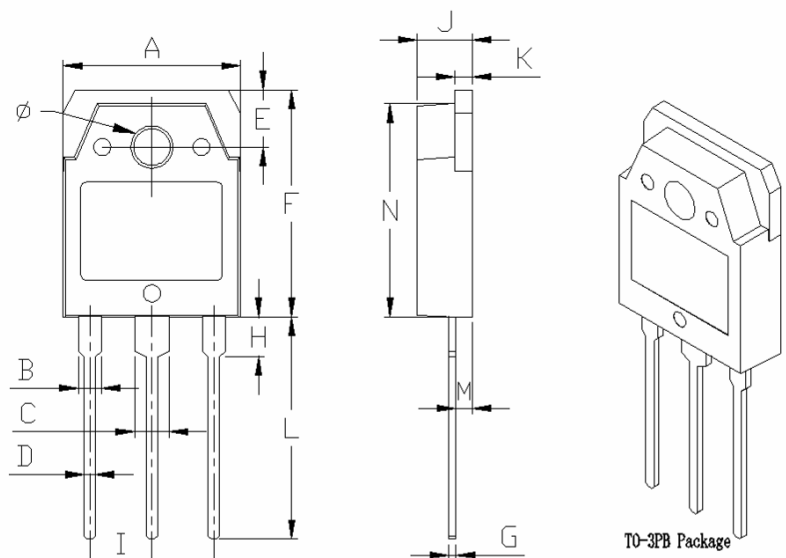


Figure 13: Transient Thermal Impedance of Diode

Mechanical Dimensions

Dim	Millimeters	
	MIN.	MAX.
A	15.50	15.70
B	1.90	2.10
C	2.90	3.10
D	0.90	1.10
E	4.90	5.10
F	19.80	20.00
G	0.55	0.65
H	3.40	3.60
I	5.45 BSC.	
J	4.70	4.9
K	1.45	1.55
L	19.9	20.10
M	1.35	1.5
N	18.6	18.8
Ø	3.20	3.40



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